

Cole County/Jefferson City Hazard Mitigation Plan 2021

Plan updates available online at www.midmorpc.org



Cover Photos (clockwise from upper left across and down):

- Aerial view of Jefferson City apartment complex after the 2019 Tornado (*St Louis Post Dispatch*)
- MODOT clearing road ways in 2020 (*KRMS NEWS ANCHOR*)
- Jefferson City flooded roadways (*41 KSHB Action News*).

The planning process for the update of the Cole County/Jefferson City Hazard Mitigation Plan was led by the Mid-Missouri Regional Plan Commission through a contractual agreement with the MO State Emergency Management Agency and Cole County.

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



FEMA

August 25, 2021

Mr. James Remillard, Director
State Emergency Management Agency
P. O. Box 116
Jefferson City, Missouri 65102

Subject: Review of the Cole County Multi-jurisdiction Hazard Mitigation Plan Update

Dear Mr. Remillard:

The purpose of this letter is to provide the status of the above referenced Local Hazard Mitigation Plan, pursuant to the requirements of 44 CFR Part 201 - Mitigation Planning and the Local Multi-Hazard Mitigation Planning Guidance. The Local Hazard Mitigation Plan Review Tool documents the Region's review and compliance with all required elements of 44 CFR Part 201.6, as well as identifies the jurisdictions participating in the planning process. FEMA's approval will be for a period of five years effective starting with the approval date indicated below.

Prior to the expiration of the plan, the community will be required to review and revise their plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities. After the review or revisions are completed, the plan will need to be resubmitted for approval by FEMA in order to continue to be eligible for mitigation project grant funding.

Plan Name	Date Submitted	Date Approved	Date of Plan Adoption	Date of Plan Expiration	Review Status
Cole County	August 18, 2021	August 25, 2021	December 7, 2020	August 25, 2026	Approved

If you have any questions or concerns, please contact Joe Chandler, Planning Team Lead, at (816) 283-7071.

Sincerely,

CATHERINE R
SANDERS

Catherine R. Sanders, Director
Mitigation Division

Digitally signed by CATHERINE R
SANDERS
Date: 2021.09.10 15:16:48 -05'00'

Cole County Hazard Mitigation Planning Committee

Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Org
Sierra Thomas	Cole Co Emergency Director	EMA	Cole Co EMA
Barry Gipe	Assistant Chief	EMA	Cole Co Emergency
Neil Mohrman	Chief	EMA	Cole Co Emergency
Jan Wyatt	City Clerk	Administration	Russellville
Adam Brown	Chairman	Administration	Village of Centertown
Doug Reece	City Administrator	Administration	St Martins
Carrie Tergin	City Mayor	Administration	Jefferson City
Ann Stratman	Neighborhood Services Specialist	PPS	Jefferson City
Katrina Williams	Planner	CAMPO	Jefferson City
Jim Jones	Superintendent	Administration	Blair Oaks R-II
G Hill	Chief	Police	Lincoln University
Dawn Burrow	Superintendent	Administration	Cole R-V school district
Eric Landwehr	Director	Public Works	Cole Co Road & Bridge
Derek H	Lieutenant	JCPD	Jefferson City Police
Brent Smith	Engineer	Public Works	Jefferson City
John Wheeler	Sheriff	Cole SD	Cole County
Mathew Lindewirth	Chief	EMS	Cole EMS
Debbie Boyce	City Clerk	Administration	Lohman
Perry Gorrell	Superintendent	Administration	Cole R-I
Frank Underwood	Director of Facilities	Administration	Jeff City Public Schools
Shirley Stockman	Clerk	Administration	Wardsville
Ron Walker	Taos Board	Administration	Taos

Stakeholder Representatives

Name	Title	Department	Agency/Organization
Derek H	Lieutenant	JCPD	JCPD
Britt Smith	Operations Director	Public Works	JC Public Works
Erin Vador	Superintendent	JC Diocese	JC Diocese
Karen Crawford	Administrator	Lighthouse Preparatory Academy	Lighthouse Preparatory Academy
Eric Landwehr	Director	Cole County Public works	Cole Co
Brenda Gerlach	Region F		SEMA
Shannon Kliethermes	Senior Planner	Public Works	Cole Co
John Wheeler	Sheriff	Cole County	Cole Co Sheriffs Department
Mike Bock	Director		SSM
Johnathan Johnson	Manager	Operations	CRMC
Matthew Lindewirth	Chief	Cole county	Cole Co EMS
Melissa Stafford	Regional Planner		Mid-MO Regional Planning Commission

The Cole County Hazard Mitigation Plan was developed by the communities and citizens of Cole County, their elected officials, and public servants. The process was carried out by identifying the natural and manmade hazards that impact Cole County and its residents, assessing the probability of occurrence and severity posed by each hazard, identifying the most vulnerable areas, and evaluating all possible mitigation actions which might be effective. Potential mitigation actions were assessed and prioritized based on the perceived need, probable outcome, potential for being executed, and benefit related to cost.

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Executive Summary

Hazard mitigation focuses on anticipating and lowering risks to lives and property. Natural hazards are taking an increasing toll on lives and property in the United States. The number of FEMA declared Presidential Disasters across the nation has increased drastically over the past two decades. The year 2011 (when an EF-5 tornado devastated the Missouri town of Joplin) set a record with 242 disaster declarations. The cost of these disasters has also increased in recent years, in part because of increased population and a larger built environment but also because of the magnitude of many recent disasters. Hazard mitigation, the cornerstone of emergency management, seeks to address these issues.

Hazard mitigation can save lives and property; it also makes good economic sense. A 2005 study conducted by the National Institute of Building Science found that every dollar spent on mitigation activities saves four dollars in post-disaster recovery costs. Hazard mitigation is a good business practice for both the public and private sectors.

The Plan: Cole County and its jurisdictions have had a FEMA approved hazard mitigation plan in place since 2005; the plan, and the mitigation strategy within it, is updated every five years as required by federal law. Starting with the 2016 update and moving forward, the Cole County plan has been enhanced to an All-Hazards Mitigation Plan. In addition to profiling eleven natural hazards, the plan now also profiles ten technological/human-made hazards which are potential threats. A risk assessment is included for each potential hazard.

The risk assessment (Chapter 3) indicates the natural hazards posing the greatest threat to Cole County as a whole are: tornado, severe thunderstorm, severe winter weather, and an earthquake of significant magnitude at the New Madrid Seismic Zone. Flood is of particular concern for the jurisdictions with land near the Missouri River and other river/branch floodplains. Drought is of concern for the rural parts of the County.

The technological/human-made hazards posing the greatest potential threat are a public health emergency, utility service disruption, cyber-attack, armed intruder, cyber-attack, and mass casualty/fatality event. Civil disorder is of particular concern for the jurisdictions of Jefferson City and Lincoln University.

Mitigation Currently in Place: Much progress in mitigation has been made in Cole County since the first plan was written in 2005; many mitigation activities are in place in the regular operations of the county, its communities, educational institutions, and special districts.

2020 Mitigation Strategy: The current mitigation strategy, found in Chapter 4 of the plan, lays out a series of actions to be focused on during the coming five years. Each of the actions has been analyzed as to applicable jurisdiction(s), the agency or department which will lead the effort, and the means of implementing and financing the action. All of these decisions were made by jurisdictional representatives participating as members of the hazard mitigation planning committee.

Not every action in the overall mitigation strategy applies to each jurisdiction. For example, “Maintain formal agreements with appropriate shelter locations throughout Cole County” is an action carried out by the Cole County Emergency Management Agency, working in conjunction with the American Red Cross. Other jurisdictions do not need to do anything with this action, although they do benefit from it. An example of an action applicable to many jurisdictions is “Encourage the construction of tornado safe rooms”; this is an important action which most of the jurisdictions will be undertaking to address their own particular circumstances.

Each participating jurisdiction in the plan has resolved to execute some of the specific actions outlined in the strategy. Chapter 4 of the plan contains a subsection for each participating jurisdiction which outlines the actions for which that jurisdiction is responsible. Government officials can easily find their jurisdiction in Chapter 4 in order to thoroughly familiarize themselves with the tasks ahead.

While it is to be hoped that many of the mitigation actions in the strategy will have been completed before the next five-year update, nothing in the plan is legally binding on the participating jurisdictions.

- Goal 1: Mitigation Planning – Mitigate effects of future natural, man-made, and technological hazards throughout the County through public and private cooperation.
- Goal 2: Mitigation Policy – Develop policies that limit the impact of natural, man-made, and technological hazards on lives and property.
- Goal 3: Mitigation Programs – Implement cost effective and feasible mitigation programs to protect lives and property of Cole County jurisdictions.
- Goal 4: Public Awareness – Increase public awareness of natural, man-made, and technological hazards in order to make the public a greater partner in hazard mitigation planning.
- Goal 5: Future Development – Promote natural, man-made, and technological hazard-proof development in the jurisdictions of Cole County.

Funding and Funding Issues: Some actions in the current mitigation strategy can be put in place given minimal resources and some staff time. However, there are some very important mitigation activities which require major funding. For example, there is a serious lack of tornado safe rooms in the jurisdictions and tornadoes/high winds are one of the greatest threats in the area. More generators and power transfer hookups are also needed to mitigate power outages that often accompany damaging winds or severe winter storms. (Severe winter storms occur almost every year and have been responsible for three Presidential Disaster Declarations since 2006.)

The Federal Emergency Management Agency (FEMA) has both pre-disaster and post-disaster mitigation grant programs to help local jurisdictions with mitigation projects. The jurisdictions

participating in the plan are eligible to apply for funding from these programs; a 25% local match is typically required for the funds received.

Unfortunately, there has been a severe decline in recent years in the amount of pre-disaster federal money available. This creates the unfortunate situation where most federal funding for local mitigation projects becomes available after a disaster has occurred - if a Presidential Disaster Declaration is declared. At that point, 20% of the total federal cost of the disaster is awarded to the state to be used for mitigation projects.

Planning Process: A plan is only as good as the planning process which developed it. A thorough update of the plan was completed with the active participation of representatives from Cole County jurisdictions and utility providers at regularly scheduled meetings over a five-month period. The draft plan was presented at two public meetings of the Cole County Commission, and published on the website of the Mid-MO Regional Planning Commission, to allow for input from the general public. The update was completed with the active participation of 13 jurisdictions in Cole County (the county itself, 7 communities, 4 school districts, and one university).

The active participating jurisdictions:

- Cole Co
- Jefferson City
- Centertown
- Lohman
- Russellville
- Toas
- Wardsville
- St Martins
- Cole R-1 school
- Blair Oaks R-II school
- Cole R-V School
- Jefferson City Public Schools
- Lincoln University

Representatives from these jurisdictions comprised the hazard mitigation planning committee which met for four general sessions. In addition, meetings were held with other established committees in Cole County and with individuals particularly knowledgeable on specific topics.

Jurisdictions that were invited but chose not to participate in this update include:

- Howard County
- Cooper County
- Callaway County
- Boone County
- St Thomas
- Jamestown C-I

The draft plan was presented at one public meeting and published on the website of the Mid-MO Regional Planning Commission, to allow for input from the general public.

The plan will be evaluated and maintained on a yearly basis with the help of the planning committee; the next complete update will be undertaken in five years.

The ultimate test of a plan is the action taken on the roadmap presented. It is to be hoped that many of the mitigation actions in this plan will have been completed before the next five-year update. Action on the strategy in this plan will help to ensure a greater, and more cost-effective, level of protection for the citizens and property of Cole County and its jurisdictions.

The Cole County Hazard Mitigation Plan can be found online at: www.mmrpc.org/reports-library/hazard-mitigation-reports/.

The ultimate test of a plan is the action taken on the roadmap presented. It is to be hoped that many of the mitigation actions in this plan will have been completed before the next five-year update. Action on the strategy in this plan will help to ensure a greater, and more cost-effective, level of protection for the citizens and property of Cole County and its jurisdictions.

The Cole County/Jefferson City Hazard Mitigation Plan can be found online at:

<http://www.mmrpc.org/reports-library/hazard-mitigation-reports/>.

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.

The participating jurisdictions adopted the plan following FEMA's "approval pending adoption". Adoption resolutions and adoption letters (school districts and institutes of higher learning) are included in appendix A.

Chapter 1: Introduction and Planning Process

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Chapter 1: Introduction and Planning Process

1.1 PURPOSE

The Cole County/Jefferson City Natural Hazard Mitigation Plan is designed as a resource for county and municipal governments, residents, developers, organizations, and others interested in controlling the potentially disastrous effects of natural hazards in Cole County. Each year natural hazards take a great toll in the United States. Cole County is not immune; it is subject to numerous natural hazards which can threaten life and property. A well-conceived mitigation strategy, developed through an inclusive and thoughtful planning process, is an important step in protecting citizens and reducing loss.

The Federal Emergency Management Agency (FEMA) defines mitigation as “sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects.” A 2018 study by the Institute for Building Science found that \$6 was saved in post-disaster response and recovery for every \$1 spent on pre-disaster mitigation. The process for declaring Presidential Disasters was established with the passage of the Disaster Relief Act of 1974. In 1988, the Robert T. Stafford Disaster Relief and Emergency Assistance Act created the organizational framework through which funds and assistance would be provided after a Presidential Disaster Declaration; FEMA was designated to coordinate the relief efforts.

In 1993, FEMA created the Mitigation Directorate to oversee hazard mitigation. This established mitigation as the cornerstone of emergency management. The Disaster Mitigation Act of 2000 further defined activities related to disaster relief and mitigation; one of its provisions encourages development of hazard mitigation measures, including land use and construction regulations.

The plan was developed in accordance with FEMA’s Mitigation Planning regulations under Code of Federal Regulations (CFR), Title 44, Part 201.6, *Local Mitigation Plans*. Relevant requirements from CFR §201.6 are highlighted throughout the plan.

Multiple jurisdictions within Cole County participated in the development of this plan. Having a current and approved hazard mitigation plan makes each of the participating jurisdictions eligible to apply for FEMA pre-disaster mitigation grants and the mitigation portion of post-disaster mitigation grants.

1.2 BACKGROUND AND SCOPE

In November 2003, a “current and approved” hazard mitigation plan became a FEMA eligibility requirement for local jurisdictions applying for pre-disaster mitigation grants and the mitigation portion of post-disaster grant funds. Due to this change in FEMA grant requirements, the Missouri State Emergency Management Agency (SEMA) contracted with the Missouri Council of Governments for the Regional Planning Commissions to direct hazard mitigation planning for interested counties within their respective regions. Cole County, a member of the Mid-Missouri Regional Planning Commission (Mid-MO RPC), contracted with the Mid-MO RPC to facilitate the development of a hazard mitigation plan for the county.

The Cole County/Jefferson City Natural Hazard Mitigation Plan 2016 was written to be a working document to guide participating jurisdictions in the county in mitigating potential natural hazards. To this effect, the plan has been publicly available on the website of the Mid-MO RPC (www.mmrpc.org) since it was approved and adopted in 2017.

Maintenance of the Hazard Mitigation Plan 2016-2021

The maintenance plan in the 2016 document calls for an annual monitoring and review of the plan to be facilitated by the Mid-MO RPC. This monitoring and review was carried out in 2020. Representatives from each of the participating jurisdictions and other interested parties were contacted by email to attend a plan monitoring meeting. Eleven representatives attended the meeting; discussion centered around the tornado of 2019, COVID-19, flooding and water run offs throughout the county, installation of any new warning sirens in the County and Jefferson City, and safe rooms that are needed throughout the county.

Following the meeting, a survey was sent out to all participating jurisdictions requesting an update of any progress on the mitigation strategy outlined in the 2016 plan and any other changes in their jurisdiction; response was received from six communities.

Information from the surveys and monitoring meeting, along with updated hazard event data and two updated maps (Fire Stations map and Warning Sirens map), was compiled and added to the plan as an Addendum.

The jurisdictions participating in 2016 plan as well as the 2021 plan update include:

- Cole Co
- Jefferson City
- Russellville
- Taos
- Wardsville
- St Martins
- Cole R-1 school
- Blair Oaks R-II school
- Cole R-V School
- Jefferson City Public Schools
- Lincoln University

The jurisdiction who was invited but did not participate:

- Howard County
- Cooper County
- Callaway County
- Boone County
- St Thomas
- Jamestown C-I

All jurisdiction who participated in the 2016 update chose to participate in the 2021 update. The Village of Centertown and Lohman did not participate in the 2016 update, but did participate in the 2021 update.

Jurisdictions received email notifications of upcoming meetings and their corresponding agendas, along with any “homework” in the form of questionnaires or surveys. Meeting notices were also posted on the RPC website, meeting information was put on the RPC calendar that is emailed to the 6 county RPC region, as well as notices posted to the RPC Facebook page. Phone calls were also made by the planner and the County Office of Emergency Management to encourage participation.

1.3 PLAN ORGANIZATION

The plan is formatted into 5 Chapters with several sub-sections per section. The 2016 plan contained 6 sections. Planning Area Overview and Planning Area Assets and Capabilities were originally separate sections. For this plan the two sections were combined to match the updated outline for the local hazard mitigation plan released by the Missouri State Emergency Management Agency (SEMA) in 2017. The adjusted plan sections include:

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

Table 1.1: Changes Made in Plan Update

Plan Section	Summary of Updates
Chapter 1 – Introduction and Planning Process	Updated members of the Mitigation Planning Committee (MPC) Updated chapter format
Chapter 2 – Planning Area Profile and Capabilities	Updated chapter format
Chapter 3 – Risk Assessment	Combined Extreme Heat and cold into one hazard: extreme temperatures Updated chapter format

Chapter 4 – Mitigation Strategy	Updated chapter format Changed action worksheet layout/info
Chapter 5 – Plan Implementation and Maintenance	Updated chapter format Added planning mechanisms for hazard mitigation

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.

A Hazard Mitigation Plan must be updated and adopted by the participating jurisdictions every five years to be considered current. The update of the Cole County Hazard Mitigation Plan was directed by the emergency management planner from Mid-MO RPC (Melissa Stafford) as specified in a Memorandum of Agreement (MOA) with the Missouri State Emergency Management Agency (SEMA). The roll of Mid-MO RPC in the planning process is to:

- Assist in establishing a Mitigation Planning Committee (MPC) as defined by the Disaster Mitigation Act (DMA),
- Organize Planning Committee Meetings locations and times
- 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 update process consisted of 3 planning committee meetings over the update period. Meeting announcements and sign-in sheets are included in Appendix B.

All hazard mitigation planning meetings were open to the public and public notice was provided in accordance with Missouri’s “Sunshine Law” (Revised Statutes of Missouri 610.010, 610.020, 610.023, and 610.024.) Notice of each meeting was posted at the Mid-MO RPC in Ashland, and on the website of the Mid-MO RPC (www.mmrpc.org).

Table 1.2: Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Org
Sierra Thomas	Cole Co Emergency Director	EMA	Cole Co EMA
Barry Gipe	Assistant Chief	EMA	Cole Co Emergency
Neil Mohrman	Chief	EMA	Cole Co Emergency
Jan Wyatt	City Clerk	Administration	Russellville
Adam Brown	Chairman	Administration	Village of Centertown
Doug Reece	City Administrator	Administration	St Martins
Carrie Tergin	City Mayor	Administration	Jefferson City
Ann Stratman	Neighborhood Services Specialist	PPS	Jefferson City
Katrina Williams	Planner	CAMPO	Jefferson City
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Debbie Boyce	City Clerk	Administration	Lohman
Perry Gorrell	Superintendent	Administration	Cole R-I
Frank Underwood	Director of Facilities	Administration	Jeff City Public Schools
Shirley Stockman	Clerk	Administration	Wardsville
Ron Walker	Taos Board	Administration	Taos

Table 1.3 Stakeholder Representatives

Name	Title	Department	Agency/Organization
Derek H	Lieutenant	JCPD	JCPD
Britt Smith	Operations Director	Public Works	JC Public Works
Erin Vador	Superintendent	JC Diocese	JC Diocese
Karen Crawford	Administrator	Lighthouse Preparatory Academy	Lighthouse Preparatory Academy
Eric Landwehr	Director	Cole County Public works	Cole Co
Brenda Gerlach	Region F		SEMA
Shannon Kliethermes	Senior Planner	Public Works	Cole Co
John Wheeler	Sheriff	Cole County	Cole Co Sheriffs Department
Mike Bock	Director		SSM
Johnathan Johnson	Manager	Operations	CRMC
Matthew Lindewirth	Chief	Cole county	Cole Co EMS
Melissa Stafford	Regional Planner		Mid-MO Regional Planning Commission

Table 1.4 MPC Capability with Six Mitigation Categories

Community Department/Office	Prevention	Structure and Infrastructure Projects		Natural Systems Protection	Education and Awareness Programs	Emergency Services
		Property Protection	Structural Flood Control Projects			
Cole County EOC	X				X	X

Centertown	X	X	X		X	X
Jefferson City	X	X	X		X	X
Lohman	X	X	X		X	X
Russellville	X	X	X		X	X
St Martins	X	X	X		X	X
Taos	X	X	X		X	X
Wardsville	X	X	X		X	X
Blair Oaks SD	X				X	
Cole R-1 SD	X				X	
Cole R-V SD	X				X	
Jefferson City PSD	X				X	
Lincoln University	X				X	X
Lighthouse Prep	X				X	
JC Diocese	X				X	
SSM	X				X	X
Capital Region Medical	X				X	X
SEMA	X	X	X	X	X	X
United Way	X				X	X

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.

Multiple jurisdictions within Cole County participated in the development of this plan. Having a current and approved hazard mitigation plan is a prerequisite for participating jurisdictions to be eligible to apply for FEMA pre-disaster mitigation grants and the mitigation portion of post disaster mitigation grants. Invitations to participate in the development of the plan were sent to commissioners, incorporated community leaders, public schools and colleges, special districts, and various other stakeholders multiple times throughout the update to encourage participation in some manner. Each jurisdiction who participated will have to adopt the updated plan.

- Participation in at least one meeting was required via in person or phone (group/individual meeting). Representatives from Cole Co, Jefferson City, Lohman, Russellville, St Martins, Taos, Wardsville, Centertown, Public Works, Russellville Cole R-I, Blair Oaks, Eugene Cole R-V, Jefferson City Public Schools, and Lincoln University participated through phone meetings and emails with the planner and provided feedback through the questionnaire. Meeting participation could be in-person or by proxy.
- Each participating jurisdiction must provide sufficient information to support plan development by completion and return of surveys.
- Provide documentation to show time donated to the planning effort

- All participants have formally adopted the mitigation plan prior to submittal to SEMA and FEMA for final approval.

Table 1.5 Jurisdictional Participation in Planning Process

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Phone/Email	Data Collection Questionnaire	Update/Develop Mitigation Actions
Cole County	x	x	x		X	X
Centertown	x	x	x		X	X
Jefferson City	x	x	x		X	X
Lohman				X	X	X
Russellville	x	x	x		X	X
St. Martins	x	x	x		X	X
Taos				x	X	X
Wardsville				x	X	X
Blair Oaks R-II	x	x			X	X
Cole Co. R-I	x			X	X	X
Cole Co. R-V			x		X	X
Jefferson City Public SD			x		X	X
Lincoln University			x		X	X

1.4.2 The Planning Steps

Surveys and questionnaires were important in getting first-hand information from jurisdictions. One-on-one time, public meetings, and many emails produced a wealth of information taken into the plan. Other resources used to update the plan include the following:

- FEMA’s Local Mitigation Planning Handbook (March 2013), Local Mitigation Plan Review Guide (October 1, 2012), and Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013).
- Tools provided by SEMA, we tested the validity of the plan and made revisions as needed.
- 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, and Flood Mitigation Assistance Program as well as qualify for points under Activity 510 for Mitigation Plans, under the Community Rating System.

Table 1.6 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

Contact lists were made for past participating jurisdictions as well as neighboring communities to Cole, and email notices were directly sent out to all jurisdictions and special districts in Cole County making sure to update contacts for positions who may have changed personnel. The notice consisted of a meeting announcement and short summary of what the meeting would be covering and its importance.

A kick-off meeting was hosted September 9, 2020 at Cole County Fire District #4 building with teleconferencing available. The foundation topic of this meeting was to outline the process of the hazard mitigation plan update and its importance. Surveys were passed out to each jurisdiction in attendance to identify what data the participants could provide. This meeting also served as an introduction to the types of hazards that would be included in the plan. Those in attendance were asked to sign in. Documentation can be found in the following appendices. They were instructed to either email the finished surveys to the lead planner or they had the option to return them in person at the next scheduled meeting. The date for the next meeting was set before everyone left the current meeting.

Meeting 2 took place on October 7, 2020 at the Cole County Fire District #4 building with teleconferencing available. Anyone who wasn't at the first meeting was given a survey to fill out for their jurisdiction. Anyone done with their survey had the opportunity to turn it in if they had not emailed it prior to the meeting. Goals of the plan were sent out and discussed. Any suggested updates were instructed to be brought forth by the next meeting. Mitigation actions were reviewed and attendees instructed to update their list by the next meeting.

Meeting 3 took place November 18, 2020 at the Cole County Fire District #4 building with teleconferencing available. New mitigation action items were discussed and questions answered. Plan Goals were reviewed and finalized. Discussion on pandemic and gaps were noted.

Table 1.7: Schedule of MPC Meetings

Meeting	Topic	Date
Kick-Off Meeting	<ul style="list-style-type: none">• Importance of Hazard Mitigation Planning• Why the Plan needs updated and what is included• Planning process• How to Participate• Handed out questionnaires	9/9/2020
Meeting #2	<ul style="list-style-type: none">• Return questionnaires• Discussed questions about the questionnaire• Discussed Risk Assessments	10/7/2020
Meeting #3	<ul style="list-style-type: none">• Presentation on climate change and adaptation• How in-kind match works	11/18/2020

Step 2. Public Involvement

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.

Each of the 3 meetings of the MPC were open to the public. It was advertised through the Mid-MO RPC (www.mmrpc.org) website, posted at the office, and included on the RPC Facebook page. The draft is available at the Mid-MO RPC website for anyone to review. Comments can be taken through email, phone, or in-person at the office. Individual invites and meeting notices were emailed to each jurisdiction for participation. Jurisdictions that did not show up or return email contact after the second meeting were called directly and educated on the importance of their participation. Anyone who did not come in-person to a meeting was emailed a survey to fill out for their jurisdiction. No public comments were received during the planning process. The needs and concerns of the public were considered based on the feedback given by jurisdictional representatives and their knowledge and interaction with the public outside the planning process.

Step 3. Coordinate with other Departments and Agencies and Incorporate Existing Information

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.

Participants from all incorporated cities, towns, and villages were invited to every meeting, along with all school districts and colleges. Other invitees were emergency response agencies, county offices, etc. Once a draft of the plan was complete it was posted to the Mid-MO RPC website for review by all interested parties. Invitations were sent by email and notices were published to the RPC Facebook page and a calendar with meetings shared via email to jurisdictions and stakeholders throughout the 6 county RPC region.

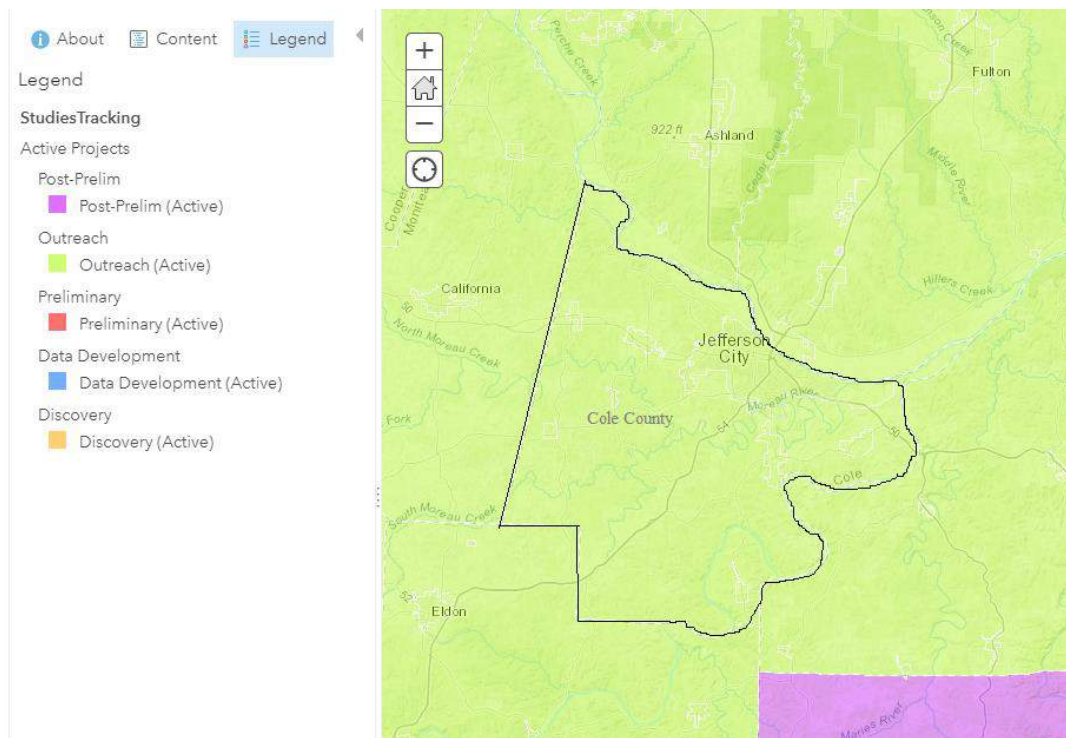
Table 1.8: Invited Stakeholders

Stakeholder/Jurisdiction	Position/Department
JC Diocese	Manager
Lighthouse Prep Academy	Superintendent
SEMA	Region F
SSM Health	Manager
Capital Region Medical	Manager
Howard County	Presiding Commissioner
Cooper County	Presiding Commissioner
Moniteau County	Presiding Commissioner
Callaway County	Presiding Commissioner
Boone County	Presiding Commissioner

Coordination with FEMA Risk MAP Project

Figure 1.1 shows the status of Risk Mapping in Cole County. Currently there shows a portion of the south-east side of Cole as in “Discover”. The northern boundary of Cole County is edged by the Missouri River which is prone to flooding. The risks of this will be more clearly defined in Section 3: Risk Assessment.

Figure 1.1 FEMA Risk Studies Tracker



Source: FEMA Mapping Information Studies Tracker

Integration of other data, reports, studies, and plans

Many existing plans, studies, and reports were consulted in the development of this plan. These include:

- *2008 Bagnell Dam Emergency Action Plan – Osage Project No. 459, Ameren UE*
- *2045 Metropolitan Transportation Plan, Capital Area Metropolitan Planning Organization (CAMPO)*
- *A Study of Active Shooter Incidents in the United States Between 2000 and 2013, Federal Bureau of Investigation*
- *Atlas of Missouri Ecoregions, Missouri Department of Conservation*
- *Communicating Before and After a Nuclear Power Plant Incident (June 2013), FEMA*
- *Cole County/City of Jefferson Emergency Operations Plan (2015)*
- *Cole County Master Plan, The*
- *Comprehensive Economic Development Strategy for the Mid-MO Region (2009), Mid-MO Regional Planning Commission*
- *Jefferson City Comprehensive Plan, The*
- *Lincoln University Emergency Operations Plan (2008)*
- *Missouri – Region F Regional Communication Interoperability Plan (R-CIP)(2015)*
- *Missouri State Hazard Mitigation Plan (2018), Missouri State Emergency Management Agency (SEMA)*

- *Missouri Weather Patterns and Their Impact on Agriculture*, Grant L. Darkow, University Extension, University of Missouri-Columbia
- *National Climate Assessment 2014*, U.S. Global Change Research Program (GlobalChange.gov)
- *Regional Transportation Plan (2016)*, Mid-MO Regional Planning Commission
- Situation Reports (online), Missouri SEMA
- *Telecommunications Infrastructure in Disasters: Preparing Cities for Crisis Communications (April 2005)*, Center for Catastrophe Preparedness and Response & Robert F. Wagner Graduate School of Public Service, New York University
- *Flood Insurance Rate Maps (FIRMs)*
- *State Department of Natural Resources (DNR) dam information*
- *The National Inventory of Dams*
- *United States Department of Agriculture – Census of Agriculture*
- *Corp of Engineers – National Levee Database*

Step 4: Assess the Hazard

Risk Assessment surveys were compiled and discussed during meeting #2. The risk of hazards were based on previous disasters, hazards that were identified in the State Hazard Mitigation Plan, previous disaster declarations, and hazards from the previously approved hazard mitigation plan. During the review by the MPC hazards were prioritized by their likelihood and severity of impacts by each jurisdiction, then totaled to rate each hazard on a whole. Additional details about the individual hazards can be found in the chapter on Risk Assessment.

Step 5: Assess the Problem

Assets for each jurisdiction were identified through the use of HAZUS, the data questionnaire, and Census. Losses were estimated by utilizing the HAZUS database and the 2018 State Hazard Mitigation Plan when needed.

Step 6: Set Goals

The goals set in the previous plan update were carried over for this plan. It was felt that the current set of goals were still relevant and necessary, when the Mitigation Actions List was discussed and updated. Those goals summarized are:

- Goal 1: Mitigation Planning – Mitigate effects of future natural, man-made, and technological hazards throughout the County through public and private cooperation.
- Goal 2: Mitigation Policy – Develop policies that limit the impact of natural, man-made, and technological hazards on lives and property.
- Goal 3: Mitigation Programs – Implement cost effective and feasible mitigation programs

to protect lives and property of Cole County jurisdictions.

- Goal 4: Public Awareness – Increase public awareness of natural, man-made, and technological hazards in order to make the public a greater partner in hazard mitigation planning.
- Goal 5: Future Development – Promote natural, man-made, and technological hazard-proof development in the jurisdictions of Cole County.

Step 7: Review Possible Mitigation Actions and Activities

Mitigation Actions were discussed. Each action from the last update was reviewed and updated individually by the MPC. A link to the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* was provided prior to first meeting with the questionnaire to give everyone projects to think about for their jurisdiction. A focus for the MPC was the addition of safe rooms in schools and public places and additional sirens that may be needed to the Mitigation Action Plan across the county.

Step 8: Draft an Action Plan

Based on the response from the final MPC meeting an Action Plan was formed from any on-going and remaining actions identified as well as actions added to the list. Possible grant opportunities to assist in achieving the set goals and actions were also discussed at throughout the meetings. On-going efforts and mitigation achievements through projects and policy is a priority for stakeholders.

Step 9: Adopt the Plan

Throughout the whole update process it was reiterated in word and text that in order for participation in the plan to count a jurisdiction must participate by attending at least one meeting or returning the survey/questionnaire, and lastly by signing an adoption resolution of the plan that can be included in the draft to SEMA.

Step 10: Implement, Evaluate, and Revise the Plan

Plan implementation was discussed at the final meeting while discussing grant and partnership opportunities to move the actions on the mitigation list along. Future revisions will be discussed in more detail one-on-one with the participating jurisdictions. Further details regarding implementation, monitoring and maintenance can be found in chapter 5, Plan Maintenance Process.

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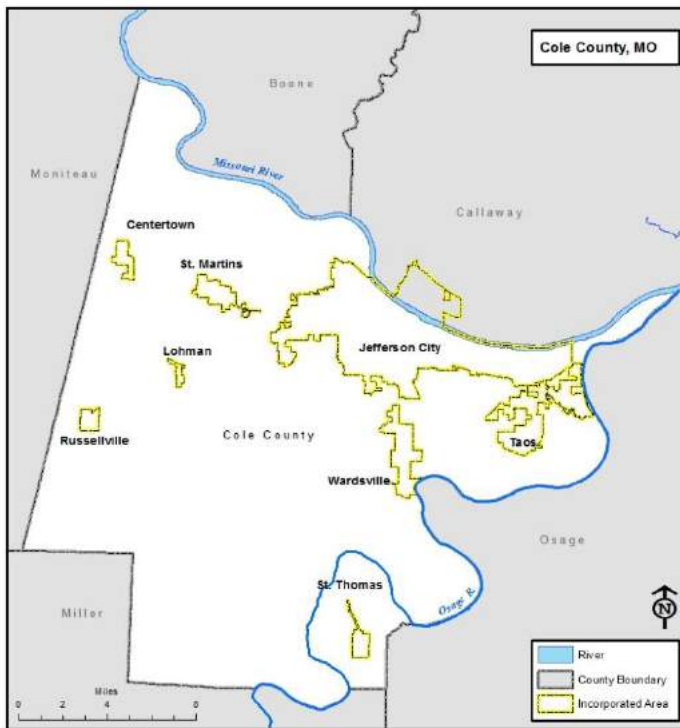
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Chapter 2: Planning Area Profile

2.1 COLE COUNTY PLANNING AREA PROFILE

Cole County is located in central Missouri with an area covering 391 square miles. It is approximately midway between Kansas City to the west and St. Louis to the east. Jefferson City is the county seat and largest population center; it is also the capital of the State of Missouri. The incorporated communities in the county are: Centertown, Jefferson City, Lohman, Russellville, St. Martins, St. Thomas, Taos and Wardsville (Map 2.1).

Map 2.1



The 2010 Census indicated an overall population increase in Cole County of 7% with an overall increase of 12% in housing units. The strongest growth was in Wardsville which saw over 50% increase in population and housing. American Community Survey (ACS) 5-year estimates the county to have a total of 76,745 people with growth overall for the county but at much lower rates than expected for some communities like Wardsville and Taos. The county’s growth change of 0.77% is below Missouri’s estimated increase of 2.7% and both are below the national increase of 6.3%.

2019 ACS estimates that the median household income for Cole county to be \$57,587 which is up 6.22% from the year before and slightly higher than the state median household income of only \$51,542, but is behind the National average of \$68,703.

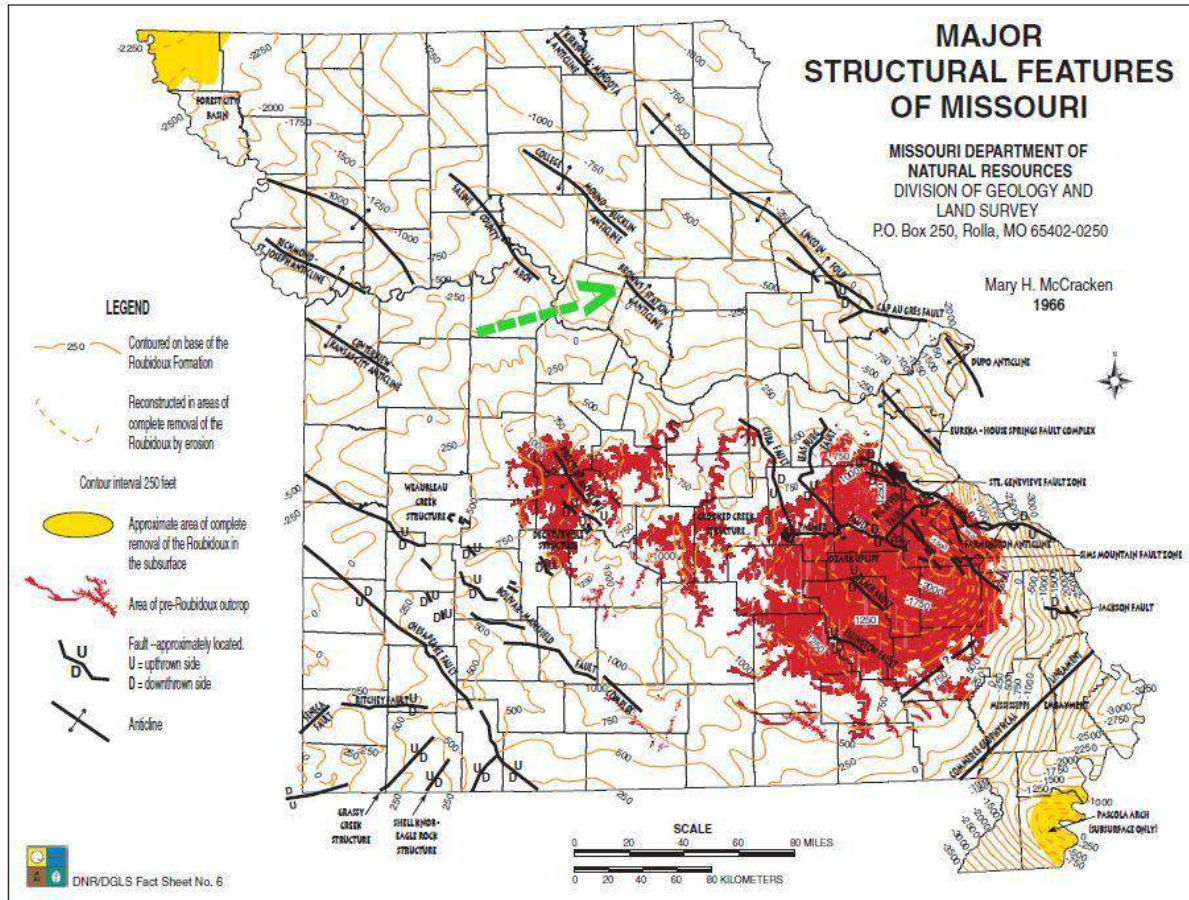
Median home prices in Cole County are estimated around \$162,300 which is a 19% increase from 2010 when it was \$136,300. This increase in median home price is mirrored by increases on both the state and

national level, but prices in Cole County still fall short of the state median of \$185,247 and the national price of \$239,100.

2.1.1 Geography, Geology, and Topography

Geologically, Cole County has been shaped primarily by the Ozark Uplift in the southeastern part of the state. This geology has implications for the hazards analyzed in this plan. Of particular concern is possible activity in the New Madrid Seismic Zone (NMSZ) to the southeast (Map 2.2).

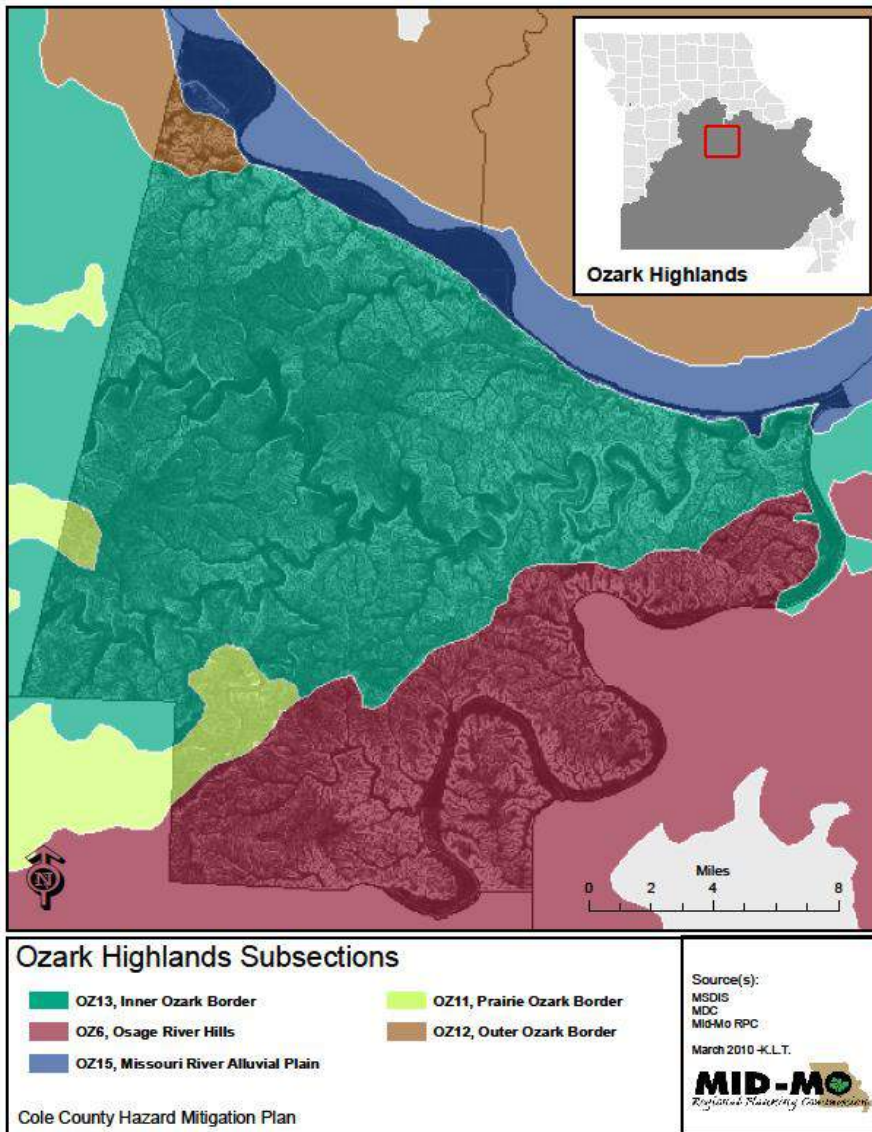
Map 2.2



The county is bordered on the north by the Missouri River, which separates it from Boone and Callaway counties, on the east by the Osage River which separates it from Osage County, on the south by Miller County, and on the west by Moniteau County.

The county is located in the northern part of the Ozark Highlands. The *Atlas of Missouri Ecoregions*, published by the Missouri Department of Conservation, describes the Ozark Highlands as “a distinctive biogeographic region that includes most of southern Missouri and much of northern Arkansas and small parts of Illinois, Oklahoma, and Kansas. Geologically, the Ozark Highlands is a low structural dome of essentially horizontally bedded strata that has been undergoing erosion and weathering for a quarter billion years into a thoroughly dissected plateau”.

Map 2.3



The Ozark Highlands is very diverse biologically and geographically with rugged hills, prairies, savannas, and open woodlands. The predominant underlying bedrock is carbonate (limestone and dolomite), giving rise to karst topographic features such as caves, underground streams, and sinkholes. Natural springs provide an abundance of fresh water in many areas.

The land area of Cole County falls into five different subsections of the Ozark Highlands distinguished by differing landforms, soils, and vegetation (Map 2.3). In turn, these subsections give rise to differences in land use patterns, conservation needs, and vulnerability to certain natural hazards.

The following information summarized from the *Atlas of Missouri Ecoregions* gives brief descriptions of the land types found within the subsections in Cole County.

Inner Ozark Border

This subsection includes most of the northern, western, and central parts of the county. It consists of dissected plains and hills with local reliefs averaging 100-150 feet. It encompasses the area of both branches of the Moreau River. Historically, the area was largely oak savanna, woodland, and forest with frequent glades and small prairie openings. Currently, the area consists of row crops, pasture, second growth forests, and overgrown glades. Urbanization pressures are strong in the Jefferson City area.

Osage River Hills

This subsection includes the eastern and southern portions of the county. This area lies within the Osage River watershed and is characterized by deeply dissected hills with local reliefs averaging 200-250 feet. High bluffs afford scenic views of the Osage River. Historically, oak woodland was dominant in the area with mixed-oak and mix-hardwood on rougher sites. The area is currently comprised of pastures, small isolated woodlots, cedar thickets, and second-growth forests.

Prairie Ozark Border

Fingers of the eastern part of this subsection extend into the western part of Cole County in two locations. This subsection is a high, smooth plain with less than 100 feet of local relief. The underlying strata are limestone and dolomite and the area is blanketed with loess. This area is transitional between the wooded hills of the Ozarks and the open plains to the west; historically, it was mostly prairie with trees alongside streams. Currently, the land is mostly pasture with some significant tracts of cropland.

Outer Ozark Border

A small tongue of this subsection extends into the far northwestern part of Cole County. This area is steep loess-covered hills and bluffs along the Missouri River. The underlying strata are limestone and dolomite. This area is the most rugged bluff land on the southern side of the Missouri River west of the Osage River. Prior to European settlement, oak savanna and woodlands dominated the higher areas and dense oak and mixed-hardwoods were found in the steep-sided limestone ravines. Currently, the uplands are primarily fescue pasture and the ravines are second-growth forests and cedar thickets.

Missouri River Alluvial Plain

This subsection, consisting of the Missouri River channel and its adjoining alluvial plain, is found along the northern border of the county. Soils are deep and loamy and the area is subject to riverine flooding. Historically, the vegetation was typical bottomland species such as cottonwood, willow, sycamore, silver maple, elm, and hackberry.

The Missouri River's relationship to Cole County deserves special attention because the river is the defining physical feature in Mid-Missouri and it defines the northern border of the county. It is the longest river in the country and drains approximately one sixth of the United States.

Flood control structures, power plants, and other engineering projects have profoundly changed the course of the river since Lewis and Clark first traversed it in the early 1800s. In recent years debates over the future of the Missouri River have taken place among the seven states through which it runs. Commercial river traffic, recreational use, environmental concerns, managing river levels to comply with the needs of endangered species, and the preservation of sacred and historical sites along the river and floodplain are all issues which make the management of the river a sensitive balancing act.

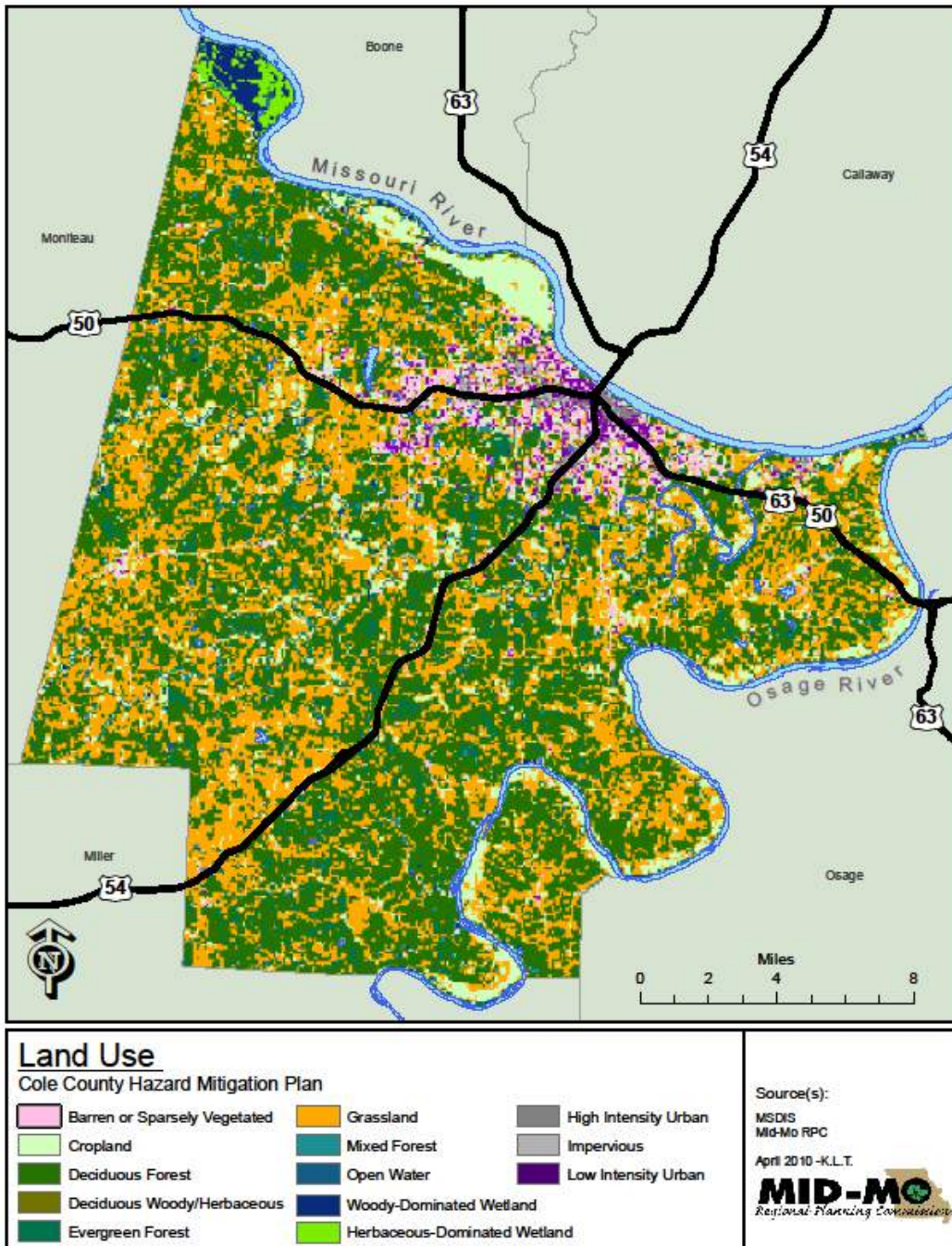
In both 1994 and 1995 the Missouri River was listed as one of the "10 Most Endangered Rivers in the Country" by American Rivers, a river conservation group (<http://www.americanrivers.org/>). This "Most Endangered" list does not reflect rivers in the worst condition; rather, it seeks to highlight rivers "confronted by decisions in the coming year that could determine their future." The Missouri River was chosen for the list in the mid-1990s because of dam, channelization, navigation, and agricultural runoff issues.

The flooding of the river in 2011 brought the controversy over its management into sharp focus. Record snowfalls in the Rockies combined with heavy spring rains to result in record water releases from six reservoirs on the river. Flooding occurred along the river from Montana to Missouri. The U.S. Army Corps of Engineers came under sharp criticism for not releasing water earlier in the season so the reservoirs would be able to accommodate the snow melt and rains. Meetings were held throughout the Missouri River Basin where local frustration was voiced over species protection and recreation being prioritized over flood control in river management decisions.

2.1.2 Current Land Use

The land use map of Cole County shows clearly the concentrated development in and around Jefferson City in the northern part of the County (Map 2.4).

Map 2.4



2.1.3 CLIMATE

Cole County, like the rest of the state of Missouri, has variable weather patterns and extremes of temperature. With its central continental location, Missouri receives air masses bringing weather from all directions.

Warm humid air from the Gulf of Mexico can bring moisture year round and is the principal source of precipitation in the spring, summer, and fall; in contrast, air from other directions may be hot and dry (southwest), warm and dry (west), cold (northwest and north), cool and moist (northeast). The flow from the different source regions typically changes in a matter of days, giving rise to the commonly heard expression in Missouri, “If you don’t like the weather, wait a day.”

At times, the flow of air from one of the source regions will settle in and persist for weeks or months. These periods are associated with particular upper air flow patterns and associated surface conditions.

The Missouri State Hazard Mitigation Plan quotes Dr. Grant Darkow of the University of Missouri - Department of Atmospheric Science on the importance of understanding these weather patterns:

“The persistence of these weather patterns and the possible resulting condition is the subject of several of the natural disasters discussed in this study. Specifically, floods, droughts, fires, heat waves, severe cold, and winter storms can be the result of the persistence of one of these weather patterns, whereas tornadoes can represent the outgrowth of rapid shifts in weather patterns. Knowing these patterns may assist in alerting disaster planners and the general public to the possibility of a developing emergency situation.”

While Cole County does have extreme variations in weather at times, there is a relative pattern of temperature and rainfall consistent with a humid continental climate (Figures 2.1-2.2). The data shown in the charts was collected at the Missouri American Water Plant weather station in Jefferson City. The rainfall data collected in the years 1931-1995 showed an average of 39” of rainfall per year; average rainfall in this data set is defined as including precipitation of any form. May tends to be the wetter month for the state averaging over 5 inches of precipitation for the month.

The average January minimum temperature was 30.4°F and the average July maximum temperature was 78.2°F.

Figure 2.1

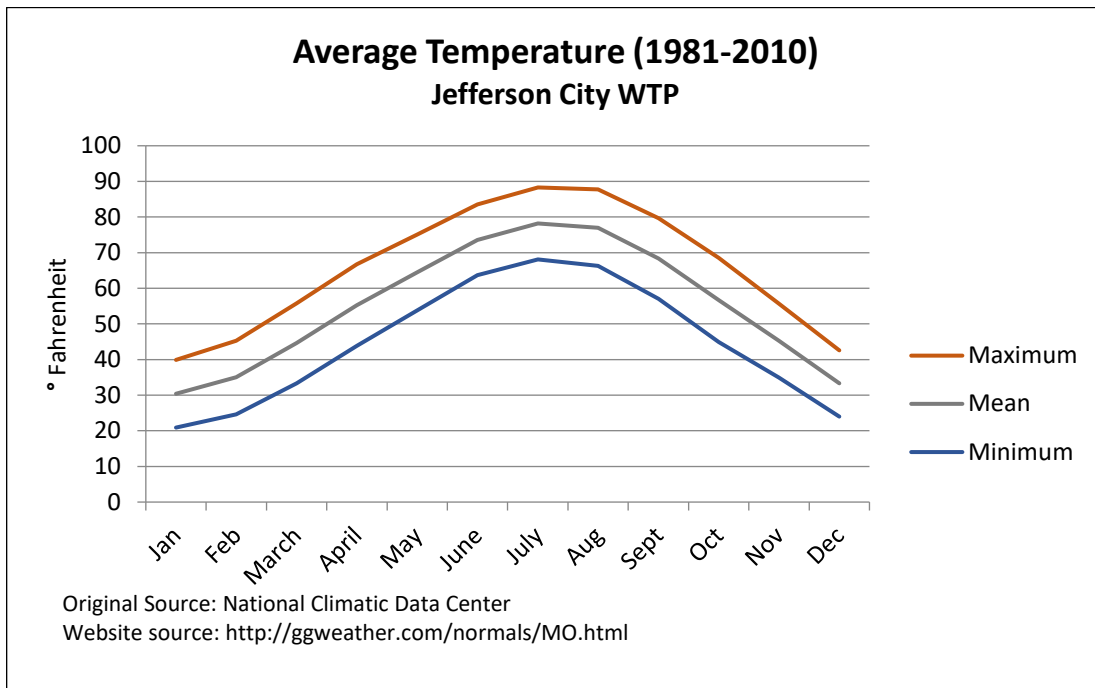
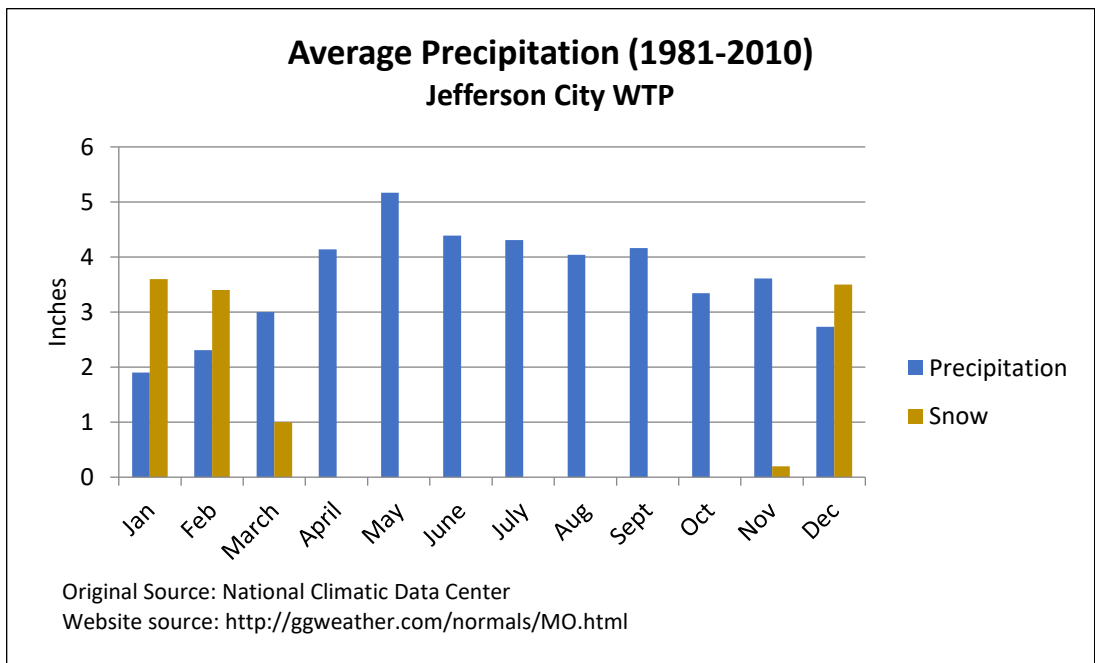


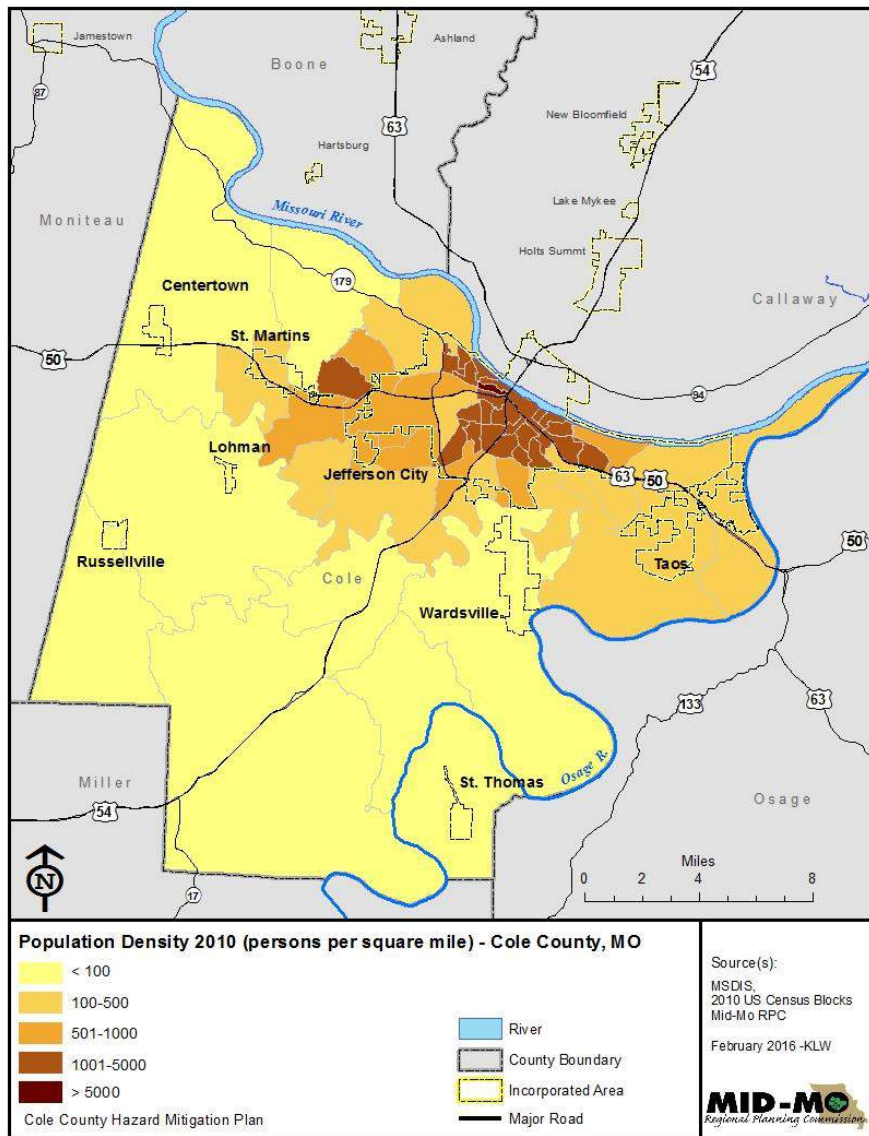
Figure 2.2



2.1.4 POPULATION/DEMOGRAPHICS

A mapping of Cole County’s population (2010 Census) by block group clearly shows that the highest population density is in the northern part of the county (Map 2.5).

Map 2.5



The 2010 Census indicated an overall population increase in Cole County of 7% from 2000 with an overall increase of 12%. 2019 ACS estimates anticipate growth for the county overall but not at the previous rate. The strongest growth was in 2010 was in Wardsville which saw over 50% increase in both population and housing. Estimates expect Wardsville to continue to grow but gives Taos an edge in growth with 53.64% of growth between 2010 and 2019.

Table 2.1 Cole County Population 2000-2010 by Jurisdiction

Jurisdiction	2000 Population	2010 Population	2019 Annual Population Estimate or ACS Population	# Change (2010-2019)	% Change (2010-2019)
Unincorporated Cole	27,422	28,066	28,086	20	0.07%
Centertown	257	278	318	40	14.39%
Jefferson City	39,636	43,057	42,919	-138	-0.32%
Lohman	168	163	166	3	1.8%
Russellville	758	807	793	-14	-1.73%
St. Martins	1,023	1,140	1,159	19	1.67%
St. Thomas	287	263	243	-20	-7.6%
Taos	870	878	1,349	471	53.64%
Wardsville	976	1,506	1,878	372	24.7%
Total	71,397	76,158	76,911	587	0.77%

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

The sizeable increase in population in Taos could be due to the city having annexed extensive areas of unincorporated Cole County since the Census data was collected. Some smaller jurisdictions outside of the major employment areas have shown estimated decreases in population. The small town of St. Thomas is estimated to lose over 7% of its population. This can be due to low housing inventory, people relocating to larger communities for jobs, and lack of amenities such as broadband access for school and jobs.

Some sectors of the population are more vulnerable in general to the threat of hazardous events. Children need the help and guidance of adults, especially in extraordinary circumstances, and this is also true for some older citizens. An estimated 6% of Cole county is assumed to be under the age of 5, which is in line with state and national percentages for that age bracket. 16% are estimated to be over the age of 65, which also falls in line with the state and national percentages of 15.5% and 15% respectively for that age range.

Table 2.2 Unemployment, Poverty, Education, and Language Percentage Demographics, Cole County, Missouri

Jurisdiction	Total in Labor Force	Percent of Population Unemployed	Percent of Families Below the Poverty Level	Percentage of Population (High School graduate)	Percentage of Population (Bachelor's degree or higher)	Percentage of population with spoken language other than English
Cole County	37,322	3.6%	10.3%	14.13%	18.19%	1.5%
Centertown	173	3.4%	16.4%	22.3%	11.3%	0.8%
Jefferson City	19,931	3.4%	12.9%	13.57%	17%	4.5%
Lohman	96	2.1%	9.7%	44.4%	21.4%	1.1%
Russellville	408	8.4%	13.9%	15.13%	11%	0.8%
St. Martins	626	3.2%	10%	18.98%	17.16%	0.6%
St. Thomas	133	0%	1.6%	15.6%	19.75%	2.6%
Taos	702	1.1%	2.4%	16.45%	19.57%	1.2%
Wardsville	1,015	1%	1.4%	11.9%	23.26%	0%

Source: U.S. Census, 2019 American Community Survey, 5-year Estimates

2.1.5 HISTORY

Cole County was originally home to the Osage and other groups of indigenous people. White settlers from Kentucky and Tennessee began settling in the area around 1816; the county was officially organized in 1820.

After Missouri was admitted into the United States in 1821, the General Assembly appointed a commission to decide on the permanent location of the state capital. The statute appointing the commission stipulated that the capital was to be on the Missouri River within forty miles of the mouth of the Osage River. The site of present day Jefferson City was eventually chosen as the site; lots were laid out for the town by Daniel Morgan Boone, son of the famous frontiersman, and Major Elias Bancroft. In 1826, Jefferson City was officially designated as the permanent seat of state government and the first capitol building was completed. All the workings of state government, including the Great Seal, were moved from the temporary capital in St. Charles to Jefferson City.

Prior to this there were very few people living in Jefferson City; after 1826, the population began to increase rapidly. In 1837, the capitol building burned; work on a new capitol began the next year using stone from the Missouri River bluffs near the city for the building and limestone from Callaway County for the pillars.

As the state of Missouri grew, so did Cole County; with the capital city located within its boundaries, the county has played a central role in Missouri ever since statehood.

2.1.6 OCCUPATIONS

Cole County is within the designated Jefferson City, Mo Metropolitan Statistical Area (MSA), according to the U.S. Census Bureau. MSAs are geographic entities defined by the U.S. Office of Management and Budget (OMB) for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. An MSA consists of a core urban area of 50,000 or more population, the county or counties containing the core urban area, and adjacent counties which have a high degree of social and economic integration with the urban core (as measured by commuting to work).

Jefferson City is the urban core for the MSA which includes Cole County and neighboring Callaway, Moniteau, and Osage Counties. The MSA designation is indicative of growth in Jefferson City area; prior to the year 2000, the core area's population was below 50,000.

Due to the location of the state capital in Jefferson City, Cole County has jobs that are often more lucrative than those found in the surrounding counties. The county benefits from a highly educated and diversified workforce. Additionally, the workforce tends to be in stable, higher income industries such as government, education, and mid-management. The major employers are shown in:

Table 2.3 Occupation Statistics, Cole County, Missouri

Place	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Cole County	14,880	5,947	8,525	3,054	5,192
Centertown	32	35	37	42	27
Jefferson City	7,748	3,682	4,383	1,142	3,076
Lohman	24	27	26	9	7
Russellville	110	82	90	59	72
St. Martins	229	116	144	45	92
St. Thomas	50	16	41	15	11
Taos	247	135	196	61	76
Wardsville	405	112	280	73	148

Source: U.S. Census, 2019 American Community Survey, 5-year Estimates.

2.1.7 AGRICULTURE

Agriculture is an important part of the economy of the planning area. There are 185,607 acres in farmland in the county according to the 2017 Census of Agriculture from the U.S. Department of Agriculture (USDA); this is up from 176,306 acres in 2012 (Table 2.4). Farmland comprises over 70.4% of the land area of the county. Of the total farmland, 70,467 acres are cropland and 57,660 of these acres were harvested in 2017.

Hay, soybeans, corn, and wheat are the major crops in the county; cattle and pigs are the main livestock. Other crops include grain sorghum, grapes, garden vegetables, nuts, fruit, native plants, trees, and shrubs. The total market value for all agricultural products (crops and livestock) sold in 2017 was \$36,830,000.

	2012	2017	Change
Approx. land area (acres)	250,559	250,559	
Land in farms (acres)	176,306	185,607	5.28%
Percentage in farms	70.4%	74%	3.6%
Number of farms	1,055	1,169	10.8%
Avg size of farm (acres)	167	159	-4.7%
Estimated market value-land & buildings	\$513,566,000	\$578,816,000	12.7%
Avg value per acre	\$2,913	\$3,646	25.16%
Total sales	\$38,372,000	\$36,830,000	-4%
Average sales per farm	\$36,372	\$31,506	-13.38%

Source: USDA Census of Agriculture 2012, 2017

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

There has been over \$100,000 in Hazard Mitigation Assistance (HMA) provided to Cole County projects since 2000. The projects listed below account for \$103,102 in funding.

Table 2.5 HMA Grant in County from 2000-2020

Disaster Declaration	Project Type	Sub-Grantee	Date Approved	Project Total
4238	Severe Storm	Cole County	8/7/2015	15044
4250	Flood	Cole County	1/21/2016	16005
4317	Flood	Cole County	6/2/2017	17047
4451	Severe Storm	Cole County	7/9/2019	19045
1463	Severe Storm	Cole County	5/6/2003	3037
1673	Severe Storm	Cole County	12/29/2006	6177
1676	Severe Ice Storm	Cole County	1/15/2007	7787
1736	Severe Ice Storm	Cole County	12/27/2007	7934
1961	Severe Storm	Cole County	3/23/2011	11026
Total				103102

Source: Federal Emergency Management Agency, 2021

2.1.9 FEMA Public Assistance (PA) Grants in Planning Area

There has been over \$2.5 million in Public Assistance (PA) grants awarded in Cole County. Below is \$2,516,800 in projects that have varied in size and location through the county.

Table 2.6 FEMA PA Grants in County from 1993-2020

Disaster #	applicant	Damage Category	Project Size	Project Total
1673	Cole County FPD	Public Buildings	Small	198.9
1673	Blair Oaks R-II school	Public Buildings	Small	1032.81
1673	Lincoln University	Protective Measures	Small	6493.25
1673	Blair Oaks R-II school	Protective Measures	Small	1827.23
1673	Jefferson City School District	Protective Measures	Small	6593.59
1673	Cole County	Protective Measures	Large	62557.78
1673	Jefferson City	Protective Measures	Small	4672.28
1673	Wardsville	Protective Measures	Small	2686.36
1673	Cole County	Protective Measures	Large	-492.37
1673	Jefferson City School District	Public Buildings	Small	1969.5
1673	Jefferson City	Protective Measures	Large	101622
1673	Jefferson City School District	Public Buildings	Small	2262.83
1673	Jefferson City	Public Buildings	Small	3888.5
1676	Lincoln University	Protective Measures	Small	6277.59
1676	Cole County R-V	Protective Measures	Small	1772.07
1676	Wardsville	Protective Measures	Small	3601.19
1676	Cole County FPD	Protective Measures	Small	1341.97
1676	Cole County R-1	Protective Measures	Small	1294.09
1676	Cole County	Protective Measures	Large	145610.2
1676	Jefferson City School District	Public Buildings	Small	889.69

1676	Wardsville	Protective Measures	Small	33.27
1676	Jefferson City	Protective Measures	Small	2993.68
1676	Jefferson City School District	Protective Measures	Small	10482.08
1676	Jefferson City School District	Protective Measures	Small	819.84
1676	Jefferson City	Protective Measures	Large	127820.9
1676	Jefferson City	Protective Measures	Small	3229.28
1676	MO Higher Edu	Protective Measures	Small	7642.85
1676	MO Higher Edu	Protective Measures	Small	10469.13
1676	Cole County FPD	Protective Measures	Small	447.32
1736	Russellville	Protective Measures	Small	4680.41
1736	Jefferson City School District	Debris Removal	Small	-24
1736	Jefferson City School District	Debris Removal	Small	-35.4
1736	Jefferson City School District	Debris Removal	Small	1224
1736	Jefferson City School District	Debris Removal	Small	1805.4
1736	Russellville	Debris Removal	Small	3672
1736	Russellville	Debris Removal	Small	-72
1736	Russellville	Protective Measures	Small	-91.77
1736	Jefferson City	Protective Measures	Small	1177.97
1736	Cole County R-V	Debris Removal	Small	900
1736	Jefferson City	Protective Measures	Large	723.93
1736	Russellville	Debris Removal	Small	9346.77
1736	Jefferson City	Protective Measures	Large	-686.66
1736	Jefferson City	Debris Removal	Small	805.16
1736	Jefferson City	Protective Measures	Large	69352.71
1736	Russellville	Debris Removal	Small	-183.27
1736	Jefferson City	Protective Measures	Small	237.11
1736	Jefferson City	Protective Measures	Small	596.07
1736	Jefferson City	Debris Removal	Small	-155.6
1736	Jefferson City	Protective Measures	Small	-337.8
1736	Jefferson City	Debris Removal	Small	7935.59
1736	Jefferson City	Protective Measures	Small	-23.07
1736	Jefferson City	Protective Measures	Small	17228.15
1736	Jefferson City	Public Buildings	Small	5411.25
1736	Cole County R-1	Debris Removal	Small	873
1736	Jefferson City	Public Buildings	Small	137.27
1736	Jefferson City	Protective Measures	Small	162.23
1736	Lincoln University	Protective Measures	Small	-395.41
1736	Lincoln University	Public Buildings	Small	750
1736	Jefferson City	Protective Measures	Small	6933.77
1736	Cole County	Protective Measures	Small	15407.18
1736	Lincoln University	Protective Measures	Small	4295.41
1736	Jefferson City	Debris Removal	Small	12735.77
1736	Jefferson City	Debris Removal	Small	3205.34
1736	Jefferson City	Debris Removal	Small	31657.19
1736	Cole County	Protective Measures	Large	126550.7

1736	Jefferson City	Debris Removal	Small	956.87
1736	Jefferson City	Debris Removal	Small	1619.78
1736	Jefferson City School District	Debris Removal	Small	8400.5
1736	Jefferson City	Debris Removal	Small	1825.34
1736	Jefferson City	Debris Removal	Small	27072.39
1736	Russellville/Lohman FPD	Protective Measures	Small	2624.9
1736	Jefferson City	Debris Removal	Small	21970.29
1736	Cole County R-1	Protective Measures	Small	801.57
1736	Jefferson City School District	Protective Measures	Small	4976.02
1736	Jefferson City	Debris Removal	Small	1562.62
1736	Wardsville	Protective Measures	Small	3055.61
1736	St Martins	Debris Removal	Small	3160.17
1736	St Martins	Protective Measures	Small	2045.43
1736	Russellville/Lohman FPD	Public Buildings	Small	187.5
1736	Cole County R-1	Public Buildings	Small	750
1736	Jefferson City	Debris Removal	Small	12915.8
1736	Jefferson City	Public Buildings	Small	3681.11
1736	Lincoln University	Debris Removal	Small	14100
1736	Cole County	Debris Removal	Small	20066.81
1736	Jefferson City	Debris Removal	Small	384.17
1736	Osage FPD	Protective Measures	Small	2167.17
1736	Cole County	Debris Removal	Large	75774.23
1736	Jefferson City	Debris Removal	Small	260.9
1736	Jefferson City	Debris Removal	Small	15785.56
1736	Jefferson City	Public Buildings	Small	112.31
1736	St Martins	Public Buildings	Small	873.3
1736	051-01C97-00	Debris Removal	Small	2411.87
1736	Jefferson City	Protective Measures	Small	1812.92
1736	Jefferson City	Protective Measures	Small	87.35
1736	Jefferson City	Debris Removal	Small	124.79
1736	Jefferson City	Debris Removal	Small	31207.5
1736	Jefferson City	Debris Removal	Large	2493.35
1736	Jefferson City	Debris Removal	Large	48185.33
1736	Cole County	Debris Removal	Small	13158
1736	Jefferson City	Debris Removal	Large	69963.21
1736	Jefferson City	Debris Removal	Small	12276.65
1736	Jefferson City	Public Buildings	Small	1875
1736	Jefferson City	Debris Removal	Small	30258.23
1736	Jefferson City	Public Buildings	Small	99.83
1736	Jefferson City	Debris Removal	Large	2361.42
1736	Jefferson City	Protective Measures	Small	32857.43
1736	Jefferson City	Debris Removal	Small	647.04
1736	Jefferson City	Debris Removal	Small	2056.61
1736	Jefferson City	Debris Removal	Small	15514.61
1736	Jefferson City	Debris Removal	Large	62933.57

1736	Jefferson City	Debris Removal	Small	782.14
1736	Jefferson City	Debris Removal	Large	1823.12
1736	Jefferson City	Debris Removal	Small	436.53
1736	Jefferson City	Debris Removal	Small	1663.06
1736	Jefferson City	Debris Removal	Large	1793.63
1736	Jefferson City	Debris Removal	Small	321.36
1736	Jefferson City	Debris Removal	Small	34655.24
1736	Jefferson City	Debris Removal	Small	14206.64
1736	Jefferson City	Debris Removal	Large	44789.61
1736	Jefferson City	Debris Removal	Small	10868.5
1736	Jefferson City	Debris Removal	Small	17743.17
1736	Jefferson City	Protective Measures	Small	212.15
1736	Jefferson City	Debris Removal	Small	1932.73
1736	Jefferson City	Debris Removal	Small	5305.93
1736	Jefferson City	Debris Removal	Small	365.55
1736	Jefferson City	Debris Removal	Small	8214.51
1736	Jefferson City	Debris Removal	Small	307.57
1961	Public Water District 3	Protective Measures	Small	1267.5
1961	Taos	Protective Measures	Small	2587.5
1961	Russellville	Protective Measures	Small	351.7
1961	Russellville	Protective Measures	Small	2300.63
1961	Jefferson City Housing Authority	Protective Measures	Small	5928.53
1961	Wardsville	Protective Measures	Small	3883.13
1961	Cole County	Roads and Bridges	Small	2696.77
1961	Cole County FPD	Protective Measures	Small	807.61
1961	Jefferson City School District	Recreational or Other	Small	1402.61
1961	Jefferson City School District	Roads and Bridges	Small	4007.81
1961	Jefferson City School District	Protective Measures	Large	-319.5
1961	St Martins	Protective Measures	Small	2901.11
1961	Jefferson City School District	Protective Measures	Large	87573.11
1961	Cole County R-1	Protective Measures	Small	1874.63
1961	Cole County	Public Buildings	Small	375
1961	Jefferson City	Protective Measures	Large	557.75
1961	Jefferson City	Protective Measures	Large	74908.07
1961	Jefferson City	Protective Measures	Small	3552.68
1961	Centertown	Roads and Bridges	Small	919.73
1961	Centertown	Protective Measures	Small	3330
1961	Cole County R-1	Recreational or Other	Small	1727.58
1961	Cole County R-V	Protective Measures	Small	1797.32
1961	Cole County FPD	Protective Measures	Small	1420.89
1961	Jefferson City	Protective Measures	Small	2811.69
1961	St Mary's Health Center	Protective Measures	Small	6930.94
1961	Cole County R-V	Public Buildings	Small	750
1961	Cole County	Protective Measures	Large	80498.96

1961	Jefferson City	Protective Measures	Small	3453.14
1961	Jefferson City	Roads and Bridges	Small	4967.4
1961	Jefferson City	Protective Measures	Small	-3453.14
1961	Jefferson City	Protective Measures	Small	2801.65
1961	Capital Region Health	Protective Measures	Small	10834.83
1961	Jefferson City	Protective Measures	Small	1460.32
1961	Cole County FPD	Protective Measures	Small	742.83
1961	Jefferson City	Protective Measures	Small	3513.49
4238	Cole County	Roads and Bridges	Small	78923.55
4238	Cole County	Roads and Bridges	Small	70502.56
4238	Cole County	Roads and Bridges	Small	46778.46
4238	Cole County	Protective Measures	Small	26409.45
4317	Jefferson City	Roads and Bridges	Large	-199478
4317	Jefferson City	Roads and Bridges	Large	434971.5
4317	Jefferson City	Public Utilities	Large	117691.1
4317	Jefferson City	Protective Measures	Small	2710.97
4451	Jefferson City	Protective Measures	Small	68412.32
Total				2,516,800

Source: Federal Emergency Management Agency, 2021

2.2 JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES

The following is the individual profiles for each participating jurisdiction. Information regarding previous mitigation initiatives and ongoing efforts can be found in the summary tables below. These tables indicate specific capabilities of each jurisdiction that relate to their ability to implement mitigation opportunities. Unincorporated Cole County is profiled first, followed by the incorporated communities, the public schools, and the universities.

2.2.1 Unincorporated Cole County

Cole County consists of all the unincorporated areas with the county boundary.

The Cole County Commission is the administrative authority. It is an elected three-member governing body with a District I (Southern) Commissioner, a District II (Northern) Commissioner, and a Presiding Commissioner. The Commission establishes County policy; approves and adopts the annual budget for all County operations; approves actual expenditures for each department, as well as supervises the operations of:

- Public Works
- Planning and Zoning
- Building Codes
- Human Resources
- Purchasing
- Information Technology
- Facilities and Grounds Maintenance

The commission also ensures County-wide compliance with numerous statutory requirements; and acts as liaison with County boards, commissions, and other governmental entities.

Cole County also has the following elected and staff positions:

- Assessor
- Auditor
- Collector
- Clerk
- Public Administrator
- Public Attorney
- Recorder
- Sheriff
- Treasurer

Eastern Commissioner, a Western Commissioner, and a Presiding Commissioner. The Commission carries out the following responsibilities: establishes Cole County policy; approves and adopts the annual budget for all County operations; approves actual expenditures for each department; supervises the operations of County departments; ensures County-wide compliance with numerous statutory requirements; and acts as liaison with County boards, commissions, and other local and regional governmental entities

Cole County has the following departments and offices: Assessor, Auditor, Circuit Clerk, Collector, County Clerk, Emergency Management, Finance, Health, Information Systems, Juvenile Justice, Maintenance, Prosecuting Attorney, Public Administrator, Public Works, Recorder of Deeds, Sheriff, and Treasurer.

In addition to the Emergency Management Agency, which was discussed previously, the following departments play especially important roles in hazard mitigation:

Information Systems Department - This department is responsible for the computing needs of County staff and for disseminating, protecting, and administering the County's computer data. Current, reliable, and accessible GIS data is immensely helpful for accurate analysis of hazard prone areas.

Public Works Department - This department is an integral part of mitigation planning. Decisions about new roads and maintenance of current infrastructure are intertwined with the overall mission of hazard mitigation planning. This department consists of the following divisions:

Technical Capabilities

Cole County has extensive technical capabilities to implement hazard mitigation into the overall role of County government.

New solar-powered warning sirens were installed in the County and Jefferson City in 2012. The cost of this project was approximately \$750,000.

Table 2.7 Unincorporated Cole County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Master Plan 2010
Builder's Plan	2003
Capital Improvement Plan	Yes
City Emergency Operations Plan	N/A
County Emergency Operations Plan	Yes-2003
Local Recovery Plan	Yes
County Recovery Plan	N/A
City Mitigation Plan	N/A
County Mitigation Plan	Yes
Debris Management Plan	Yes
Economic Development Plan	Yes
Transportation Plan	Yes-2003
Land-use Plan	Yes-2010
Flood Mitigation Assistance (FMA) Plan	N/A
Watershed Plan	N/A
Firewise or other fire mitigation plan	No
School Mitigation Plan	N/A
Critical Facilities Plan (Mitigation/Response/Recovery)	EOP-2003
Policies/Ordinance	
Zoning Ordinance	No
Building Code	2000 International
Floodplain Ordinance	Yes-2012
Subdivision Ordinance	Yes-1999
Tree Trimming Ordinance	N/A
Nuisance Ordinance	Yes
Stormwater Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes-Commercial
Historic Preservation Ordinance	No
Landscape Ordinance	No
Seismic Construction Ordinance	No
Program	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	N/A
Hazard Awareness Program	N/A
National Flood Insurance Program (NFIP)	Yes
NFIP Community Rating System (CRS) program	No
National Weather Service (NWS) Storm Ready	N/A
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	N/A
ISO Fire Rating	N/A

Capabilities	Status Including Date of Document or Policy
Economic Development Program	N/A
Land Use Program	N/A
Public Education/Awareness	N/A
Property Acquisition	N/A
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	N/A
Hazard Analysis/Risk Assessment (County)	Yes
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	N/A
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	Yes
Land Use Map	Yes
Staff/Department	
Building Code Official	Yes-Full-time
Building Inspector	Yes-2 Full-time
Mapping Specialist (GIS)	Yes
Engineer	Yes
Development Planner	Yes
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Emergency Response Team	N/A
Hazardous Materials Expert	No
Local Emergency Planning Committee	Yes
County Emergency Management Commission	N/A
Sanitation Department	N/A
Transportation Department	Yes
Economic Development Department	N/A
Housing Department	N/A
Historic Preservation	N/A
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Local Environmental Organization	Yes
Homeowner Associations	Yes
Neighborhood Associations	Yes
Chamber of Commerce	Yes-JC Chamber
Community Organizations (Lions, Kiwanis, etc.)	Yes-multiple

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

Source: Data Collection Questionnaire, 2020

2.2.2 Centertown

The Village of Centertown did not participate in the 2016 plan update. It is a small incorporated community within Cole County located off Highway 50. They are governed by a 5-person board that consists of the Chair, Chair-Protem, and Clerk. It is the responsibility of the board to oversee financials and adopt plans and resolutions that enact and enforce the vision of the community. Other village positions include:

- Public Works

Centertown is currently working on a water project that will replace the existing water tower with one more suited to the needs of the community. This project will raise the village's water pressure making it easier for the fire department to tend to local blazes.

The village also has stormwater projects in the works to deal with water runoff damage and management in portions of town.

Due to Centertown's lack of participation in the last plan update the recent storm siren added in their boundary was done so through cooperation with the county.

Table 2.8 Centertown Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes-2020
Builder's Plan	N/A
Capital Improvement Plan	N/A
City Emergency Operations Plan	Yes-2020
County Emergency Operations Plan	N/A
Local Recovery Plan	N/A
County Recovery Plan	N/A
City Mitigation Plan	Yes
County Mitigation Plan	Yes
Debris Management Plan	N/A
Economic Development Plan	N/A
Transportation Plan	N/A
Land-use Plan	N/A
Flood Mitigation Assistance (FMA) Plan	N/A
Watershed Plan	N/A
Firewise or other fire mitigation plan	No
School Mitigation Plan	N/A
Critical Facilities Plan (Mitigation/Response/Recovery)	N/A
Policies/Ordinance	
Zoning Ordinance	In Progress
Building Code	Yes-2020
Floodplain Ordinance	N/A
Subdivision Ordinance	N/A
Tree Trimming Ordinance	No
Nuisance Ordinance	N/A
Stormwater Ordinance	N/A
Drainage Ordinance	N/A
Site Plan Review Requirements	N/A
Historic Preservation Ordinance	N/A
Landscape Ordinance	N/A
Seismic Construction Ordinance	N/A
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes-2020
Hazard Awareness Program	N/A
National Flood Insurance Program (NFIP)	No
NFIP Community Rating System (CRS) program	N/A
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	N/A
ISO Fire Rating	N/A

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

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

Source: Data Collection Questionnaire, 2020

2.2.3 Jefferson City

Jefferson City is the largest community in Cole County. It is the county seat as well as the State Capital of Missouri. It has a Mayor and a City Council consisting of 10 members from 5 wards. There are also several offices such as:

- Clerk
- Finance
- Fire
- Police
- Information Technology
- Municipal court
- Parks & Recreation
- Planning and Protective Services
- Public Works

While Jefferson City doesn't have a formal Continuity of Operations Plan, the city has gone through many of the same planning exercises and thought that would be done in putting together such a plan. There are a number of redundant systems and flexibilities in place so that the City could respond to disasters or interruptions in provision of city services. The primary item is the recent construction of Fire Station #3, which includes a "hardened" room for remote data storage and a backup 911 call center. In addition, City facilities are spread across the city and many have conference rooms and data connections that could be transformed into work spaces in the case of an event at the City Hall campus. It is important to note that a small part of Jefferson City is located north of the Missouri River in Callaway County. Key infrastructure located in Callaway County includes the airport and water treatment facility; there is also a small population of Jefferson City residents in Callaway County. The Callaway County section of Jefferson City is included in this plan.

The two largest changes in Jefferson City since 2011 have been the construction of a new fire station and installation of warning sirens.

Fire Station #3 was constructed at 302 Rock Hill Road (Highway 179). The new station is a 12,826 square foot building constructed at a cost of \$2.33 million; it was completed in August 2014. The station has a small hardened backup 911 call center and remote data storage site which provides backup data storage for City Hall. The new station fills a gap in coverage between fire stations #1 and #5.

Fourteen new outdoor warning sirens were installed in 2012. The new sirens have a 360 degree radius, the ability to deliver voice announcements and are powered by solar panels.

Jefferson City is a large community with capital improvement plans, an ongoing 5 year sales tax capital improvement program, ongoing commercial, residential, and industrial development, and an eye toward the future in terms of needs for the community.

Table 2.9 Jefferson City Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Updated 2021
Builder's Plan	N/A
Capital Improvement Plan	2017: 5-year sales tax
City Emergency Operations Plan	County EOP
County Emergency Operations Plan	Yes
Local Recovery Plan	CDBG 2020 Action plan
County Recovery Plan	N/A
City Mitigation Plan	N/A
County Mitigation Plan	N/A
Debris Management Plan	N/A
Economic Development Plan	Yes-2019
Transportation Plan	2019
Land-use Plan	2019 MTP and Comp Plan
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No: Stormwater Master Plan
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes: 2015 IBC
Floodplain Ordinance	9/17/2012
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Stormwater Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	Yes
Seismic Construction Ordinance	N/A
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes
National Flood Insurance Program (NFIP)	Yes
NFIP Community Rating System (CRS) program	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	Yes
ISO Fire Rating	N/A

Capabilities	Status Including Date of Document or Policy
Economic Development Program	Yes
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	Yes
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	Yes
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Yes-2016
Hazard Analysis/Risk Assessment (County)	Yes-2016
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	N/A
Evacuation Route Map	Yes
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	Yes
Land Use Map	Yes
Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	Yes
Development Planner	Yes
Public Works Official	Yes
Emergency Management Director	Yes
NFIP Floodplain Administrator	Yes
Emergency Response Team	Yes
Hazardous Materials Expert	Yes
Local Emergency Planning Committee	Yes
County Emergency Management Commission	Yes
Sanitation Department	Yes-Contracted Republic
Transportation Department	Yes
Economic Development Department	Yes-Chamber of Commerce
Housing Department	Yes-Housing Authority
Historic Preservation	Yes
Non-Governmental Organizations (NGOs)	
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Local Environmental Organization	Yes
Homeowner Associations	Yes
Neighborhood Associations	Yes
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes

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

Source: Data Collection Questionnaire, 2020

2.2.4 Lohman

Lohman is a small city in Cole County located between Jefferson City and Russellville. It is governed by a Mayor and 4 aldermen. They do have a city clerk.

The city does not own any buildings and subsequently has no storm shelter designated. A community utilized building has been undergoing renovation to bring it up to ADA compliance.

Table 2.10 Lohman Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	N/A
Builder's Plan	N/A
Capital Improvement Plan	N/A
Local Emergency Plan	N/A
County Emergency Plan	Cole
Local Recovery Plan	N/A
County Recovery Plan	N/A
Local Mitigation Plan	N/A
County Mitigation Plan	Cole
Local Mitigation Plan (PDM)	N/A
County Mitigation Plan (PDM)	N/A
Economic Development Plan	No
Transportation Plan	Regional
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	N/A
Watershed Plan	N/A
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	N/A
Policies/Ordinance	
Zoning Ordinance	N/A
Building Code	20-1
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	98-1
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Site Plan Review Requirements	20-1
Historic Preservation Ordinance	No
Landscape Ordinance	86-3
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	N/A
Codes Building Site/Design	20-1
National Flood Insurance Program (NFIP) Participant	No
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	N/A
National Weather Service (NWS) Storm Ready	Cole
Building Code Effectiveness Grading (BCEGs)	N/A
ISO Fire Rating	N/A
Economic Development Program	N/A
Land Use Program	N/A
Public Education/Awareness	N/A
Property Acquisition	N/A
Planning/Zoning Boards	N/A
Stream Maintenance Program	N/A
Tree Trimming Program	N/A
Engineering Studies for Streams (Local/County/Regional)	N/A
Mutual Aid Agreements	N/A
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No

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

Source: Data Questionnaire, 2020

2.2.5 Russellville

The City of Russellville developed a small historic theme park in the downtown area through a grant from the EI ERA (Environmental Improvement and Energy Resources Authority). Russellville was historically a railroad town and the incorporation of a caboose in the park brings interest and traffic to the downtown area.

The City of Russellville passed a bond issue for a wastewater project in August 2014 and is currently working on completing the construction of the new 60,000 gallon capacity system.

A combination road and stormwater handling project is currently underway along Marion St. This will create and upgrade current stormwater handling, but more upgrades throughout town are needed.

Further needs include upgrading water lines throughout town to meet fire flow needs.

Table 2.11 Russellville Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	In process: 2021
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes: People's Service
County Emergency Operations Plan	Yes
Local Recovery Plan	No
County Recovery Plan	Yes
City Mitigation Plan	Yes
County Mitigation Plan	Yes
Debris Management Plan	No
Economic Development Plan	No
Transportation Plan	Yes: Regional Transportation Plan
Land-use Plan	Yes
Flood Mitigation Assistance (FMA) Plan	N/A
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	County
Floodplain Ordinance	N/A
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Stormwater Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Seismic Construction Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes-2016
National Flood Insurance Program (NFIP)	N/A
NFIP Community Rating System (CRS) program	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	4

Capabilities	Status Including Date of Document or Policy
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	Yes-as needed
Planning/Zoning Boards	No-in process
Stream Maintenance Program	No
Tree Trimming Program	No-ameren
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	Yes-2016
Hazard Analysis/Risk Assessment (County)	Yes-2016
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	N/A
Evacuation Route Map	No
Critical Facilities Inventory	Yes
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	Yes
Development Planner	No
Public Works Official	No
Emergency Management Director	No
NFIP Floodplain Administrator	No
Emergency Response Team	N/A
Hazardous Materials Expert	No
Local Emergency Planning Committee	No
County Emergency Management Commission	Yes
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	No
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	Yes
Local Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	Yes

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

Source: Data Collection Questionnaire, 2020

2.2.6 St. Martins

The City of St. Martins is governed by a Mayor and 4 aldermen.

Road improvements along Business 50 through town started in 2020 will add 1.1 mile of bike/ped lanes along Bus. 50 and connect with 2.3 miles of greenway and or sidewalks to the east of St. Martins for a total 3.4 miles of bike/ped safety improvements in the area.

Carel Place Subdivision is in the planning stage and growth is expected to continue but nothing in any hazard prone areas.

Table 2.12 St Martins Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes
Builder's Plan	No
Capital Improvement Plan	No
City Emergency Operations Plan	Yes
County Emergency Operations Plan	Yes
Local Recovery Plan	Yes
County Recovery Plan	Yes
City Mitigation Plan	Yes
County Mitigation Plan	Yes
Debris Management Plan	Yes
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	Yes
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	County
Floodplain Ordinance	No
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Stormwater Ordinance	No-In process
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Seismic Construction Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	No
National Flood Insurance Program (NFIP)	No
NFIP Community Rating System (CRS) program	No
National Weather Service (NWS) Storm Ready	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	6

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

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

Source: Data Collection Questionnaire, 2020

2.2.7 Taos

Taos has annexed significant area since 2010, more than doubling the size of the city.

The City is developing policies for wastewater connections and annexation procedures. These policies will subsequently be adopted and implemented by the Board of Alderman.

Taos has a Mayor and a City Council. It has city departments that consist of:

- Clerk
- Public Works
- Police
- Parks & Recreation
- Planning & Zoning

Table 2.13 Taos Mitigation Capabilities

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

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

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

Source: Data Collection Questionnaire, 2020

2.2.8 Wardsville

The Village of Wardsville is governed by a chairman and 5 Board of Trustees. Their other offices include:

- Clerk
- Planning & Zoning

The Village has been working with MO DNR to make decisions on future improvements to the wastewater system in order to be in compliance with newer and stricter environmental regulations.

Table 2.14 Wardsville Mitigation Capabilities

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

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

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

Source: Data Collection Questionnaire, 2020

Table 2.15 Mitigation Capabilities Summary Table

CAPABILITIES	Uninc. Cole County	Centertown	Jefferson City	Lohman	Russellville	St. Martins	Taos	Wardsville
Planning Capabilities								
Comprehensive Plan	Master Plan 2010	Yes	Updated 2021	N/A	2021	Yes	No	N/A
Builder's Plan	2003	N/A	N/A	N/A	No	No	No	No
Capital Improvement Plan	Yes	N/A	2017	N/A	No	No	N/A	No
Local Emergency Plan	N/A	Yes	County EOP	N/A	Yes	Yes	N/A	No
County Emergency Plan	Yes-2003	N/A	Yes	Cole	Yes	Yes	Yes	Yes
Local Recovery Plan	Yes	N/A	2020 Action plan	N/A	No	Yes	Yes	N/A
County Recovery Plan	N/A	N/A	N/A	Cole	Yes	Yes	Yes	Yes
Local Mitigation Plan	N/A	Yes	N/A	N/A	Yes	Yes	N/A	N/A
County Mitigation Plan	Yes	Yes	N/A	Cole	Yes	Yes	Yes	Yes
Debris Management Plan	N/A	N/A	N/A	N/A	No	Yes	N/A	No
Economic Development Plan	Yes	N/A	Yes-2019	N/A	No	No	N/A	No
Transportation Plan	Yes-2003	N/A	2019	Regional	Yes	No	Regional	Regional
Land-use Plan	Yes-2010	N/A	2019 MTP	N/A	Yes	No	N/A	N/A
Flood Mitigation Assistance (FMA) Plan	N/A	N/A	No	N/A	N/A	No	No	N/A
Watershed Plan	N/A	N/A	No	N/A	No	Yes	No	No
Firewise or other fire mitigation plan	No	No	No	No	No	No	No	No
School Mitigation Plan	N/A	N/A	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	EOP-2003	N/A	No	N/A	No	No	No	No
Policies/Ordinance								
Zoning Ordinance	No	In Progress	Yes	N/A	Yes	Yes	Yes	Yes
Building Code	2000-Intl.	Yes	Yes-2015	20-1	County	County	Yes	N/A
Floodplain Ordinance	Yes-2012	N/A	Yes-2012	No	N/A	No	Yes	Yes
Subdivision Ordinance	Yes-1999	N/A	Yes	No	Yes	Yes	N/A	Yes
Tree Trimming Ordinance	N/A	No	Yes	No	No	No	No	No
Nuisance Ordinance	Yes	N/A	Yes	98-1	Yes	Yes	Yes	Yes
Storm Water Ordinance	NO	N/A	Yes	No	No	No	Yes	No
Drainage Ordinance	No	N/A	Yes	No	No	No	N/A	No

CAPABILITIES	Uninc. Cole County	Centertown	Jefferson City	Lohman	Russellville	St. Martins	Taos	Wardsville
Site Plan Review Requirements	Yes-Commercial	N/A	Yes	20-1	Yes	No	Yes	Yes
Historic Preservation Ordinance	No	N/A	Yes	No	No	No	No	No
Landscape Ordinance	No	N/A	Yes	86-3	No	No	No	No
Seismic Construction Ordinance	No	N/A	N/A	No	No	No	No	No
Program								
Zoning/Land Use Restrictions	No	Yes	Yes	N/A	Yes	Yes	Yes	Yes
Codes Building Site/Design	N/A	Yes	Yes	20-1	Yes	Yes	Yes	Yes
National Flood Insurance Program (NFIP) Participant	Yes	No	Yes	No	N/A	No	Yes	Yes
NFIP Community Rating System (CRS) Participating Community	Yes	N/A	No	No	No	No	No	No
Hazard Awareness Program	N/A	N/A	Yes	N/A	Yes	No	N/A	No
National Weather Service (NWS) Storm Ready	N/A	No	No	Cole	No	No	No	N/A
Building Code Effectiveness Grading (BCEGs)	N/A	N/A	Yes	N/A	No	No	No	N/A
ISO Fire Rating	N/A	N/A	N/A	N/A	4	6	N/A	N/A
Economic Development Program	N/A	N/A	Yes	N/A	No	No	No	No
Land Use Program	N/A	N/A	Yes	N/A	No	No	No	No
Public Education/Awareness	N/A	N/A	Yes	N/A	Yes	No	No	No
Property Acquisition	N/A	N/A	Yes	N/A	Yes	No	No	NO
Planning/Zoning Boards	N/A	N/A	Yes	N/A	No	Yes	Yes	Yes
Stream Maintenance Program	N/A	N/A	No	N/A	No	No	No	No
Tree Trimming Program	No	No	No	N/A	No	No	No	No
Engineering Studies for Streams (Local/County/Regional)	No	No	Yes	N/A	No	No	No	No
Mutual Aid Agreements	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes
Studies/Reports/Maps								
Hazard Analysis/Risk Assessment (Local)	N/A	Yes	Yes	No	Yes	Yes	Yes	Yes
Hazard Analysis/Risk Assessment (County)	Yes	Yes	Yes	Yes	Yes	yes	Yes	Yes
Flood Insurance Maps	Yes	N/A	Yes	No	No	No	Yes	Yes
FEMA Flood Insurance Study (Detailed)	N/A	No	N/A	No	N/A	No	No	No
Evacuation Route Map	Yes	Yes	Yes	No	No	No	No	N/A

CAPABILITIES	Uninc. Cole County	Centertown	Jefferson City	Lohman	Russellville	St. Martins	Taos	Wardsville
Critical Facilities Inventory	Yes	N/A	Yes	No	Yes	Yes	Yes	Yes
Vulnerable Population Inventory	Yes	N/A	Yes	No	No	Yes	No	N/A
Land Use Map	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Staff/Department								
Building Code Official	Yes-fulltime	No	Yes	No	No	Yes	Yes	Yes
Building Inspector	Yes-fulltime	County	Yes	No	No	Yes	N/A	Yes
Mapping Specialist (GIS)	Yes	No	Yes	No	No	Yes	N/A	No
Engineer	Yes	Bartlett&West	Yes	No	Yes	No	N/A	Yes
Development Planner	Yes	No	Yes	No	No	Yes	N/A	No
Public Works Official	Yes	Yes	Yes	No	No	Yes	Yes	No
Emergency Management Coordinator	Yes	No	Yes	No	No	Yes	N/A	No
NFIP Floodplain Administrator	Yes	No	Yes	No	No	No	Yes	Yes
Emergency Response Team	N/A	N/A	Yes	No	N/A	Yes	No	No
Hazardous Materials Expert	No	N/A	Yes	No	No	Yes	No	No
Local Emergency Planning Committee	Yes	N/A	Yes	No	No	No	N/A	No
County Emergency Management Commission	N/A	N/A	Yes	Cole	Yes	N/A	N/A	No
Sanitation Department	N/A	N/A	Yes	No	No	No	No	No
Transportation Department	Yes	N/A	Yes	Cole	No	No	No	No
Economic Development Department	N/A	N/A	Yes	No	No	No	No	No
Housing Department	N/A	N/A	Yes	No	No	No	No	No
Historic Preservation	N/A	N/A	Yes	No	No	NO	No	No
Non-Governmental Organizations (NGOs)								
American Red Cross	Yes	No	Yes	Yes	No	No	No	No
Salvation Army	Yes	No	Yes	Yes	NO	NO	No	No
Veterans Groups	Yes	No	Yes	No	Yes	Yes	No	No
Environmental Organization	Yes	No	Yes	No	No	No	No	No
Homeowner Associations	Yes	No	Yes	No	No	Yes	Yes	No
Neighborhood Associations	Yes	No	Yes	No	No	Yes	Yes	No
Chamber of Commerce	Yes	No	Yes	No	No	No	No	No

CAPABILITIES	Uninc. Cole County	Centertown	Jefferson City	Lohman	Russellville	St. Martins	Taos	Wardsville
Community Organizations (Lions, Kiwanis, etc.)	Yes	No	Yes	No	Yes	Yes	No	Yes

Financial Resources								
Apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Fund projects through Capital Improvements funding	Yes	N/A	Yes	N/A	Yes	Yes	Yes	N/A
Authority to levy taxes for specific purposes	Yes	Yes	Yes	Yes	Yes	No	Yes	N/A
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	No	Yes	No
Impact fees for new development	No	No	No	No	No	No	No	N/A
Incur debt through general obligation bonds	Yes	No	Yes	Yes	No	No	N/A	Yes
Incur debt through special tax bonds	N/A	Yes	Yes	No	Yes	No	N/A	N/A
Incur debt through private activities	N/A	No	No	No	N/A	No	No	N/A
Withhold spending in hazard prone areas	Yes	No	Yes	No	No	No	Yes	N/A

Source: Data Collection Questionnaire, 2020

2.3 SPECIAL DISTRICT

There are numerous special districts in the planning area which are vital to the health and safety of the population. In addition to providing basic services, personnel of the special districts possess a wealth of knowledge and experience valuable for hazard mitigation planning.

2.3.4 Non-Governmental and Volunteer Organizations

After the floods in 1993 the non-profit agencies in Missouri organized the Missouri Volunteers Against Disaster (MOVOAD). The main goal of MOVOAD is to increase cooperation, coordination, communication, education, and to pass local, county and state disaster legislation. Their mission is to bring together National Voluntary Organizations Active in disaster to foster more effective service through mitigation and response for the benefit of people affected (Imperiled and impacted) by disaster through:

1. Cooperation: To create a climate of cooperation at all levels (including grass roots) to provide information.
2. Coordination: To coordinate policy among member organizations and to serve as a liaison, advocate and national voice.
3. Communication: To disseminate information through the newsletter, the director, research and demonstration, case study and critique.
4. Education: To increase mutual awareness and understanding of each organization.
5. Convention Mechanisms: To arrange for such meetings and conferences as necessary to accomplish the purpose of MOVOAD.
6. Legislation: To encourage effective disaster relief legislation and policy.

Organization in Cole County such as the American Red Cross, church agencies, and other non-profits are active in supporting the work of MOVOAD. This collaborative effort ensures that Cole County non-profits are well prepared to respond to a natural disaster. Through their legislative efforts, they also work to help make Missouri and Cole County as a disaster resistant as possible.

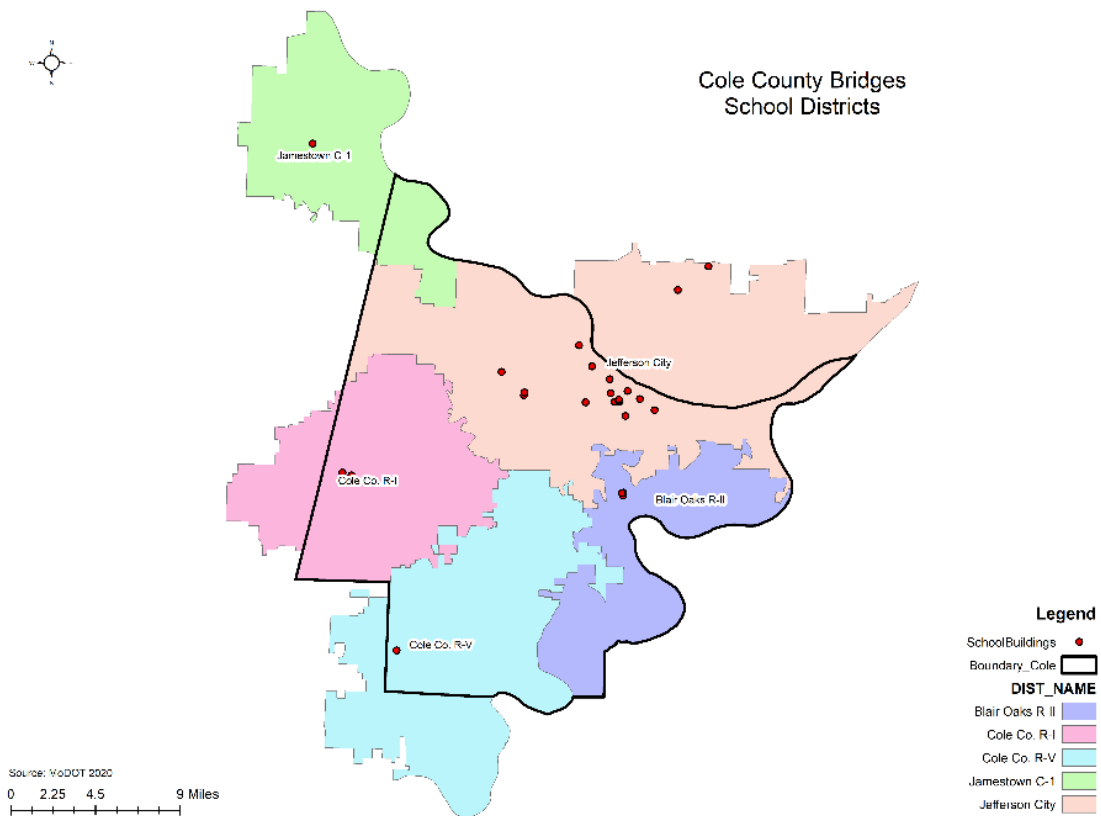
2.4 Public School District Profile and Mitigation Capabilities

There are 5 School districts that intersect the Cole County boundary. They are:

- Blair Oaks R-II
- Cole Co. R-I
- Cole Co. R-V
- Jamestown C-I
- Jefferson City Public Schools

Map 2.6 displays the school districts and how they are situated within and around the Cole County boundary.

Map 2.6 Cole County School Districts



2.4.1 Blair Oaks R-II School District

During the 2011-2012 school year, Blair Oaks R-II School District purchased 25.55 acres of land. The land is located east of the middle school on the opposite side of Falcon Lane in Wardsville. The District is currently building a new high school on campus. The new high school will be equipped with dual locker room complexes that will serve as storm shelters for the occupants of the building. This storm shelter will be the highest rated on campus. These dual complexes were a part of the district’s initial design of the facility and funded locally through bond revenues.

Safety and security continues to be a focus. The administrative offices at the high school were moved nearer the front entrance of the building for the start of the 2015-2016 school year. The changes improve safety and security, as well as make the offices more accessible by all.

The district has a full-time school resource officer. This officer is a Cole County Sheriff’s Department Deputy. The officer serves in a proactive capacity for the prevention of unwanted activities on and around school campus. Having a full-time school resource officer on campus places the district in a position to quickly react to an unwanted situation such as an active shooter. The response time for the Cole County Sheriff’s Department, the Jefferson City Police Department, and the Missouri State Highway Patrol could be as much as 12 minutes in the event of an on-campus emergency.

The biggest challenge to be overcome by the District is the limitations that exist in capital improvements bonding capacity. State statute limits a school districts bonding capacity to 15% of its total assessed valuation.

Table 2.16			
Blair Oaks R-II School District			
School Name	Enrollment		Staff
	Grades	2019-20	FT
Blair Oaks Elementary	K-4	407	35
Blair Oaks Middle	5-8	385	33
Blair Oaks High	9-12	36	36
Total		1,252	104
Source: School District Personnel			
Property Valuation			
	Count	Replacement Value	
Buildings	8	\$32,868,239	
Contents		\$3,491,734	
Source: School District Insurance Statement			

2.4.2 Cole County R-I

The Cole County R-I School District offices are located in Russellville. The district did not participate in the 2016 update of the plan. While the school is split into an elementary, middle school, and high school they only have 2 buildings. Neither buildings have FEMA rated safe-rooms but do have designated sheltering areas. A FEMA rated safe-room has been expressed as a need for the district.

The school employs a community resource officer through a partnership with the Cole county Sheriff's Office for campus police needs.

Table 2.17			
Cole County R-I School District			
School Name	Grades	Enrollment 2019-2020	Staff
			FT
Cole Elementary	PK-8	425	51
Cole Highschool	7-12	189	22
	Total	614	73
Source: District staff			
Property Valuation			
	Count	Replacement Value	
Buildings	3	\$22,572,429.23	
Contents		\$3,367,948.11	
Source: School District Insurance Statement			

2.4.3 Cole R-V School District

Cole County R-V has its campus located in Eugene. The students and staff are split between two buildings with elementary in one building and middle school and high school in another. They do not currently have FEMA rated safe rooms but do have sheltering locations designated when needed. The district is working to ensure that there is professional development available to train teachers how to react and protect students.

Since the last update, the District has added a concession stand and storage building at the track site. No further construction is planned for the district at this time but the main buildings are due to have their roofs replaced in the next 5 years.

The school employs a school resource officer through a roughly 50/50 partnership with the Cole County Sheriff’s office.

Table 2.18			
Cole County R-V School District			
School Name	Grades	Enrollment 2019-2020	Staff
			FT
Eugene Elementary	PK-6	352	30
Eugene Highschool	7-12	291	27
	Total	643	57
Source: District staff			
Property Valuation			
	Count	Replacement Value	
Buildings	5	N/A	
Contents		N/A	
Source: School District Insurance Statement			

2.4.4 Jefferson City Public Schools

The school district has installed access control/secure vestibules in each school building. In 2016, a Safety & Security Coordinator administrative support position was added to the full-time staff through a contract with the Jefferson City Police Department.

The building formerly known as the Simonsen 9th grade center was sold after is sustained damage during the 2019 Jefferson City tornado. Since the last plan update Capital City High School was built and Jefferson City High School underwent a remodel. Both high schools have FEMA rated safe rooms. Multiple elementary schools are scheduled to go through remodels in the coming years. There are also plans to rebuild some of the middle school facilities.

Staff are continually being offered and encouraged to take training in the event of a hazardous conditions. Medical training, crisis support, loss of utilities and hazardous materials, bomb threats and active intruder training are a few of the offered trainings.

Table 2.19			
Jefferson City Public Schools			
School Name	Enrollment		Staff
	Grades	2019-20	FT
Elementary Schools	Pre-5	4,370	423
Middle Schools	6-8	2,055	202
High Schools	9-12	2,584	265
Total		9,009	890
Source: School District			

District Owned Property		
	Count	Value
Buildings	26	N/A
Contents		N/A
Source: Jurisdictional Insurance Statement		

The district is responsible for several buildings district-wide. Table 2.20 lists the buildings and grades they house.

Table 2.20 Jefferson City School District Buildings

Building Name	Grades
Prenger Family Center	9-12
Jefferson City High School	9-12
Capital City High School	9-11
Nichols Career Center	9-12
Lewis and Clark Middle School	6-8
Thomas Jefferson Middle School	6-8
Belair Elementary	k-5
Callaway Hills Elementary	k-5
Cedar Hill Elementary	k-5
East Elementary	k-5
Clarence Lawson Elementary	k-5
Moreau Heights Elementary	k-5
North Elementary	k-5
South Elementary	k-5
Pioneer Trail Elementary	k-5
Thorpe J. Gordon Elementary	k-5
West Elementary	k-5
Southwest Early Childhood Center	Pre-Kindergarten

Table 2.21 Summary of Mitigation Capabilities- Cole County School Districts

Capability	Blair Oaks	Cole Co. R-I	Cole Co. R-V	Jefferson City PSD
Planning Elements				
Master Plan/ Date	Yes	Yes	Yes	6/2020
Capital Improvement Plan/Date	Yes	2017	Yes	9/2020
School Emergency Plan / Date	Yes	Yes	7/2020	6/2020
Weapons Policy/Date	Yes	8/2003	6/2010	10/2002
Personnel Resources				
Full-Time Building Official (Principal)	Yes	Yes	Yes	Yes
Emergency Manager	No	Yes	Yes	Yes
Grant Writer	No	No	No	No
Public Information Officer	No	No	Yes	Yes
Financial Resources				
Capital Improvements Project Funding	No	Yes	Yes	Yes
Local Funds	Yes	Yes	Yes	No
General Obligation Bonds	Yes	Yes	Yes	No
Special Tax Bonds	No	No	No	No
Private Activities/Donations	No	Yes	No	Yes
State and Federal Funds/Grants	Yes	Yes	Yes	Yes
Other				
Public Education Programs	Yes	Yes	Yes	Yes
Privately or Self- Insured?	Self	Self	Self	Self
Fire Evacuation Training	Yes	Yes	Yes	Yes
Tornado Sheltering Exercises	Yes	Yes	Yes	Yes
Public Address/Emergency Alert System	Yes	Yes	Yes	Yes
NOAA Weather Radios	Yes	Yes	Yes	Yes
Lock-Down Security Training	Yes	Yes	Yes	Yes
Mitigation Programs	Yes	Yes	Yes	Yes
Tornado Shelter/Saferoom	Yes	Yes	Yes	Yes
Campus Police	Yes	Yes	Yes	Yes

Source: Data Collection Questionnaire, 2020

2.5 HIGHER EDUCATION

2.5.1 Lincoln University

Lincoln University brings in students from other parts of the country as well as local throughout the year. The University has a large student percentage that is PELL eligible and the 2020 pandemic is expected to cause a decline in enrollment. It's unclear how long the drop could continue. Prior to the pandemic two new buildings were constructed. Dickenson Research Center and Sikeston Extension. Both are around 8,000 sqft. There are no current plans to remodel any other buildings.

The Lincoln University Police Department is a fully functioning law enforcement agency appointed by the Board of Curators. Once hired, an officer is sworn in by a member of the Board of Curators. They then are commissioned, armed law enforcement officers clothed with full police powers as authorized in sections 175.040, 172.350 and as outlined in section 172.355 of the Revised Statutes of the State of Missouri.

All commissioned LUPD officers possess the same powers on the Lincoln University campus as city police officers within their particular city. In addition, commissioned LUPD personnel, by virtue of Missouri state laws like all other peace officers in the State of Missouri, possess certain statewide powers of arrest for certain offenses

Thus, in every respect, commissioned law enforcement officers employed by Lincoln have enforcement authority. Furthermore, by virtue of state law, LUPD personnel may apprehend violators anywhere within the State of Missouri for any offense regardless if committed in their presence, or not as long as the incident originated on the campus and that officer is attempting to apprehend, while in continuous pursuit, a violator who flees that officer from the campus. Please note that on-campus crimes reported to other local law enforcement agencies will typically be referred to LUPD, since it is the local law enforcement agency that has the jurisdiction for Lincoln University.

In addition, the LUPD is staffed with student cadets and civilian staff who function as security officers possessing no police powers. These personnel may respond to non-criminal incidents such as non-injury motor vehicle accidents, parking violations and other similar incidents. The commissioned law enforcement officers may be distinguished from the non-commissioned security personnel by the color of their uniforms.

In addition, at times due to limited manpower, the campus law enforcement may be augmented by officers of the Jefferson City Police Department and, in some cases, by deputies with the Cole County Sheriff's Department and the Missouri State Highway Patrol. While there are no official memorandums of understanding or other agreements in place, the aforementioned agencies each possess powers of arrest on the Lincoln University campus. All crimes, both felony and misdemeanor, that occur on Lincoln University property are investigated by officers of the Lincoln University Police Department. Assistance, as needed and requested, in the investigation of crimes on the campus is available through the aforementioned agencies.

Table 2.22	
Lincoln University	
	Count
Student Population	2,436
Faculty and Staff	N/A
Source: Lincoln University	

Lincoln University owns several buildings, both on their main campus and at remote research and learning locations. They have approximately 1,244,692 total square feet in facilities.

Chapter 3: Natural Hazards Risk Assessment

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Chapter 3: Natural Hazard Risk Assessment

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

Risk assessment is a process of estimating the potential for injury, death, property damage, or economic loss which may result from a hazard. A risk assessment is only as valuable as the thoroughness and accuracy of the information on which it is based. As will be seen, there is a great variation between hazards in the amount and reliability of the data available for analysis.

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; and 3) Problem Statement briefly summarizes the problem and develops possible solutions.

3.1 HAZARD IDENTIFICATION

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

As part of the planning process each jurisdiction was asked to evaluate the probability and potential severity of each hazard addressed in this plan. The following natural hazards have been identified as posing potential risk to all, or portions, of the planning area:

- Flood (includes riverine flooding, flash flooding, and storm water flooding)
- Levee Failure
- Dam Failure
- Earthquake
- Land Subsidence/Sinkhole
- Severe Thunderstorms (includes Damaging Winds, Hail, and Lightning)
- Tornado
- Severe Winter Weather (Snow, Ice, and Extreme Cold)
- Drought
- Extreme Heat
- Wildfire

3.1.1 Review of Existing Mitigation Plans

There are certain other natural hazards which FEMA requires to be addressed in Hazard Mitigation Plans if they are applicable to the planning area. Avalanches and volcanoes have not been included in this plan as they do not pose a threat due to Cole County's topography and geology. Coastal erosion, coastal storms, hurricanes, and tsunamis do not pose a threat to the county due to its inland location.

The Missouri State Hazard Mitigation Plan (2018) indicates that expansive soils, landslides, and rockfalls are recognized as hazards in Missouri but occur infrequently and with minimal impact. For this reason, those hazards were not profiled in the state plan nor will they be profiled in the Cole County/Jefferson City Plan.

The MPC decided to include man-made hazards since the threat and likelihood of such hazards are elevated for the region due to the size of Jefferson City and the significance of it as the state capital, as well as the importance and influence of the traffic infrastructure that passes through the planning area.

3.1.2 Review Disaster Declaration History

Severe storms and flooding are the most common events to warrant a disaster declaration in Cole County. In the event of flooding the declaration is brought on by mounting costs due to widespread water damage and the closure or destruction of several homes and businesses that impact the local economy of the affected area.

Table 3.1. FEMA Disaster Declarations that included Cole County, Missouri, 1973-Present

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
372	Heavy rains tornadoes and flooding	1973	IA/PA
407	Severe storms and flooding	1973	IA/PA
3017	Drought	1976	PA-A/PA-B
779	Severe storms and flooding	1986	IA
995	Severe storms and flooding	1993	IA/PA
1023	Severe storms tornadoes and flooding	1994	IA
1054	Severe storms tornadoes hail and flooding	1995	IA/PA
1270	Severe storms and flooding	1999	IA
1463	Severe storms tornadoes and flooding	2003	IA
3232	Hurricane Katrina evacuation	2005	PA-B
1673	Severe winter storm	2006	PA
1736	Severe winter storm	2007	PA
1676	Sever winter storms and flooding	2007	PA-A/PA-B
1749	Severe storms and flooding	2008	PA-B
3303	Severe winter weather	2009	PA-B
3325	Flooding	2011	PA-B
3317	Severe winter weather	2011	PA-B
1961	Severe winter storm and snow storm	2011	PA
4238	Severe storms tornadoes strait-line winds and flooding	2015	PA
3374	Severe storms tornadoes strait-line winds and flooding	2016	PA
4250	Severe storms tornadoes strait-line winds and flooding	2016	IA
4317	Severe storms tornadoes strait-line winds and flooding	2017	IA
4451	Severe storms tornadoes and flooding	2019	IA/PA
3482	COVID-19	2020	PA-B
4490	COVID-19 pandemic	2020	IA/PA-B

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

3.1.3 Research Additional Sources

Sources utilized for information regarding past disaster incidents and research in the planning area include:

- Missouri Hazard Mitigation Plans (2013 and 2018)
- Previously approved Cole County Hazard Mitigation Plan (2016)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's Ag Census
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Hazards US (Hazus)
- Missouri Department of Transportation
- County Emergency Management
- County Flood Insurance Rate Map, FEMA
- U.S. Army Corps of Engineers
- United States Geological Survey (USGS)
- National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI)

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). 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. 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.

The NCEI damage amounts are estimates received from a variety of sources, including those listed above in the Data Sources section. Damages reported are in dollar values as they existed at the time of the storm event. They do not represent current dollar values.

The database currently contains data from January 1950 to March 2018. Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type.

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

Profiled below is a summary of Natural Hazards in alphabetical order that have significant impacts on the planning area. Each jurisdiction is unique and may not be affected by every hazard. X indicates hazards that impact that jurisdiction.

Table 3.2 Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Temperatures	Flooding (River and Flash)	Land Subsidence/Sinkholes	Levee Failure	Severe Winter Weather	Thunderstorm/Lightning/Hail/High Wind	Tornado	Wildfire	
Cole County	x	x	x	x	x	x	x	x	x	x	x	
Centertown		x	x	x	x			x	x	x	x	
Jefferson City	x	x	x	x	x		x	x	x	x	x	
Lohman		x	x	x				x	x	x	x	
Russellville		x	x	x	x			x	x	x	x	
St. Martins		x	x	x		x		x	x	x	x	
Taos		x	x	x	x			x	x	x	x	
Wardsville		x	x	x	x			x	x	x	x	
Schools and Special Districts												
Blair Oaks		x	x	x	x			x	x	x	x	
Cole Co. R-I		x	x	x	x			x	x	x	x	
Cole Co. R-V		x	x	x	x			x	x	x	x	
Jefferson City PSD		x	x	x	x			x	x	x	x	
Lincoln University		X	X	X	X			X	X	X	X	

3.1.5 Multi-Jurisdictional Risk Assessment

The 2021 Cole County Hazard Mitigation plan is an update of an earlier plan. The hazard profiles that follow are assessed on a county-wide basis but each jurisdiction will have unique levels of impact based on population and geographical location. The City of Columbia is the urban center of the planning area, with dense development and infrastructure that brings vulnerability state-wide if a hazard were to cause widespread destruction in the city. Other areas of the county are rural with little population or infrastructure to be damaged in the event of a natural hazard.

The planning area is subject to various natural hazards such as dam failure, drought, earthquake, extreme temperature, flooding, levee failure, wildland fire, severe winter weather, sinkholes/land subsidence, and thunderstorms and lightning. Each natural hazard poses different levels of risk depending on the jurisdiction and each will be discussed further in detail later in this section.

3.2 ASSETS AT RISK

This section assesses the planning area population, structures, critical facilities and infrastructure, and other important assets that may be at risk to hazards. Since the last update the area has experienced much growth in population creating a need for more housing units and infrastructure such as roads, sewers, water, and electricity to provide those homes with necessary amenities. This has expanded the number of connections and structures at risk of failure during a hazard event along with an expanded population at risk. The inventory of assets for each jurisdiction was derived from census block exposure data out of HAZUS, Missouri GIS Database, and local jurisdiction data questionnaires.

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

The following tables provide population data based on the 2019 American Community Survey estimates which are calculated over a 5-year period. Building counts and building exposure values are based on data developed by the State of Missouri Geographic Information Systems (GIS) database. Content 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. Land values have been excluded from consideration due to the fact that land remains following disasters and any market devaluations are often short term and difficult to quantify. State and Federal assistance programs do not generally address loss of land outside that of crop insurance. The total valuation of buildings is based on county assessor's data which may not be current and government-owned properties are usually taxed differently or not at all. This may cause some inaccuracies in the representation of true value. Public school district assets and special districts are included in the total exposure tables assets by community or county.

The following tables provide a look at population, building and content exposure by jurisdiction, as well as a look at exposure by usage type and building counts per each jurisdiction. The exposure and building information for each school district is also included

Table 3.3 Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2019 Annual Population Estimate	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Unincorporated Cole	28,086	29059	8978599	7763246	16741845
Centertown	278	156	35144	19798	54942
Jefferson City	42,919	15759	5377302	5702765	11080067
Lohman	166	86	25419	17081	42500
Russellville	793	371	93090	61696	154786
St. Martins	1,159	493	129215	83633	212848
Taos	1,349	669	175544	103339	278883
Wardsville	1,878	531	161717	98560	260277
Totals	76,911	47124	14976030	13850118	28826148

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

Table 3.4 Building Values/Exposure by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Cole County	7323942	1373381	244643	36633	8978599
Centertown	32751	2180	213	0	35144
Jefferson City	4060632	1148342	159491	8837	5377302
Lohman	20869	4210	219	121	25419
Russellville	82422	9225	171	1272	93090
St. Martins	98666	21408	8620	521	129215
Taos	165264	6352	3720	208	175544
Wardsville	147091	11900	1669	1057	161717
Totals	11931637	2576998	418746	48649	14976030

Source: Missouri GIS Database, SEMA Mitigation Management Section

Table 3.5 Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Total
Cole County	26874	1677	365	143	29059
Centertown	146	9	1	0	156
Jefferson City	14304	1216	202	36	15758
Lohman	75	9	1	1	86
Russellville	349	19	0	3	371
St. Martins	441	29	19	4	493
Taos	634	22	12	1	669
Wardsville	502	18	5	6	531
Totals	43325	2999	605	194	47123

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

While school’s total assets are included in the tables above, additional information gathered through the data questionnaires and school websites allow for further discussion. The table below shows enrollment and building information, including counts and replacement cost (exposure).

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

Public School District	Enrolment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Blair Oaks	1,252	8	\$32,868,239	\$3,491,734	\$36,359,973
Cole R-I	614	3	\$22,572,429.32	\$3,367,948.11	\$25,940,377.43
Cole R-V	643	5	\$25,405,085.61	\$3,612,820.73	\$29,017,906.34
Jefferson City PSD	9,009	26	\$615,499,834	\$32,310,450	\$647,810,284
Lincoln University	2,361	24	\$120,240,000	\$170,320,000	\$290,560,000

Source: 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.

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

Jurisdiction	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Wastewater Facility	TOTAL
Cole County	0	0	0	1	1	1	18	26874	2	1	1	0	4	1	5	0	0	3	0	0	26912	
Centertown	0	0	0	1	0	0	0	146	1	0	0	0	0	0	1	0	0	0	0	0	0	150
Jefferson City	1	1	20	2	0	1	5	14304	25	2	1	0	1	1	1	1	1	40	0	0	114408	
Lohman	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	75
Russellville	0	0	1	0	0	0	0	349	3	0	0	0	0	0	1	0	1	2	0	0	1358	
St. Martins	0	0	1	0	0	0	0	441	0	0	0	0	0	0	0	0	0	1	0	0	443	
Taos	0	0	1	0	0	0	0	634	0	0	0	0	0	0	0	0	0	1	0	0	1637	
Wardsville	0	0	0	0	0	0	0	502	1	0	0	0	0	0	1	0	1	0	0	0	1506	
Totals	1	1	23	4	1	2	23	43325		3	2	0	14	2	9	1	4	46	0	0	443468	

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

3.2.2 Critical and Essential Facilities and Infrastructure

There are four main types of facilities of concern in a hazard event. Critical Facility, essential facility, high potential loss facility, and transportation and lifeline facilities. These facilities are defined by FEMA as “... all manmade structures or other improvements that, because of their function, size, service area, or uniqueness, have the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if they are destroyed, damaged, or if their functionality is impaired.”

Critical facilities commonly include all public and private facilities that a community considers essential for the delivery of vital services and for the protection of the community. The adverse effects of damaged critical facilities can extend far beyond direct physical damage. Disruption of health care, fire, and police services can impair search and rescue, emergency medical care, and even access to damaged areas.

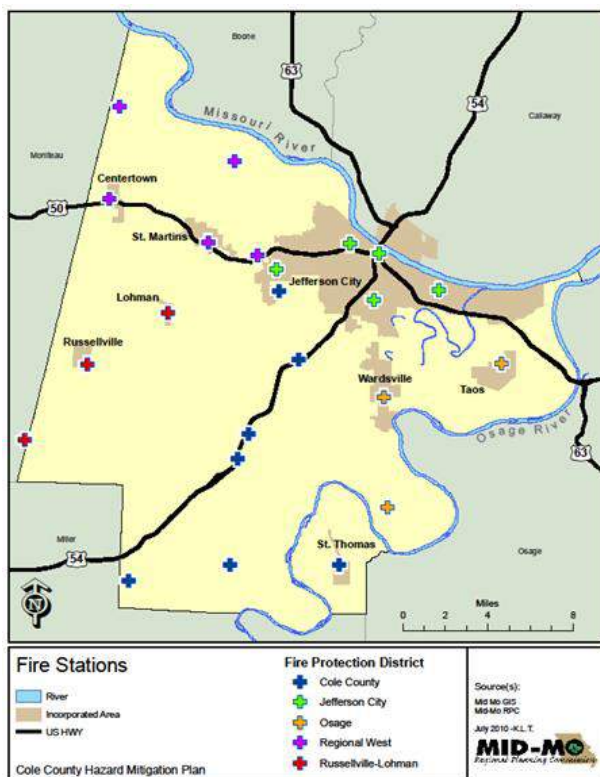
Government

The jurisdictions of Cole County, Jefferson City, Russellville, St. Martins, Taos and Wardsville all own buildings critical to the functioning of their jurisdictions. Jefferson City is both the location of the state government and the county seat; many key government facilities which serve the entire county are located there.

Fire Protection

The following fire protection district and fire department respond to fires, accidents, and other emergencies from stations located throughout the planning area (Map 3.1):

Map 3.1 Fire Stations



- Cole County Fire Protection District
- Osage Fire Protection District
- Regional West Fire Protection District
- Russellville-Lohman Fire Protection District
- California Rural Fire Protection District
- Jefferson City Fire Department

The five fire districts are rural, most volunteer, and supported by taxes levied on all Cole County residents with the exception of Jefferson City residents. The Jefferson City Fire Department is a career organization funded by a city tax levy.

Mutual aid agreements exist between all the departments and also with surrounding county departments.

The fire districts have been proactive in public education campaigns, updating training, and general outreach efforts to ensure the

community at large is safe. The fire districts are key players in hazard mitigation and preparedness activities.

Water Supply

The water supply in the planning area is provided through a mix of public water supply districts, municipal governments, private industry, and state and private wells.

There are five public water supply districts located in the planning area and one that supplies water to the portion of Jefferson City located north of the Missouri River in Callaway County. Each water district is composed of an elected board. The districts are responsible for maintaining existing water supply infrastructure and developing new infrastructure.

The incorporated communities of Lohman, Russellville and Wardsville provide their own municipal water.

Missouri American Water, a private utility, supplies water to part of Jefferson City and part of unincorporated Cole County.

Water Districts are primarily related to mitigation activities focused on drought, wildfire, and flood; protecting water supply infrastructure from floodwaters is another critical task. Connecting water supplies so that areas have multiple water supplies is an important mitigation strategy.

Wastewater

Jefferson City provides regional wastewater collection and treatment for Jefferson City and parts of unincorporated Cole County. The cities of Russellville, Taos and Wardsville have their own wastewater systems.

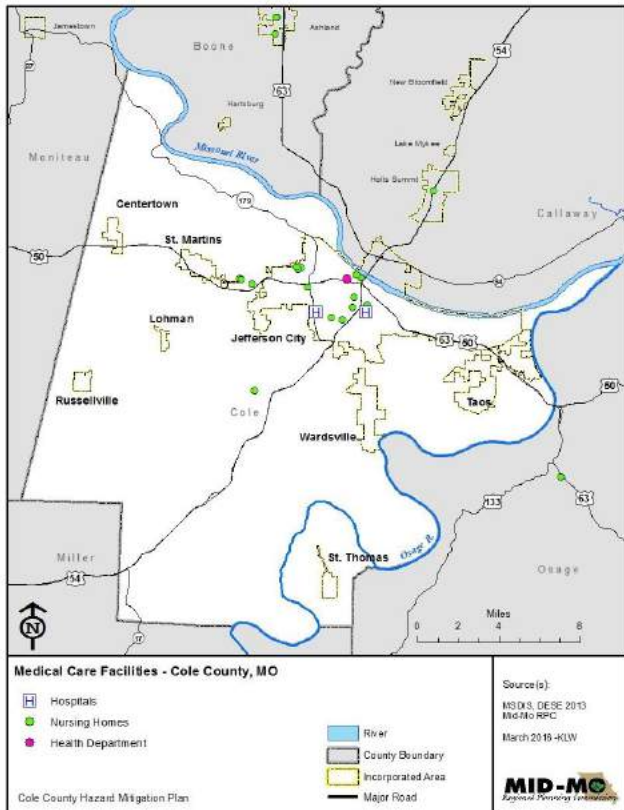
Missouri American Water maintains 45 wastewater sites throughout the planning area.

Medical Facilities

There are numerous medical and healthcare facilities located in the planning area (Map 3.2). The planning area has two hospitals located in Jefferson City: Capital Region Medical Center and SSM Medical Center (St. Mary's Hospital). In addition to the planning area, these medical centers serve the counties located to the south and west of Cole. Each of the hospitals has developed its own emergency plan, in accordance with state and federal regulations; these plans are exercised regularly and can act independently or in coordination with the LPHEP and/or the EOP.

There is also one large collective medical center (Jefferson City Medical Group), two urgent care providers, one Federally Qualified Health Center, and multiple physicians' offices and clinics.

Capital Region Medical Center, SSM Medical Center and JCMG all maintain lighted helicopter landing pads which are used by Air Response providers.



There is also one federally qualified health center, Community Health Center of Central Missouri (CHCCM), located in Jefferson City and the Samaritan Center in Jefferson City functions as a free medical clinic.

Ambulance service for Cole County is currently provided by Cole County Emergency Medical Services located in Cole County/City of Jefferson. The ambulance service maintains its own dispatch system. Mutual aid agreements are maintained with all surrounding ambulance services that reside within the area.

Emergency Management Agency

The Cole County Emergency Management Agency is in charge of protecting the lives and property of all Cole County residents from major disasters. Cole County and Jefferson City share oversight of this office. The Emergency Management staff has had extensive training from SEMA, FEMA, and

other bodies in emergency response, preparedness, mitigation, and overall emergency management.

Personnel of the EMA play a critical role in hazard mitigation due to their strong network of connections, awareness of hazard threats, wide-ranging experience of all facets of emergency management, and work with public education.

Map 3.2 Medical Facilities

Transportation

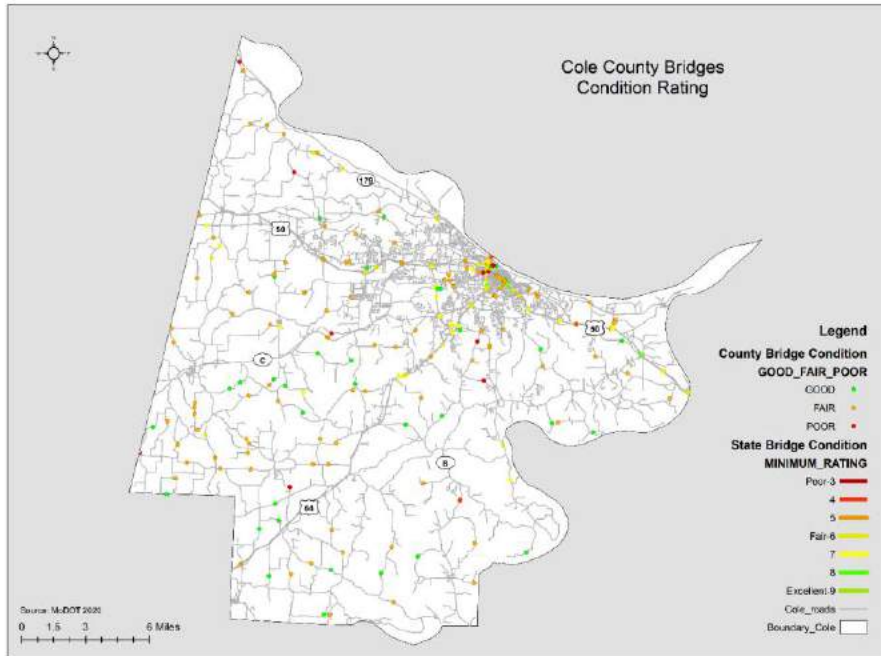
Cole County has three major highways which intersect in Jefferson City. There is a sizeable commuting population within, and to and from, the planning area due to the location of the State Capital in Jefferson City and the location of the University of Missouri at Columbia in adjacent Boone County to the north.

Bridges

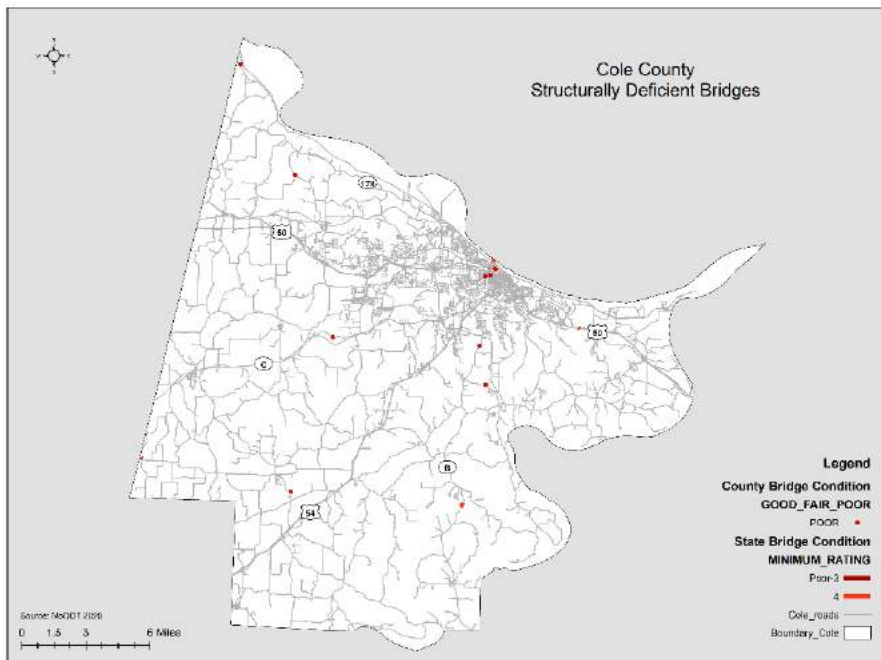
Bridge conditions are described using a “scour index”. This index rates bridges on their vulnerability to scour during a flood and is based on a scale of 0 to 9. Zero are failed bridges. Bridge with a scour index of 9 are new bridges. An index rating of 1 to 3 are in critical condition. A rating of 4 is poor. Anything 5 and higher are fair to excellent.

In 2019 legislation passed the Governor’s Focus on Bridges program. There will be two critical bridges replaced in Cole County through this program.

Map 3.1 Cole County Bridges



Map 3.2 Cole County Structurally Deficient Bridges



Roadways

The three major highways in Cole County (U.S. 54, U.S. 50, and U.S. 63) all intersect near the center of Jefferson City, the state capital. U.S. 54 provides access to the Lake of the Ozarks, a major recreational and tourism area approximately 60 miles southwest of Jefferson City. U.S. 50 provides access to the State Fair in Sedalia approximately 75 miles to the west. U.S. 54 and U.S. 63 both provide access to Interstate 70, approximately 30 miles to the north. Interstate 70 connects to St. Louis in the east and Kansas City in the west and is the most used east-west artery in the state.

Many citizens from neighboring counties work and conduct business in Jefferson City.

Railroads

Passenger Rail

Amtrak provides passenger service from Jefferson City to both Kansas City (and points westward) and St. Louis (and points eastward) via the *Missouri River Runner*. Two trains traveling in each direction stop daily at the Jefferson City Amtrak Station. The completion of a 9,000-foot rail siding extension just west of California, Missouri in November 2009 increased the on-time arrival percentage of the *Missouri River Runner* trains from 55-79% in recent years to over 90%, according to the Missouri Department of Transportation (MoDOT).

Rail Freight

A large amount of freight travels by rail through Cole County. Union Pacific operates tracks through the northern part of the county.

Air

The Jefferson City Memorial Airport, operated by Jefferson City, is located across the Missouri River in Callaway County. A wide variety of military, state government, corporate, and general aviation aircraft operate out of the airport but there are no scheduled commercial airline flights. The nearest public passenger airport is the Columbia Regional Airport, located approximately twenty miles north of Jefferson City in neighboring Boone County. Lambert-St. Louis International Airport and Kansas City International Airport are both 2-3 hours drive from Jefferson City.

The Jefferson City Memorial airport is located in floodplain and suffered during the floods in 2019. Due to the flooding the terminal is currently being rebuilt and raised.

Public Transportation

OATS, Inc., a private not-for-profit corporation, was founded by a group of seniors in 1971 as transportation for older citizen. Its current mission is to “provide reliable transportation for transportation disadvantaged Missourians so they can live independently in their own communities.” OATS, Inc. serves a wide diversity of citizens in 87 Missouri counties. In Cole County, the organization provides transportation between Jefferson City and the communities of Centertown, Eugene, Meta, Russellville, St. Martin, Taos, and Wardsville. OATS predominantly serves the elderly and disabled, but will serve anyone needing transportation.

Public transportation is available within Jefferson City through the fixed-route city run bus system (JEFFTRAN) which provides service Monday through Friday. JEFFTRAN also provides a door-to-door paratransit service (Handi Wheels) for clients who qualify under the Americans with Disabilities Act (ADA).

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

Threatened and Endangered Species

There are 9 plant and animal species listed as threatened or endangered that are known or are believed to occur in Cole County.

Table 3.8 Threatened and Endangered Species in Cole County

Common Name	Scientific Name	Status
Topeka shiner (fish)	Notropis topeka	Endangered
Indiana Bat (mammal)	Myotis sodalist	Endangered
Gray Bat (mammal)	Myotis grisescens	Endangered
Northern Long Eared Bat (mammal)	Myotis septentrionalis	Threatened
Running Buffalo Clover (plant)	Trifolium stoloniferum	Endangered
Pallid Sturgeon (fish)	Scaphirhynchus albus	Endangered
Pink Mucket (clam)	Lampsilis abrupta	Endangered
Scaleshell Mussel	Leptodea leptodon	Endangered
Spectaclecase (mussel)	Cumberlandia monodonta	Endangered

Source: U.S. Fish and Wildlife Service, <http://ecos.fws.gov/ecp/report/species-listings-by-current-range-county>

Public Land

Table 3.9 Parks in Cole County		
Name	Address	City
Binder Lake	Binder Lake Road	Jefferson City
Conservation Commission Head Quarters	2901 W Truman Blvd	Jefferson City
Clark's Hill/Norton State Historic Site	8838 Osage Hickory St	Jefferson City
Honey Creek Access	6500 Bungart Ln	Jefferson City
Hough Lake/Park	Ivan Rd	Jefferson City
Jaycee Park Lake	County Park Rd	Cole County
Jefferson Landing State Historic Site	100 Jefferson St	Jefferson City
Mari-Osa Access	Marina Rd	Jefferson City
Marion Bottoms Conservation Area	6125 Marion Main St	Centertown
Marion Access	Marion Main St	Centertown
McKay Park Lake	1700 Southridge Dr	Jefferson City
Moreau 50 Access	3219 Moreau View Dr	Jefferson City
Pikes Camp Access	State Hwy W	Westphalia
Runge Conservation Area and Nature Center	330 Commerce Dr	Jefferson City
Scrivner Road Conservation Area	7422 Scott Rd	Russellville
Smith Conservation Area	Sweetwater Rd	Centertown
Smoky Waters Conservation Area	Engineers Rd	Jefferson City
St. Thomas Ferry Access	Old Ferry Rd	St Thomas
Stringtown Bridge Access	Hemstreet Rd	Lohman
Sources: MO Department of Conservation (MDC), MO Spatial Data Server(MSDIS), MO Department of Natural Resources (DNR)		

Cole County Properties on the National Register of Historic Places

Cole county has several properties listed on the National Register of Historic Places. This registry is an official list of registered cultural resources that are worth preserving. The National Historic Preservation Act of 1966 authorized such a list as part of a national program. The program is administered by the National Parks Service and acts as a resource to coordinate public and private efforts to find, evaluate, and preserve historically and archeologically significant sites. Properties on the list include districts, buildings, structures, and sites that have significance through history, culture, architecture, archeology, and engineering. Table 3.10 is a list of historic sites located in Cole County.

Table 3.10 Cole County Properties on the National Register of Historic Places

Property	Address	City	Date Listed
Lewis Bolton House	9514 Hwy W	Wardsville	8/20/99
Henry Bockrath House	309 Dunklin St	Jefferson City	4/23/13
Dunklin Broadway Historic District	Broadway/Dunklin St	Jefferson City	11/14/02
Nelson Burch House	115 Atchison St	Jefferson City	1/8/03
Oscar Burch House	924 Jefferson St	Jefferson City	11/15/02
Capitol Avenue Historic District	Capitol Ave	Jefferson City	12/28/05
Cole County Courthouse	Monroe/High St	Jefferson City	4/3/73
Cole County Historical Society Building	109 Madison St	Jefferson City	5/21/69
Dulle Farmstead Historic District	1101 Hwy 54	Jefferson City	12/30/93
East End Drugs	630 High St	Jefferson City	8/21/03
Gensky Grocery Store Building	423 Cherry St	Jefferson City	6/6/01
Grove House	505 State St	Jefferson City	11/14/02
Herman Haar House	110 Bolivar St	Jefferson City	5/2/97
Philip Hess House	714 Washington St	Jefferson City	11/15/02
Hobo Hill Historic District	Miller/Jackson St	Jefferson City	1/2/13
Ivy Terrace	500 Capitol Ave	Jefferson City	3/16/90
Jefferson City Community Center	608 Dunklin St	Jefferson City	5/14/92
Jefferson City National Cemetery	1024 McCarty St	Jefferson City	10/01/98
Jefferson Female Seminary	416 & 420 State St	Jefferson City	2/24/00
Kaullen Mercantile Co.	900 & 902 High St	Jefferson City	11/21/02
Lansdown-Higgins House	5240 Tanner Bridge Rd	Jefferson City	11/12/99
Lincoln U. Hilltop Campus Historic Dis.	820 Chestnut St	Jefferson City	8/21/02
Lohman's Landing Building	Jefferson/Water St.	Jefferson City	2/25/69
Mo Governor's Mansion	100 Madison St	Jefferson City	5/21/69
Mo State Capitol Building & Grounds	High St	Jefferson City	6/23/69
Mo State Historic District	Adams/McCarty/Mulberry St	Jefferson City	6/23/69
Mo State Penitentiary Warden House	700 Capitol	Jefferson City	10/24/91
Moreau Dr. Historic District	Moreau Dr	Jefferson City	9/30/09
Munichburg Commercial Historic District	114-130 Dunklin/Madison	Jefferson City	7/1/09
Lester Parker House	624 Capitol Ave	Jefferson City	6/15/00
Joseph Porth House	631 W. Main	Jefferson City	1/26/01
John Ruthven House	406 Cherry St	Jefferson City	5/26/00
St. Francis Xavier Catholic Church	7319 Co. Rd. M	Taos	3/22/16
Charles Schmidt House	215 Atchison St	Jefferson City	1/7/03
John Sommerer House	2023 W. Main St	Jefferson City	1/7/03
Hugh Stephens House	601 Jackson St.	Jefferson City	5/12/09
Tergin Apartment Building	201 W McCarty St	Jefferson City	4/22/99
Albert Thomas House	224 Elm St	Jefferson City	11/14/02
Villa Panorama	1310 Swifts Hwy	Jefferson City	1/3/85
Joseph Wallendorf House	701 Country Club Dr	Jefferson City	4/4/08
West End Saloon	700-702 W Main St	Jefferson City	6/27/14
Woodland-Old City Cemetery	1022/1000 E McCarty St	Jefferson City	7/23/18
Zion Lutheran Church	2346 Zion Rd	Jefferson City	11/15/00
William Zuentd House	920 Jefferson St	Jefferson City	11/15/02

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

The major employers for the planning region are shown in Error! Reference source not found.. The majority of large employers are located in or near Jefferson City, or within easy access of a

major area road.

Table 3.11

Major Employers in Cole County

Employer	Employees	Employer	Employees
State of Missouri	14,174	Jefferson City Medical Group	629
Jefferson City Public Schools	1,627	WIPRO Infocrossing	461
Scholastic, Inc.	1,500	Missouri Farm Bureau	283
Capital Region Medical Center	1,527	McDonald's Restaurants	250
SSM Health - St. Mary's Hospital	1,070	Modine Manufacturing	191
Central Bancompany	1,020	State Technical College of Missouri	229
ABB, Inc.	865	Command Web	200
Walmart Supercenter (2 locations)	665	Learfield Communications	171
City of Jefferson	830	DeLong's, Inc.	154
Quaker Window Products	1,051	Lowe's	178
Lincoln University	369	Meyer Electric Co.	216
Unilever Home & Personal Care	467	Sam's Club	182
Cole County	363	Modern Litho/Brown Printing	193
Gerbes Supermarket (2)	294	Hy-Vee Food Stores	455

jcchamber.org

Cole County is a heavy agriculture area. There are 1,169 farms listed in the 2017 Ag Census. Those farms do not usually employ several people though. The average size of a farm in Cole County is 159 acres and employs less than 10 people.

Table 3.12 Agriculture Employment

Employment Information	Farms	Workers	\$1,000 Payroll
Hired Farm Labor	156	413	2,091
Farms with One Worker	70	70	x
Farms with two Workers	48	96	x
Farms with Three or Four Workers	16	55	x
Farms with Five to Nine Workers	17	109	x
Farms with 10 Workers or More	5	83	x
Reported only workers working 150 days or more	21	31	92
Reported only workers working less than 150 days	112	232	425
Reported Both	23	x	1,574
Unpaid Workers	538	1,406	x

Source: 2017 Ag Census

3.3 Land Use and Development

3.3.1 Development Since Previous Plan Update

Cole County as a whole has shown small growth. Communities with the largest growth estimated are the jurisdictions of Taos and Wardsville. Both communities are within easy commute of Jefferson City where the majority of job producers are located but still have amenities such as community water, sewer, and quality internet connection.

Table 3.13 Cole County Population 2000-2010 by Jurisdiction

Jurisdiction	2010 Population	2019 Annual Population Estimate or ACS Population	# Change (2010-2019)	% Change (2010-2019)
Unincorporated Cole	28,066	28,086	20	0.07%
Centertown	278	318	40	14.39%
Jefferson City	43,057	42,919	-138	-0.32%
Lohman	163	166	3	1.8%
Russellville	807	793	-14	-1.73%
St. Martins	1,140	1,159	19	1.67%
St. Thomas	263	243	-20	-7.6%
Taos	878	1,349	471	53.64%
Wardsville	1,506	1,878	372	24.7%
Total	76,158	76,745	587	0.77%

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

Growth translates into a need for more housing, and the expansion of local emergency capabilities to keep up with demand and added fuel to the system. While American Community Survey estimates a small growth in population for Cole county, the heightened growth for some jurisdictions means higher need for housing in certain areas while other jurisdictions may have a decline in need. It should be noted that estimates are based on housing estimates before the 2019 Jefferson City tornado. An estimated 500 homes were damaged during the storm throughout its mid-Missouri tract. Many homes were located in unincorporated Cole County and in Jefferson City. While many homes have been fixed a large number of homes remain vacant in the aftermath which has led to a housing shortage.

Table 3.14 Change in Housing Units, 2010-2019

Jurisdiction	Housing Units 2010	Housing Units 2019	2010-2019 # Change	2000-2019 % Change
Unincorporated	11,449	12,234	785	6.86%
Centertown	151	159	8	5.3%
Jefferson City	18,842	18,992	150	0.8%
Lohman	79	97	18	22.78%
Russellville	360	417	57	15.83%
St. Martins	474	494	20	4.2%
Taos	340	524	184	54.1%
Wardsville	529	707	178	33.65%

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

Population growth is expected to continue in Cole County and its jurisdictions. Due to the transportation network that passes through Cole County it continues to be a major shipping corridor. With the jobs provided by state government Cole and its jurisdictions are in a good location to serve as a home point for those working for the state or any of the distribution centers or jobs in nearby Columbia that are within easy commuting distance.

St. Martins has a new housing development planned to start construction soon.

School District's Future Development

Steady growth is expected in the participating school districts. Jefferson City Public Schools have plans for more new buildings to house their growing student population. As new buildings are built and old ones are remodeled it is a trend across all districts to employ hardening methods and mitigation tactics to keep their students and faculty safe from all hazards.

3.4 Hazard Profiles, Vulnerability, and Problem Statements

A Risk Assessment has been conducted for each hazard identified as affecting the planning area. The remainder of this section includes these risk assessments which are discussed in alphabetical order and organized according to the following outline:

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.

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. For some hazards, the entire planning area is a risk.

Strength/Magnitude/Extent - The extent of the hazard refers to the strength or magnitude of that hazard which can be expected in the planning area; extent is an attribute of the hazard alone and does not include its effect on humans or the built environment.

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

Probability of Future Events (Natural Hazards) - The probability of future events is, for the most part, based on historical data while also taking into account the expected impact of climate change. It is assigned based on the following scale which was slightly modified from that found in the *Missouri State Hazard Mitigation Plan (2018)*:

- Low – The hazard has little or no chance of happening (less than 1 percent chance of occurrence in any given year)
- Moderate – The hazard has a reasonable probability of occurring (between 1 and 10 percent chance of occurrence in any given year).
- High – The probability is considered sufficiently high to assume that the event will occur (between 10 and 100 percent chance of occurrence in any given year).

In the case of earthquakes, projections made by the USGS have also been taken into account in assessing the probability.

Probability of Future Events (Technological/Human-made Hazards) – There is a lack of historical data for most of the technological/human-made hazards profiled; in addition, some of them are evolving on a monthly basis as political and cultural events play a large role in some of the hazards.

For at least one technological/human-made hazard for which historical is available (hazardous materials release), the probability calculated using the same scale as used for natural hazards was considered ridiculous by those working closely with this hazard. (The calculated probability would have been high.) Representatives of the LEPC indicated that seeing a “high” probability associated with this hazard would make them question the validity of the entire hazard mitigation plan.

So, for these reasons, the probability of technological/human-made hazards was evaluated and assessed by those working most closely with these hazards in some emergency management or preparedness capacity.

Analysis of Risk - Presented by the hazard, including a **measure of severity** for each participating jurisdiction. The **measure of severity** is an estimate of the deaths, injuries, or damage (property or environmental) that could result from the hazard. It is also broadly based on the scale found in the Missouri State Hazard Mitigation Plan (2018):

Low – Few or minor damage or injuries are likely.

Moderate – Personal injuries and/or damage to property or the environment are expected.

High – Major injuries and/or death and/or major damage will likely occur.

Changing Future Conditions Considerations – This discusses the potential future impacts climate change could have on natural hazard events and their effects on the planning area.

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.

A jurisdiction's vulnerability to a hazard is connected to the extent of that hazard, the probability of future events, the estimated measure of severity, and mitigation measures already in place for that hazard.

In many cases, the potential severity of the hazard event contributes the greatest weight to the vulnerability rating. In some cases, however, a low severity event with high frequency can cause economic strain which translates into a higher vulnerability.

Existing Mitigation/Operating Assumptions: Both the measure of severity and overall vulnerability are greatly impacted by the mitigation already in place in the planning area; this existing mitigation is taken as an operating assumption when evaluating the vulnerability to a particular hazard. The following mitigation activities are applicable to many or all hazards:

- Building codes are in place in Cole County. The majority of jurisdictions have adopted the same codes as the county and added their own amendments as needed, but Jefferson City have their own codes.
- Resources for the public on retrofitting and protecting buildings are available through the Office of Emergency Management.

- Critical infrastructure in the county is accessible and provided with backup power.
- Cooperative agreements are in place between utility providers in the county.
- Agreements are in place with local shelters in the county.
- General evacuation procedures are included in the Office of Emergency Management's (OEM) Emergency Operation Plan.
- Evacuation routes are in place in all school districts in the county.
- Buses in all school districts have two-way radios on board.

Other current mitigation activities are aimed at mitigating the effects of a specific hazard and are described under the specific hazard profile.

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

- **Vulnerability Overview** – This is an overall summary of each jurisdiction's vulnerability to the identified hazards. It identifies structures, systems, populations or other community assets that are susceptible to damage and loss for hazard events.
- **Potential Losses to Existing Development/life** – Covers how impacts and potential impacts of the hazard has consequences on existing jurisdictional assets such as buildings, critical facilities, life, etc.
- **Previous and Future Development** - This section goes over how changes in development have impacted the jurisdiction's vulnerability to the hazard.
- **Hazard Summary by Jurisdiction** – Hazards vary by jurisdiction and this section will provide an overview of such variations.

Problem Statements

The problem statement consists of a brief summary of the problems created by the hazard in the planning area, and possible ways to resolve those problems.

3.4.1 Flooding (Riverine and Flash)

DESCRIPTION OF HAZARD

Flooding is defined as partial or complete inundation of usually dry areas. **Riverine flooding** refers to when a river or creek overflows its normal boundaries. The relatively flat areas adjacent to rivers and stream banks which are inundated at times of high water are called floodplains. The term base flood, or 100-year flood, is the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year, based upon historical records.

The planning area is at great risk for riverine flooding. Major waterways include the Missouri River to the north, the Osage River to the east and southeast, the Moreau River in the west and southwest, and various other creeks and branches. Flooding could potentially occur anywhere along these waterways.

The Missouri River, which forms the northern border of Cole County, is the longest river in the United States. The Missouri River drains approximately one-sixth of the area of the continental United States, according to the USGS. It drains over half the state of Missouri as it flows eastward to join the Mississippi River at St. Louis. Since Cole County is located less than 200 miles upstream from the mouth of this 2,540 mile river, it is obvious that flooding of the Missouri River is a major concern for the county.

In addition to the threat of riverine flooding, when a river or creek overflows its normal boundaries, the planning area is also susceptible to **flash flooding**. NOAA defines a flash flood as “an event that occurs within 6 hours following the end of the causative event (such as rains, ice jams, or dam breaks)...” Flash floods develop quickly and are responsible for more flood related deaths than any other type of flooding. The textual descriptions for flash flooding events in the NOAA database indicate that flash flooding in the planning area is usually triggered by 2-5 inches of rainfall within a “short period”.

In some cases, however, flooding may not be directly attributable to a river, stream or lake overflowing its banks. It may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place else to go, 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.

FEMA defines sheet flooding as “a type of flood hazard with flooding depths of 1 to 3 feet that occurs in areas of sloping land.”

Local **storm water flooding** can result when tremendous flow of water occurs due to large rain events. Local flooding can create public safety issues due to flooded roadways and drainage structures.

Most flooding in Cole County occurs in spring and summer but floods can occur in any season.

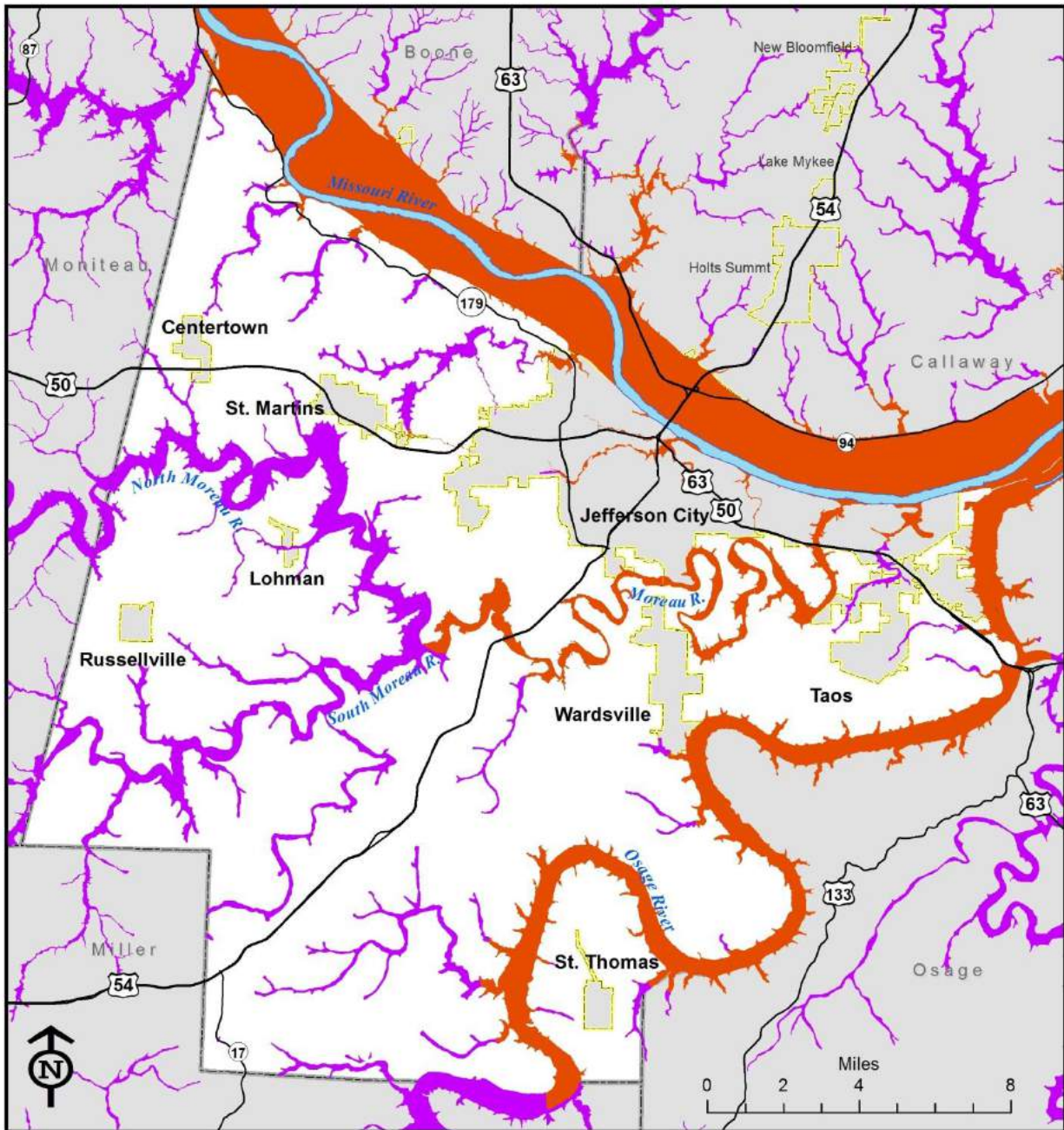
Location

The entire planning area is at risk from some type of flooding.

Cole County (unincorporated area), Jefferson City, St. Martins, Taos, and Wardsville are all at risk from riverine flooding because they have area in the 100-year flood plain. None of the school districts nor Lincoln University have buildings lying within the 100-year flood plain.

Varying levels of flood risk are designated by flood zones mapped on Flood Insurance Rate Maps (FIRMs). The current FIRM for Cole County (#29051) has an effective date of 11/02/2012. Overview maps showing the floodplains for the entire planning area (Map 3.1) and for Jefferson City (Map 3.2) are included in the following pages. For the smaller jurisdictions with significant flooding risk, the National Flood Hazard Layers from the online system are included (Figures 3.1 A-L).

Map 3.1



Cole County Flood Zones

- A**
-an area inundated by 100 year flooding,
for which no BFEs* have been established
- AE**
-an area inundated by 100 year flooding,
for which BFEs* have been determined

Cole County Hazard Mitigation Plan

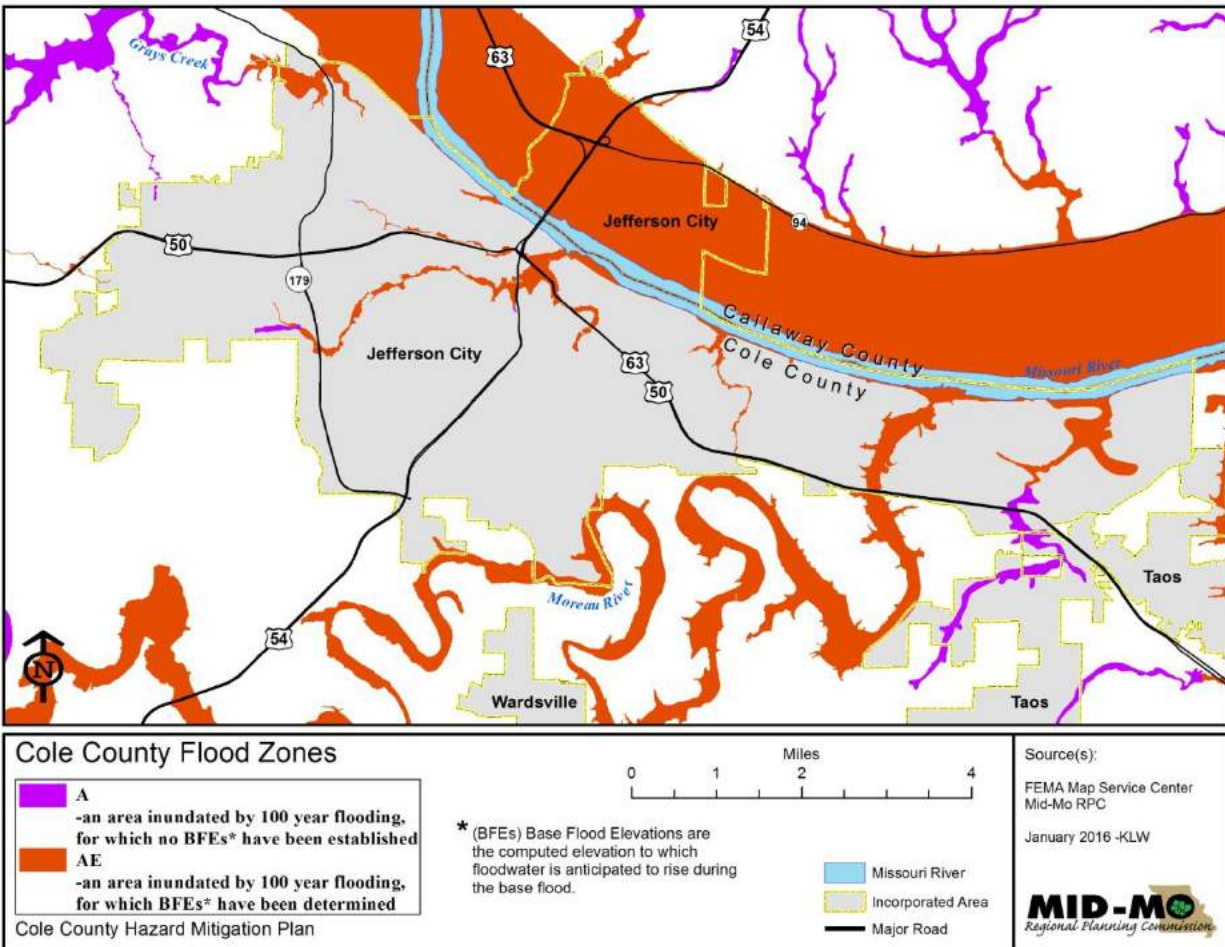
* (BFEs) Base Flood Elevations are the computed elevation to which floodwater is anticipated to rise during the base flood.

- Missouri River
- Incorporated Area
- Major Road

Source(s):
FEMA Map Service Center
Mid-Mo RPC
January 2016 -KLW

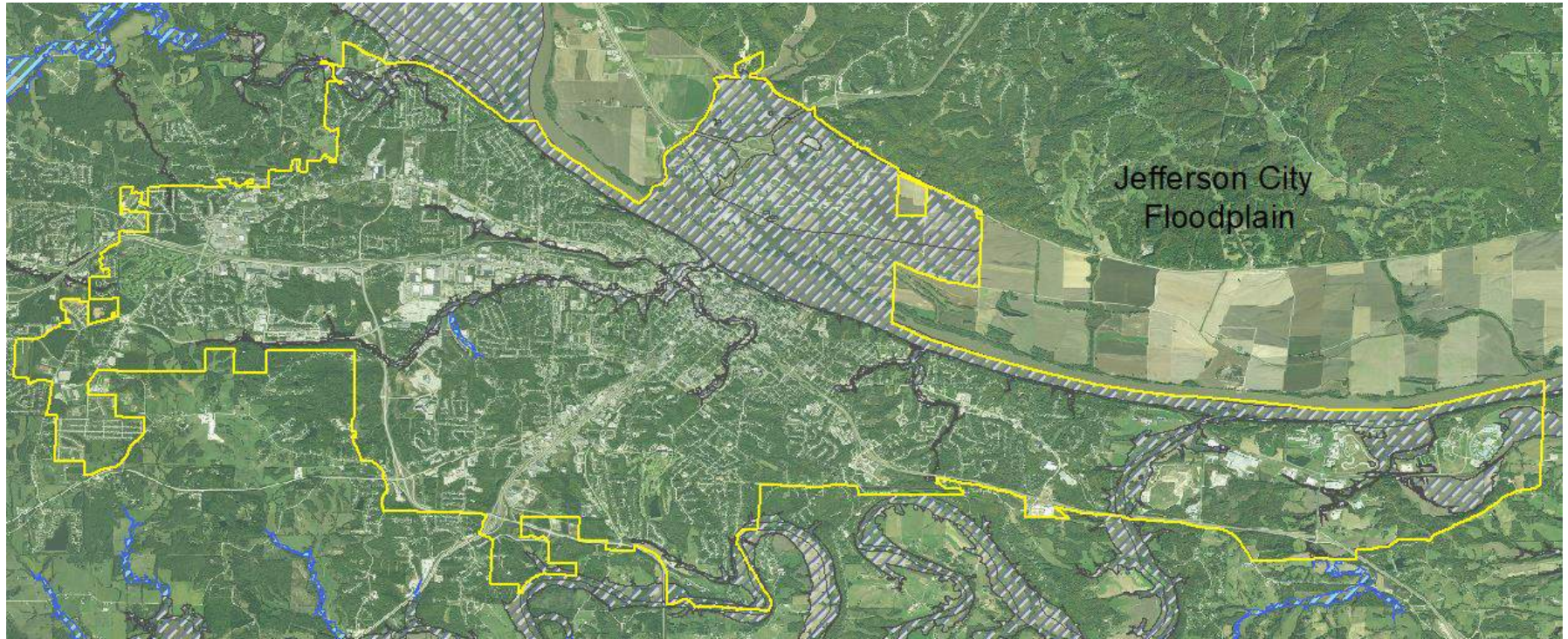


Map 3.2



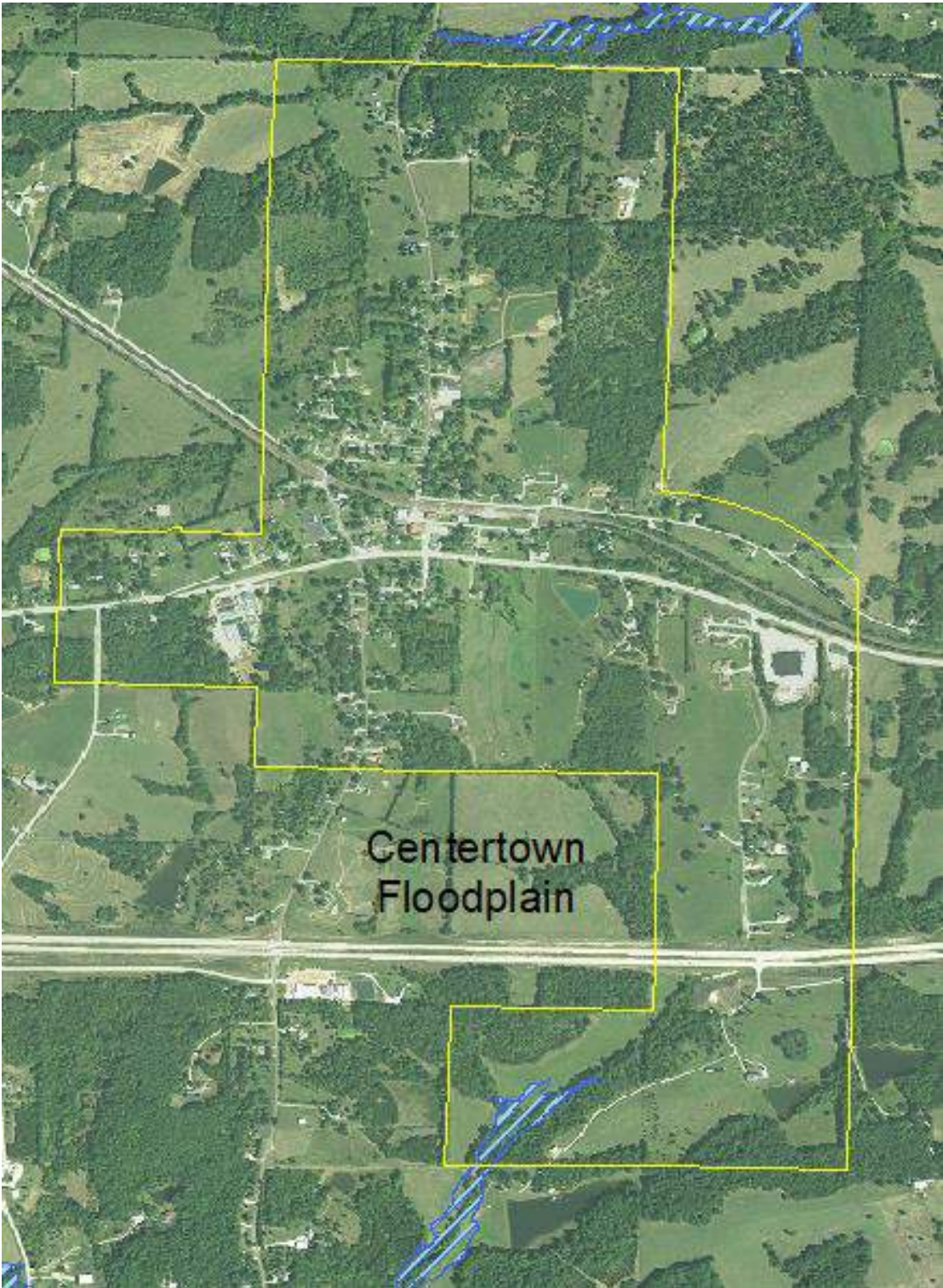
Jefferson City

Figure 3.1a



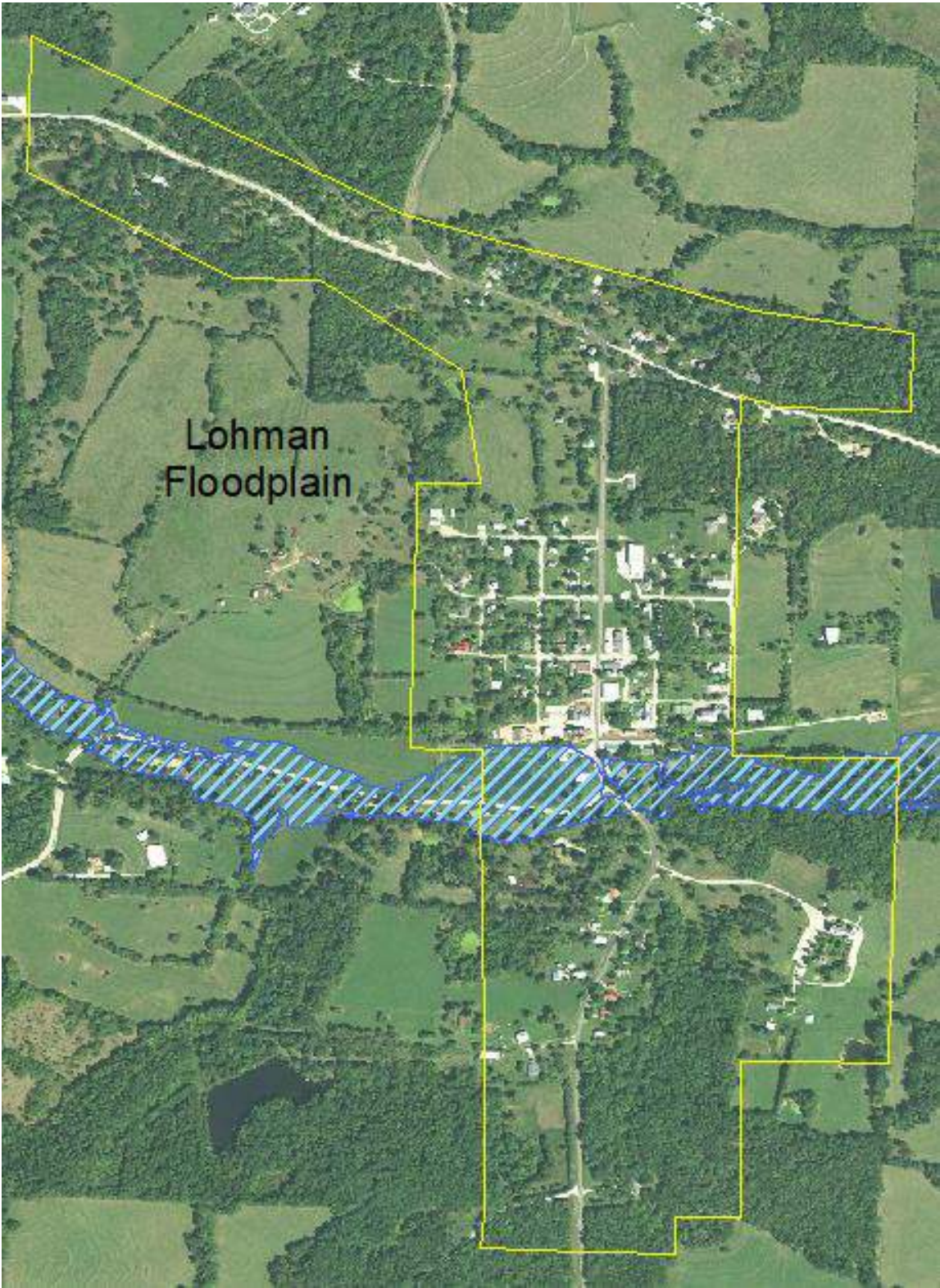
Centertown

Figure 3.1b



Lohman

Figure 3.1c



Russellville

Figure 3.1d

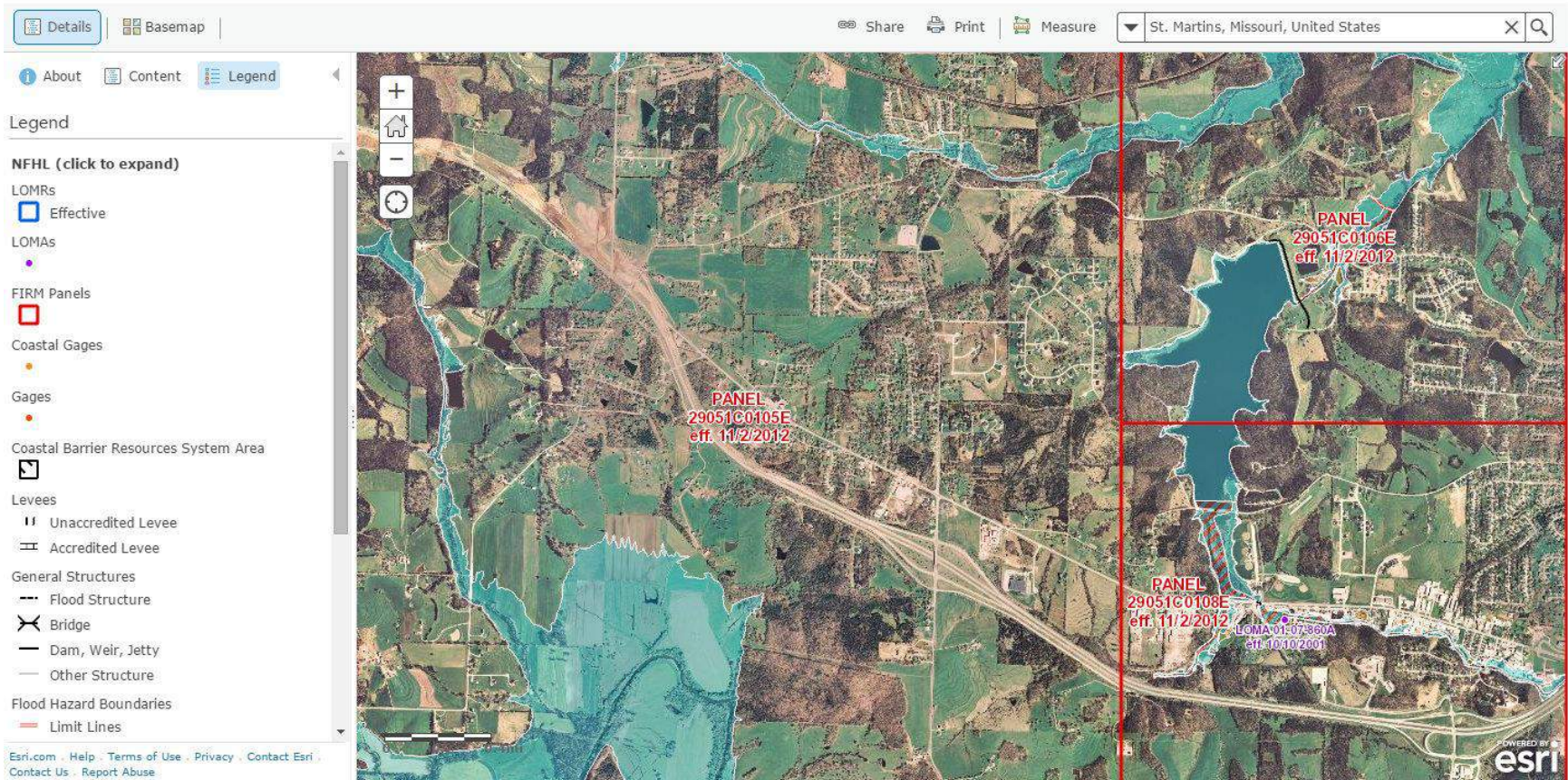


St. Martins

Figure 3.1e

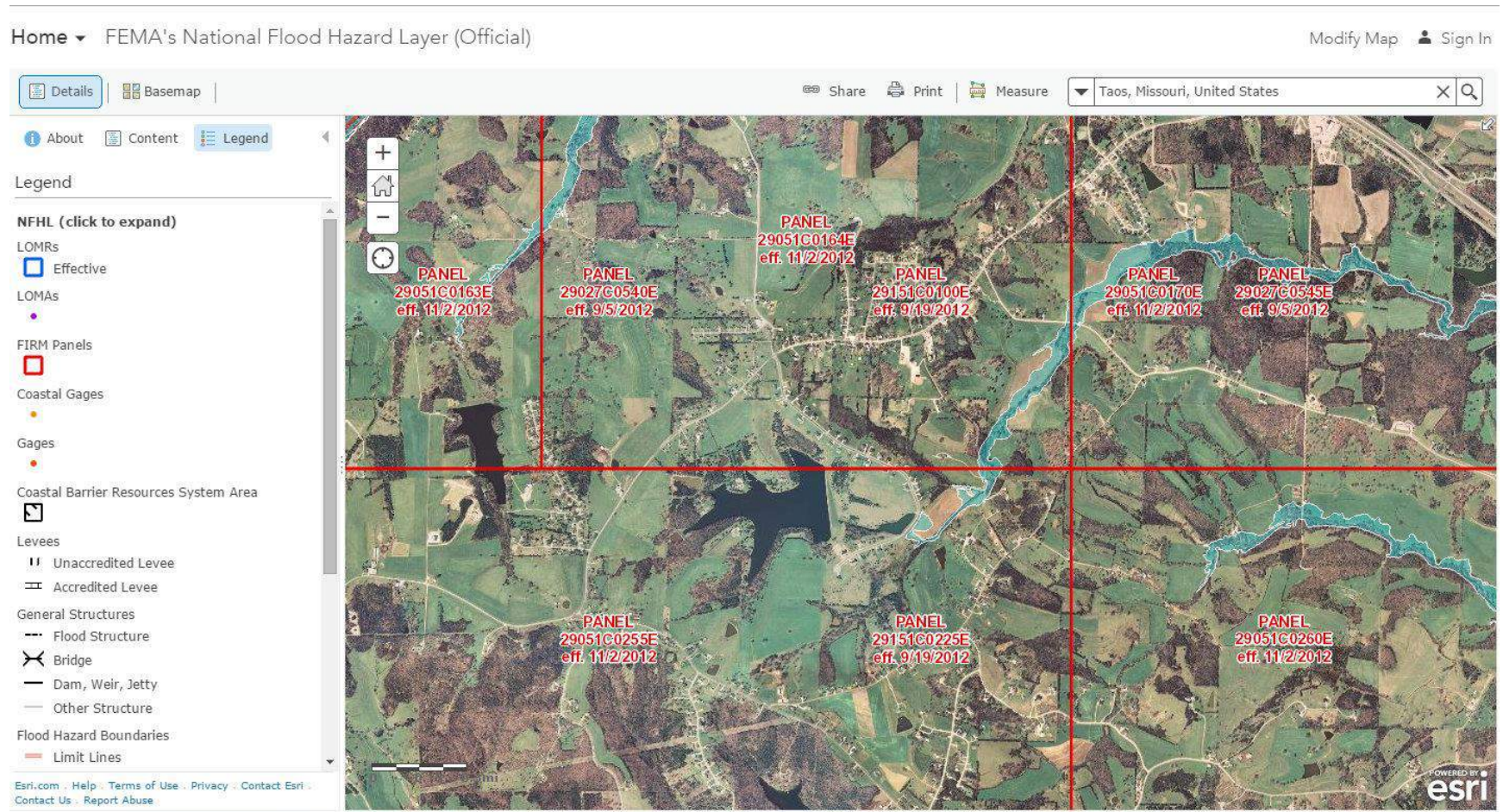
Home ▾ FEMA's National Flood Hazard Layer (Official)

Modify Map Sign In



Taos

Figure 3.1f



Wardsville

Figure 3.1g (Northern part of city)

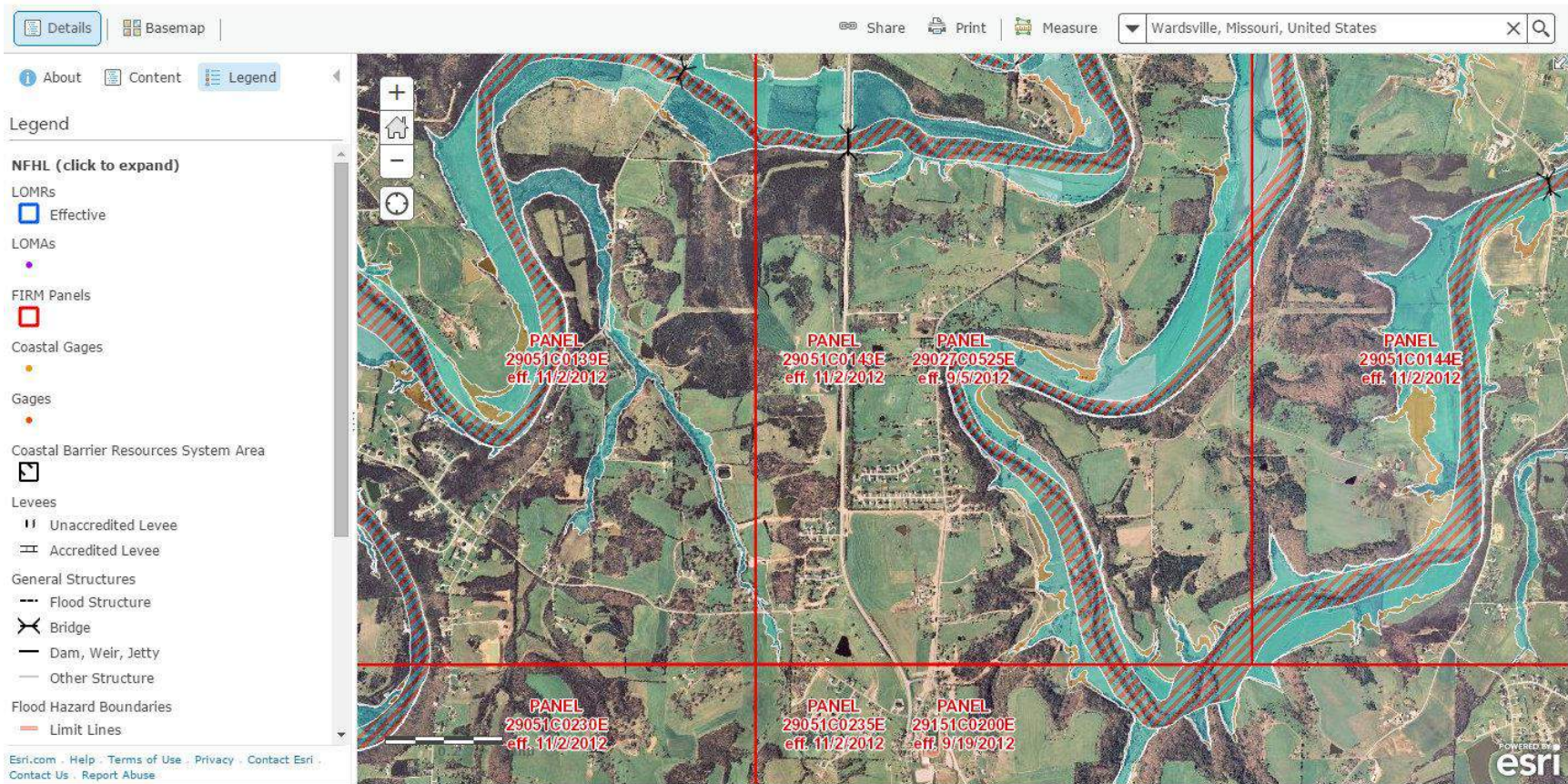
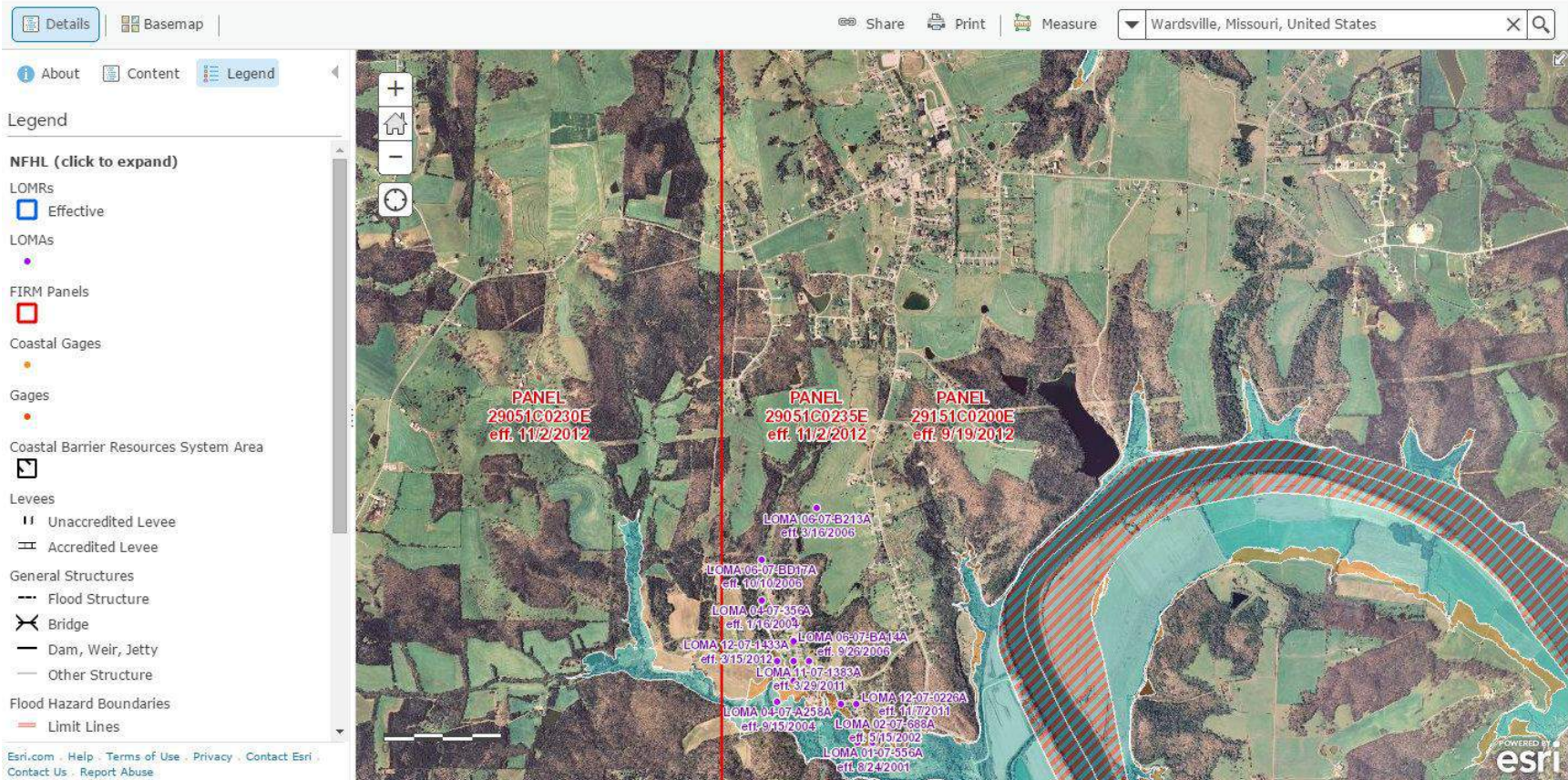


Figure 3.1h (Southern part of city)

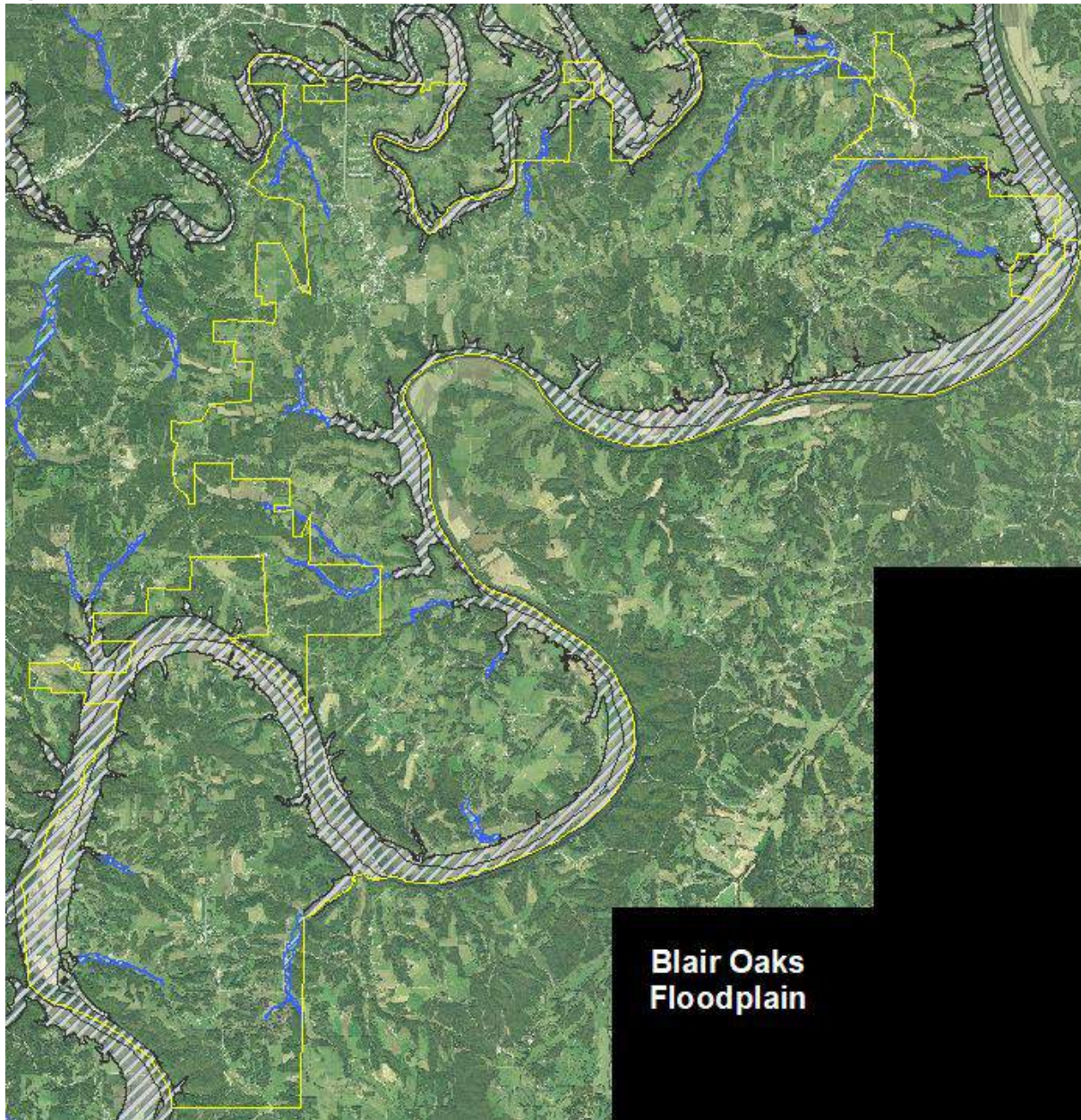
Home ▾ FEMA's National Flood Hazard Layer (Official)

Modify Map Sign In



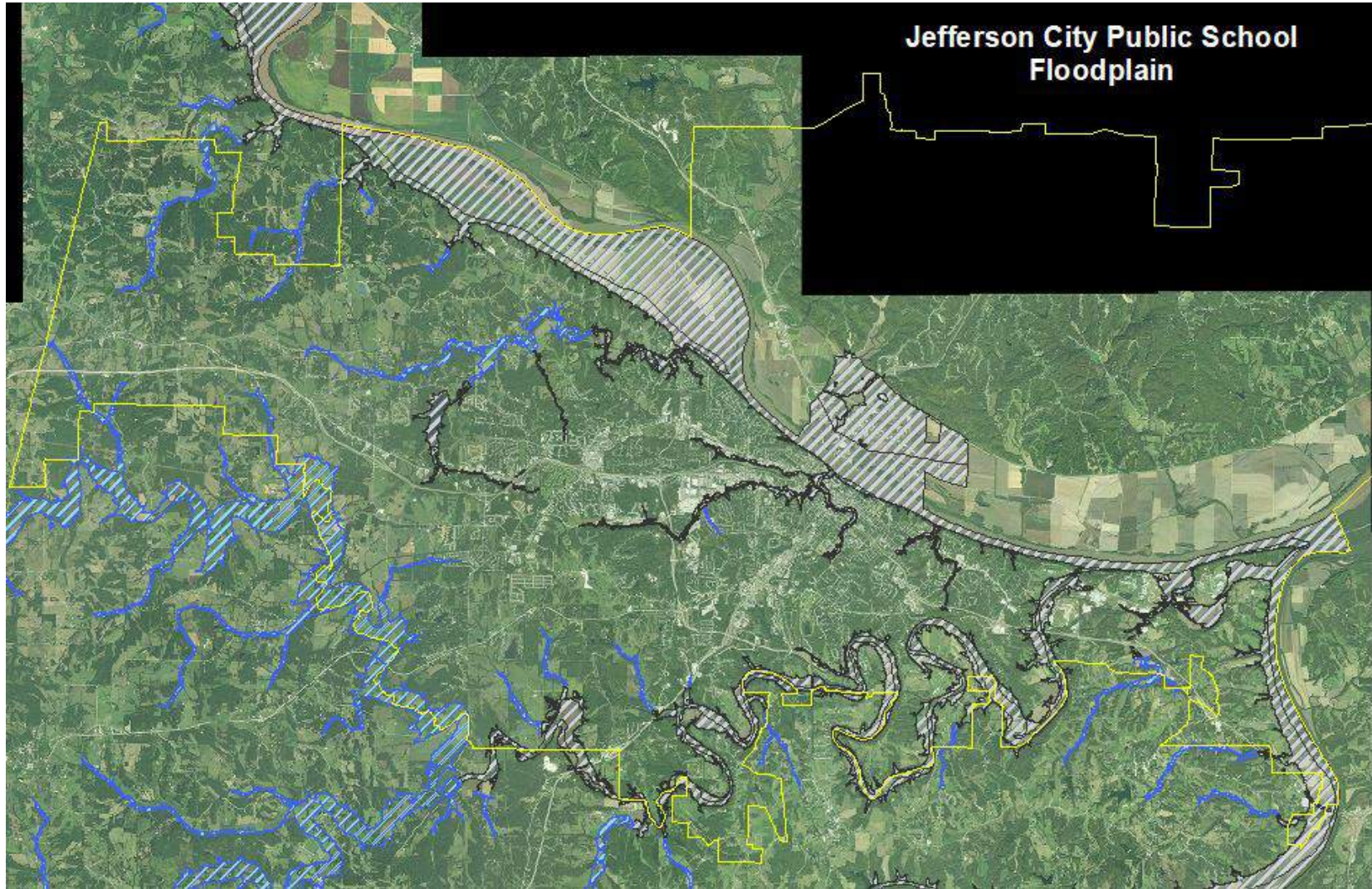
Blair Oaks

Figure 3.1i



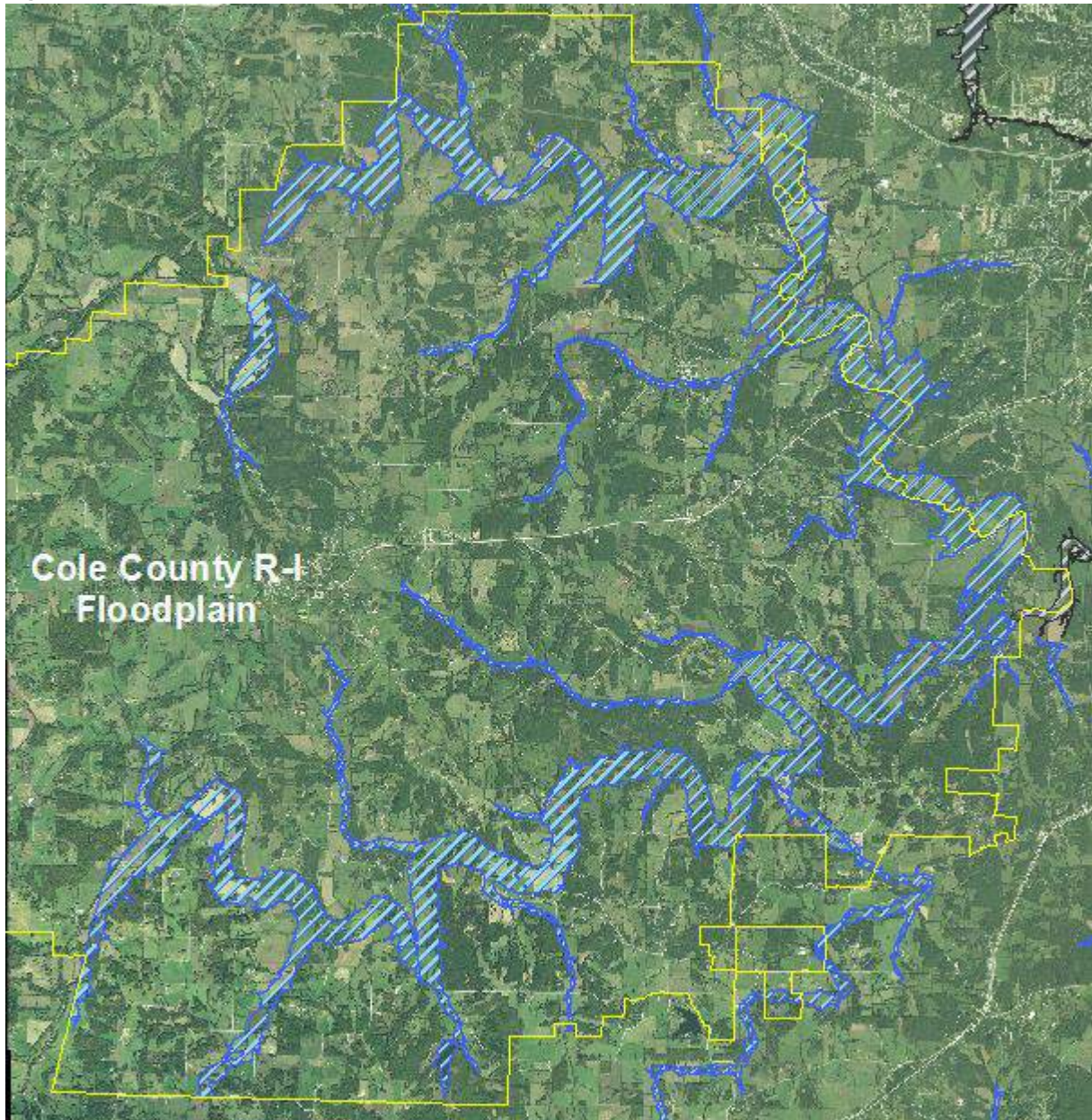
Jefferson City Public Schools

Figure 3.1j



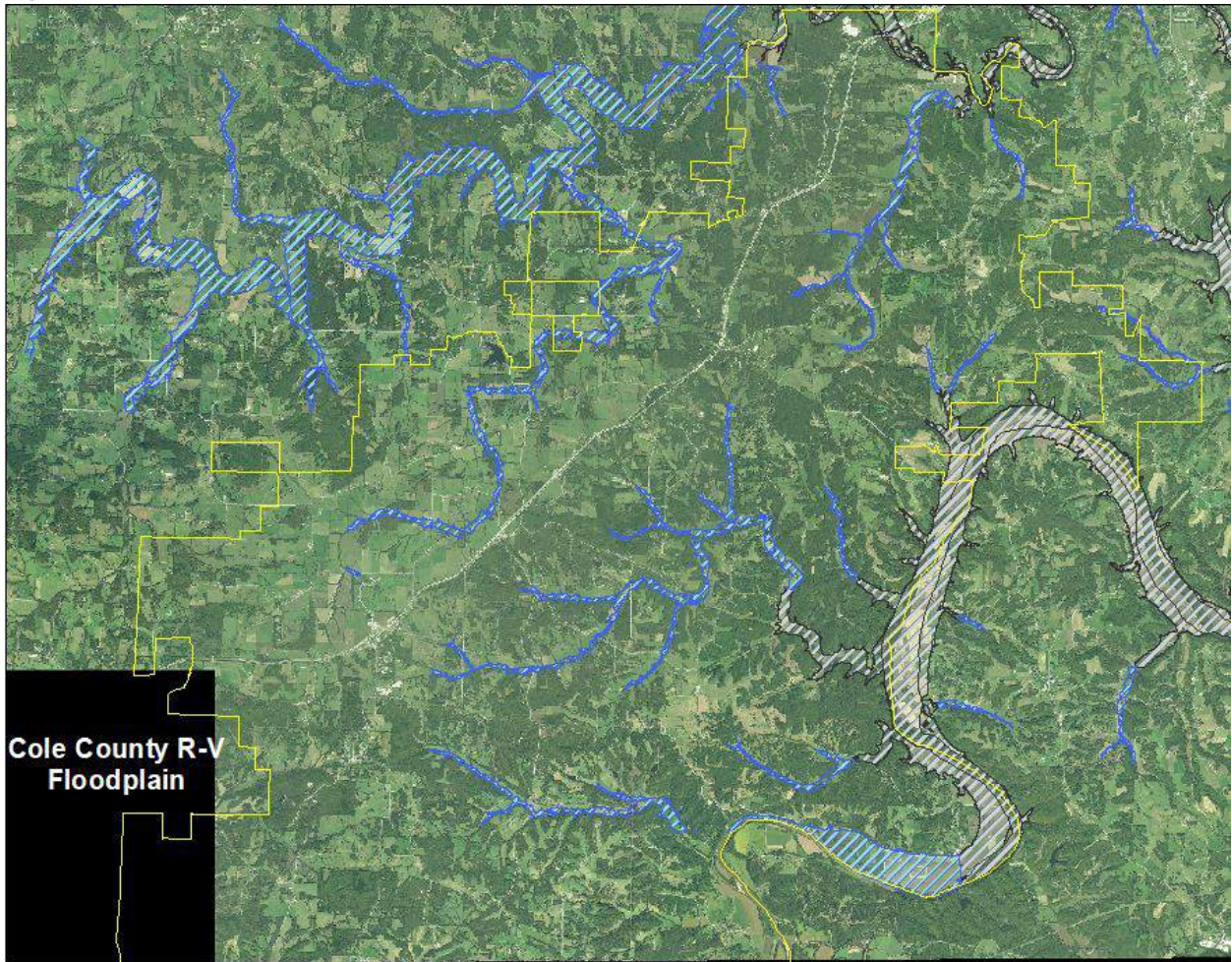
Cole R-I

Figure 3.1k



Cole R-V

Figure 3.1L

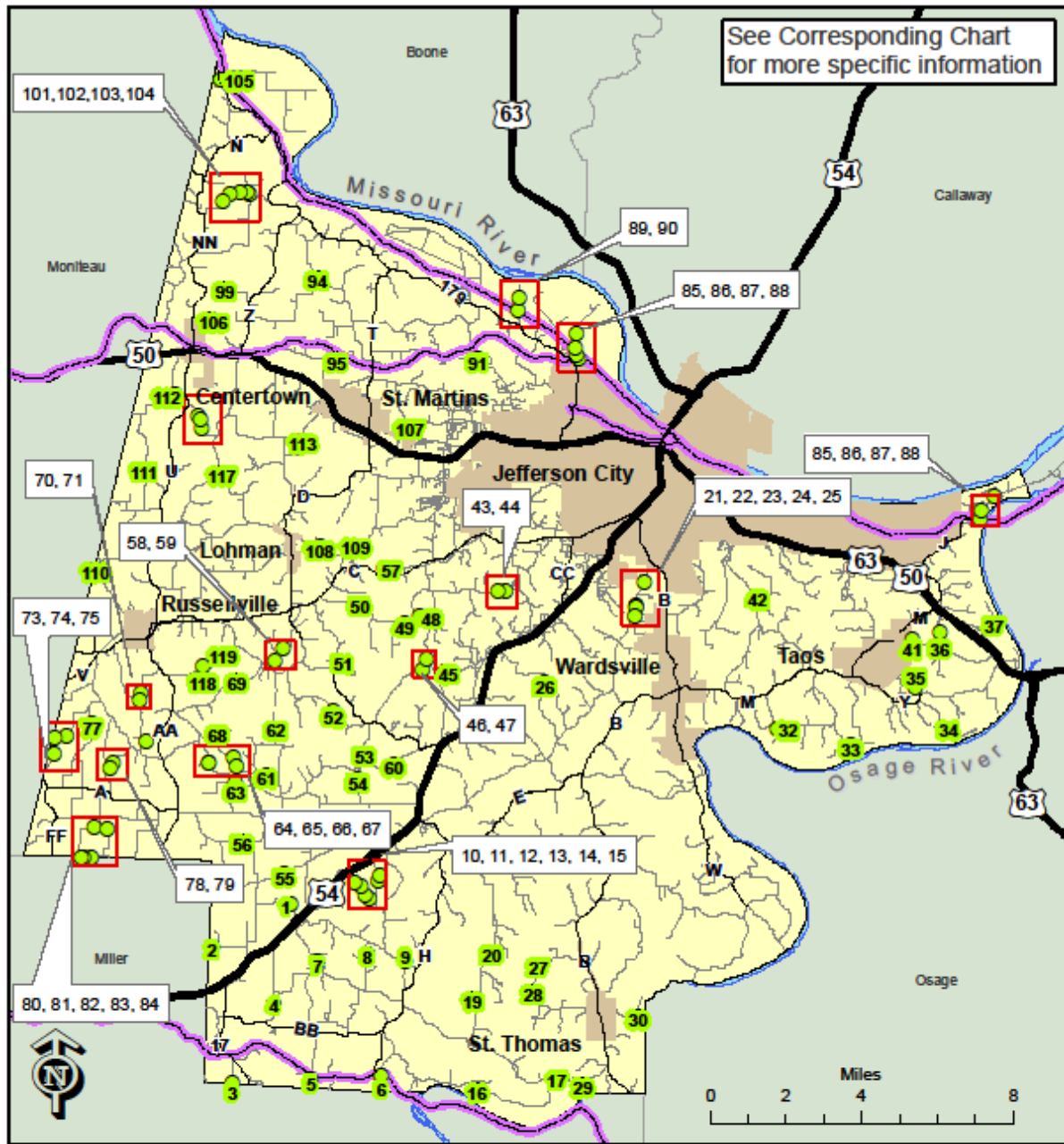


Flash flooding and subsequent road closures are a concern for all jurisdictions in the planning area. Flash flooding occurs throughout the planning area and as a result road closures due to high water are common.

Cole County Public Works collected GIS (and explanatory) data on county maintained low water crossings, low water bridges, culverts and pipes for the update of the hazard mitigation plan (Map 3.3).

Points labeled “flooding area” on the map in Map 3.3a are posted with the following three flood warning signs: “Flood area ahead”, “Impassable during high water”, “Do not enter when flooded”.

Map 3.3



<h3>Flooding Areas designated by Cole County Public Works</h3>		<p>Note: This information was provide by Cole County Public works and does not represent areas that are maintained by individual communities</p>	<p>Source(s): Cole County Public Works MSDIS Mid-Mo RPC September 2010 -K.L.T.</p>
<p>● # Flooding area</p> <p>— Rail</p> <p>— State Route</p> <p>— US HWY</p>	<p>Water Body</p> <p>Incorporated Area</p> <p>Cole County</p>		

Cole County Hazard Mitigation Plan

Table 3.15			
Cole County Public Works Designated Flood Areas			
Map ID	Road	Structure	Area Designation/Comments
1	Clark Fork Rd	Box Culvert	Flood Area
2	Binkley Rd	Low Water Crossing	Flood Area
3	Southwest Rd	Low Water Crossing	Not Signed For Flooding
4	Penny Hollow Rd	Bridge	Flood Area
5	Swift Rd	Low Water Crossing	Flood Area
6	Pit Rd	Box Culvert	Flood Area
7	Boise Brule Rd	Low Water Crossing	Not Signed For Flooding
8	Blue Ridge Rd	Low Water Crossing	Flood Area
9	Hickory Hill Rd	Box Culvert	Flood Area
10	Sandy Fork Rd	Low Water Crossing	Flood Area
11	Sandy Fork Rd	Low Water Crossing	Flood Area
12	Sandy Fork Rd	Low Water Crossing	Flood Area
13	Sandy Fork Rd	Low Water Crossing	Flood Area
14	Fall Hill Rd	Pipe	Flood Area
15	Fall Hill Rd	Box Culvert	Flood Area
16	S Teal Bottom Rd	Pipe	Flood Area, Slough Backs Up From Osage River
17	Scheuler Ferry Rd W	Box Culvert	Flood Area, Slough Backs Up From Osage River
18	Deer Run Rd	Pipe	Flood Area
19	Deer Run Rd	Bridge	Flood Area
20	Deer Run Rd	Box Culvert	Flood Area
21	Tanner Bridge Rd	Bridge	Flood Area
22	Tanner Bridge Rd	Pipe	Flood Area
23	Tanner Bridge Rd	Pipe	Flood Area
24	Tanner Bridge Rd	Pipe	Flood Area
25	Tanner Bridge Rd	Box Culvert	Flood Area
26	Buffalo Rd	Box Culvert	Flood Area
27	Upper Bottom Rd	Box Culvert	Flood Area
28	Upper Bottom Rd	Box Culvert	Flood Area
29	Scheuler Ferry Rd	Pipe	Flood Area, Slough Backs Up From Osage River
30	Profits Creek Rd	Box Culvert	Flood Area
31	Lake Rd	Box Culvert	Flood Area
32	Lake Rd	Box Culvert	Flood Area
33	Bode Ferry Rd	Bridge	Flood Area
34	Lock And Dam Rd	Pipe	Flood Area, Slough Backs Up From Osage River
35	Helias Spur	Box Culvert	Flood Area
36	S Liberty Rd	Low Water Crossing	Flood Area
37	Lisletown Rd	Pipe	Flood Area, Slough Backs Up From Osage River
38	Osage Water St	Flood Area	Flood Area, Road Next To Osage River
39	Engineers Rd	Flood Area	Flood Area, Slough Backs Up From Osage River
40	Engineers Rd	Flood Area	Flood Area, Slough Backs Up From Osage River
41	Stoney Gap Rd	Box Culvert	Flood Area
42	Bald Hill Rd	Bridge	Flood Area
43	Zion Rd	Box Culvert	Flood Area

44	Zion Rd	Bridge	Flood Area
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Cole County Public Works Designated Flood Areas Cont.			
Map ID	Road	Structure	Area Designation/Comments
41	Stoney Gap Rd	Box Culvert	Flood Area
42	Bald Hill Rd	Bridge	Flood Area
43	Zion Rd	Box Culvert	Flood Area
44	Zion Rd	Bridge	Flood Area
45	Beck Rd	Box Culvert	Flood Area
46	Bainer Rd	Box Culvert	Flood Area
47	Loesch Rd	Bridge	Flood Area
48	Walnut Acres Rd	Bridge	Flood Area
49	Walnut Acres Rd	Box Culvert	Flood Area
50	Walnut Acres Rd	Bridge	Flood Area
51	Stringtown Rd	Box Culvert	Flood Area
52	Vaughn Ford Rd	Low Water Crossing	Flood Area
53	Oakland Rd	Box Culvert	Flood Area
54	Oakland Rd	Low Water Crossing	Flood Area
55	Old Bass Rd	Bridge	Flood Area
56	Jones Rd	Low Water Crossing	Not Signed For Flooding
57	Hemstreet Rd	Bridge	Flood Area
58	Kautsch Rd	Box Culvert	Flood Area
59	Kautsch Rd	Box Culvert	Flood Area
60	Scrivner Rd	Box Culvert	Flood Area
61	Gully Rd	Low Water Crossing	Flood Area
62	Dawson Rd	Low Water Crossing	Not Signed For Flooding
63	S Branch Rd	Low Water Crossing	Flood Area
64	N Branch Rd	Low Water Crossing	Flood Area
65	N Branch Rd	Low Water Crossing	Flood Area
66	Scrivner Rd	Bridge	Flood Area
67	Scrivner Rd	Bridge	Flood Area
68	Scott Rd	Low Water Crossing	Not Signed For Flooding
69	Claywell Rd	Box Culvert	Flood Area
70	Curtman Rd	Box Culvert	Flood Area
71	Curtman Rd	Box Culvert	Flood Area
72	Clearwater Rd	Bridge	Flood Area
73	Enon Rd	Box Culvert	Flood Area
74	Settlen Rd	Pipe	Flood Area
75	Settlen Rd	Pipe	Flood Area
76	Campbell Rd	Low Water Crossing	Flood Area
77	Campbell Rd	Bridge	Flood Area
78	Payne Rd	Low Water Crossing	Flood Area
79	Payne Rd	Bridge	Flood Area
80	W Alexander Rd	Box Culvert	Flood Area
81	Alexander Rd	Box Culvert	Flood Area

82	County Line Rd	Bridge	Flood Area
83	County Line Rd	Box Culvert	Flood Area

Cole County Public Works Designated Flood Areas Cont.			
Map ID	Road	Structure	Area Designation/Comments
84	County Line Rd	Box Culvert	Flood Area
85	E Cole Junction Rd	Flood Area	Flood Area, Road Is Next To Greys Creek Which Backs Up From Missouri River
86	E Cole Junction Rd	Pipe	Flood Area, Slough Backs Up From Missouri River
87	E Cole Junction Rd	Pipe	Flood Area, Slough Backs Up From Missouri River
88	W Cole Junction Rd	Pipe	Flood Area, Slough Backs Up From Missouri River
89	Claysville Rd	Pipe	Flood Area, Slough Backs Up From Missouri River
90	Claysville Rd	Pipe	Flood Area, Slough Backs Up From Missouri River
91	Scott Station Rd	Bridge	Flood Area North Of Bridge
93	High Point Rd	Box Culvert	Flood Area
94	High Point Rd	Box Culvert	Flood Area
95	Old Stage Rd	Pipe	Flood Area
99	Bryant Rd	Flood Area	Flood Area, Road Next To Unnamed Creek
100	Mud Creek Rd	Low Water Crossing	Flood Area
101	Mud Creek Rd	Low Water Crossing	Flood Area
102	Mud Creek Rd	Box Culvert	Flood Area
103	Mud Creek Rd	Box Culvert	Flood Area
104	Mud Creek Rd	Pipe	Flood Area
105	Moniteau Creek Rd	Bridge	Not Signed For Flooding, Moniteau Creek Backs Up From Missouri River
106	Kings Chapel Rd W	Low Water Crossing	Flood Area
107	Rainbow Dr	Box Culvert	Flood Area
108	E Lohman Rd	Low Water Crossing	Flood Area
109	Meadows Ford Rd	Low Water Crossing	Flood Area
110	Rockhouse Spur	Low Water Crossing	Flood Area
111	Waterford Rd	Low Water Crossing	Flood Area
112	Waterford Rd	Box Culvert	Flood Area
113	Kaylor Bridge	Bridge	Flood Area
114	Wayside Rd	Box Culvert	Flood Area
115	Wayside Rd	Box Culvert	Flood Area
116	Wayside Rd	Pipe	Flood Area
117	Murphy Ford Rd	Low Water Crossing	Flood Area
118	Tellman Rd	Box Culvert	Flood Area
119	Tellman Rd	Box Culvert	Flood Area

Source: Cole County Public Works - Collected September 2010

Extent

There are characteristic differences between riverine flooding and small stream/flash flooding in the planning area; these differences involve both the speed of onset and duration of flooding events.

Riverine flooding –

- Speed on Onset - Riverine flooding is a hazard which allows for mitigation, preparation, and potential evacuation because of the relatively long speed of onset.
- Duration - An examination of the NOAA data for riverine flooding from January 1, 1996- September 30, 2015 indicates an average duration of over 14 days per event.

Small Stream and Flash Flooding –

- Speed on Onset - In contrast to riverine flooding, small stream flooding and flash flooding occur very quickly with heavy rains.
- Duration - Small stream flooding in the planning area usually takes place within the span of one day, according to the NOAA data (Figure 4.29). The data of reported events in the NOAA database indicates an average duration of 4.7 hours.

Table 3.16 Cole County Historic Data River Flooding January 1, 1996 – December 30, 2020		
Location	Date	River
20 counties and the City of St. Louis	1996: 5/1/96-5/31/96	Missouri
11 counties	1998: 10/6/98-10/12/98	Missouri
11 counties	2001: 6/4/01-6/12/01	Missouri
9 counties	2002: 5/8/02-5/28/02	Missouri
County	2002: 5/8/02-5/18/02	Moreau
Jefferson City to Osage City	2007: 5/8/07-5/20/07	Missouri
Cole County	2010: 6/9/10-6/30/10	Missouri
Marion	2013: 6/1/13-6/5/13	Missouri
Henley	2015: 12/27/15-12/30/15	Moreau
Jefferson City	2017: 4/30/17	Missouri
Jefferson City	2017: 5/1/17	Missouri
Source: http://www.ncdc.noaa.gov/stormevents		

Data from NOAA indicates 24 days of flash flooding in Cole County since the Missouri River flood of 1995.

Table 3.17 Cole County Historic Data Flash Flooding January 1, 1996 – December 30, 2020	
Location	Date
Countywide	5/6/1996
Jefferson City area (several homes evacuated)	6/22/1997
Countywide (Jefferson City - Highway 50/63; Moreau River; numerous low-water crossings)	6/4/1998
North Portion of County	7/4/1998
Countywide	7/26/1998
North Portion of County (Elston - Gray's Creek; county roads)	7/29/1998
Countywide (Rock House Rd. W of Russellville; Rte. D between Russellville and Highway 54)	10/5/1998
Countywide (Rock House Rd. W of Russellville; Rte. D between Russellville and Highway 54)	10/5/1998
North Portion of County	5/27/2000
Countywide	5/9/2002
Countywide	5/12/2002
Countywide	1/12/2005
NW of Wardsville to Jefferson City (Meadows Ford Road; Murphys Ford Road; numerous other secondary roads)	4/10/2008
Marion area (Highway 179)	6/13/2008
Jefferson City to NW of Schubert (numerous roads, low-water crossings, streets in Jefferson City)	9/20/2009
Jefferson City to N/NE of Elston (Scrivner, Loesch and Bainer Roads)	11/15/2009
Jefferson City to 3 miles SSE	4/24/2010
Marion	4/14/2012
St Thomas	7/1/2015
Marion	7/31/2016
Marion	8/1/2016
Jefferson City	8/12/2016
Jefferson City	9/10/2016
Jefferson City	7/19/2020
Scrivner	7/30/2020
Source: http://www.ncdc.noaa.gov/stormevents	

During the round of flooding in late July 2016 several water rescues had to be administered for stranded motorists and one person was killed by flood waters. The body of a 51-year-old homeless man was found washed up near the ice arena in Jefferson City.

Strength/Magnitude/Extent

According to the 2018 State Hazard Mitigation Plan, Missouri has a long history of flooding. Flooding along Missouri’s major rivers generally results in slow-moving disasters. Since river crest levels are forecast several days in advance communities in these active areas are given time to take protective measures against heightened water levels through means of evacuation and/or sandbagging efforts. Flash-flooding by contrast is a rapid rise of flood waters and has a history of causing a higher number of deaths and property damage.

Table 3.18: National Flood Insurance Program (NFIP) Participation

Cole County Jurisdictions - NFIP Status			
Participating			
Jurisdiction	Entry into Program	Date of Current FIRM	Community ID (CID)
Cole County	1/21/1982	11/2/2012	290107
Jefferson City	4/15/1980	11/2/2012	290108
Taos	4/28/2011	11/2/2012	290876
Wardsville	12/2/2005	11/2/2012	290633
Not Participating			
Jurisdiction	Sanction Date*	Date of Current FIRM	Community ID (CID)
Centertown	5/2/76	11/2/2012	290625
Lohman	12/2/06	11/2/2012	295322
Russellville	na	11/2/2012	290659
St. Martins	12/6/06	11/2/2012	295323
* Sanction Date indicates the date that a community decided not to participate in the NFIP (or was suspended for noncompliance).			
Source: NFIP Community Status Book			

Centertown, Lohman, and St. martins are sanctioned due to lack of participation due to not having any structures located in the floodplain.

Table 3.19: NFIP Policy and Claim Statistics

Community Name	Policies in force	Insurance in force	Closed Losses	Total Payments
Uninc. Cole County	73	14,048,500		80,336
Jefferson City	84	17,146,100		143,337
Taos	1	156,800		1,922
Wardsville	1	140,000		355

Source: NFIP Community Status Book, [09/24/19]; BureauNet, <http://bsa.nfipstat.fema.gov/reports/reports.html>; *Closed Losses are those flood insurance claims that resulted in payment. Loss statistics as of 09/30/20.

Repetitive Loss/Severe Repetitive Loss Properties

Properties with at least two flood insurance payments of \$1,000 or more in a 10-year period are categorized as Repetitive Loss Properties. Properties that have repetitive loss fall within unincorporated Cole County, and the jurisdictions of Jefferson City and Taos. They combine for a total of 247 losses. Due to federal restrictions on data sharing, the state was unable to provide full Repetitive Loss data or current Severe Repetitive Loss data. This also impacts information on Property Type and whether the properties are mitigated or non-mitigated.

Table 3.20: Repetitive Loss Payments

Jurisdiction	# of Properties	Type of Property	# Mitigated	Building Payments	Content Payments	Total Payments	Average Payment	# of Losses
Uninc. Cole County	31	N/A	0	\$1,904,836.84	\$340,084.86	\$2,244,921.70	\$18,251.39	123
Jefferson City	26	N/A	12	\$2,266,735.26	\$635,420.13	\$2,902,155.39	\$30,549.00	95
Taos	1	N/A	0	\$45,400	\$11,000	\$56,400	\$28,200	2
Total	58	N/A	12	\$	\$4,216,972.10	\$5,203,477.09	\$77,000.39	220

Source: Flood Insurance Administration as of 09/30/19

Severe Repetitive Loss (SRL): A SRL property is defined as a single family property 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 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. A single-family property can consist of one-to-four residences. Cole County has 6 such properties.

Table 3.21: Cole County Severe Repetitive Loss Property

County	Community Name	Number of SRL Properties	Number of Paid NFIP Claims	Total Paid Losses	Average Payment
Cole	Cole County	18	113	\$3,219,654.81	\$28,492.52

Source: 2018 Missouri State Hazard Mitigation Plan

Previous Occurrences

The floods of 1993 and 1995 were the worst repetitive flood events in Missouri history, according to the Missouri State Hazard Mitigation Plan (2010). There was also severe flooding in the state in 1994. There were five presidential disaster declarations for flooding in the state during this period; Cole County was included in Disaster Declaration #995 (July 9, 1993), Disaster Declaration #1023 (April 21, 1994), and Disaster Declaration #1054 (June 2, 1995).

After a Presidential Disaster Declaration, Public Assistance (PA) and/or Individual Assistance (IA) is made available through FEMA. Cole County was eligible for both PA and IA from Disaster Declarations #995 and #1054 and for IA from Disaster Declaration #1023.

All levees in Cole County failed during the Flood of 1993, according to the U.S. Army Corps of Engineers. Levee failure is discussed separately is included in Section 4.5.

Unincorporated areas of Cole County near the Missouri River and Osage River, along with Jefferson City, experienced elevated loss statistics during the Missouri River floods of 1993 and 1995 as compared with damages in the remainder of the county.

Data from NOAA indicates eight reported riverine flooding events in Cole County since the Missouri River flood of 1995. A significant flood of the Moreau River in the summer of 2015 is missing from this data set. Cole County was included in Federal Disaster Declaration #4238 for the damages sustained from this flooding. In addition, the Osage and Moreau Rivers flooded in December 2015 during a period of significant flooding in the state, mostly in the eastern and southern areas. Cole County was included in Federal Disaster Declaration #4250 which can provide Individual Assistance (IA) for property owners sustaining damages.

Several rounds of storms that hit central Missouri at the end of July 2016 that dumped several inches of rain that led to mass flash flooding. Five water rescues were performed due to stranded motorists and the body of a homeless man was discovered in Wears Creek in Washington Park near the ice arena in Jefferson City. It was believed he had drowned in flood waters during the early morning hours.

Table 3.22 NCEI Cole County Flash Flood Events Summary 2000-2020

Date	# of Event	# of Deaths	# of Injuries	Property Damage	Crop Damage
5/27/2000	1	0	0	0	0
5/9/2002	1	0	0	0	0
5/12/2002	1	0	0	0	0
1/12/2005	1	0	0	0	0
4/10/2008	1	0	0	1000	0
6/13/2008	1	0	0	1000	0
9/20/2009	1	0	0	0	0
11/15/2009	1	0	0	0	0
4/24/2010	1	0	0	0	0
4/14/2012	1	0	0	0	0
7/1/2015	1	0	0	750000	0
7/31/2016	1	0	0	0	0
8/1/2016	1	1	0	0	0
8/12/2016	1	0	0	0	0
9/10/2016	1	0	0	0	0
Total	15	1	0	752000	0

Table 3.23: NCEI Cole County Riverine Flood Events Summary 2000-2020

Date	# of Deaths	# of Injuries	Property Damage	Crop Damage
4/3/2001	0	0	0	0
6/4/2001	0	0	0	0
5/8/2002	0	0	0	0
5/8/2002	0	0	0	0
5/8/2007	0	0	2000	0
9/13/2008	0	0	0	0
6/9/2010	0	0	0	0
6/1/2013	0	0	1000	3000
12/27/2015	0	0	0	0
4/30/2017	0	0	0	0
5/1/2017	0	0	0	0
Total	0	0	3000	3000

Probability of Future Events

Table 3.24			
Probability of Future Flooding Events			
EF-Scale	# of years with flood event (2000-2020)	Probability	Probability Rating
River flood	8	40%	High
Flash flood	9	45%	High

While the probability of flooding of the Missouri River is high the main jurisdiction at risk from it is Jefferson City, St. Martins, and portions of unincorporated Cole County. Taos and Wardsville are mostly at risk of flooding from the Osage River. Russellville, Lohman, and Centertown are not at risk for river flooding due to not being located near a river or tributary, but all jurisdictions have some level of risk for flash flooding from storm runoff and undersized culverts.

Probability: High – Cole County (unincorporated area), Jefferson City, St. Martins, Taos, Wardsville

Low – Russellville, Centertown, Lohman

CHANGING FUTURE CONDITIONS CONSIDERATIONS

As precipitation is projected to increase, and in more extreme events, the risk of flooding could increase. This risk can be exacerbated by more and more construction that adds more impermeable surfaces that give large quantities of water nowhere to go.

VULNERABILITY

VULNERABILITY OVERVIEW

Cole County is vulnerable to both Missouri and Osage River Flooding and flash flooding. St. Martins and Jefferson City is vulnerable to both flooding from the Missouri River and flash flooding from branches that feed the river that often backup into streets within the Capital. Wardsville and Taos are more vulnerable to river flooding from the Osage as well as flash flooding events. Notable flash flooding events happen every 2-3 years. Other jurisdictions are less vulnerable to flooding but access in and out of communities such as Russellville and Lohman can be challenging during flash flooding events due to undersized or blocked culverts that can back water over the road.

Severity: High – Cole County (unincorporated area), Jefferson City, St. Martins, Taos, Wardsville
Low – Russellville, Centertown, Lohman

Potential Impact – Life

All types of flooding present a threat to human life. Small stream/urban stream flooding and flash flooding are particularly hazardous due to their quick onset. It is an ongoing struggle to educate the public concerning the very real hazard presented by flooded low water crossings and other flash flooding situations.

In addition to the risk of drowning, exposure to flood waters can result in infection or injury from sewage, agricultural runoff, and industrial chemicals. Flooded buildings present health risks from mold, chemicals and electrical hazards.

Flooding also poses a threat to the livelihood of those farming in low lands; this is especially a problem near the Missouri River. When the river level is high for an extended period, water will seep up through the soil and cause additional flooding to that already caused by heavy rains. Standing water in fields may prevent planting at the optimal time for a successful harvest or damage/destroy crops during the growing season.

Potential Losses to Existing Development

Structures and infrastructure near the Missouri, Osage and Moreau Rivers are potentially vulnerable to damage from riverine flooding; many of these structures are protected by levees but there is the potential for floodwaters to top the levees or for levee failure.

Cole County, Jefferson City, St. Martins, Taos and Wardsville all have area within the SFHA; structures and infrastructure in those areas is vulnerable to potential damage.

Flash flooding events present a risk of damage to roadways, drainage systems, and culverts.

Potential Losses to Previous and Future Development

There is a high level of awareness in the planning area regarding the dangers and potential of flooding. Participation in the NFIP by Cole County and the vulnerable communities means that floodplain ordinances are in place regulating development in the floodplain.

However, development is vigorous in portions of the planning area, especially around Taos and Wardsville. An increase in impervious surface means an increase in runoff. It is important that development projects are closely monitored to ensure compliance with all storm water requirements and regulations in order to minimize increases to flash flooding from development. This is increasingly crucial as it is now known that climate change is causing an increase in the type of heavy downpours which trigger flash flooding.

Hazard Summary by Jurisdiction

The Missouri River floods of 1993 and 1995 were devastating events for many parts of the Midwest United States. Changes in river management, including major wetland restoration projects along the river's long course and the buyout of properties in the river floodplain have all helped to mitigate risk associated with riverine flooding in the planning area.

Cole County

As mentioned earlier in the flooding profile, Cole County posts a series of three signs at areas prone to flooding. The signs read: "Flood area ahead", "Impassable during high water", and "Do not enter when flooded".

Cole County Public Works has plans in place for access to certain critical structures at different flood levels.

Jefferson City

Jefferson City has a Floodplain & Stormwater Management Division under the Department of Public Works; the division has two staff members.

The city has a Flood Action Plan which includes a map of the city at different flood stages; this mapping was originally done after the 1993 flood. The plan identifies access problems and steps to take at different flood levels. The Flood Action Plan is revised after each event.

The city posts "Prone to flash flooding" signs at needed locations.

The city has had a storm water ordinance since the early 1990s; it is Chapter 31 of the city code.

Lohman

The City of Lohman has installed diffusing rocks to slow runoff in vulnerable areas in the city. In addition, private citizens have built berms to help mitigate flood prone properties.

St. Martins

As of 2010, the City of St. Martins has hired an engineer to evaluate storm water drainage in the city.

Wardsville

Flood prone areas in the Village of Wardsville are posted with warning signs.

Summary of Vulnerability

The entire planning area is at risk from some type of flooding. The most common types of flooding in the area are flash and sheet flooding associated with heavy downpours. This type of flooding can impact a neighborhood or a city but are limited in their spatial extent.

Flash flooding is of particular concern in the unincorporated parts of Cole County, where roads can become impassable. Climate change is causing an increase in heavy downpours and this will, in turn, most likely increase the frequency and/or severity of flash flooding.

Flooding of the Missouri, Osage, and Moreau Rivers (and their branches) is a potential problem for the areas near those rivers and branches: the unincorporated areas of Cole County, the jurisdictions of Jefferson City, St. Martins, Taos, and Wardsville which all have at least some area in the 100-year floodplain.

Cole County, Jefferson City, Taos, and Wardsville are members of the NFIP and have floodplain regulations in place. These factors, plus a high awareness of the threat of potential flooding, all act to help mitigate the vulnerability to this hazard.

Problem Statement

Flooding and flash flooding are frequent occurrences in the planning area that pose a threat to life, livelihood, property, and infrastructure. Risk to these things vary across the planning area with highest risk being to lands and jurisdictions along the Missouri River, Osage River, and creeks and streams that feed them. While not all jurisdictions in the planning area are part of the NFIP, all jurisdictions can be impacted by flash flooding in one way or another. As a result of past events ordinances and guidance has been put in place to help control development in hazard areas. Proper stormwater handling, warning systems, elevated low-water crossings, and river bank restoration are all actions to aid in reduction of flood damage in the planning area.

3.4.2 Levee Failure

DESCRIPTION OF HAZARD

A levee is defined by the National Flood Insurance Program as “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.”

Federally authorized levees are typically designed and built by the US Army Corps of Engineers in cooperation with a local sponsor then turned over to a local sponsor to operate and maintain.

Non-federal levees are designed, built, and managed by a non-federal entity.

There is no single agency with responsibility for levee oversight. The Corps of Engineers has specific and limited responsibilities for approximately 2,000 levees nationwide through their Levee Program.

The responsibilities of local levee owners or sponsors are broad and may include levee safety; land use planning and development; building codes; and operations, maintenance, repair, rehabilitation, and replacement of the levee. The certification of levees for FEMA’s National Flood Insurance Program is also the responsibility of the local levee owners or sponsors.

Federally authorized and some non-federal levees may be eligible for Corps of Engineers rehabilitation assistance funding.

This assessment discusses the major levees in the planning area; these levees are owned and operated by levee districts. There are also several privately owned levees which are maintained by their owners; official data on the locations of these private levees is not available.

The USACE notes that there is a “large universe of private and other non Corps levees that have not been inventoried or inspected/assessed. We don’t know the size of this universe, where the levees are located, their condition, or the consequences of failure, loss of life being of paramount concern.”

Levee failure, according to FEMA, can occur by the following means:

- **Overtopping** - When a large flood occurs, water can flow over a levee. The stress exerted by the flowing water can cause rapid erosion.
- **Piping** - Levees are often built over old stream beds. Flood waters will follow these sub grade channels causing a levee to erode internally thereby allowing flood waters to rupture the levee structure.
- **Seepage and Saturation** - If flood waters sit up against a levee for a long period, the levee may become saturated and eventually collapse.

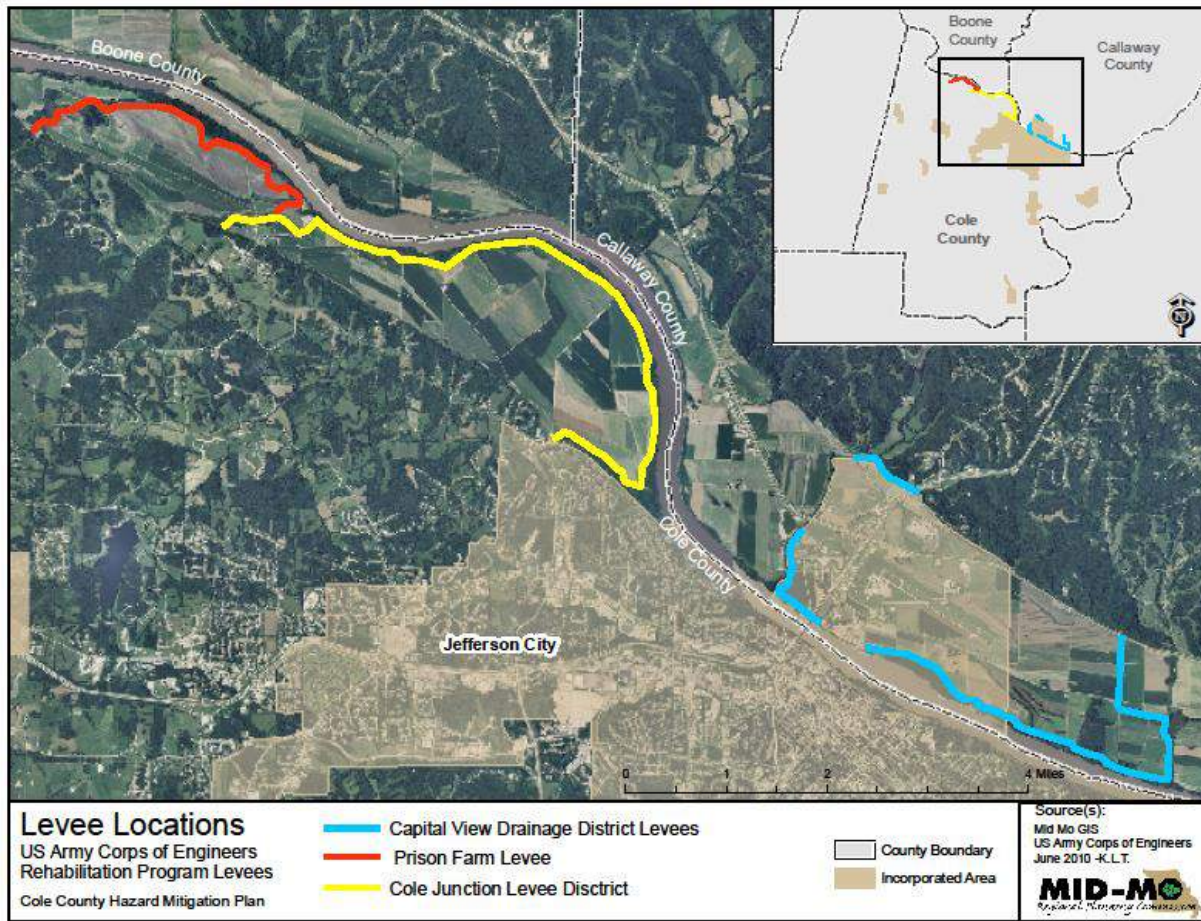
- **Erosion** - Most levees are constructed of sand or soil which erodes easily under high-velocity flood waters.
- **Structural Failures** - Lack of regular maintenance is a key reason levees fail at gates, walls, or closure sites.

Location

Cole County (unincorporated) and Jefferson City are vulnerable to levee failure.

The major levees in the planning area are located along the Missouri River (Map 3.4). They protect agricultural land and the portion of Jefferson City that is located north of the Missouri River in Callaway County.

Map 3.4



The levees are part of the U.S. Army Corps of Engineers (USACE) Rehabilitation Program. As part of this program, a levee district is eligible for USACE levee rehabilitation assistance should its levee receive damage during a flood event. The levee must maintain a *minimally acceptable* standard to remain eligible for the assistance. According to the USACE, “The rating is based on the levee inspection checklist, which includes 125 specific items dealing with operation and maintenance of levee embankments, floodwalls, interior drainage, pump stations, and channels.”

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

The levee ratings from the most recent inspections in 2013 and 2014, along with other information, are shown in Table 3.25.

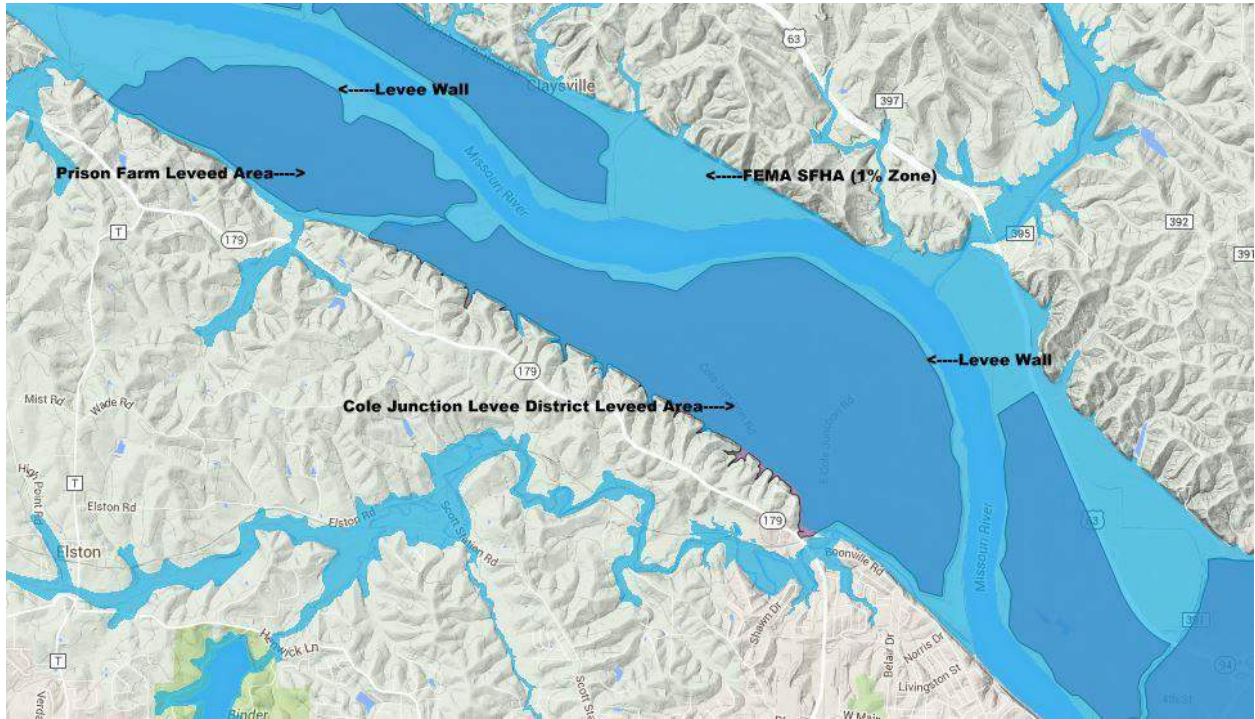
Levee Name	Segment Length (miles)	Leveed Area Acreage	Inspection Date	Inspection Rating
Prison Farm Levee	3.75	998.29	10/18/2013	Minimally acceptable
Cole Junction Levee District	7.58	2,686.61	10/18/2013	Acceptable
Capital View Drainage District	7.28	3,277.65	7/30/2014	Minimally acceptable

Sources: USACE National Levee Database; USACE Levee Inspection Reports

More detailed views of the major levees are shown in Figures 3.2 and 3.3.

PRISON FARM LEVEE AND COLE JUNCTION LEVEE DISTRICT

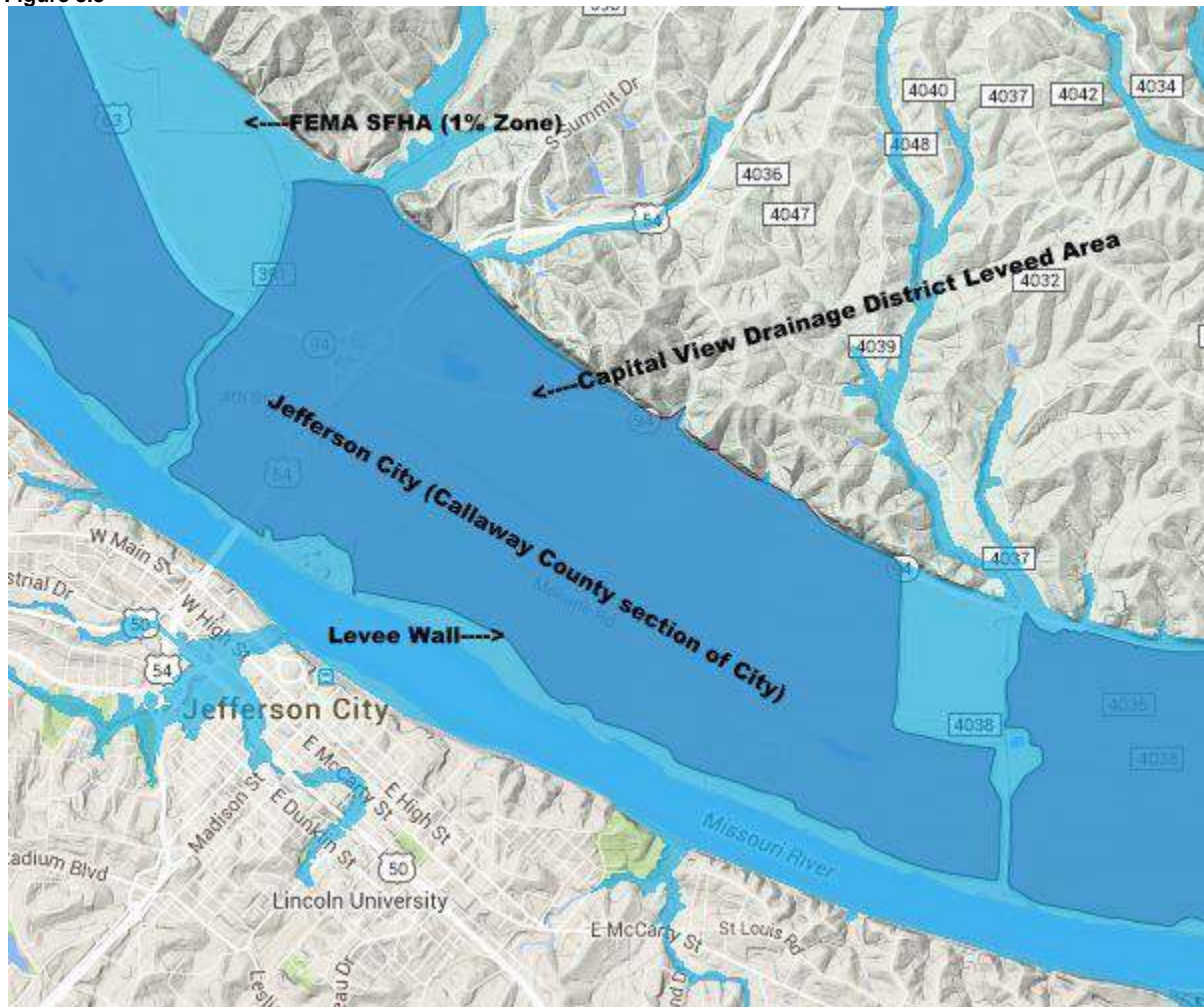
Figure 3.2



Source: USACE National Levee Database

CAPITAL VIEW DRAINAGE DISTRICT

Figure 3.3



Source: USACE National Levee Database

There are other, privately owned, levees in the planning area; official data on the locations of these private levees is not available. These privately owned levees are maintained by their owners and are not part of any federal rehabilitation program. Tracking of levee conditions is a point of concern, especially because there are so many of these privately owned levees.

Extent/Magnitude/Severity

Levee failure is typically an additional or secondary impact of another disaster such as flooding or earthquake. Levee failure often occurs during a flood event, causing destruction in addition to what would have been caused by flooding alone. A breach on an agricultural levee can not only cause immediate crop loss but sand and silt brought in from a levee break can impact the growing medium for years to come.

Regular maintenance and inspection of the levees is critical. For the major levees in the planning area, the potential of major failure is connected to flooding of the Missouri River, a hazard with a longer speed of onset than many other hazards. This longer speed of onset allows time to mitigate and prepare for potential failure as flooding threatens.

Previous Occurrences

All levees in Cole County and most of the surrounding counties failed during the 1993 Flood, according to the US Army Corps of Engineers. This resulted in the inundation of land and structures being protected.

Structures that were affected by the levee breach included the Jefferson City Airport, Cedar City (now annexed by Jefferson City), the Jefferson City Wastewater Treatment Plant, and several residences and businesses. All of these inundated areas are within the boundary of the Capitol View Drainage District located in Callaway County.

Probability of Future Events

Probability: Moderate – Cole County (unincorporated), Jefferson City
Not applicable – All other participating jurisdictions

There haven't been any levee breaches in the planning area in the last 20 years. With regular maintenance the probability of a levee break is low but with the high rate of flooding along the Missouri river the potential for a break is never zero.

Changing Future Conditions Considerations

As precipitation is projected to increase, and in more extreme events, the risk of flooding could increase. Prolonged elevated water levels can make maintenance and repairs difficult to accomplish only increasing the risk for a break through scouring and seepage.

VULNERABILITY

Vulnerability Overview

Portions of unincorporated Cole County are vulnerable to Levee issues. The portions at risk though are mostly all agriculture land where risk to life is low. Failure or overtopping of a levee can damage or kill crops being grown in the fertile lowland areas and also contaminate soil with sand and other things washed in from the Missouri River which can create significant long-term impacts for farmers.

Severity: Moderate – Cole County (unincorporated), Jefferson City
Not applicable – All other participating jurisdictions

Potential Losses – Life

Levee failure presents a flooding threat to life. The longer period of onset associated with failure of levees along the Missouri River would minimize the threat of actual drowning; however, drowning could still occur. The greater threat from levee failure would be exposure to flood waters with possible resulting infection or injury from sewage, agricultural runoff, and industrial chemicals. Flooded buildings present health risks from mold, chemicals and electrical hazards.

Potential Losses to Existing Development

Structures and infrastructure near the levees are potentially vulnerable to damage from flooding due to failure. Many of these structures are related to agriculture. Both the Prison Farm Levee and the Cole Junction Levee protect farm land. There are 9 farm business related barns/sheds located within the Cole Junction Levee protection zone, as well as various roads and utilities in both levee zones that would be impacted if a breach were to happen.

There are significant structures located behind the Capital View Levee such as the Jefferson City Memorial Airport, Missouri Air National Guard Facility, Jefferson City Wastewater Treatment Plant, Cedar City Lions Club Building and Corley Park, Jefferson City Part pavilion and baseball fields and approximately 3.00 miles of Katy Trail State Park. All of the development behind the Capital View Levee is located in Callaway County and not Cole.

Impact to Previous and Future Development

The land protected by the major levees in the planning area is within the Missouri River floodplain and any development would be subject to the floodplain regulations of either Cole County or Jefferson City. It is highly unlikely that development, other than necessary infrastructure, will take place in these areas

Existing Mitigation Activities

The three major levees in the planning area are maintained by the levee districts. They receive regular inspections as part of the USACE Rehabilitation and Inspection Program.

The areas protected by the major levees are in the floodplain and new construction must meet either Cole County or Jefferson City floodplain regulations, depending on the jurisdiction involved.

Hazard Summary

Cole County and Jefferson City are vulnerable to levee failure. Unincorporated area in Cole County near the Missouri River is protected by the Prison Farm levee and the Cole Junction Levee District levee; the latter levee also protects part of Jefferson City south of the river. The portion of Jefferson City located north of the Missouri River in Callaway County is protected by the Capital View Drainage District levee.

Taken as a group, these levees also protect; thousands of acres of agricultural lands; state and county roads, public utilities and three miles of the Katy Trail State Park.

These levees failed during the 1993 Missouri River flood. Changes in management of the Missouri River, including major wetland restoration projects along the river's long course, have helped to control flood levels on the lower Missouri since that time. In addition, the major flood buyout of Cedar City, north of the Missouri River greatly reduced the number of structures vulnerable to flooding/levee failure. Regular maintenance and inspection of the levees has helped to ensure their integrity to withstand the pressures of rising river levels.

The risk of flooding from levee failure remains, however. The warning time afforded by a hazard such as levee failure, which has a long period of onset, will allow for preparations and evacuations to take place, should the need arise.

Problem Statement

Levee failure is not a common occurrence in the planning area. The last instance of levee failure in the planning area was in 1993 when records were set across the state for flooding levels. Levee failure is usually a slow process that gives people time to evacuate areas at risk. Keeping up with maintenance and frequent inspections are actions of mitigation to help prevent such breakages that could lead to property damage and crop loss.

3.4.3 Dam Failure

DESCRIPTION OF HAZARD

A dam is defined by the National Dam Safety Act as an artificial barrier which impounds or diverts water and is:

1. more than 6 feet high and stores 50 acre feet or more or
2. 25 feet or more high and stores more than 15 acre feet.

Based on this definition, there are over 80,000 dams in the United States. Over 95% are non-federal, with most being owned by state governments, municipalities, watershed districts, industries, lake associations, land developers, and private citizens.

Dam owners have primary responsibility for the safe design, operation and maintenance of their dams. They also have responsibility for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials. The State has ultimate responsibility for public safety, and many states regulate construction, modification, maintenance, and operation of dams, and also ensure a dam safety program.

Dam construction varies widely throughout the state. A majority of dams are of earthen construction. Missouri's mining industry has produced numerous tailing dams for the surface disposal of mine waste. These dams are made from mining material deposited in slurry form in an impoundment. Other types of earthen dams are reinforced with a core of concrete and/or asphalt. The largest dams in the state are built of reinforced concrete, and are used for hydroelectric power.

Failure - Dams can fail for many reasons. The most common are:

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.

These three types of failures are often interrelated. For example, erosion, either on the surface or internal, may weaken the dam or lead to structural failure. Similarly a structural failure may shorten the seepage path and lead to a piping failure.

Dam Hazard Classification - Dams in Missouri have been classified according to both a federal and state system with regards to potential hazard posed.

The **federal classification system** is based upon the probable loss of human life and the impact on economic, environmental and lifeline interests from dam failure. It should be noted that there is always the possibility of loss of human life when a dam fails; this classification system does not account for the possibility of people occasionally passing through an inundation area which is usually unoccupied (e.g. occasional recreational users, daytime user of downstream lands, etc.)

The **state classification system** is based upon the type and number of structures downstream from a dam. An inventory of all the dams of the state was done in the late 1970s and early 1980s, according to Glenn Lloyd, Civil Engineer and Dam Safety Inspector with the Dam Safety Program of the MO Department of Natural Resources (DNR). All of the known dams were classified by the state at that time.

A summary of the federal and state classification systems, how the two systems relate to each other, and inspection requirements for regulated dams is shown in Table 3.26.

Table 3.26				
Dam Hazard Classification Systems				
Federal		State		
Classification	Criterion	Classification	Downstream Environment	Inspection Requirement (Regulated Dams)
High hazard	Probable loss of human life	Class 1	10 or more permanent dwellings; or any public building	Every 2 years
		Class 2	1-9 permanent dwellings; or 1 or more campgrounds with permanent water, sewer and electrical services; or one or more industrial buildings	Every 3 years
Significant hazard	No probable loss of human life but potential economic loss, environmental damage, disruption of lifeline facilities or other impact of concern	Class 3	Everything else	Every 5 years
Low hazard	No probable loss of human life; low economic and/or environmental loss; loss principally limited to owner's property			

Sources: Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams, April 2004, <http://www.fema.gov/library/viewRecord.do?id=1830>; <http://www.sos.mo.gov/adrules/csr/current/10csr/10c22-2.pdf>; Glenn Lloyd, Civil Engineer/Dam Safety Inspector, MO DNR, Water Resources Center, Dam Safety Program

Dam Regulation in Missouri

Pursuant to Chapter 236 of the Revised Statutes of Missouri, a dam must be 35 feet or higher to be state regulated; regulation makes a dam subject to permit and inspection requirements. For regulated dams, the state classification system dictates the required inspection cycle. According to the Association of State Dam Safety Officials, 5,113 dams in Missouri have been classified and only 685 are regulated by the state.

The inspection cycle for regulated dams allows for a regulated dam’s classification to be updated when appropriate. Classification is a dynamic system; development can easily change the situation downstream. A regulated dam in Missouri would have its classification appraised at least once every 5 years.

In addition, the DNR database of dams in Missouri reflects only the known dams; a dam less than 35 feet in height which was built since the inventory was taken over 30 years ago may not appear in the database.

There are currently 34 dams in Cole County according to the Department of Natural Resources database. Of these, only 8 are regulated by the state.

Table 3.27				
State Classification and Regulation of Dams in the Planning Area				
	State Hazard Classification			
	1	2	3	Total
Regulated	4	3	1	8
Non-regulated	3	13	10	26
Total dams	7	16	11	34

One must use caution in assuming the classifications of non-regulated dams are currently accurate. It is very probable that, for most of the non-regulated dams, the classification does not take into account over 30 years of development and change in Cole County.

Location

Cole County (unincorporated), Jefferson City, and Taos are all vulnerable to the effects of dam failure within or near their jurisdictions.

In addition to the dams located within the planning area, areas lying in the Osage River floodplain (the unincorporated area of Osage City, other portions of unincorporated Cole County, and portions of Taos and Wardsville) are vulnerable to dam failure stemming from Bagnell Dam. Bagnell Dam is located 82 miles upstream from the confluence of the Osage and Missouri Rivers. More information about Bagnell Dam is included further on in this section.

The locations of dams in the planning area are shown in the following series of maps and associated data charts:

- An overview of all known dams in the planning area (Map 3.5)
- State Regulated dams (Map 3.6)
- Non-regulated dams (Map 3.7)

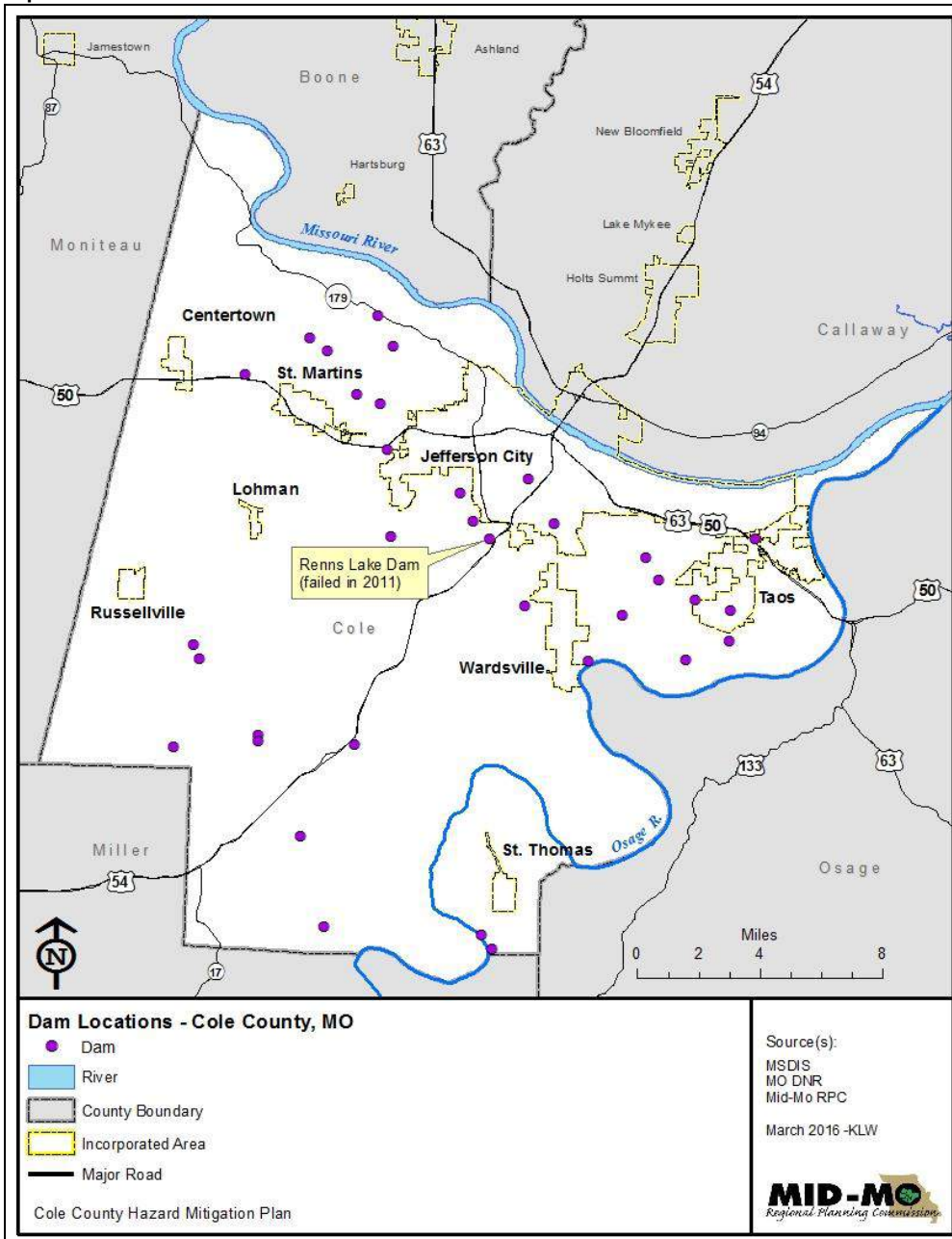
The mapping data uses a layer from the DNR Dam Database; it was compared with the National Inventory of Dams (NID) to ensure the currency of the data. The data has been updated to reflect the following local knowledge about changes to two dams:

McKay Park Lake Dam (formerly Sunset Lake Dam) was completely drained and rebuilt in the 1980's, according to Jefferson City Parks and Recreation staff. The lake is currently owned by Jefferson City who drained and rebuilt the lake for storm water storage and public recreation.

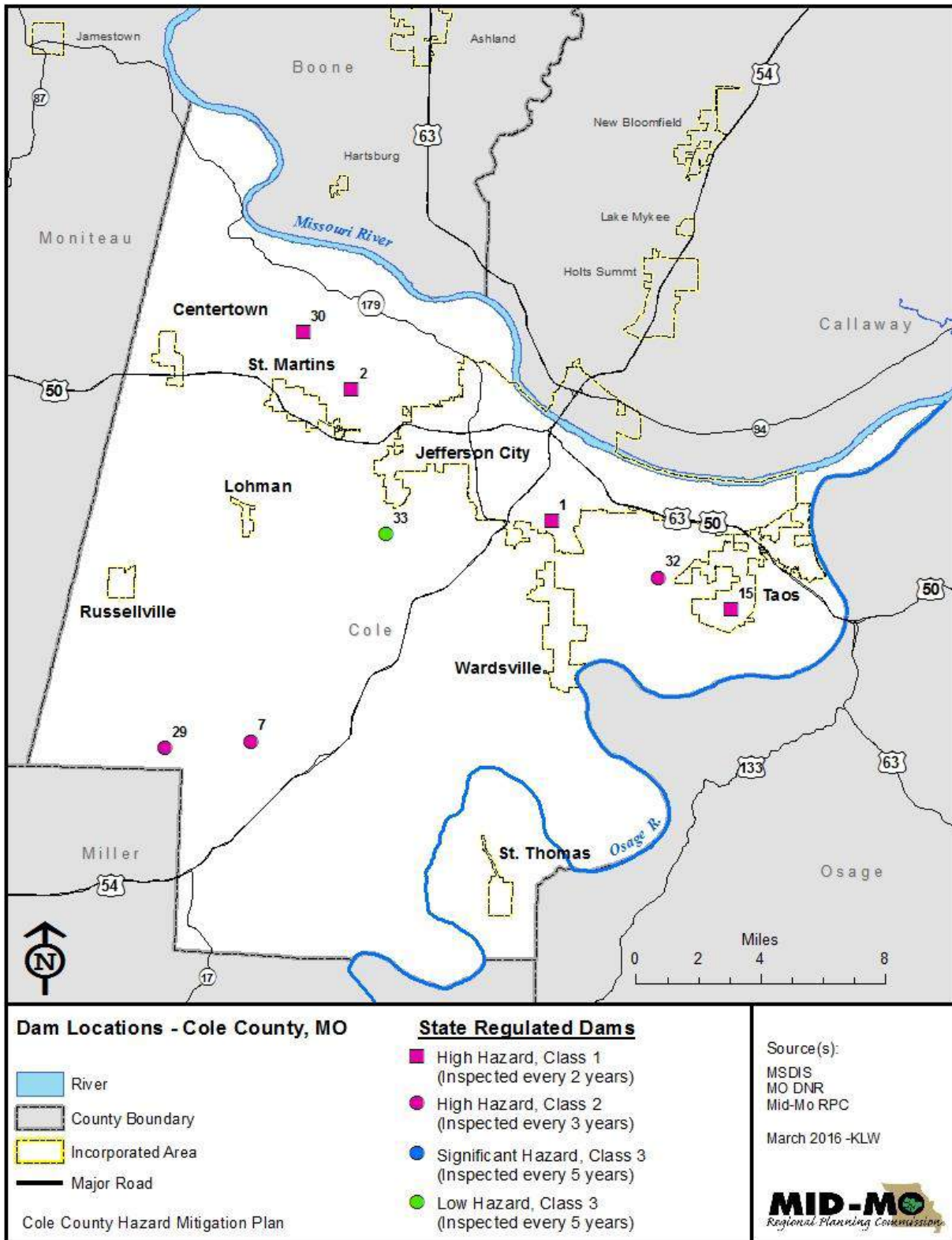
Renn's Lake Dam nearly failed in 2009 following heavy rains. The County subsequently breached the dam and drained the lake. In 2018 homeowners were approved to establish an association to take over the property from the county. The property is currently declared a wetland by the Missouri Department of Natural Resources and would have to be mitigated in order to re-establish it as a lake.

According to information from Missouri DNR, much of this data for the unregulated dams, perhaps most of it, has not been updated since the dam survey was first conducted in the late 1970s and early 1980s. The heights of the unregulated dams may be, in some cases, the only currently reliable information.

Map 3.5



Map 3.6



Map 3.7

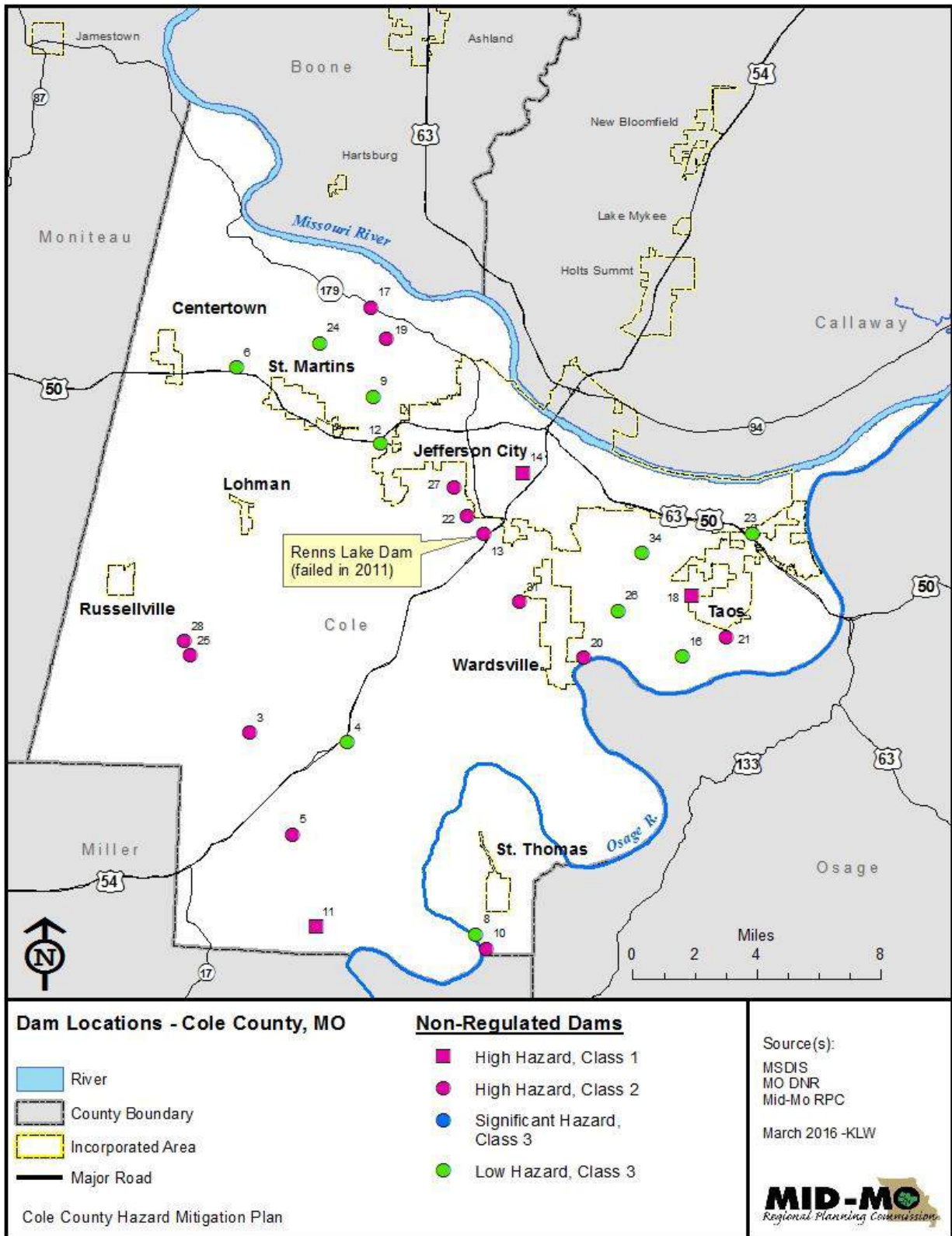


Table 3.28: High Hazard Dams in the Cole County Planning Area

Dam Name	Emergency Action Plan (EAP)AP	Dam Height (Ft)	Normal Storage (Acre)	Last Inspection Date	River	Nearest Downstream City	Distance To Nearest City (Miles)	Dam Owner
Young Dam	Yes	64	26	4/19/18	Tr Moreau	Taos		Private
Twehous Lake Dam	Yes	48	41	7/6/17	Tr-Rising Creek			Randall Twehous
Hough Park Dam	Yes	47	11	7/6/17	Tr Moreau	Jeff City	0	Parks & Rec
Dalton Dam	Yes	46	41	9/23/16	Tr Moreau	Russellville	20	Private
Lake Carmel Dam	Yes	37	43	4/19/18	Tr Clark Fork	Lohman	10	Carmel Estates
Binder Lake Dam	Yes	43	138	3/10/16	Dickerson Cr	Jeff city	1	Dept Conservati
Klosterman Lake	Yes	39	15	6/9/16	N/A	Jeff City	10	Dale Klosterma
Miller Ag Dam	NR	34	6	8/23/11	Herbrandt Br	Jeff City	2	Private
Dove Lake Dam	NR	31	20	7/16/80	Rising Cr	Taos	1	Marvin Talken
Graessle-Rockers	NR	31	15	N/A	Tr Osage	Wardsville	1	Paul Graessle
Deer Valley	NR	31	9	N/A	Tr Osage	Taos	10	Seth Evans
Starr Lake Dam	NR	30	3	N/A	Tr Clark Fork	Lohman	10	Ronald Star
Church Farm Lake	NR	29	5	N/A	Workman Cr	Jeff city	1	Dept Correction
Lubker Dam	NR	29	3	N/A	Grays Cr	Jeff City	1	Al Lubker
Winegar Lake Dam	NR	28	10	N/A	Tr South Moreau	Russellville	20	Alvon Winegar
Lakewood Dam	NR	26	4	N/A	Neighorn Br	Jeff City	1	Gill Land Co
McCay Lake Dam	NR	25	12	4/11/78	Tr Wears Cr	Jeff City	1	Sunset Realty
Shadow Lake Dam	NR	25	5	N/A	Tr Wears Cr	Jeff City	3	Fred Luelkenho
Spring Rock Dam	NR	24	6	N/A	Tr South Moreau	Russellville	20	Robert Hauser
Mar-Kay Lake Dam	NR	20	8	N/A	Bois Brule Cr	Wardsville	30	Raymond Lahmeyer

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

Bagnell Dam

In addition to the above-mentioned areas of impact, areas along the Osage River floodplain (the unincorporated area of Osage City, other portions of unincorporated Cole County, and portions of Taos and Wardsville) are vulnerable to dam failure stemming from Bagnell Dam. According to the Miller County Museum, Bagnell Dam was constructed between 1929 and 1931. It is located 82 miles upstream from the confluence of the Osage and Missouri Rivers and impounds the Lake of the Ozarks Reservoir (Map 3.8). The Lake of the Ozarks reservoir holds approximately 86.4 billion cubic feet of water and has a total drainage area of 2,500 square miles.

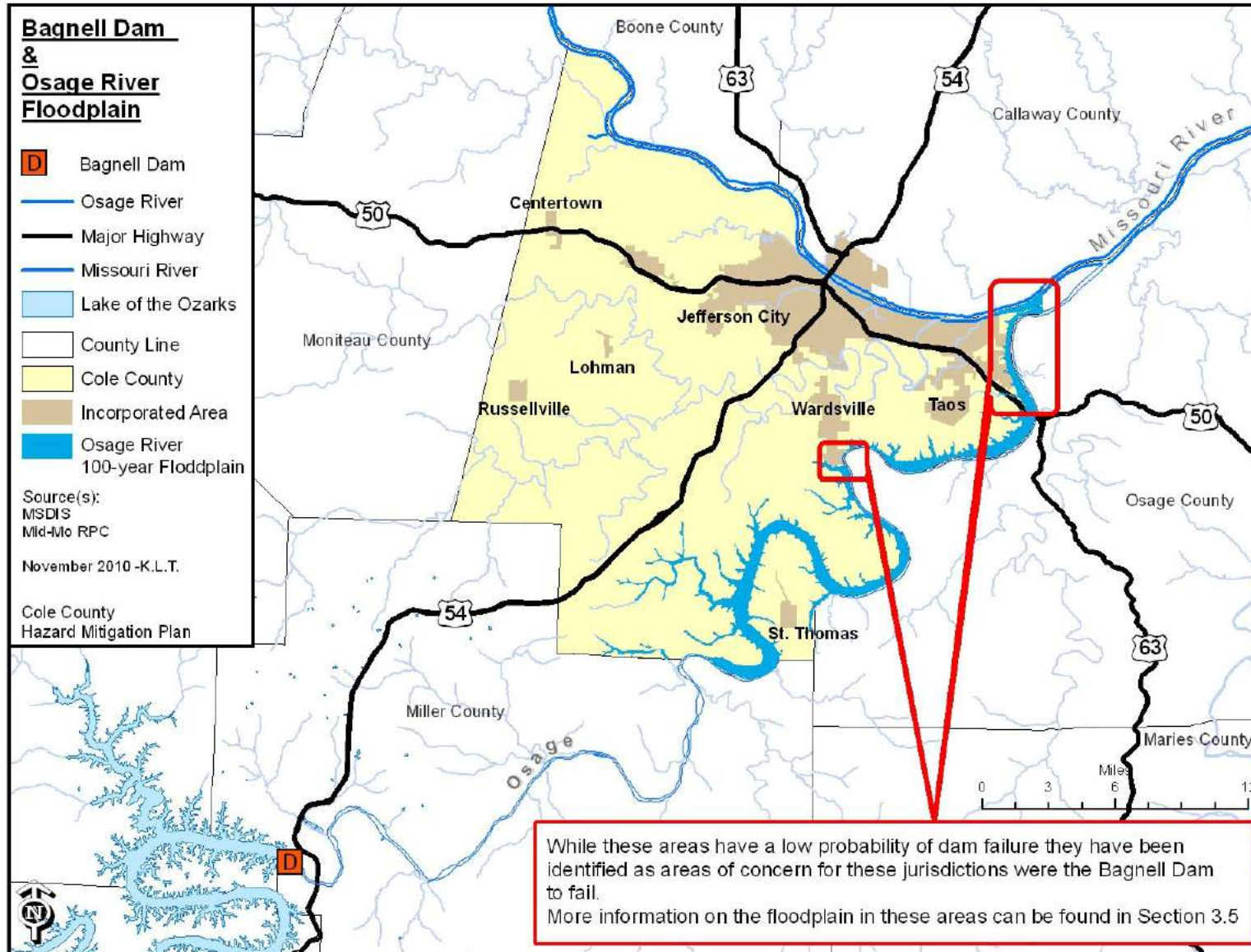
Currently the dam is owned and operated by the Ameren UE Osage Power Plant. Ameren UE maintains an EAP (Emergency Action Plan) for Bagnell Dam in coordination with local and state authorities. The EAP outlines three levels of emergency conditions that may pose a threat to the dam and/or the surrounding area:

- Condition A: Failure is Imminent or Has Occurred
- Condition B: Potential Failure Situation Developing
- Condition C: Non-Failure Emergency Condition

Emergency Conditions for Harry S. Truman Dam are also taken into account in this EAP. Truman Dam lies 93 miles upstream and its failure has the potential to significantly impact Bagnell Dam.

The Bagnell Dam EAP contains inundation studies for all downstream areas that could be affected by a failure. The EAP is reviewed annually and key agencies and personnel are given updated copies. For more information regarding the *Bagnell Dam EAP Osage Project No. 459* contact the Ameren UE, Osage Power Plant in Lake Ozark, MO at 573-365-9320.

Map 3.8



Strength/Magnitude/Extent

The speed of onset of a dam failure can vary considerable. In most cases, regular inspections, either formal or informal, will promote a longer period of onset and allow for possible mitigation. Unfortunately, the current lack of required dam inspections increases the likelihood of dam conditions being ignored by owners – a situation which promotes a quicker speed of onset and an increased threat from the hazard.

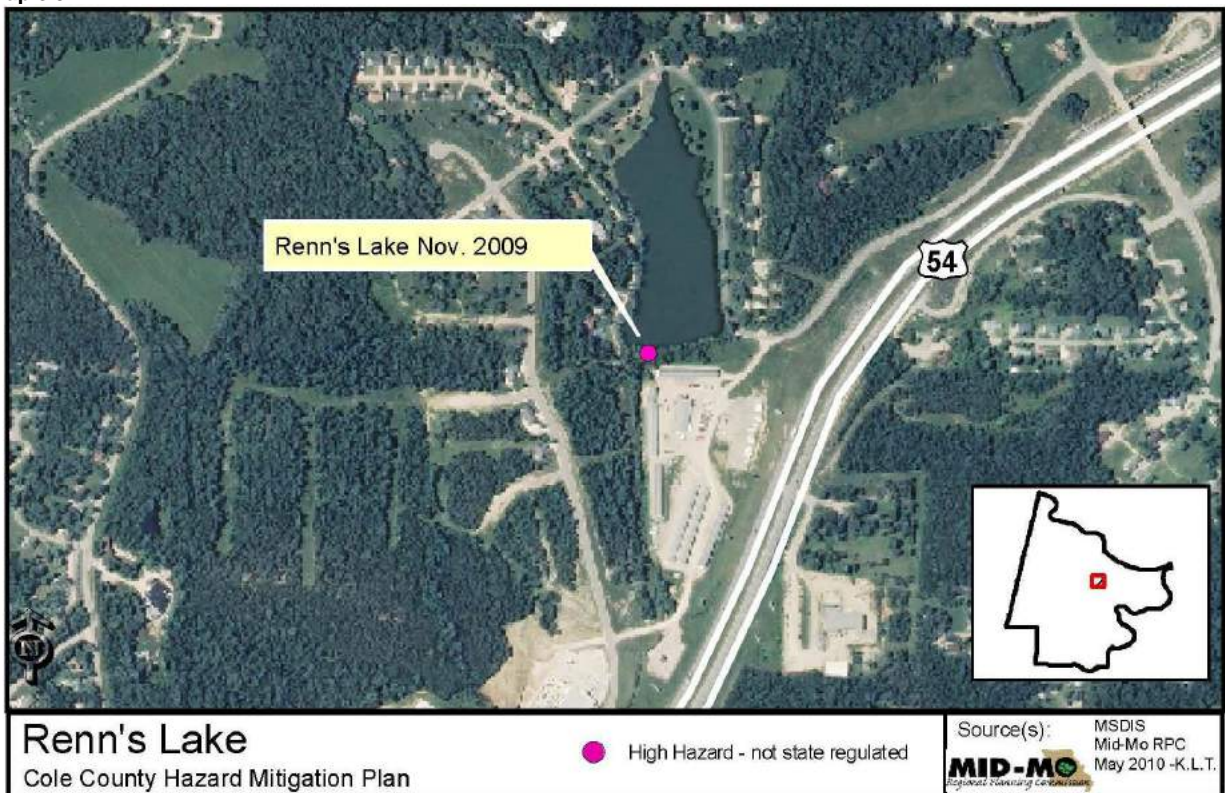
The extent of hazard which a dam failure poses is also influenced by the reservoir size.

Previous Occurrences

The serious issue of dam failure was highlighted for Cole County in 2009 with the near failure of Renn's Lake Dam, located to the south of Jefferson City (Map 3.7). The 30-foot dam, built in 1950, had been weakened by the growth of trees and heavy rainfall had caused a 15-foot section to erode. Since the dam was less than 35 feet, it was unregulated and thus not inspected by the state. Emergency crews and volunteers worked for several days in late October and early November to relieve pressure on the earthen dam by pumping thousands of gallons of water from 7-acre Renn's Lake.

Renn's Lake is located immediately to the west of U.S. Highway 54; the potential dam failure threatened the highway. The Missouri Department of Transportation (MoDOT) was put on alert so the highway could be shut down quickly if necessary.

Map 3.9



A year previous to this near failure, neighboring Boone County experienced its first known dam failure in March 2008. Moon Valley Lake Dam in Columbia, an 18 foot high unregulated dam, had been built in 1964; it drained 2,100 acres and had a 13 acre reservoir according to the DNR database.

The threat posed by these two dams in central Missouri within two years has highlighted this potential hazard in the region.

Cole and Boone Counties are not the only counties in Missouri to experience dam failures. According to the Missouri State Hazard Mitigation Plan (2007), Missouri has the largest number of manmade dams in any state. The Stanford University's National Performance of Dams Program documented 16 dam failures in Missouri between 1975 and 2001.

More recently, there was a huge dam failure which destroyed Johnson Shut-Ins State Park in Reynolds County. On December 14, 2005, the AmerenUE's Taum Sauk reservoir dam at their hydroelectric complex failed; 1.5 billion gallons of water were released into the park in 10 minutes. There was no loss of life, even though the superintendent's family was swept out of their home. However, if this failure had occurred during the summer when the popular park has many visitors, it could have resulted in a catastrophic loss of life.

All of these dam failures indicated that this is a serious problem which needs attention. Many of Missouri's smaller dams are becoming a greater hazard as they continue to age and deteriorate.

While hundreds of them need to be rehabilitated, lack of available funding and often questions of ownership loom as obstacles difficult to overcome.

Probability of Future Events

Based on known historical occurrences, there has been near failure in the planning area since 2000. If it had failed the probability of 5% (1/20*100).

Probability: Low – Cole County (unincorporated), Taos, Wardsville
Not applicable – all other participating jurisdictions

Changing Future Conditions

The future of climate change on dam failure is largely tied to future precipitation events. Since precipitation is predicted to increase in the future with potential for more vigorous rainfall events, this creates an elevated risk of flooding and pressure on dams and spillways to handle the extra water amounts. This elevated pressure brings about the importance for regular inspections and maintenance, as well as the need for engineering with higher flood levels in mind.

VULNERABILITY

Vulnerability Overview

A dam failure in Cole County could range from very minimal environmental damage to a significant loss of life and infrastructure. All impacts are dependent upon several variables: water, debris, people, and structures.

Twenty-three (23) dams in the planning area are considered to pose a high hazard should there be a dam break. Of these dams, sixteen (16) of them are not regulated by the state and thus not subject to inspection requirements. The Missouri State Hazard Mitigation Plan (2007) quoted Jim Alexander, chief engineer for the DNR's Dam Safety Program, who says that many of the non-regulated dams have gone without inspections for years. "There are accidents out there waiting to happen," he notes.

The Dam Inventory for the state of Missouri was compiled in the late 1970's to early 1980's. Of the non-regulated dams in planning area, there is only one which is documented to have been inspected since 1981. This presents two main problems. First, it has been 35 years since most of the non-regulated dams have been inspected, if they were ever inspected in the first place. Second, the state has no jurisdiction over maintenance of these non-regulated dams. These two issues lead to the overall problem of dam location and development downstream.

State regulated dams are classified by what lies downstream of the dam and what will be impacted by the failure of that dam. Non-regulated dams received their classifications nearly 30 years ago or more and development that occurs downstream is not monitored by any agency; this potentially puts the public at risk. Also, development upstream that might increase the contents held by the dam can cause failure. Because there is no entity in charge of non-regulated dams, the original classifications for these dams may not be correct. Some dams may not exist anymore while others may pose a greater downstream threat than their classifications indicate.

Note that ratings for dam failure are based on estimates of homes that lie within a half mile downstream of a high hazard dam. Due to the current lack of inundation studies, dam failure estimates are not exact and may change when proper inundation data is collected. Again, inundation information is not available to accurately quantify vulnerability.

Severity: Moderate – Cole County (unincorporated), Jefferson City, Taos, Wardsville
 Not applicable - all other participating jurisdictions

Potential Impact – Life

There is the very real danger of injury or loss of life with a dam failure event. This threat is recognized and built into the dam classification system.

Potential Impact - Existing Structures

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

Jefferson City and Taos have dams inside, or within a mile upstream of, their corporate boundaries. Depending on the size of the reservoir behind the dam, structures downstream of these dam locations could potentially be at risk if a failure were to occur.

Throughout the county several other dams lie upstream of structures that have the potential of being impacted. Existing structures in the jurisdictions of Taos, Wardsville, and portions of unincorporated Cole County that lie along the Osage River are vulnerable to the effects of dam failure stemming from a failure of Bagnell Dam.

The downstream areas and parcels within a half mile of the State Hazard Class 1 dams and a number of the State Hazard Class 2 dams in the planning area have been mapped (Map 3.10a-k) All figures were created using the same scale.

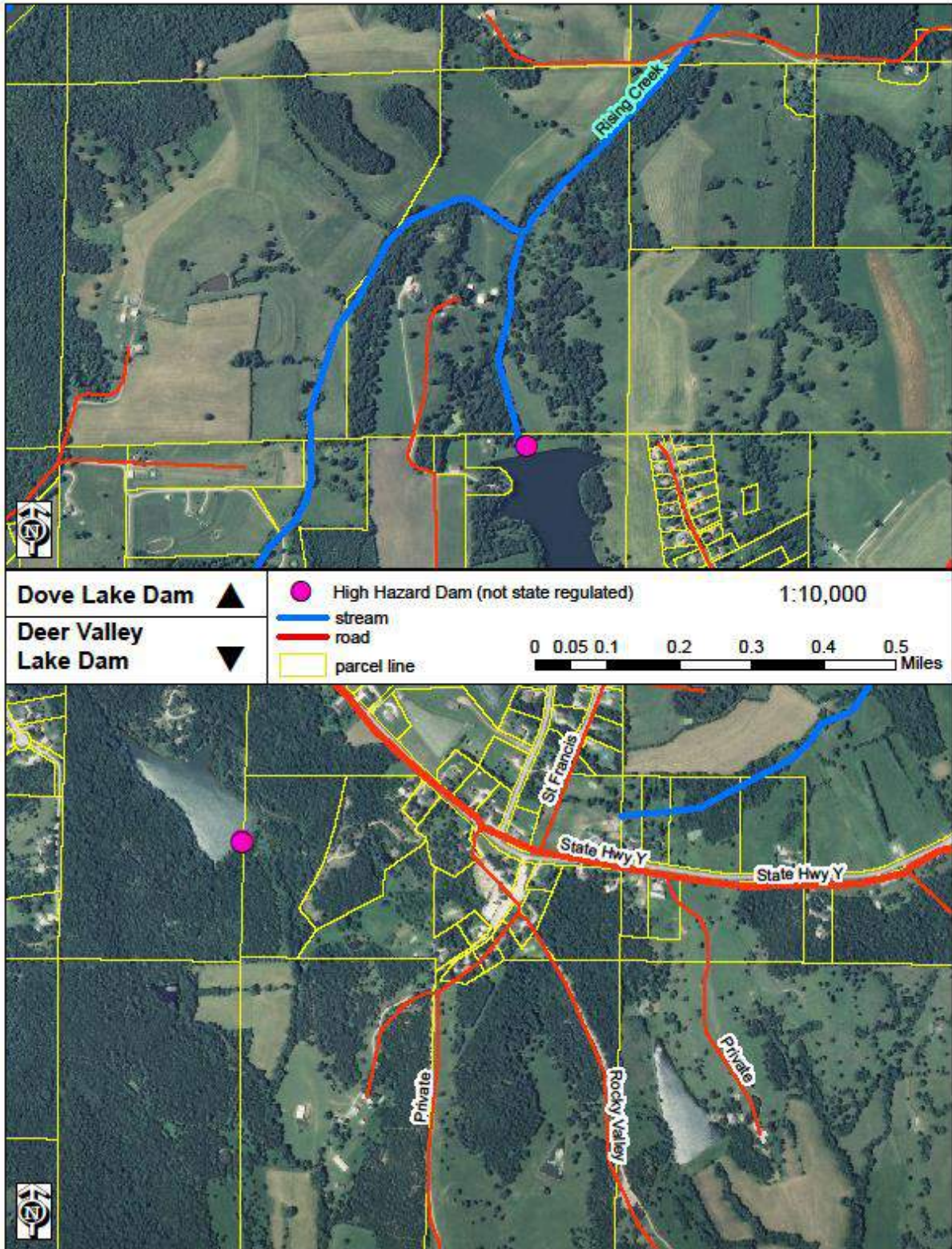
Table 3.29		
Location Guide for Aerial View Maps of High Hazard Dams		
Map ID #	Dam Name	Figure 4.53
2	Binder Lake Dam	B
17	Church Farm Lake Dam	G
30	Dale Klosterman Lake Dam	B
29	Dalton Dam	E
21	Deer Valley Lake Dam	C
18	Dove Lake Dam	C
20	Graessle-Rockers Lake Dam	D

11	Henley Lake Dam	H
1	Hough Park Dam	E
7	Lake Carmel Dam	K
22	Lakewood Dam	F
19	Lubker Dam	G
5	Mar-Kay Lake Dam	H
14	McKay Park Lake Dam (Sunset Lake)	I
13	Renn's Lake Dam	F
27	Shadow Lake Dam	I
28	Spring Rock Lake Dam	J
3	Starr Lake Dam	K
10	Turpin Lake Dam	D
15	Twehous Lake Dam	L
25	Winegar Lake Dam	J
32	Young Dam	L

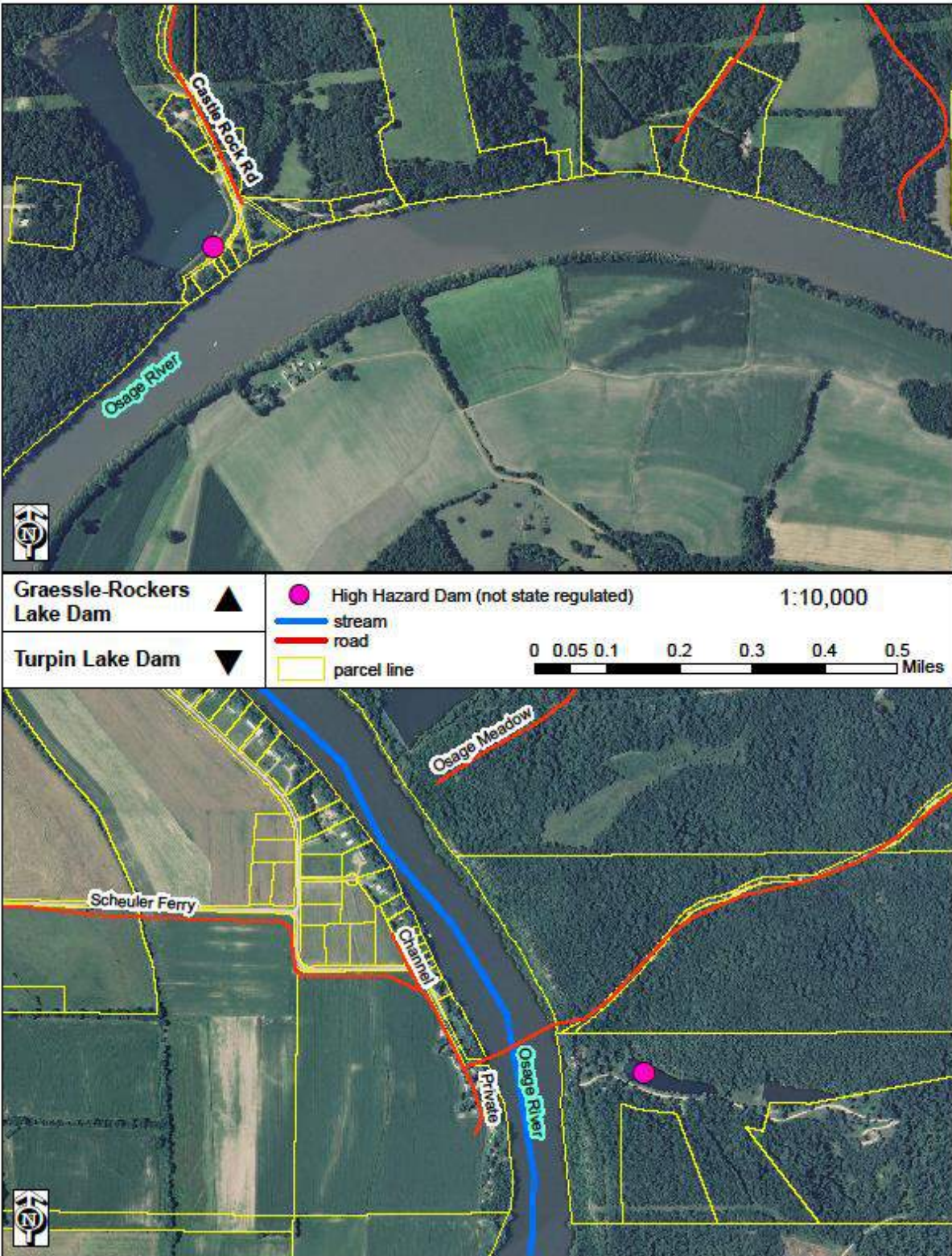
Map 3.10a



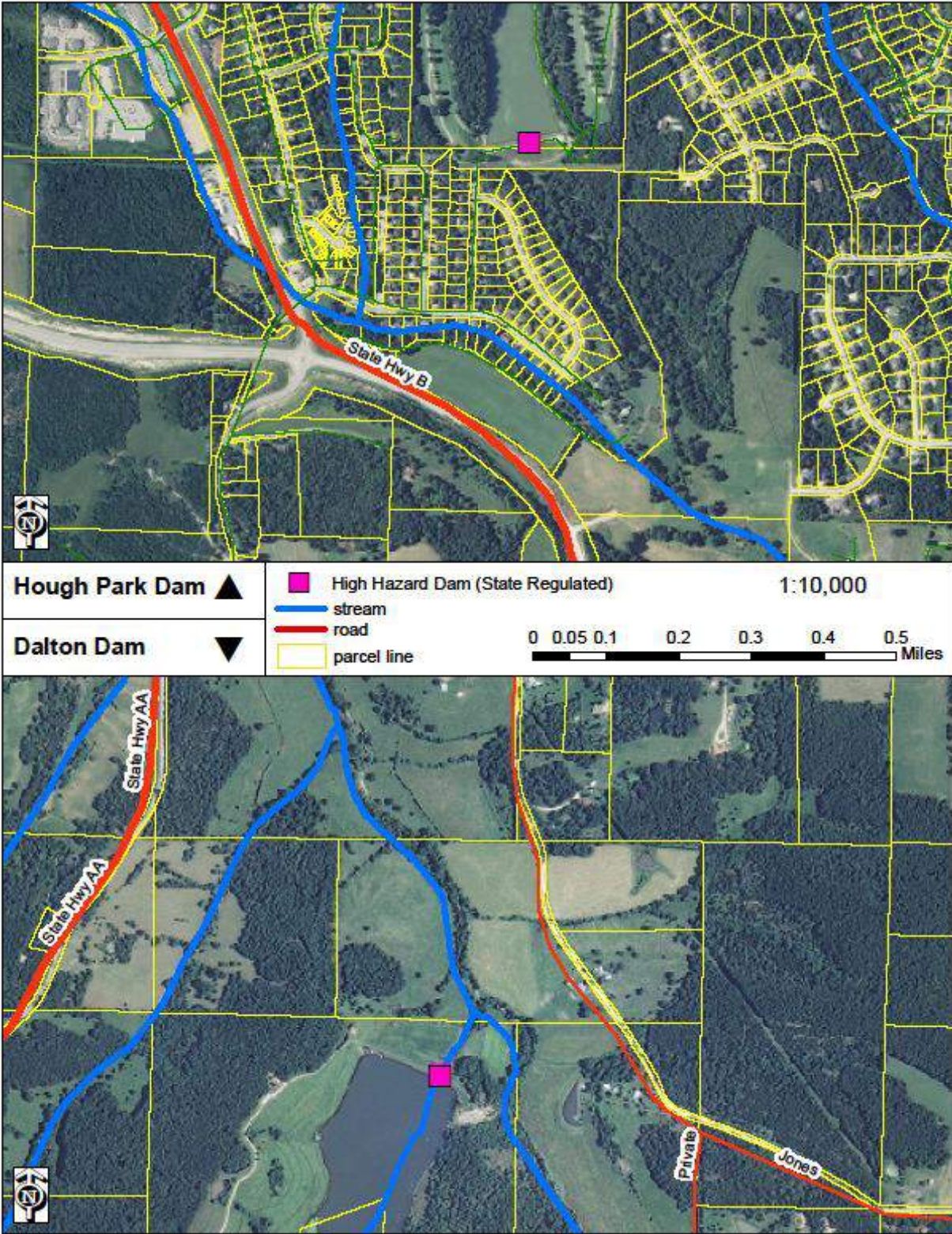
Map 3.10b



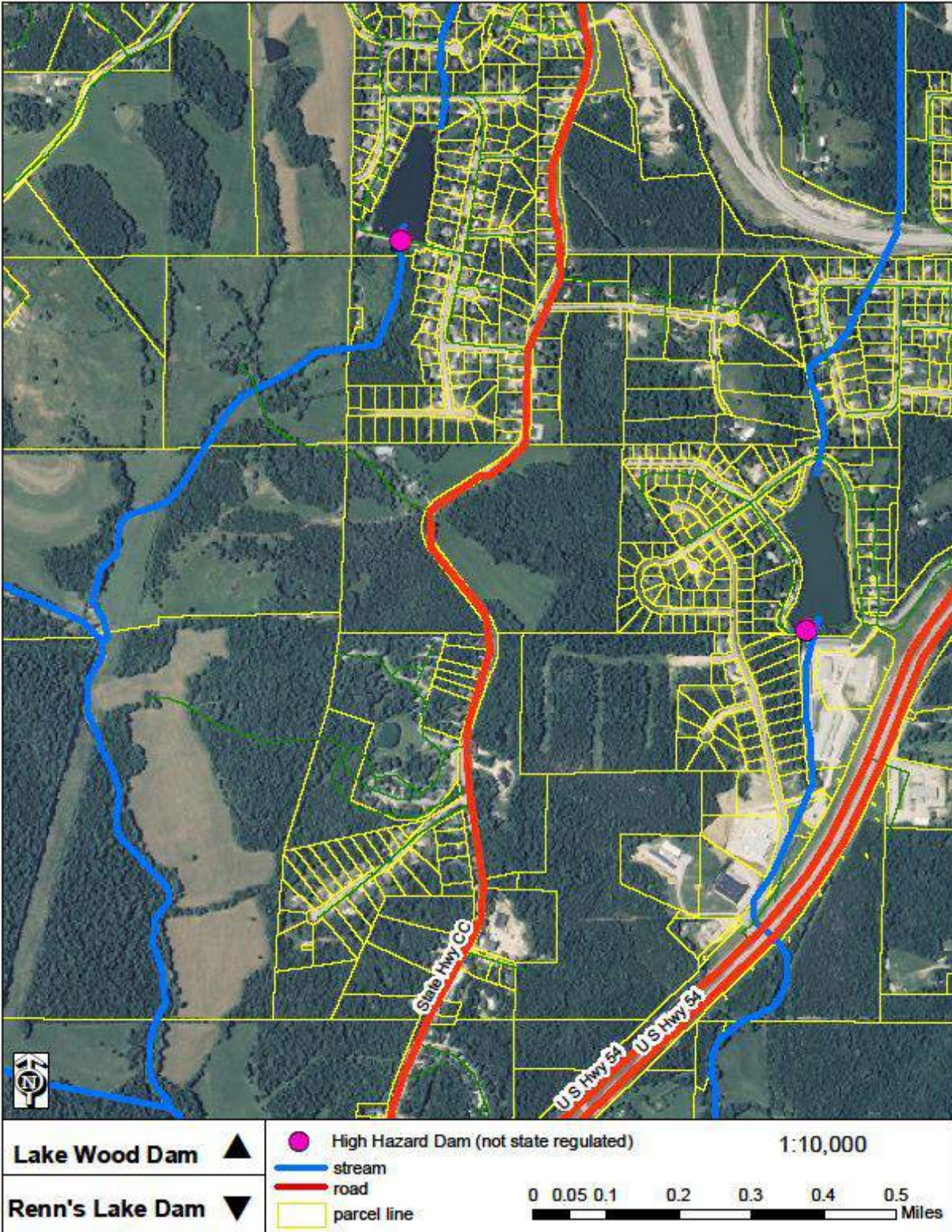
Map 3.10c



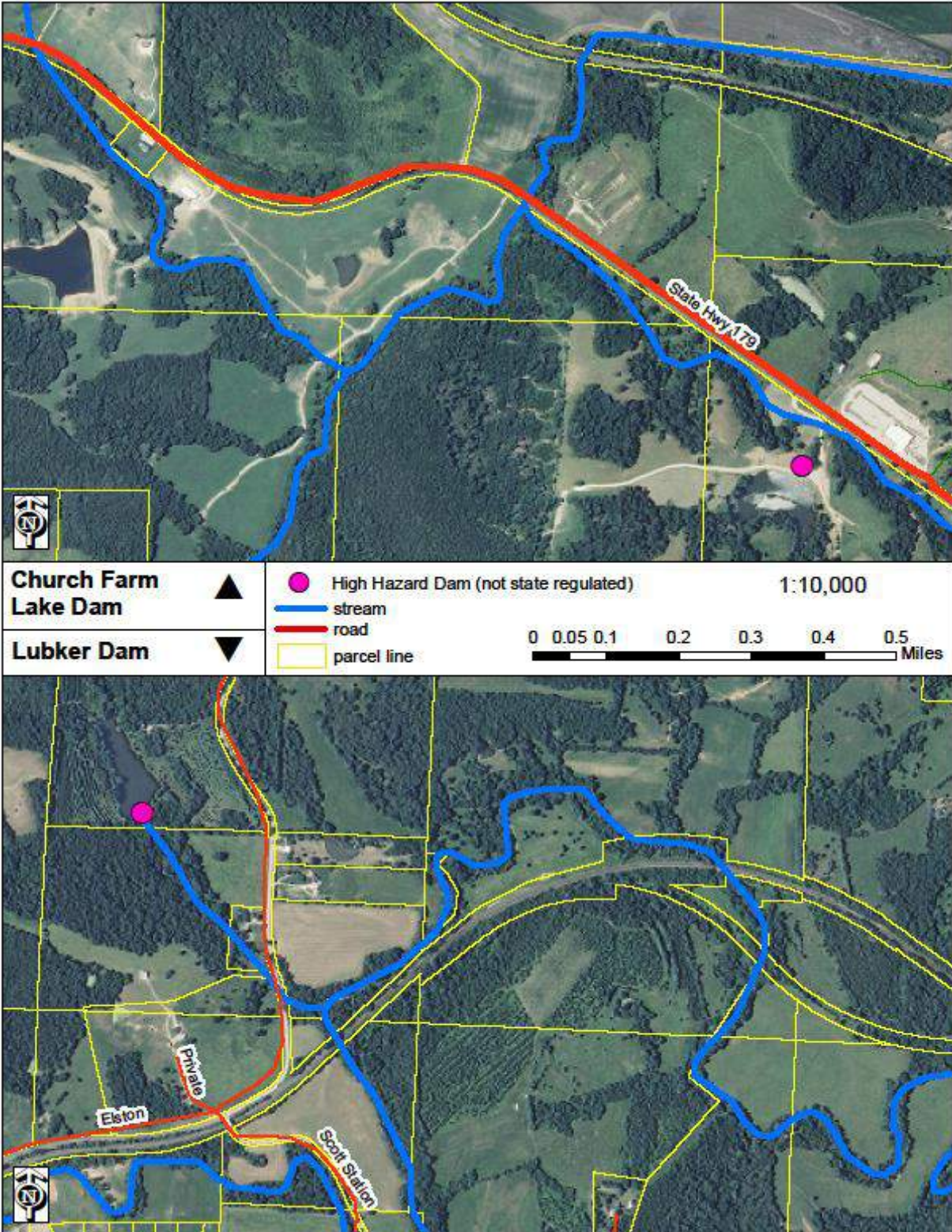
Map 3.10d



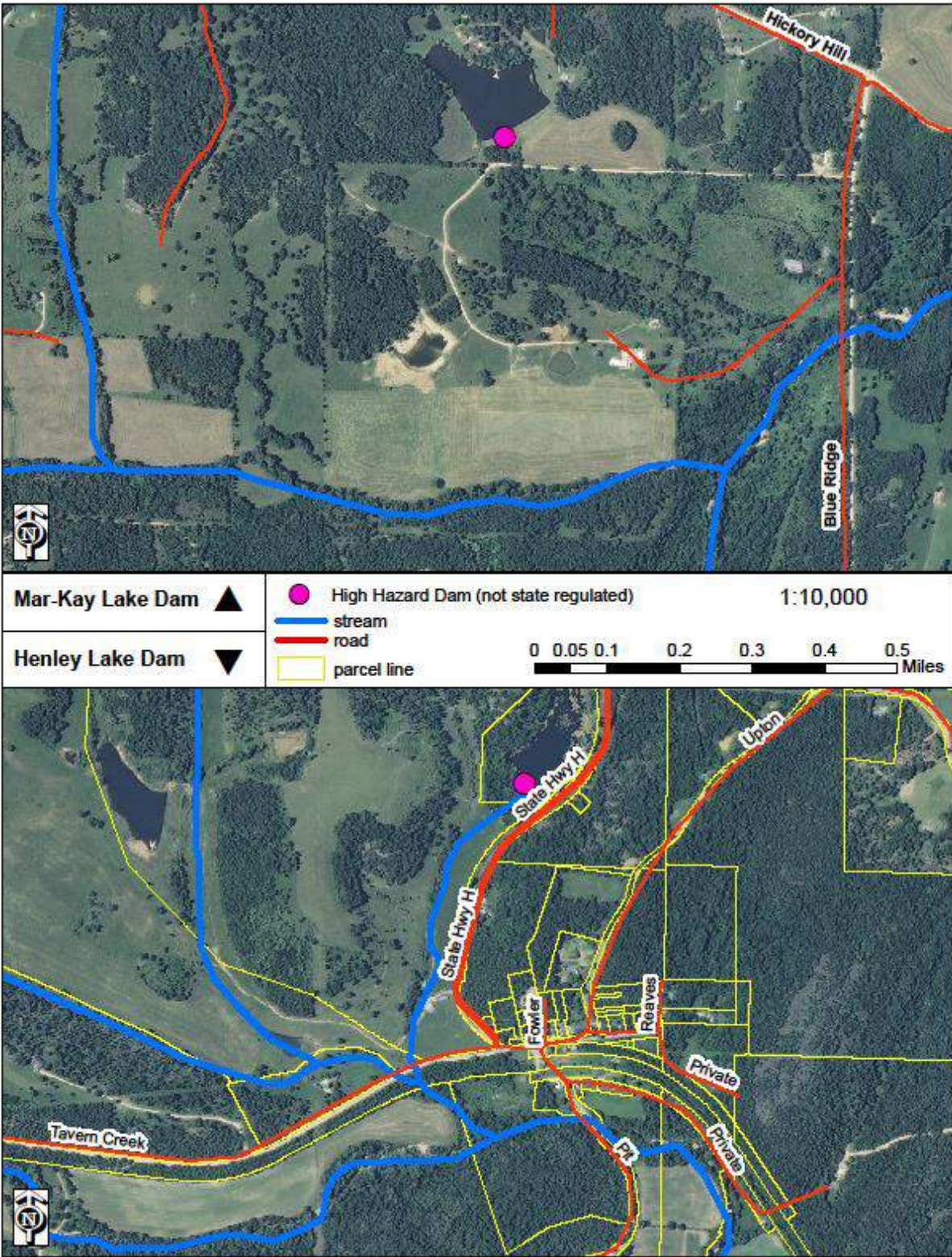
Map 3.10e



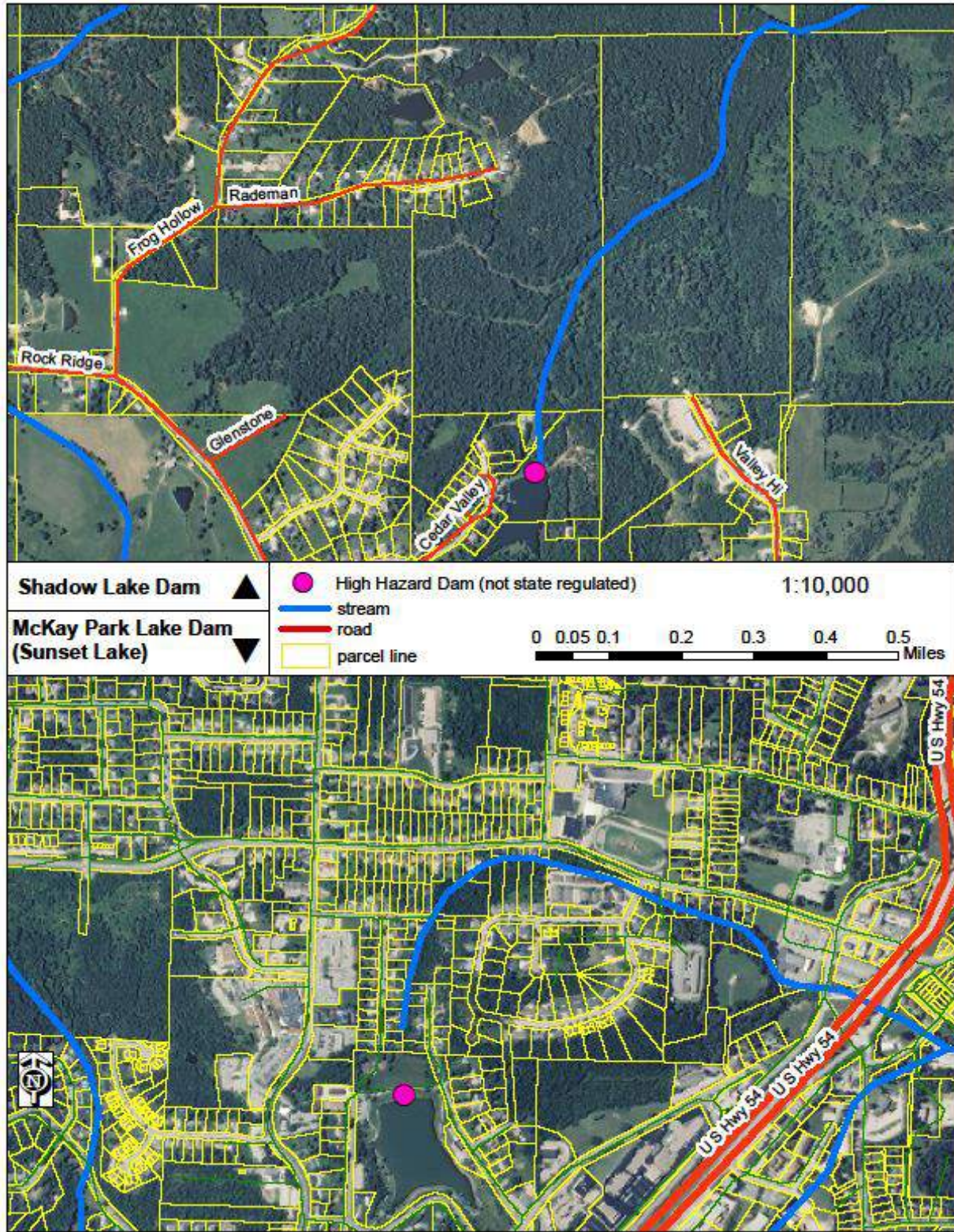
Map 3.10f



Map 3.10g



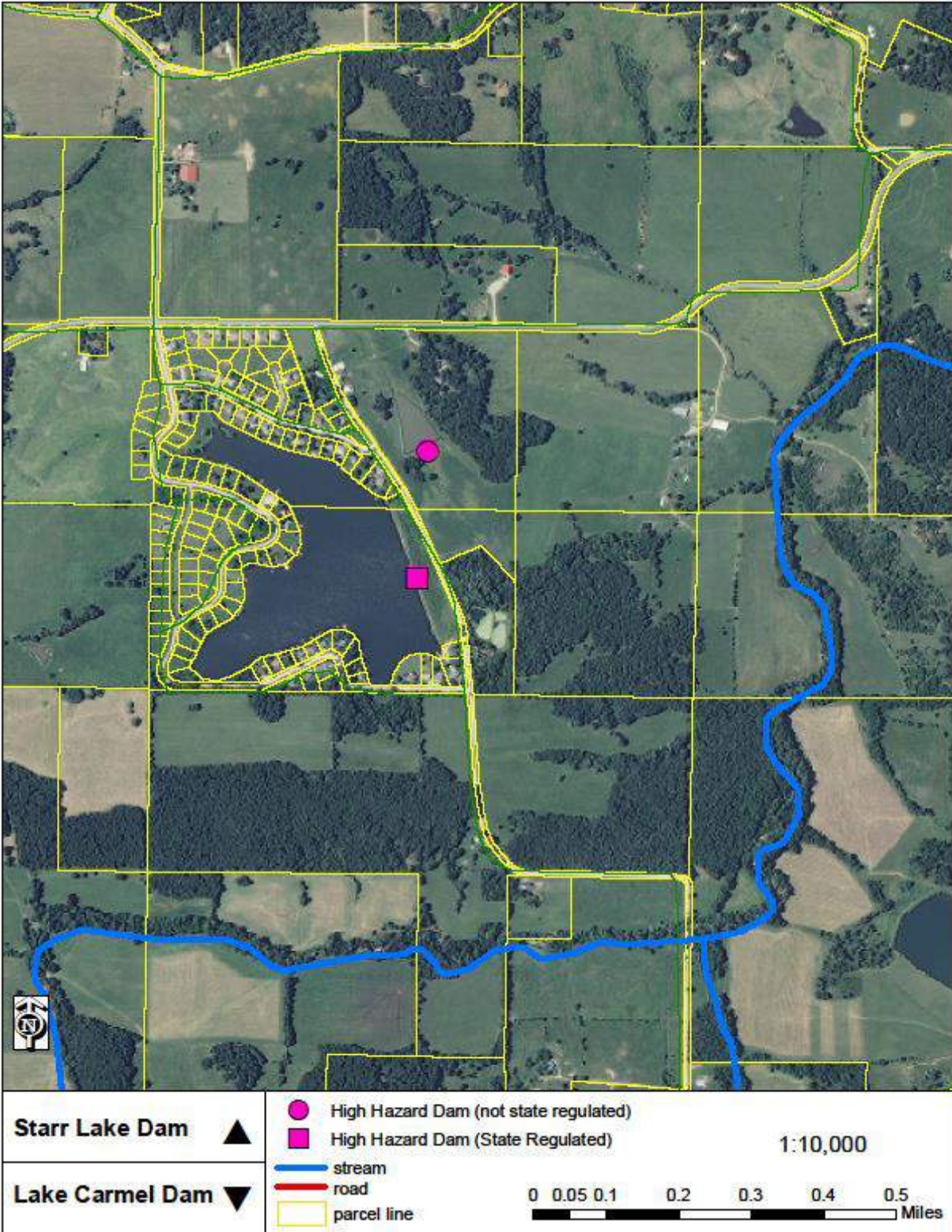
Map 3.10h



Map 3.10i



Map 3.10j



Map 3.10k



Impact - Future Development

Development below an aging or unsafe dam potentially puts both the development and lives at risk.

Inundation studies of the state regulated high hazards dams have recently been carried out by the Natural Resources Conservation Service's Water Resources Center and Emergency Action Plans (EAPs) are being written for these dams. The inundation studies and EAPs will be finalized in the near future and information will be available sometime in 2016, according to Glenn Lloyd, Civil Engineer and Dam Safety Inspector with the Dam Safety Program of the MO Department of Natural Resources (DNR). The information from these inundation studies will be of great use when assessing the potential and dangers of future development in the planning area. Future federal funding of state dam safety programs will be linked to the completion of these EAPs for regulated dams.

There is still a risk of development below privately owned dams, non- regulated dams.

Existing Mitigation Strategies

State regulated dams are inspected, according to classification, through the Dam Safety Program of the DNR.

The Cole County Emergency Management Coordinator reviews the EAPs being written for the state regulated, high hazard dams.

Cole County is prepared, through its Public Works Department and Emergency Management Coordinator, to send a monitoring team to a potential dam failure site.

Hazard Summary by Jurisdiction

The jurisdictions of Cole County (unincorporated), Jefferson City, Taos and Wardsville are all vulnerable to dam failure. There are 34 known dams in the planning area; of these, only 8 are regulated by the state. The rest of the 34 dams do not fall under any regulatory authority. In addition, a dam failure at Bagnell Dam to the south threatens parts of the planning area.

The issue of the unregulated dams in the planning area remains. The data for unregulated dams in the DNR National Dam Inventory, including their ownership and hazard classification, dates back to the late 1970s and early 1980s. Their classifications may not accurately reflect current downstream conditions. In addition, there is a lack of knowledge of the physical condition and maintenance of these dams. Most of these dams are in unincorporated Cole County.

Centertown, Lohman, Russellville, and St Martins are not located in any inundation zones for dams that pose a high risk to populations or facilities.

Problem Statement

Much like flash flooding, the risk in a dam failure to life and property comes from the sudden rush of water downstream. Development in the inundation zone of a high hazard dam poses a risk to life and structure.

3.4.4 Earthquakes

DESCRIPTION OF HAZARD

The United States Geological Society (USGS) describes an earthquake as “a sudden movement of the earth’s crust caused by the release of stress accumulated along geologic faults or by volcanic activity.” Earthquakes can be one of the most destructive forces of nature causing death, destruction of property, and billions of dollars of damage.

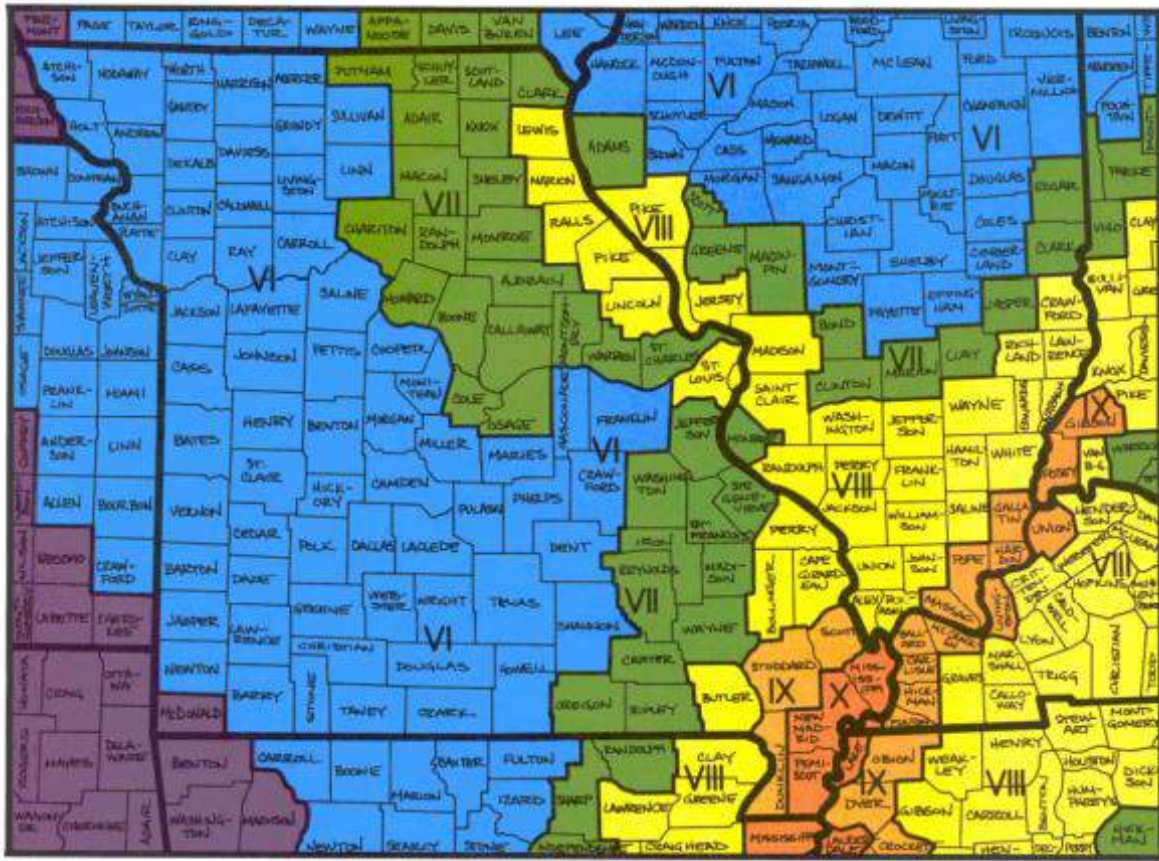
The New Madrid Seismic Zone (NMSZ), which runs through southeastern Missouri, is the most active seismic zone east of the Rocky Mountains. Any hazard mitigation planning in Missouri must, of necessity, take possible earthquakes into account.

Missouri and much of the Midwest can feel earthquakes from very far away because the geology of the area is more amenable to ground shaking than the California geology. New Madrid earthquakes can cover up to twenty times the area of typical California earthquakes because of this differing geology.

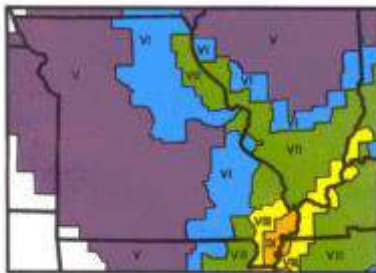
Location

The entire planning area is at risk for the effects of an earthquake along the New Madrid Seismic Zone. Areas close to the Missouri River may be particularly vulnerable. The soil, or alluvium, along river channels is especially vulnerable to liquefaction from earthquake waves; river alluvium also tends to amplify the waves.

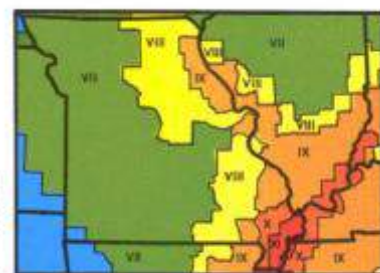
Figure 3.4



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.



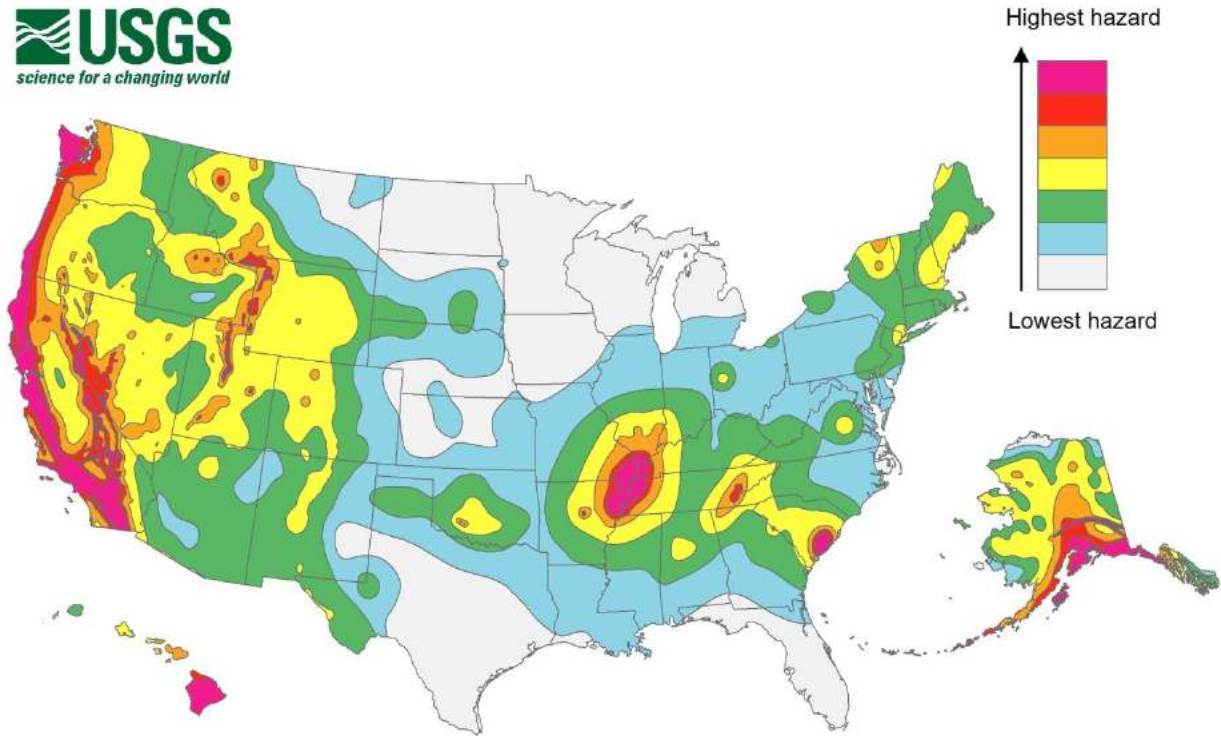
This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 8.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

Table 3.30: Projected Earthquake Intensities

Figure 4.38	
Modified Mercalli Intensity Scale	
I. Instrumental	Not felt by many people unless in favorable conditions.
II. Feeble	Felt only by a few people at best, especially on the upper floors of buildings. Delicately suspended objects may swing.
III. Slight	Felt quite noticeably by people indoors, especially on the upper floors of buildings. Many do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV. Moderate	Felt indoors by many people, outdoors by few people during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rock noticeably. Dishes and windows rattle alarmingly.
V. Rather Strong	Felt outside by most, may not be felt by some outside in non-favourable conditions. Dishes and windows may break and large bells will ring. Vibrations like large train passing close to house.
VI. Strong	Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight.
VII. Very Strong	Difficult to stand; furniture broken; damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars.
VIII. Destructive	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved.
IX. Ruinous	General panic; damage considerable in specially designed structures, well designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X. Disastrous	Some well built wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent.
XI. Very Disastrous	Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Catastrophic	Total damage - Almost everything is destroyed. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move position.
Source: http://en.wikipedia.org/wiki/Mercalli_intensity_scale	

The below map shows the seismic hazards across the United States. The planning area located in the center of the United States is included in zone VII, which is displayed in green.

Figure 3.5: United States Seismic Hazard Map



Source: United States Geological Survey at https://earthquake.usgs.gov/hazards/hazmaps/conterminous/2014/images/HazardMap2014_1g.jpg

Strength/Magnitude/Extent

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

Richter Magnitude Scale

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

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

Earthquakes along the New Madrid Seismic Zone with magnitudes around 6.0 or greater would be of concern for the planning area.

Previous Occurrences

Historical quakes along the New Madrid Seismic Zone in southeastern Missouri have been some of the largest in U.S. history since European settlement. The Great New Madrid Earthquake of 1811-1812 was a series of over 2000 quakes which caused destruction over a very large area. According to information from Missouri SEMA's Earthquake Program, some of the quakes measured at least 7.6 in magnitude and five of them measured 8.0 or more.

The 1811-1812 quakes changed the course of the Mississippi River. Some of the shocks were felt as far away as Washington D.C. and Boston.

The first federal disaster relief act was a result of the Great New Madrid Earthquake of 1811-1812. President James Madison signed an act into law which issued "New Madrid Certificates" for government lands in other territories to residents of New Madrid County who wanted to leave the area.

Probability of Future Events - Moderate

It is difficult to predict the probability of an earthquake occurring along the New Madrid Seismic Zone which would be significant enough to affect the planning area. The following information from MO DNR helps to illustrate why this is difficult:

The active faults in the NMSZ are poorly understood because they are not expressed at the ground surface where they can be easily studied. The faults are hidden beneath 100- to 200-foot thick layers of soft river deposited soils called alluvium.

Microseismic earthquakes (magnitude less than 1.0 to about 2.0), measured by seismographs but not felt by humans, occur on average every other day in the NMSZ (more than 200 per year).

Active faults that have generated dangerous earthquakes in historic times or the recent geologic past (the last 10,000 years) are not always microseismically active. In fact, in some settings these quiet faults are considered the most dangerous ones because high built up stress has locked the two sides of the fault together thereby preventing the microseismic earthquakes. This is thought to happen as a prelude to a major rupture of the fault. It is not known if faults of this type exist in the NMSZ. If they do exist there is no easy way to locate them.

If one looks strictly at the historical record for earthquakes of 6.5 magnitude or greater, there have been 2 years (1811 and 1812) out of the last 204 years in which such earthquakes have

occurred. This equals less than 1% probability in any given year (Probability= $2/204 \times 100 = 0.98\%$). However, there were many serious quakes in just the two years of 1811 and 1812, according to MO DNR.

In 2002, U.S. Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis released the following expectations for earthquakes in the NMSZ in following 50 years:

- 25-40% percent chance of a magnitude 6.0 and greater earthquake.
- 7 -10% chance of a magnitude 7.5 - 8.0 quake (magnitudes similar to those in 1811-1812)

According to information provided by MO SEMA, the above expectations can be translated into the following likelihoods for a given year in the 50 year period:

- 1.0-1.6% likelihood of a magnitude 6.0 and greater earthquake
- 0.28-0.40% likelihood of a magnitude 7.5-8.0 earthquake

Since a magnitude 6.0 earthquake would affect the planning area the probability has been determined to be moderate.

VULNERABILITY

Vulnerability Overview

Severity: High

Potential Impact - Existing Structures

The intensity of an earthquake refers to the potentially damaging effects of a quake at any particular site. An earthquake of a specific magnitude will have different intensities depending on a location's distance from the epicenter of the quake, intervening soil type, and other factors.

According to the USGS, Cole County is one of the 47 counties in Missouri that would be severely impacted by a 7.6 magnitude earthquake with an epicenter on or near the New Madrid Seismic Zone.

The State Emergency Management Agency (SEMA) has made projections of the highest earthquake intensities which would be experienced throughout the state of Missouri should various magnitude quakes occur along the New Madrid Seismic Zone (Map 3.5).

The pertinent information for Cole County is summarized in Table 3.31.

Table 3.31			
Projected Earthquake Hazard for Cole County			
Magnitude at NMSZ	Probability of Occurrence (2002 -2052)	Intensity (MMI)	Expected Damage
6.7	25-40%	VI	Slight
7.6	7-10%	VII	Significant damage to poorly built structures

In 2008, the Mid-America Earthquake Center mapped the expected probability of at least moderate damage to electric power facilities from a 7.7 magnitude earthquake in the NMSZ; such damage was considered “highly unlikely” in the planning area. This correlates well with the projected damage to *poorly* built structures from a 7.6 magnitude quake.

Annualized Loss Scenario

The *MO State Hazard Mitigation Plan (2018)* explains the annualized loss scenario as follows:

HAZUS defines annualized loss as the expected value of loss in any one year. The software develops annualized loss estimates by aggregating the losses and their exceedance probabilities from the eight return periods. Annualized loss is the maximum potential annual dollar loss resulting from various return periods averaged on a ‘per year’ basis. It is the summation of all HAZUS-supplied return periods multiplied by the return period probability (as a weighted calculation).

The results of the modeling for Cole County are shown in Table 3.32.

Table 3.32 Hazus-MH Earthquake Loss Estimate: Annualized Loss Scenario

County	Total Losses, in \$ Thousands	Loss Per Capita, in \$ Thousands	Loss Ratio, in \$ Per Million
Cole	\$372	\$0.0049	\$35

While Cole County has among the lowest loss ratios in the state, it’s estimated building damage in actual dollars ranks 22nd. (For a comparison, the modeling estimates the loss ratio in \$ per million for St. Louis County (ranked #1) at \$150 and in the City of St. Louis (ranked #2) at \$235.

The building inventory in Cole County, the seat of State Government, is both relatively large and high in value so there is the potential for costly damage even at a considerable distance from the New Madrid Fault. However the percentage of buildings sustaining damage and/or the level of damage sustained would be much lower than in a county adjacent to the fault. The loss ratio reflects this and gives an indication of both the potential economic impact of an earthquake and the difficulty of recovery in the county. Cole County is better equipped to deal with the economic loss it would be expected to incur than most other counties in the state.

2% Probability of Exceedance in 50 Years Scenario

This analysis models a worst case scenario using a level of ground shaking recognized in earthquake design. The *MO State Hazard Mitigation Plan (2013)* gives the following explanation of the modeling:

The methodology is based on probabilistic seismic hazard shaking grids developed by the U.S. Geological Survey (USGS) for the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of peak ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively that have a 2% probability of exceedance in the next 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas. This scenario used a 7.7 driving magnitude in HAZUS-MH, which is the magnitude used for typical New Madrid fault planning scenarios in Missouri. While the 2% probability of exceedance in the next 50 years ground motion maps

incorporate the shaking potential from all faults with earthquake potential in and around Missouri, the most severe shaking is predominately generated by the New Madrid Fault.

Table 3.33 HAZUS-MH Earthquake Loss Estimation 2% Probability of Exceedance in 50 Years Scenario Direct Economic Losses

County	Cost Structural Damage	Cost Non-Structural Damage	Cost Content Damage	Inventory Loss	Loss Ratio	Relocation Loss	Capital Related Loss	Wage Losses	Rental Income Loss	Total Loss
Cole	\$43,457	\$120,094	\$44,103	\$541	1.53	\$32,126	\$7,001	\$14,911	\$13,288	\$275,521

It can be seen that in the modeling of a “worst case scenario”, Cole County’s loss ratio and loss ratio rank get higher. In addition, Cole County moves to the #25 rank in estimated building damage in actual dollars.

The modeling suggests that damages from a worst case scenario earthquake in the NMSZ (7.7 magnitude) would be greater in Cole County than the Modified Mercalli map of Missouri suggests. Caution indicates that mitigation and preparedness be focused on the most conservative estimates (in this case, those which predict greater injury and damage) unless these have been shown to be incorrect.

Even a significant earthquake event in the NMSZ which does not cause great damage in Cole County could still very possibly cause cascading economic losses in the county. There is the very real potential for disruption of road and rail traffic to the eastern part of the state, including the metropolitan area of St. Louis. Regions of the state outside of the severely damaged areas would probably be called upon for emergency and recovery assistance.

Potential Impact - Life

The potential for loss of life goes up as the magnitude of the earthquake goes up. Areas with a high rate of older or historical structures with construction methods not designed to withstand such an event pose a higher risk for loss of lives that work or live within such buildings.

The potential for “emotional aftershocks” also exists with any earthquake event. Major earthquake events require mental health services for people dealing with loss, stress, anxiety, fear, and other difficult emotions. Even a smaller quake, however, has the potential for emotional repercussions; the sudden movement of something experienced as stable for one’s entire life (the earth itself) can be very traumatic.

Potential Impact - Future Development

The standards followed in new construction will impact vulnerability to earthquake damage; the building codes in place in Cole County and the incorporated communities contain a basic level of seismic safety. Building new structures according to even more stringent earthquake resistant codes would lessen the potential damage should an earthquake occur, however, this type of mitigation activity may not be cost effective for many communities.

Hazard Summary by Jurisdiction

Building Codes and Regulations: Cole County and its communities all have building codes or regulations in place. The smaller communities adopt the County’s codes. The building codes contain a basic level of seismic safety and provide a mechanism for whereby earthquake resistant codes could be put in place to a higher standard.

Cole County Emergency Services: Personnel are well-trained and well-equipped to respond to disasters of all kinds.

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

All educational institutions in Cole County are subject to these statutory requirements and must provide training and exercises to students in preparation for a large earthquake. This is implemented throughout the county.

The Office of Emergency Management (OEM) maintains good relationships with the media who contact the EMC regularly for information. In addition, the EMC is interviewed every 1-2 months on KWOS Radio to discuss pertinent issues. Both the Cole County Sheriff’s Department and Jefferson City have Public Information Officers.

All county bridges are inspected by the MODOT on a 2-year cycle; if an earthquake impacted the planning area, MODOT would be in charge of county bridge inspection post-earthquake.

SAVE Coalition: This is a program of Missouri SEMA. According to the SEMA website:

The Missouri Structural Assessment and Visual Evaluation (SAVE) Coalition is a group of volunteer engineers, architects, building inspectors and other trained professionals that assists the Missouri State Emergency Management Agency with building damage inspections. After a disaster, SAVE volunteers are trained to move quickly to determine which buildings are safe to use and which should be evacuated.

Problem Statement

The entire planning area is vulnerable to the risk of damage from an earthquake in the New Madrid Seismic Zone (NMSZ) located in southeastern Missouri. Cole County is one of 46 “critical counties” where school districts are required by state law to establish earthquake emergency procedure systems in every school.

Studies and predictions indicate that there would be significant damage to poorly built structures in the planning area from a 7.6 magnitude (Richter) quake in the NMSZ. In addition to structural damage, and possible injury/loss of life, the planning area could be affected by an influx of people needing sheltering, disruption of the flow of goods, calls for assistance from other areas, and the psychological traumatization of the population.

There is extensive ongoing education and preparation in the planning area for the possibility of an earthquake event. Encouraging new construction buildings and infrastructure to be rated for earthquakes and taking on hardening efforts on existing structures can help minimize damage.

3.4.5 Land Subsidence/Sinkholes

HAZARD PROFILE

DESCRIPTION OF HAZARD

“Land subsidence is sinking of the earth’s surface due to the movement of earth materials below the surface. This sinking can be sudden or gradual...In Missouri, subsidence is primarily associated with sinkholes but...can also occur from void space left by mining and natural caves...” (*MO State Hazard Mitigation Plan, 2013*)

Gradual or sudden land subsidence is a key sign of sinkhole formation. The Stormwater Design Manual from Boone County, Cole County’s neighbor to the north, distinguishes between two types of sinkholes associated with karst topography:

- Depression sinkholes which have a defined drainage area and are generally shown as closed contours on a topographic map; best management practices are required to protect groundwater when runoff from development drains into these areas
- Collapse sinkholes are areas of “karst-related subsidence with no defined drainage area when occurring outside of a depression sinkhole. Collapse sinkholes can occur in the bottom of a depression sinkhole and are commonly referred to as the ‘eye’ of the sinkhole”

Construction excavation and well drilling can also cause sinkholes, according to the Missouri Department of Natural Resources (DNR).

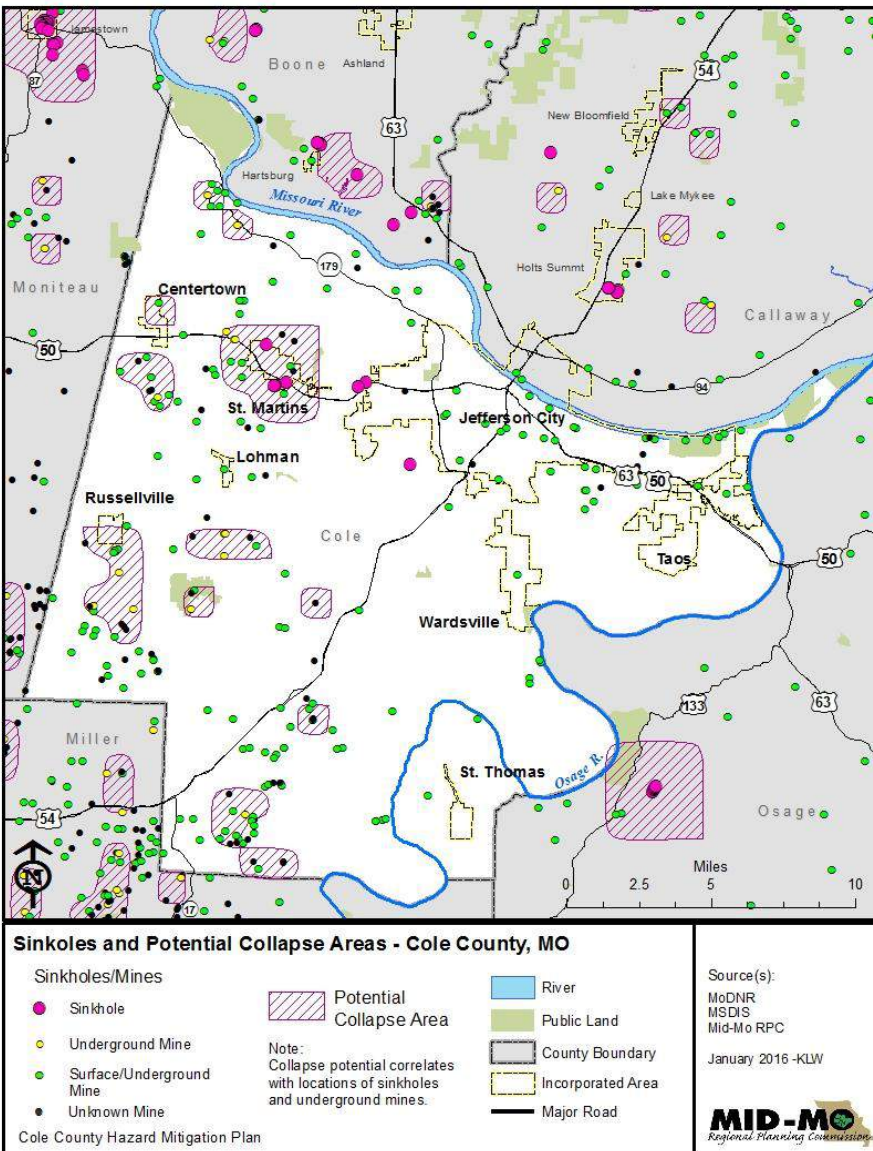
In addition to being at risk for land subsidence and sinkhole collapse associated with karst topography, the planning area is at risk from land subsidence/collapse associated with underground mining and exploratory drilling for petroleum.

Location

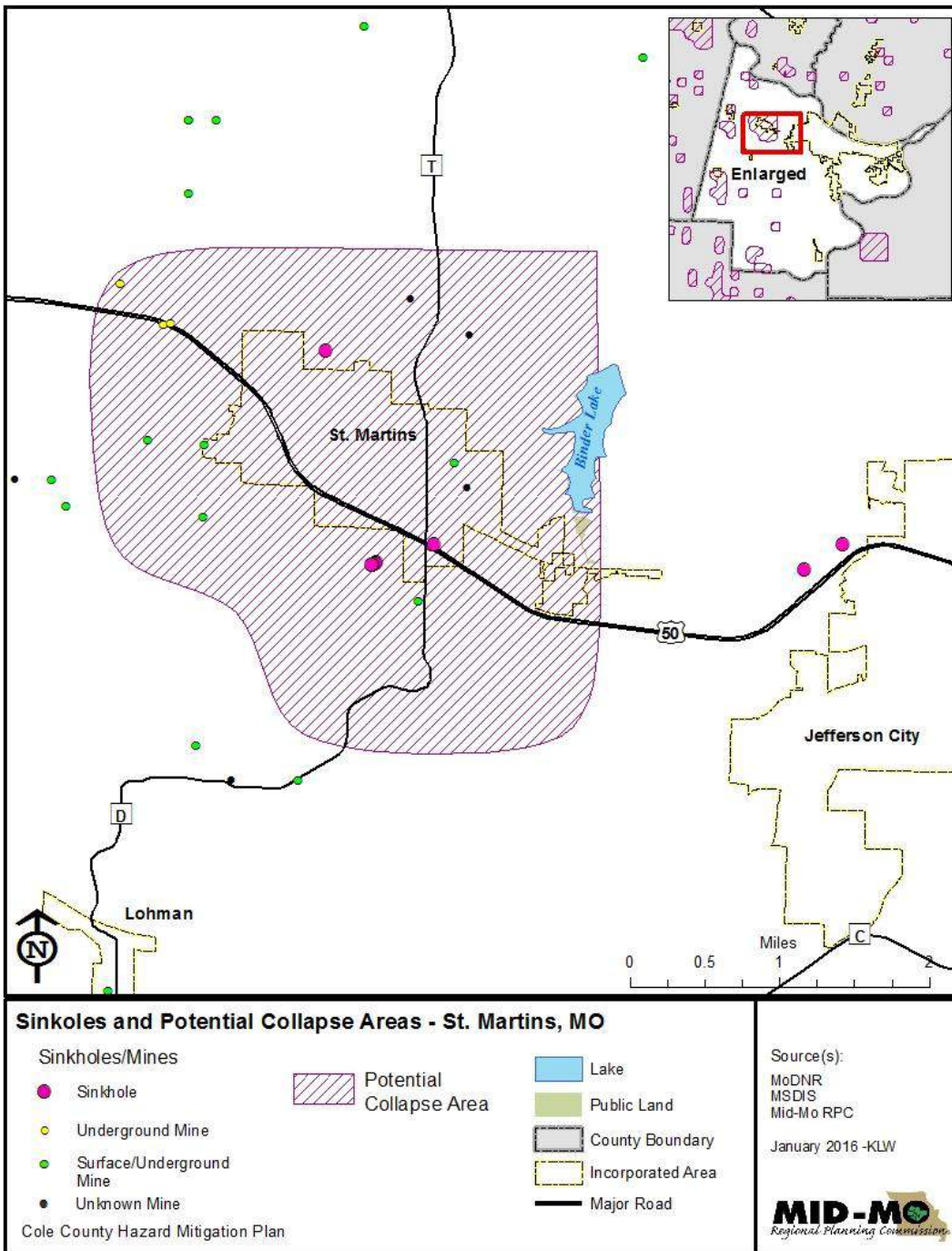
There are fewer than ten known sinkholes in the planning area. They are located in the northern part of the planning area near Jefferson City and St. Martins (Map 3.11-3.12).

The maps also show potential collapse areas around the known sinkholes and underground mines; these collapse areas were mapped by the MO DNR. These may not be the only potential collapse areas however; further development may bring to light previously unknown sinkhole areas in the karst regions and also more abandoned underground mines.

Map 3.11



Map 3.12



The sinkhole shown within the corporate limits of St. Martins was filled during the construction of Highway 50 in the 1990s and is now part of the right-of-way of the highway, according to a city official from St. Martins. The official also indicated that the mapped sinkhole immediately north of the city boundary was formerly a coal mining hole; it is now a farm cattle pond.

It is important to note the potential exists for sinkholes to develop near these areas and also in other areas without currently known sinkholes. Gradual or sudden land subsidence is a key sign of sinkhole formation.

The potential for collapse from underground mining is primarily in the western and southwestern parts of the planning area (Figure 4.80). These underground mines were mainly coal, lead, and zinc mines.

Strength/Magnitude/Extent

Sinkholes can vary “from a few feet to hundreds of acres and from less than one to more than 100 feet deep,” according to the USGS.

There have been 15,891 sinkholes identified in the State of Missouri. One hundred and sixty sinkhole collapses examined by the MO Department of Natural Resources between 1970 and 2007 were less than 10 feet in diameter and less than 10 feet deep. However, there were also some very large collapses within the state: one collapse drained a lake near St. Louis, one drained a sewage lagoon in West Plains, and one in Nixa swallowed a garage with a car in it.

Previous Occurrences

In 1975, a 40-foot sinkhole opened up just west of Jefferson City. In 2012, a sinkhole opened up on farmland south of Jefferson City near Zion Road and Route C; the sinkhole measured more than 60’ long and 15’ wide. In 2017 a garbage truck sunk into a hole on Glenwood Dr in Jefferson City that was due to aging infrastructure and possible underground flood erosion.

Sinkhole collapse in undeveloped areas may go unreported. Previous occurrences of sinkhole development in other parts of Missouri with similar geologic features are a source of concern.

Probability of Future Events

Moderate - Cole County (unincorporated)

Low - All other jurisdictions

There have been 2 known sinkhole collapses in unincorporated Cole County and one in Jefferson City in the period 1975-2020 (a 45-year period). Therefore, the calculated probability of a sinkhole collapse in any year is 6.6% ($3/45 \times 100$).

There have been no known sinkhole collapses in the other participating jurisdictions.

CHANGING FUTURE CONDITIONS CONSIDERATIONS

With expected rainfall events to happen more frequently and with higher intensity with climate change, instances of sinkhole collapse could go up in the planning area due to erosion from flooding and severe runoff exposing depressions below. Periods of rain followed by drought also elevate potential for sinkholes to open up with the fluctuating water table. There is also the opportunity for aging infrastructure such as water and sewer lines located underground to collapse as they get weaker with age or vehicle travel becomes more heavy.

VULNERABILITY

Vulnerability Overview

Severity: Low to High

It is very difficult to predict the severity of a sinkhole collapse due to their great variance in size, varying speeds of collapse onset, and proximity to the built environment. The severity of a sinkhole collapse will also be greater if contamination occurs.

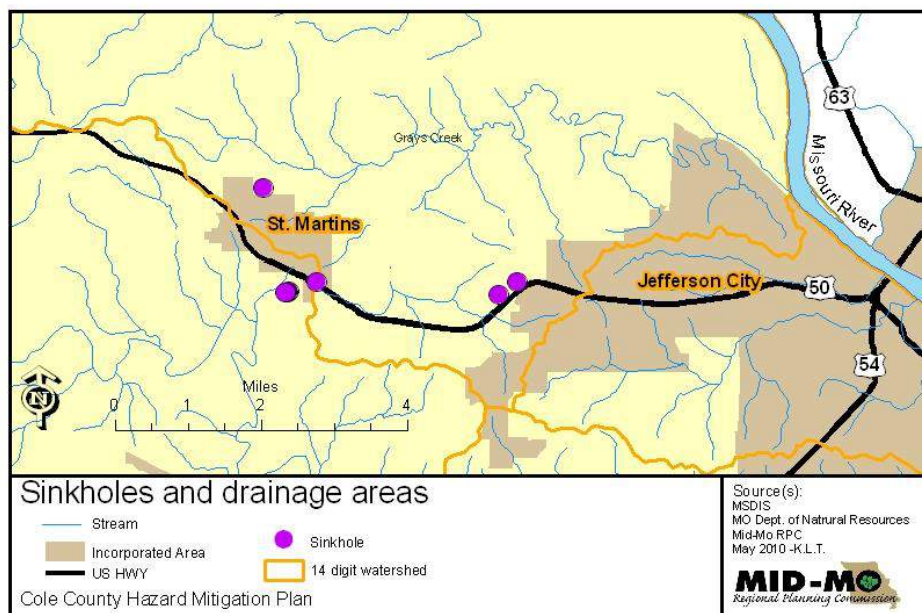
Potential Impact – Life

Sinkhole collapse poses a potential threat to human life; there have been numerous news stories in recent years of collapsing sinkholes swallowing up people. In 2013, a man hunting in southern Missouri lost his life when he stepped in a sinkhole which had possibly opened up due to recent heavy rain.

Sinkhole collapse potentially poses a threat to public health via contamination of the water supply. According to information from the Missouri DNR, a 1978 sinkhole collapse in southern Missouri drained the West Plains lagoon, resulting in sewage draining directly into underground water sources. More than 800 local residents reported illness and Mammoth Spring in Arkansas was contaminated.

The watersheds affected by the sinkhole areas in the St. Martins/Jefferson City area are shown in Map 3.13. It is important to note that due to the nature of karst topography some of the karst sinkhole areas may drain into watersheds other than the ones in which they are located. This makes the impact of pollutants in these areas harder to quantify. Some drainage patterns have been mapped using dye tracing and information on that mapping is available from the Missouri Department of Natural Resources.

Map 3.13



Potential Impact - Existing Structure

Sinkholes vary in size and can potentially cause damage to roads, water/sewer lines, buildings, and lagoons. It is difficult to determine the potential impact of land subsidence and sinkholes on existing structures for a number of reasons:

There is a lack of data on historic damages caused by land subsidence and sinkhole collapse in Missouri.

Even with the mapping of known and possible sinkhole locations, it is difficult to predict where a sinkhole will collapse and if the collapse will be significant enough to damage any structures in the vicinity.

Because sinkhole collapse is not predictable there is no direct way to assess a cost impact for this hazard. Vulnerable structures, roads, or property could potentially be impacted by a sudden and usually localized drop in elevation. The resulting damage incurred from the sinkhole could result in broken roads, building collapse, compromises to water sources, environmental impacts, and/or loss of life. While loss of life could occur, it would most likely be minimal.

Potential Impact - Future Development

It is difficult to assess the effects of sinkholes on future development because sinkhole development is unpredictable and few sinkhole areas have been identified in the planning area. However, it should be noted that future development can affect the impact of this hazard. Construction of septic tanks, lagoons, and structures can cause shifts in soil and may plug or disturb karst areas allowing for the formation of a sinkhole. Also, soil disturbance can cause the drainage pattern to change, which may lead to blockage of a sinkhole and potentially cause flooding.

Hazard Summary by Jurisdiction

Sinkhole collapse/land subsidence is not of great concern in the planning area due to the relatively few known sinkhole areas. However, this does not mean it is not a potential issue. There have been two known sinkhole collapses in unincorporated Cole County in the past 41 years; another sinkhole in St. Martins had to be filled during the construction of Highway 50 and aging infrastructure has caused a collapse in Jefferson City. While there are not any known sinkholes in the other jurisdictions of Cole county residents should be aware of potential collapse from old mines and utility lines.

Problem Statement

Cole County and its jurisdictions are all vulnerable to land subsidence/sinkholes to some extent.

Sinkhole collapse in karst areas poses the threat of contamination of the groundwater over a wide region. By keeping infrastructure properly maintained and tracking new collapse occurrences jurisdictions can more easily discourage land disturbance near potential problem areas.

3.4.6 Drought

DESCRIPTION OF HAZARD

The National Weather Service defines a drought as “a period of abnormally dry weather which persists long enough to produce a serious hydrologic imbalance (for example crop damage, water supply shortage, etc.) The severity of the drought depends upon the degree of moisture deficiency, and the duration and the size of the affected area.”

Droughts occur either through a lack of precipitation (supply droughts) or through overuse of water which outpaces what the surrounding environment can naturally support (water use droughts). Water use droughts can theoretically happen anywhere but are generally seen in arid climates, not humid places such as Missouri. At the present time, Missouri is most vulnerable to supply droughts brought on by a lack of precipitation.

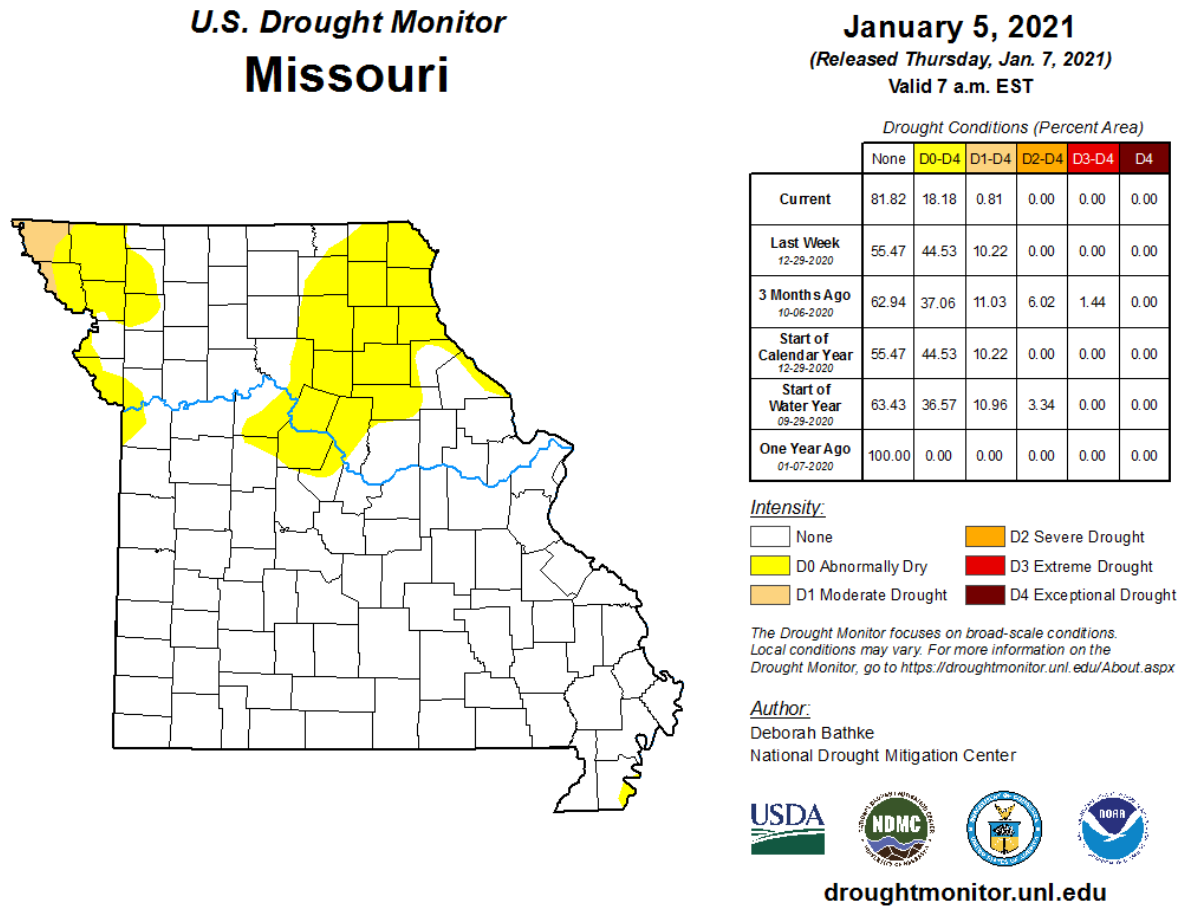
The period of lack of precipitation needed to produce a supply drought will vary between regions and the particular manifestations of a drought are influenced by many factors. As an aid to analysis and discussion, the research literature has defined different categories of drought (Table 3.34). The most common type of drought in Mid-Missouri is the agricultural drought.

Table 3.34 Drought Categories	
Agricultural	Defined by soil moisture deficiencies
Hydrological	Defined by declining surface and groundwater supplies
Meteorological	Defined by precipitation deficiencies
Hydrological and land use	Defined as meteorological drought in one area that has hydrological impacts in another area
Socioeconomic	Defined as drought impacting supply and demand of some economic commodity
Source: <i>Missouri Drought Plan, 2002</i> (Mo DNR)	

Geographic Location

The entire planning area is potentially at risk for drought. However, since agricultural drought is most common in Missouri, the unincorporated agricultural areas of Cole County are most at risk. Drought can mean crop failure in these areas and the resulting immediate, and potentially severe, economic loss.

Figure 3.7: Missouri Drought Monitor Map



Strength/Magnitude/Extent

Numerous indices have been developed to measure drought severity; each tool has its strengths and weaknesses.

Palmer Drought Severity Index: One of the oldest and most widely used indices is the Palmer Drought Severity Index (PDSI, Table 3.35), which is published jointly by NOAA and the U.S. Department of Agriculture (USDA).

Score	Description	Score	Description
Greater than 4	Extreme moist spell	0 to -0.4	Near normal conditions
3.0 to 3.9	Very moist spell	-0.5 to -0.9	Incipient drought
2.0 to 2.9	Unusual moist spell	-1.0 to -1.9	Mild drought
1.0 to 1.9	Moist spell	-2.0 to -2.9	Moderate drought
0.5 to 0.9	Incipient moist spell	-3.0 to -3.9	Severe drought
0.4 to 0	Near normal conditions	Below -4.0	Extreme drought

According to the National Integrated Drought Information System (NIDIS), the PDSI "...uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief."

Missouri is divided into six regions of similar climactic conditions for PDSI reporting; Cole County is located in the West Central Region.

Standardized Precipitation Index: A newer index currently being used by The National Drought Mitigation Center (NDMC) is the Standardized Precipitation Index (SPI). This index is based on the probability of precipitation; the time scale used in the probability estimates can be varied and makes the tool very flexible. The SPI is able to identify emerging droughts months sooner than is possible with the PDSI.

The NDMC uses the PDSI, SPI, and three other indicators to classify the severity of droughts throughout the country on a 5-point scale ranging from D0 Abnormally Dry to D4 Exceptional Drought for reports on the U.S. Drought Monitor (Table 3.36).

Based on the Drought Severity Classification from the NDMC, Cole County is subject to droughts ranging from D1 (Moderate Drought) to D4 (Exceptional Drought). The most common droughts are in the D1-D2 range.

Table 3.36

U.S. Drought Monitor - Drought Severity Classification

Category	Description	Ranges					
		Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

Source: <http://droughtmonitor.unl.edu>

Previous Occurrences

The Dust Bowl years of the 1930s and early 1940s were dry in Missouri but not as dry as the period 1953-57. A major nationwide drought in the late 1980s resulted in low water and decreased barge traffic on the Mississippi and Missouri Rivers. The fall of 1999 was another serious drought period in the state; in October of that year, all counties in Missouri were declared agricultural disaster areas by the USDA.

The drought which affected the entire state beginning in the summer 2012 was the worst drought in 30 years, according to the *MO State Hazard Mitigation Plan (2013)*. The planning area, and the surrounding region, suffered agricultural losses.

Missouri American Water opened their interconnect with PWSD #1 because of the drought but didn't need to open the interconnect with PWSD #2. Cover fires in the planning area were down during the drought. Various mitigation factors were thought to contribute to this: Public notices and press releases; both Cole County and Jefferson City Fire Department announced Red Flag Days; and Cole County Public Works minimized cutting work on right-of-way to avoid starting fires from equipment sparks.

Probability of Future Events

In the 21-year period 2000-2020, there were 9 years without any level of drought in the planning area, according to the U.S. Drought Monitor. Based on this data, the calculated probability of having at least a Moderate (D1) drought in a year is 42.8%. (Probability calculation: $1 - (9/21 * 100) = 42.85$)

The probability of occurrence of the maximum drought severity in any given year, based on the 2000-2020 data, has also been calculated (Table 3.37).

Table 3.37				
Probability of Maximum Future Drought Events				
Severity Scale	Drought Description	# of years with drought event (2000-2020)	Probability	Probability Rating
D1	Moderate	5	24%	High
D2	Severe	7	33%	High
D3	Extreme	4	19%	High
D4	Exceptional	0	0%	Low

Changing Future Conditions Considerations

Droughts are naturally occurring events in the planning area. While overall precipitation is predicted to rise with climate change the intensity of rainfall events at a given time could mean less rainfall at other times throughout the season leading to more frequent droughts and crop failures. Raising global temperatures could lead to more severe droughts.

VULNERABILITY

Vulnerability Overview

Severity

Moderate – Cole County (unincorporated)

Low - all other participating jurisdictions

The primary affect of drought in the planning area is on the economic livelihood of those in the agricultural sector. According to the *2017 US Census of Agriculture*, 72% of Cole County land use is tied to farming activities. In 2017 the market value of Cole County farm products was estimated at almost \$36.8 Million.

Potential Impact – Life

Both crops and livestock are at risk from drought. During the Exceptional Drought conditions in 2012, there were large sell-offs of livestock in the mid-Missouri region.

The psychological and economic stresses involved for those working directly in the agricultural sector can be great in times of drought. Uncertainty, high stress and fear are not compatible with optimal health.

Potential Impact - Existing Structures

Excessive drought can cause damage to roads, streets, water mains, and building foundations. Missouri American Water thought that the 2012 drought played a role in the 29 main breaks of cast iron pipe in August of that year; the number of breaks was higher than would have been expected. However, drought damage to infrastructure is not a major concern in the planning area, due to the soil types.

The arid conditions created by drought also pose an increased risk of fire and wildfire and thus to structures.

Drought can also have far reaching economic consequences beyond the agricultural sector; businesses dependent upon that sector can suffer serious losses. A severe drought can affect the economics of an entire region.

Potential Impact - Future Development

Drought is primarily an issue of water supply for the rural and agricultural parts of the planning area. 72% of the land in Cole County is agricultural and agriculture plays an important role in the life and economy of the area. This makes drought mitigation an especially important concern as population increases. Good land management techniques are crucial in mitigating future impacts.

There was strong growth in some parts of unincorporated Cole County between 2000 and 2010 with a similar trend expected for the 2020 census. Good land management techniques and the interconnection of water supplies will become increasingly important in mitigating the impacts of drought if this growth continues.

Hazard Summary by Jurisdiction

All jurisdictions in the planning area can be impacted by drought. Incorporated cities may see a drain on their water supply in times of extreme drought and wear on roads under cracking and shrinking dry ground can become damaged. The largest impact to drought though comes to unincorporated Cole County due to the agriculture-based nature of its economy and land usage. Crop losses deal large economic blows and the potential for wildfire pose a risk to those living nearby.

Problem Statement

Drought of some degree is a common occurrence in the planning area. The unincorporated agricultural areas of Cole County are the most vulnerable but all jurisdictions are potentially vulnerable to cascading economic effects during extended and serious drought conditions. In addition to damage to crops, produce, livestock, soil and the resulting economic consequences, the arid conditions created by drought pose an increased risk of fire. There is also the risk of damage to infrastructure from drought; while this has possibly contributed to some pipe breakage in the planning area, it is not seen as a major problem due to the soil types.

Drought conditions are carefully monitored at the state and national levels; state law requires the Missouri Department of Natural Resources to implement a drought response system to ensure the quantity and quality of available water resources.

Based on 2000-2020 data from the NDMC, the planning area is subject to droughts ranging from Moderate Drought (D1) to Exceptional Drought (D4); the most common droughts are D1 (Moderate Drought).

The planning area has decent interconnections, and backup for, water systems although there is still some room for improvement in this area. The Missouri Rural Water Association can assist with backup generators when needed and available.

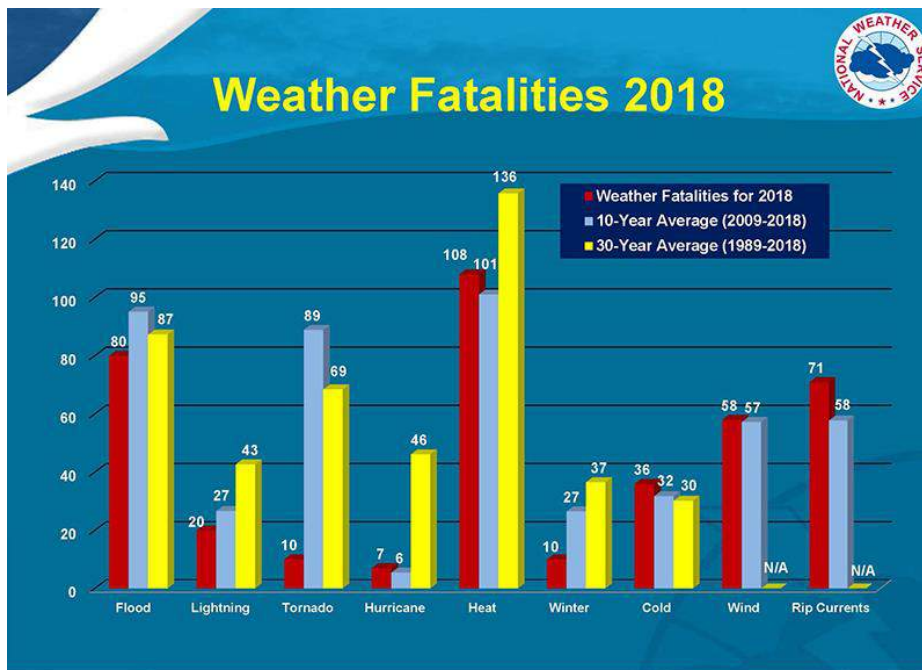
3.4.7 Extreme Temperatures

HAZARD PROFILE

DESCRIPTION OF HAZARD

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture, and other economic sector. Extreme heat is the number one weather-related killer in the United States, according to the National Weather Service (Figure 3.30). In contrast to the visible, destructive, and violent nature of floods, hurricanes, and tornadoes, extreme heat is a silent killer.

Figure 3.8



As can be seen in the NWS graph, there are no 30-year averages for heat fatalities or a number of other weather-related fatalities. Fatality data on these hazards began to be recorded more recently than fatalities from the more dramatic causes of death such as flood, lightning, tornado, and hurricane.

As the data shows, extreme heat resulted in an average of 101

deaths per year when looked at over a 10-year period; this is 6 more deaths per year than the number cause by flood, the next most frequent cause of death.

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can also cause issues with power sources by freezing fuel lines and overwhelming heating systems. It can also freeze and bust pipes in homes and businesses.

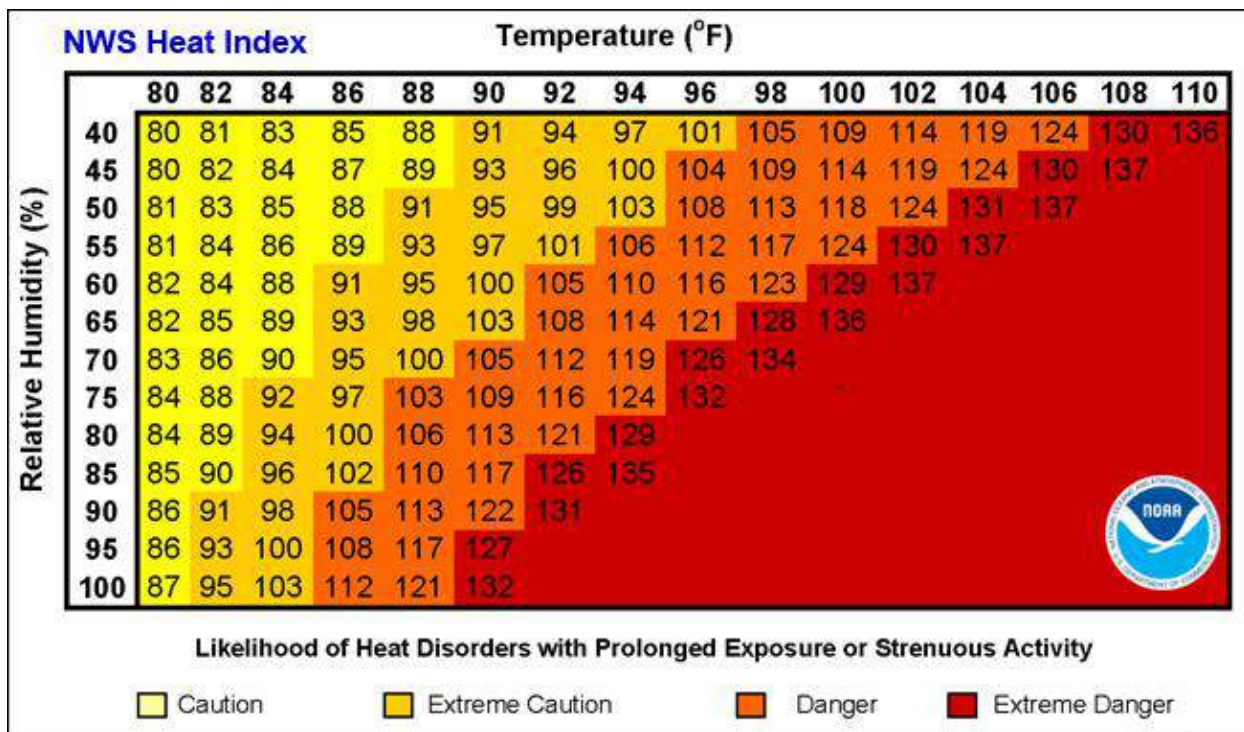
Geographic Location

The entire planning area is at risk from extreme temperature events.

Strength/Magnitude/Extent

The planning area routinely experiences prolonged periods with temperatures in the 90s and 100s (Figure 3.9). The duration of these periods of extreme heat can range from just one day to weeks. The National Weather Service (NWS) has an alert system in place to alert people when the Heat Index is expected to have a significant impact on public safety. The severity decides whether an advisory or a warning is issued.

Figure 3.9



Source: National Weather Service (NWS) <https://www.weather.gov/safety/heat-index>

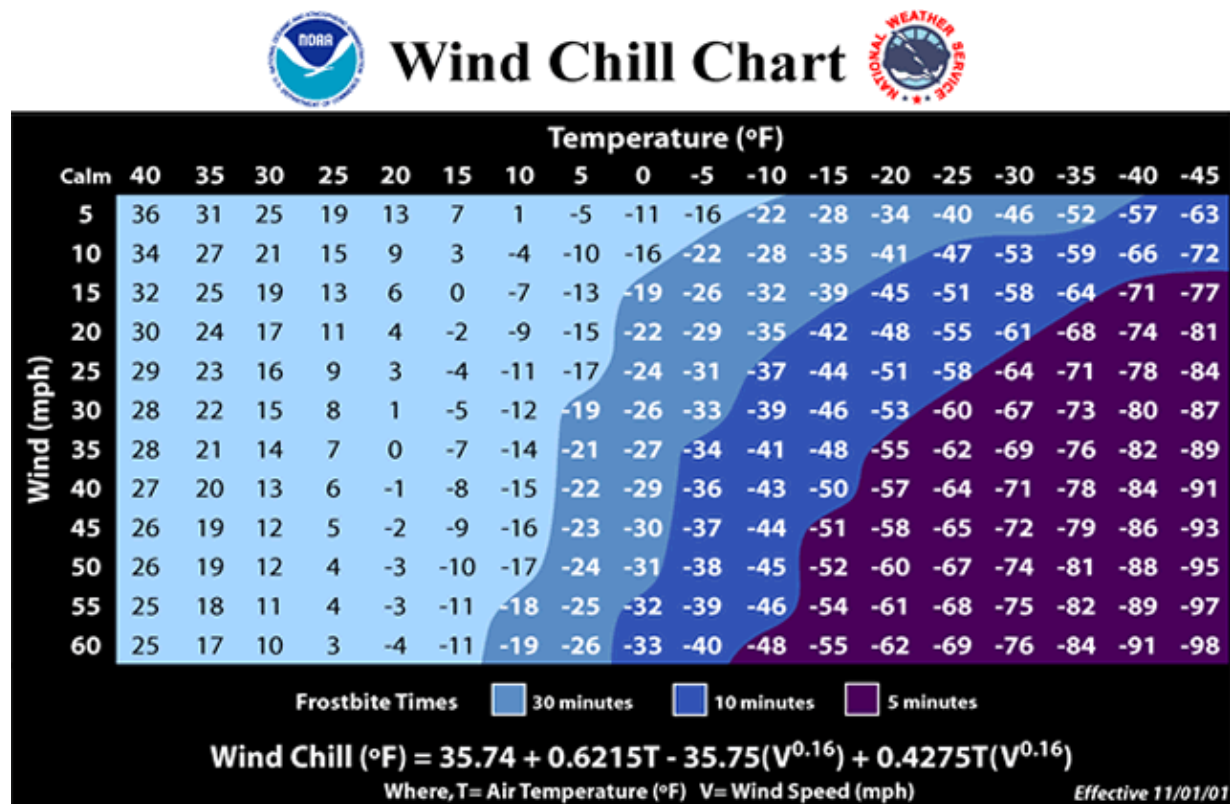
Note: Exposure to direct sun can increase Heat Index values by as much as 15°F. The shaded zone above 105°F corresponds to a HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

Similar to heat index the NWS also has an index for wind chill. It 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. Based on estimated temperatures advisories or warnings maybe issued.

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.

The figure below shows wind chill temperatures which are based on the rate of heat loss from exposed skin caused by wind and cold. When wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 3.10

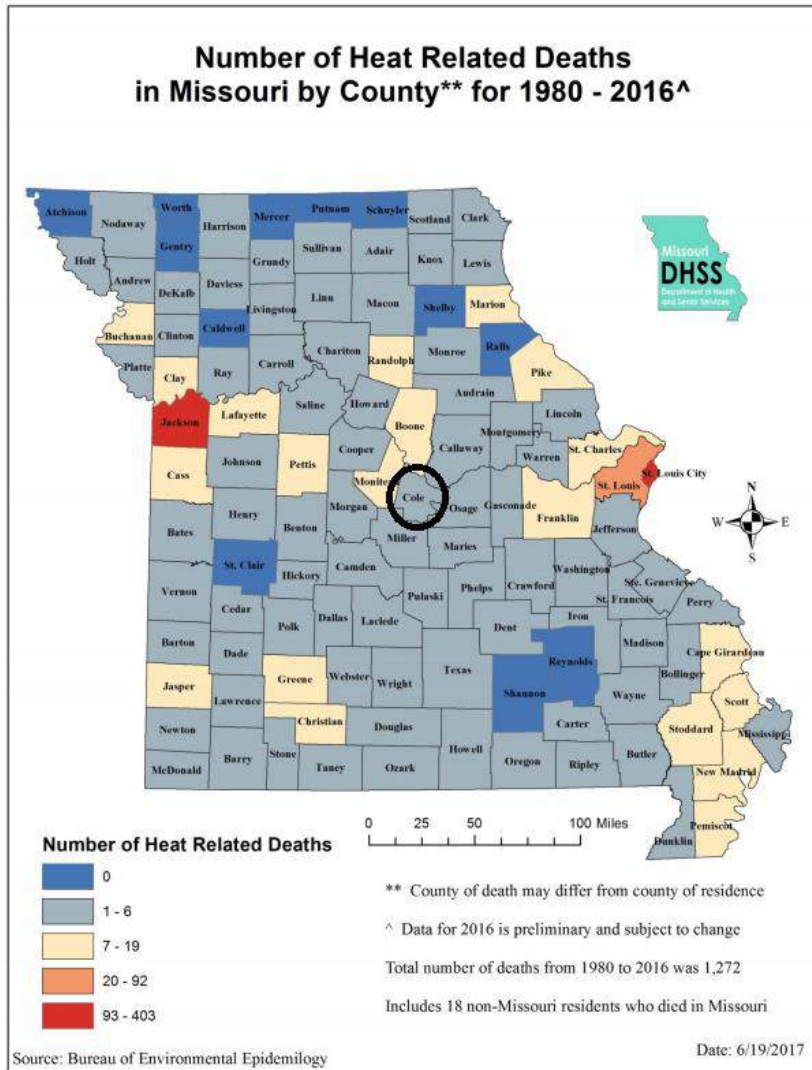


Previous Occurrences

Table 3.38			
Periods of Extreme Temperature in Cole County, 1/1/2000-1/1/2020			
Date	Air Temp	Temp. Index	Deaths
12/16/00	Single digits	-30	0
08/05/07	100-103	na	8
06/21/09	90s	100 -107	0
06/18/10	mid 90s	100 -105	0
07/14/10	100 - 103	na	0
07/17/10	mid-90s	105	0
07/22/10	mid-upper 90s	105 -110	0
08/02/10	100 -102	110	1
08/08/10	upper 90s - 100	110 -115	2
07/17/11	100	110	8
06/27/12	lower 90s - 100	105 -115	2
07/01/12	100 -109	very dry air	17
07/16/12	100 -106	102 -108	3
07/22/12	up to 108	up to 110	0
07/31/12	105	105-110	0
08/20/14	mid-upper 90s	105-110	0
07/12/15	Upper 90s	110	0
07/17/15	Mid 90s	105-110	0
07/25/15	Mid 90s	110	0
07/18/16	Upper 90s	110	1
07/18/17	Upper 90s	105-110	0
Total Deaths			42
* Deaths and injuries are for entire area in MO affected by extreme heat event.			
Source: www.ncdc.noaa.gov/stormevents/			

Of the 42 deaths reported for extreme temperature events since 2000 none were in Cole county. All were related to excessive heat and the majority were in St. Louis City or County. Figure 3.11 shows number of heat related deaths from 1980 to 2016.

Figure 3.11



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

Probability of Future Occurrence

– High for all participating jurisdictions

- NOAA data dating back to 1994 indicates only 6 years without extreme heat events (1996, 1997, 2008, 2013, 2018 and 2019). In most years during that period, there were multiple extreme heat events. Based on this historical data, the calculated probability of an extreme heat event in any year is 76%. (Probability calculation: $1 - (6/26) = 0.76$)
- NOAA data dating back to 1994 indicates that there was only 1 year with an extreme cold event. That event took place in 2000. This makes for a probability of an extreme cold event in any year 1%. (Probability calculation: $1 - (1/26) = 0.96$)

The chances of an extreme heat event are much higher and happen much more frequently than extreme cold but cool snaps that may not bother humans can bother crops.

VULNERABILITY

VULNERABILITY OVERVIEW

Measure of Severity - Moderate for all participating jurisdictions

Potential Impact – Life

Extreme temperatures kill by overloading a body’s capacity to regulate its internal temperature. The human body cools itself by perspiring; the evaporation of perspiration carries excess heat from the body. High humidity often accompanies heat in Missouri and increases the danger to warm-blooded humans and animals. High humidity makes it difficult for perspiration to evaporate and thus interferes with this natural cooling mechanism. The body attempts to heat itself through shivering when faced with cold.

The Heat Index devised by the NWS (Table 3.38) is a measure of how hot it really feels. The Heat Index takes into account both air temperature and relative humidity. It also gives an indication of the added risk presented by high humidity to bodies attempting to cool. One known death occurred in the planning area in August 2002. when a 59-year-old Boone County man died from heat exhaustion after collapsing while doing yard work.

Table 3.38 Typical Health Impacts of Extreme Heat

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

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

Many factors, such as age, general level of health, outdoor activity level, and availability of adequate shelter and clothing, affect the actual risk level. The elderly in general are vulnerable to the effects of extreme temperatures. Hypothermia sets in when internal body temperatures fall below 95 F. While this is most likely to occur when temperatures outside are extremely cold it is possible to happen slowly at temperatures as high as 40 F if the exposure is prolonged and exacerbated by chill caused by sweat, rain, or submersion into cold water.

Extreme temperature events can also result in livestock deaths and fish kills; drought in conjunction with extreme heat exacerbates the situation. Strenuous outdoor activity in extreme cold can also be life threatening. Frostbite can lead to the loss of limbs and hypothermia can result in death.

Potential Impact - Existing Structures

While illness and loss of life are of the most concern with extreme temperatures, structural impacts may also occur. Structural impacts depend on the length of the period of extreme temperature and exacerbating factors such as concurrent drought or heavy precipitation. Road damage and electrical infrastructure damage may occur with intense and prolonged heat. Water pipes may break with steep drops in temperature below freezing and cold temperatures can make materials more brittle and prone to failure.

Potential Impact - Future Development

Thoughtful future development has the potential to include mitigation for extreme temperatures in its design. This is true on all levels ranging from actions by individual homeowners to larger redevelopment projects planned by cities. Properly placed shade trees can contribute greatly to lowering inside temperatures and the load placed on cooling systems. Planning for adequate green space as cities infill allows for air movement and shaded locations. Placing utilities below ground under the freeze line can protect them from bitter cold temperature that could cause failure.

Hazard Summary by Jurisdiction

Those at greatest risk for temperature-related illness and deaths include children under 5 years of age and people over the age of 65. To determine jurisdictions within the planning area with populations more vulnerable to extreme temperatures, demographic data was obtained from the 2019 American Community Survey estimates for populations 5-years-old and younger, as well as ages 65 and older. Since students and faculty of school districts are not typically part of the vulnerable age groups they have been left out of the following table.

Table 3.39: Cole County Population by Age

Jurisdiction	Population Under 5 yrs	Population 65 yrs and over
Unincorporated Cole County	4592	12306
Centertown	26	48
Jefferson City	2434	6871
Lohman	17	51
Russellville	56	102
St. Martins	36	202
Taos	93	149
Wardsville	137	236

Source: American Community Survey 5-year Estimates 2014-2019

Jefferson City, the major population center in the planning area, is well equipped with warming/cooling centers to help protect those most vulnerable. Warnings regarding the dangers of extreme temperatures are widely broadcast during times of threat.

The following departments, agencies, and organizations all are involved in educating the public about the dangers of extreme weather and/ or issuing alerts when the threat of extreme temperatures is imminent:

The Cole County Health Department alerts the public on the dangers of extreme temperatures.

The Missouri State High School Activities Association (MSHSAA) provides coaches with educational pamphlets on the dangers of excessive heat. Schools in the planning area have air conditioning in their main buildings and many of their detached buildings, but warnings should be taken into consideration for outdoor sports and practices. Many schools in the planning area are closed for summer session during the more hot portions of the summer season.

The Missouri Department of Health and Senior Services announces statewide hot weather health alerts.

The National Weather Service (NWS) has devised a method to warn of advancing heat waves up to seven days in advance. The new Mean Heat Index is a measure of how hot the temperatures actually feel to a person over the course of a full 24 hours. It differs from the traditional Heat Index in that it is an average of the Heat Index from the hottest and coldest times of each day.

The National Weather Service initiates alert procedures when the Heat Index is expected to exceed 105°- 110°F for at least two consecutive days. (The exact Heat Index temperature used depends on specifics of the local climate.)

PROBLEM STATEMENT

All jurisdictions are vulnerable to the effects of extreme temperatures. Extreme heat is already responsible for more weather-related deaths than any other hazard in the country; it is also one of the hazards shown to be increasing with changes in the climate.

Heat stroke and loss of life are the most significant consequences of extreme heat. While heat-related illness and death can occur due to exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. The persistence of a heat wave increases the danger.

The elderly in general are vulnerable to the effects of extreme temperatures; the 2010 Census recorded 15,072 citizens in Cole County (9.3% of the population) as 65 years and older. However, any residents without access to air conditioning, or shade and water if outside, are very vulnerable to this hazard. Likewise, frostbite and hypothermia can set in for those who cannot afford to heat their homes or who must be out in extremely cold temperatures. Older structures with less insulation may be at risk for frozen pipes. Outreach to raise awareness amongst the most vulnerable populations and educating those about where warming and cooling centers are located can help mitigate the potential loss of life that can come with extreme temperatures.

In addition to the human toll, prolonged extreme temperatures can result in livestock deaths, fish kills, and infrastructure damage; drought in conjunction with extreme heat exacerbates the situation. Winter weather can also take a toll on crops in the area. Unseasonable cold snaps and late frosts can kill and damage crops costing thousands of dollars in insurance claims.

3.4.8 Severe Thunderstorms, Including High Winds, Hail, and Lightning

DESCRIPTION OF HAZARD

A thunderstorm is a rainstorm with thunder and lightning present. Warm, humid climates, such as that in mid-Missouri, are favorable for the formation of thunderstorms. Thunderstorms can occur during any season in Missouri but they are more frequent in the spring and summer.

The average Missourian is well aware of the hazards of the thunderstorm season; these include heavy rains and, potentially, strong winds, tornadoes, hail, and lightning strikes. The effects of heavy rains will be considered in the section on flood (Section 4.4) and tornadoes are covered in Section 4.3.

Thunderstorms can range in complexity from single cell storms through multicell cluster storms, multicell line storms (squall lines), and on to supercell storms. A single cell thunderstorm typically lasts 20-30 minutes but when numerous cells are generated, as in a multicell storm, the thunderstorm can last for hours. Supercell storms include rotation and are responsible for the generation of severe tornadoes.

Severe and damaging winds in the planning area are usually, but not always, associated with thunderstorms. Thunderstorm winds can reach speeds up to 100 mph and produce damage paths for hundreds of miles. According to the National Oceanic and Atmospheric Administration (NOAA), property and crop damage from thunderstorm winds is more common, and can be more severe, than damage from tornadoes. Thunderstorm wind damage accounts for half of all the NOAA reports of severe weather events in the lower 48 states.

Thunderstorm winds are often called "straight-line" winds to distinguish them from tornadoes, which have a rotational element. The following are the distinctions made between different thunderstorm winds:

- Gust front - Gusty winds out ahead of a thunderstorm; characterized by a wind shift and temperature drop.
- Downbursts – A strong downdraft with a width of greater than 2.5 miles which results in an outward burst of damaging winds near the ground; may possibly produce damage similar to that of a strong tornado.
- Microbursts – A small concentrated downburst with a width less than 2.5 miles; generally short-lived, lasting only 5-10 minutes, with maximum wind speeds up to 168 mph.

A derecho is a widespread, massive, and violent thunderstorm wind event producing straight-line winds in excess of 70 mph and moving quickly over large areas. These are not common events;

however, in the spring of 2009, a massive derecho almost as large as the state of Missouri caused extensive damage in southern Missouri and Illinois.

Much of the damage caused by high winds occurs because of falling trees; people, buildings, and vehicles may be damaged by falling trunks and branches. Power lines may be blown or knocked down and people left without electricity. In some cases, roofs are directly blown off buildings and windows are shattered.

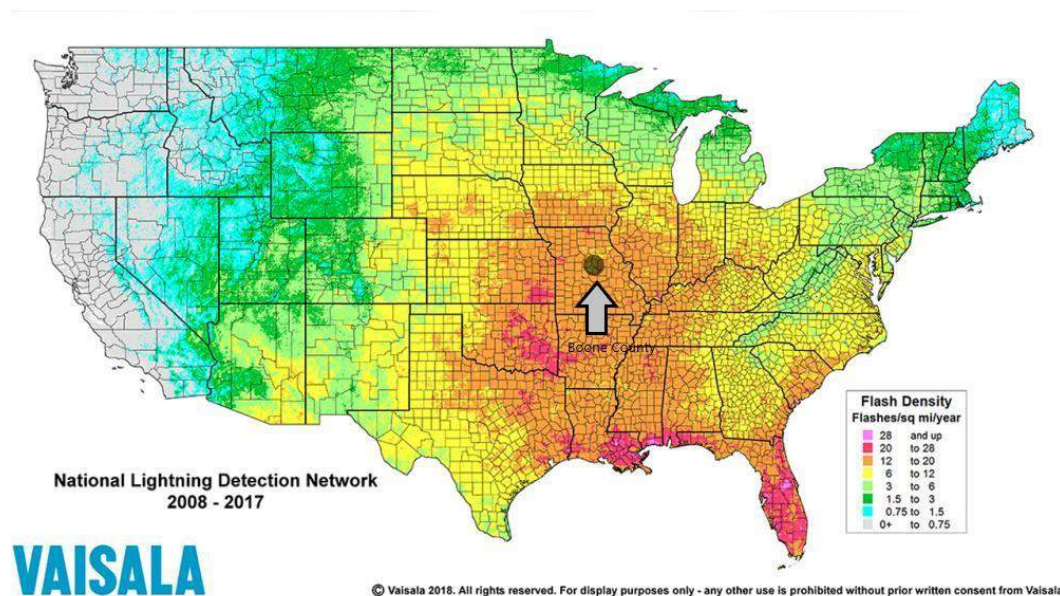
Hail is formed when updrafts in thunderstorms carry raindrops up to very high and cold areas where they freeze into ice. Hail, especially large sized hail, can cause severe damage and presents a threat to automobiles, airplanes, roofs, crops, livestock, and even humans.

Lightning, a massive electrical discharge, is produced by all thunderstorms. The electrical discharge can be within a cloud, between clouds, or between a cloud and the ground.

Location

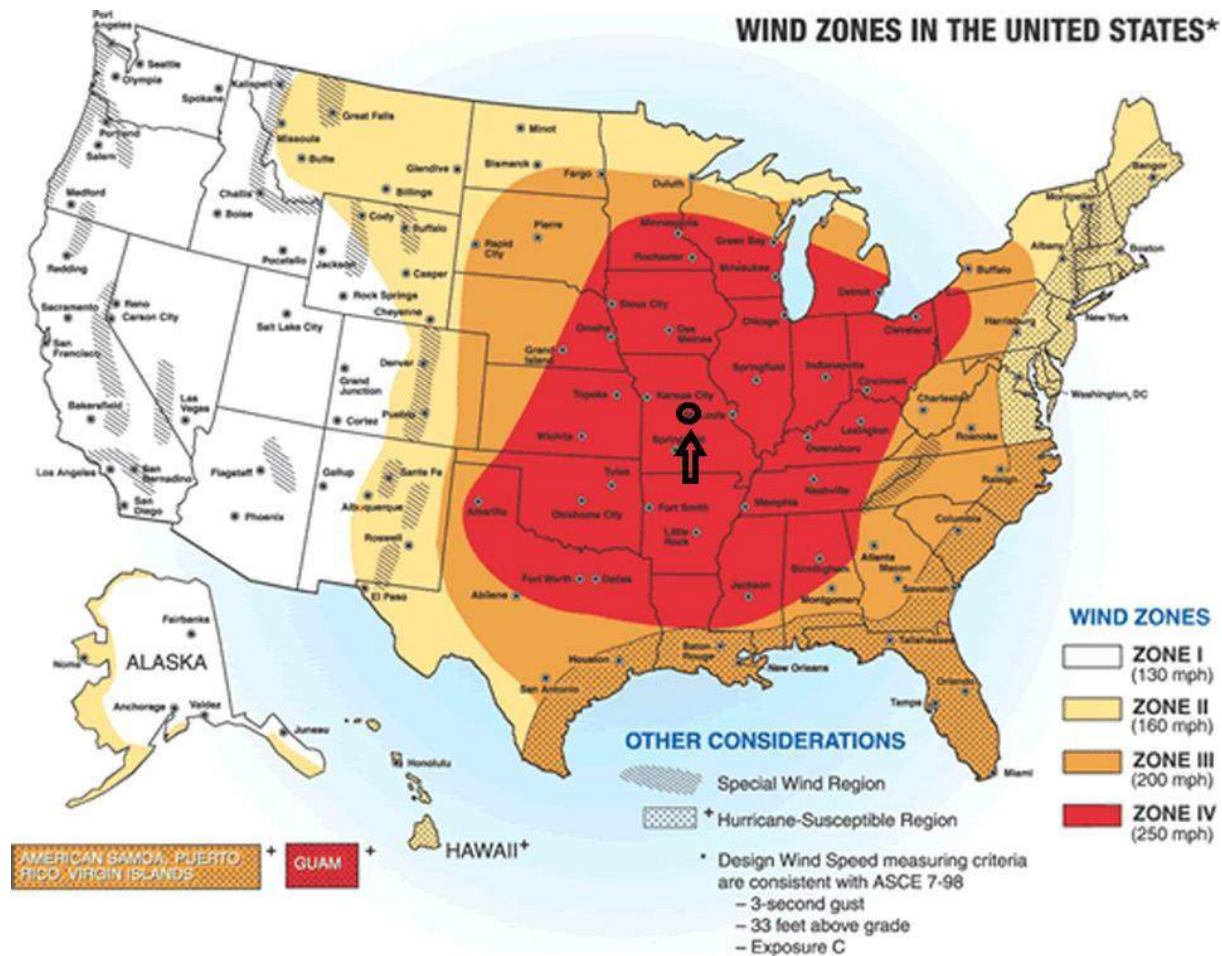
The entire planning area is at risk from severe thunderstorms and all the related threats accompanying them. Although these events occur similarly throughout the planning area damages are more likely to occur in more densely developed areas and areas with older homes. Cole County is located in central Missouri and has a medium flash density of 6-12 Flashes/square mile/year.

Figure 3.12: Location and Frequency of Lightning in Missouri



The Planning area is in a high wind zone according to FEMA. All of the planning area is located in Zone IV and can see winds of 250 mph.

Figure 3.13 Wind Zones in the United States



Strength/Magnitude/Extent

The National Weather Service considers a thunderstorm “severe” when it includes one or more of the following: winds gusting in excess of 57.5 mph, hail at least 0.75 inch in diameter, or a tornado. The NOAA database records thunderstorm events which fall into this severe classification.

Based on information provided by the Tornado and Storm Research Organization (TORRO), Table 3.40 below describes typical damage impacts of the various sizes of hail.

Table 3.40: Hail Damage by Size

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	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Hailstorms				
Super	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Hailstorms				

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

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

According to information from NOAA, a lightning bolt can contain 100 million to 1 billion volts of electricity and billions of watts of energy. This energy can heat the air around the lightning 18,000 to 60,000 °F.

Previous Occurrences

The NCEI is limited in its reporting of lightning due to the fact that only lightning events that result in fatality, injury and/or property and crop damage are in the NCEI. There were no direct reports of lightning for the review period in the planning area. The tables below summarize past crop damages as indicated by crop insurance claims and give insight into the magnitude of the impact on the planning area's agricultural economy.

Table 3.41 Crop Insurance Claims Paid in Cole County from Thunderstorms, 2010-2020

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2016	Soybeans	Other, Storms	754
2018	Soybeans	Other, Storms	9718
Total			10472

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

Table 3.42 Crop Insurance Claims Paid in Cole County from Hail, 2010-2020

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2011	Corn	Hail	4692
2012	Soybeans	Hail	731.34
2012	Soybeans	Hail	3.74
2013	Soybeans	Hail	9458
Total			14885.08

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

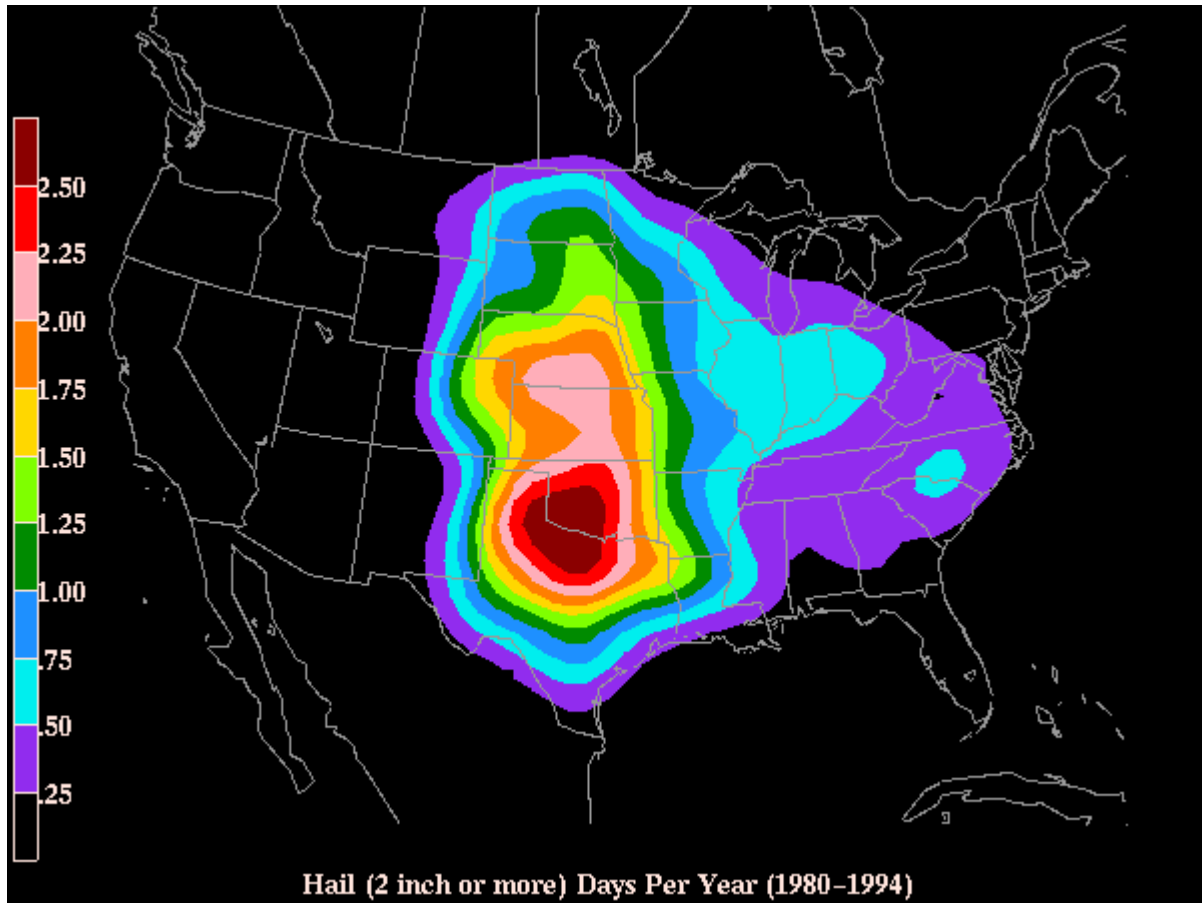
In March of 2020 a storm went through portions of the planning area dropping hail the size of softballs. It damaged hundreds of buildings and vehicles. Much of the damage was on the western portion of Jefferson City and portions of unincorporated Cole.

There were no specific claims shown for high wind events. More often wind events come with storms and other weather and damages were lumped in with those rather than stating that wind alone caused damages.

Probability of Future Occurrences

High for damaging winds, hail, and lightning – All participating jurisdictions

Figure 3.14 Annual Hailstorm Probability (2” diameter or larger) 1980-1994

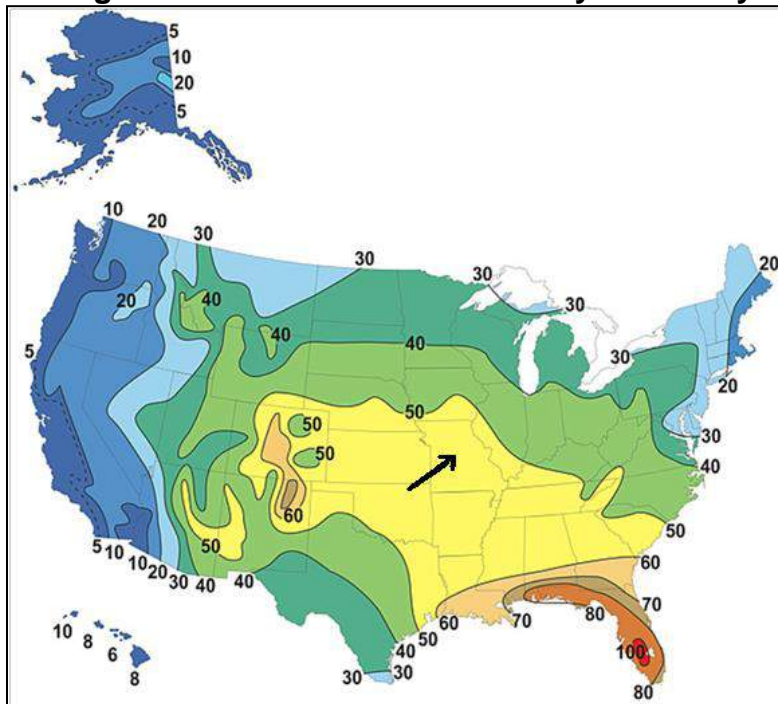


The planning area is indicated to have at least 1 hailstorm event a year according to NOAA.

National Weather Service data indicates an average 50-60 thunderstorm days per year in Missouri (Figure 3.15).

Figure 3.15

Average Number of Thunderstorm Days Annually in U.S.



Source: NOAA

Data from NOAA for the recent 10 year period (10/1/2005-9/30/2015) indicates 23 thunderstorm wind events in Cole County (Figure 4.13). There was at least one reported event during each year of this period. Based on this data, the calculated probability of a future severe thunderstorm wind event in any given year is 100%.

Data from NOAA for the same 10 year period indicates 58 reported severe hail events in the planning area (Figure 4.14). There were 2 years without severe hail events in the planning area during this period. Based on this data, the calculated probability of a future severe hail event in any given year is 80%.

Data from NOAA for the same 10 year period 6 reported lightning events which caused property damage or injury in the planning area (Figure 4.15). These events occurred in 4 different years during the 10-year period. Based on this data, the calculated probability of a future lightning event causing property damage, injury, or death in any given year is 40%.

CHANGING FUTURE CONDITIONS CONSIDERATIONS

According to the State Hazard Mitigation Plan 2018, “Predicted increases in temperature could help create atmospheric conditions that are fertile breeding grounds for severe thunderstorms and tornadoes in Missouri.” These changing conditions will affect the entire planning area and should be considered when building new structures.

VULNERABILITY

Vulnerability Overview

Measure of Severity –

Moderate to High for damaging winds, hail, and lightning – all participating jurisdictions

Potential Impact - Life

Severe thunderstorms and their related hazards pose a threat to both people and animals. Windblown debris, falling trees and branches, and lightning are very dangerous to those who are exposed. Excessive damage to utilities can leave people without electricity for long periods – an especially dangerous situation for vulnerable populations.

Hail also presents a potential bodily threat. In 2000, a man in Texas died from softball size hail. According to NOAA's National Severe Storms Laboratory, it has been estimated that a 3.25 inch hailstone weighing 1.5 pounds has a falling velocity of about 106 mph.

The only injury from thunderstorm related events reported in the recent 10-year data for the planning area was a man struck by lightning in June 2008.

Potential Impact - Existing Structures

There is a wide range of possible impact from severe thunderstorms. Non-permanent and wood framed structures are very vulnerable to destruction. While high winds are the force behind damage, it is the windblown debris and falling trees and branches that cause the most damage. Lightning can cause costly disruptions to electrical systems.

SEMA Situation Reports indicate the following about the thunderstorm winds (and hail) which impacted Cole County on May 6, 2003: Power and telephones were down throughout the county; there were some water outages which were addressed by delivery of bottled water; 130-140 homes reported minor to severe damage (mostly in the Osage Bend area), and one road was closed. These winds and hail were part of a larger storm system which spawned tornadoes further south in Missouri. A Presidential Disaster (#1463) was declared for this storm; Individual Assistance (IA) was made available to Cole County through this Declaration. The NOAA data, however, does not indicate any property damage from this storm in Cole County.

While the NOAA data does not indicate damage from any hailstorm events in the period, common knowledge would indicate that this is not accurate. A huge storm in the spring of 2006 caused massive hail damage across the mid-Missouri region. Information from neighboring Boone County indicates that there was over \$1 million in hail damage incurred by that county's buildings for the year 2006. Many private homes throughout the region received new roofs because of hailstorm damage that year.

While hailstorms of the magnitude that caused such damage in 2006 do not occur every year in Cole County, hail is a costly hazard for the planning area.

Potential Impact - Future Development

A larger population and more extensive built environment increase the risk of injury, loss of life, and damage from severe thunderstorms.

There has been strong growth in population and housing in certain parts of the planning area, most notably Wardsville, in recent years. While Census figures indicate an overall population growth rate of 7% in the planning area (Cole County) between 2000 and 2010, the population growth in Wardsville was 54%. Overall housing units increased by 12% during this period, with housing in Wardsville increasing by 52%.

It would be wise to consider mitigation strategies for severe thunderstorms during the planning phase of any new development. The type of construction affects vulnerability to damaging winds, hail, lightning, and tornadoes. Design and construction choices and the inclusion of hardened areas for safe rooms can save lives.

Hazard Summary by Jurisdiction

There are a variety of strategies in place in the planning area by which the public can be informed of severe weather conditions resulting from thunderstorms.

- Cole County has been recognized by the National Weather Service as a StormReady® Community. In order to become recognized as StormReady®, the Emergency Management Agency is evaluated on its abilities to do the following:
 - receive real time weather information from the NWS
 - disseminate that information to the public,
 - transmit real time information to the NWS
 - educate the public regarding weather hazards/protection

Warning Systems The following warning systems are used in the county:

- Local television weather reports
- Local radio weather reports
- 9-1-1 call center and Public Emergency Broadcast Center
- Outdoor warning sirens

The Jefferson City Airport has a small safe room which will accommodate about 8 people, mostly tower personnel. Jefferson City Fire Department Station also has a very small hardened area for a safe room for personnel. The Jefferson City Public School District has safe rooms in their high schools.

The State of Missouri regulates manufactured housing and modular units through the Missouri Public Service Commission. This includes enforcing tie down and anchoring requirements.

There are numerous Red Cross Certified Shelters in the planning area should sheltering become necessary.

Problem Statement

Severe thunderstorms with damaging winds, hail, and lightning are common, dangerous, and often costly occurrences in the planning area. These weather events can be expected almost every year and every jurisdiction is highly vulnerable to these hazards.

Both human life and the built environment are at risk; the impact on the built environment has been quite costly in the past and this can be expected to continue into the future.

Public awareness education, excellent weather coverage by the local media, an excellent outdoor warning system, and regular emergency exercises in the schools help mitigate the risk to human life. However, there is a great need throughout the planning area for more safe rooms to protect from high wind events; this is especially true in the schools. Additional generators and power transfer hookups are needed in case of widespread and/or lengthy power outages. These identified needs have been targeted for action in the mitigation strategy but funding remains an issue for the costly safe rooms and generators/power transfer hookups.

3.4.9 Severe Winter Weather

Hazard Profile

Hazard Description

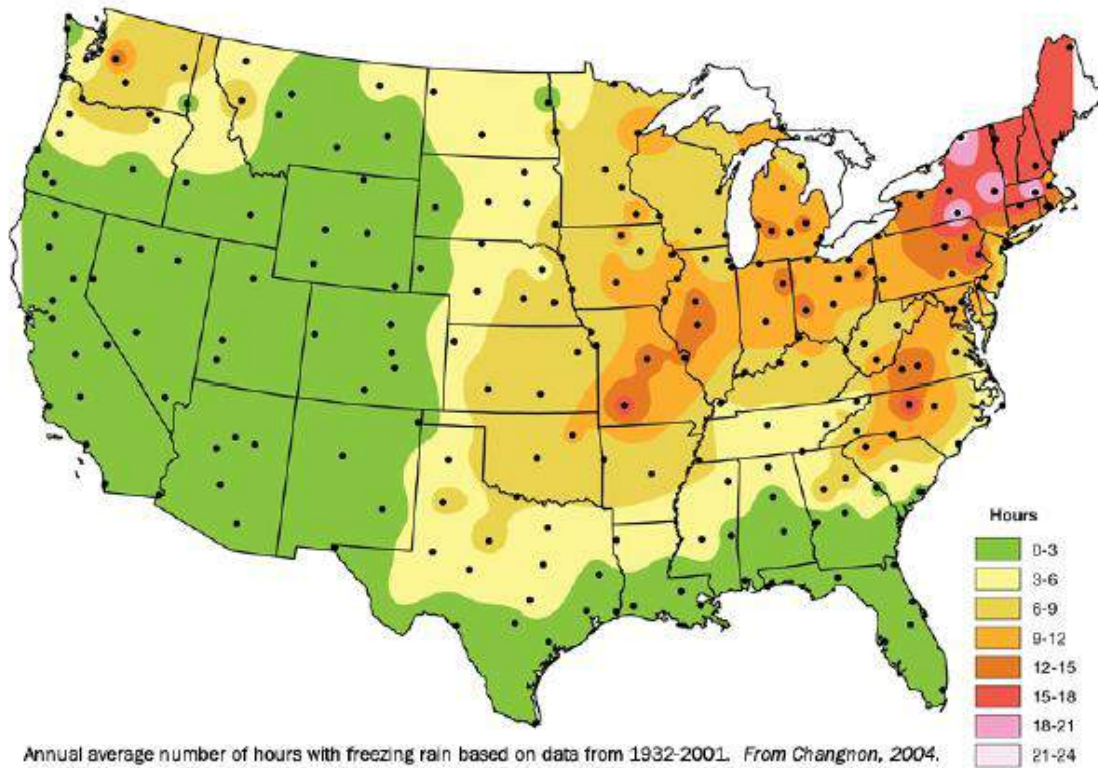
Winter storms in central Missouri contain ice, snow, severe cold, sleet, and wind; each of these associated factors has the potential to disrupt life in the region by making normal activity difficult and/or dangerous. The National Weather Service describes different types of winter storm events as follows:

- 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 planning area is at risk from severe winter weather. This includes heavy snow, ice, and freezing rain. The planning area falls in the 9-12 hours a year average for freezing rain.

Figure 3.1. NWS Statewide Average Number of Hours per Year with Freezing Rain



Source: https://mrcc.illinois.edu/living_wx/icestorms/

Strength/Magnitude/Extent

The entire planning area is at risk for a variety of winter weather. There are various levels of alerts for various conditions of winter weather. The National Weather Service may issue any of the following as conditions warrant.

Table 3.43	
National Weather Service Winter Warnings	
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. The greatest hazard is often 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 in your area.
Blizzard Warning	Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill. Seek refuge immediately.

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.
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As the duration of a winter weather event goes longer, the potential for increased severity also rises. Prolonged events tax resources for residents and businesses.

Previous Occurrences

Severe winter weather presents a risk to both life and property in the planning area. Some of the damage is direct but some comes in the form of economic losses due to closed businesses and schools and slowed or halted transportation (Table 3.44).

Table 3.44: NCEI Cole County Winter Weather Events Summary, 2000-2020

Inclusive Dates	Type of event	# of Injuries
1/27/2000	Winter Storm	0
12/13/2000	Heavy Snow	0
2/25/2002	Winter Storm	0
3/2/2002	Winter Storm	0
12/4/2002	Winter Storm	0
12/24/2002	Winter Storm	0
2/23/2003	Winter Storm	0
12/9/2003	Winter Storm	0
12/13/2003	Winter Storm	0
1/25/2004	Winter Storm	0
11/24/2004	Winter Storm	0
12/8/2005	Winter Storm	0
11/29/2006	Winter Storm	0
12/1/2006	Winter Storm	0
1/12/2007	Ice Storm	0
12/8/2007	Ice Storm	0
2/11/2008	Winter Weather	0
2/23/2008	Winter Weather	0
1/6/2010	Winter Weather	0
1/19/2011	Heavy Snow	0
1/31/2011	Winter Storm	0
2/1/2011	Winter Storm	0
2/21/2013	Heavy Snow	0
3/24/2013	Heavy Snow	0
12/21/2013	Winter Storm	0
1/5/2014	Winter Storm	0
2/4/2014	Winter Storm	0
3/1/2014	Winter Storm	0
1/11/2019	Heavy Snow	0

Source: NCEI, data accessed 2020

Recorded events of extreme cold are not numerous. During a 2-day cold snap in December 2000, wind chills reached -20° to -40° F. The winter of 2013-2014 was, in general, very cold. A 2-day cold period in January 2014 had the coldest recorded temperatures in 20 years, according to the NOAA data. The thermometer read -14° F. in Jefferson City and wind chills in the region on the morning of January 6th ranged from -25° to -33° F.

Table 3.45 Crop Insurance Claims Paid in Cole County as a Result of Cold Conditions and Snow 2010-2020

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid (\$)
2010	Wheat	Cold Wet Weather	1701
2010	Soybeans	Cold Wet Weather	1244
2012	Wheat	Cold Wet Weather	306
2014	Wheat	Cold Winter	231
2018	Soybeans	Cold Wet Weather	1525
2018	Soybeans	Cold Wet Weather	15233
2020	Wheat	Cold Wet Weather	993
Total			21233

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

Probability of Future Occurrence

The historical data indicates there were only 8 years (2001, 2009, 2012, 2015, 2016, 2017, 2018, and 2020) without a severe winter weather event in the period 2000-2020, a 21-year period; most years witnessed multiple events. Based on this historical data, the calculated probability of a severe winter weather event in any year is 38%. (Probability calculation: $1 - (8/21) = .38$)

Changing Future Conditions Considerations

As temperatures rise and shorten the winter season there could be ecological impacts to plant and animal species that could cause them to shift their native territory. An increase in precipitation events throughout the winter months and a general saturation of the ground could increase the likelihood of flooding events and freezing rain or ice storm events in the planning area.

Vulnerability

Vulnerability Overview

Severe winter weather is one of the most common and costly natural hazards to affect the planning area; it has been responsible for three federal Emergency Disaster Declarations and four Presidential Disaster Declarations for Cole County since 2006. In addition, climate data indicates that winter storms are increasing due to changes in the climate. All participating jurisdictions are vulnerable to this hazard.

Some of the worst problems from severe winter weather occur when ice storms affect the area; widespread and lengthy power outages can occur. In addition, traffic accidents are a major source of injuries during severe winter weather.

Potential Impact to Life

Many deaths and injuries from winter storms are a result of traffic accidents caused by a combination of poor driving surfaces and speeds too fast for the conditions. Accidents during winter storms can be particularly devastating because of multiple car involvement. Response times for emergency vehicles may also be slowed by poor road conditions.

Strenuous outdoor activity in extreme cold can also be life threatening. The elderly are especially vulnerable to excessive and/or prolonged cold (or heat). The 2010 Census recorded 9,325 citizens (12.3% of the population) as 65 years and older in Cole County.

Severe winter weather may require that people without power be sheltered and fed. Three shelters were opened in the county to assist people suffering the effects of power outages from the severe winter weather in December 2007. In addition, the Salvation Army opened a feeding center in Jefferson City.

Potential Impact to Existing Development

Much of the property damage that occurs from severe winter weather is due to some type of utility failure:

Power Lines - Ice storms often adversely impact consistent power supplies. Ice buildup on wires can cause them to fall; downed tree limbs downed can knock out power lines. Prolonged power outages can be a threat for those relying on electricity for heat. This is a particular concern for more vulnerable populations such as the elderly.

Water Lines - Winter storms and the associated cold weather can be problematic for water lines, especially if a rapid freeze/thaw cycle is involved. As the ground freezes and thaws, pipes can shift and sometimes break causing a lack of potable water. Broken pipes can cause extensive and expensive damage to property. Frozen and burst water pipes are a real concern for the homeowner; the pipes in many homes in the planning area were not insulated in the past to protect from the low temperatures currently experienced.

Previous and Future Development

The planning area has numerous mitigation activities in place which help mitigate the hazards associated with severe winter weather: active tree trimming programs to protect power lines; excellent media coverage of winter weather advisories/warnings and preparedness information; two way radio communication on all schools buses; maintenance of chemical and fuel stocks in both Cole County and Jefferson City for event response; snowplowing plans in the County and Jefferson City which prioritize routes; an online GIS-based road conditions map for Jefferson City; backup power at many government facilities in Cole County and Jefferson City; and abundant Red Cross certified shelters.

However, there is still a need for more backup generators and transfer switches in the planning area. This is a difficult issue as the expense is great and the funding possibilities are limited. In addition, there is a need to find reliable transportation for vulnerable populations in need of transfer to shelters.

Hazard Summary by Jurisdiction

Unincorporated Cole County is at high risk for winter weather impacts. It has miles of above ground utility lines that can be brought down by heavy snow or ice and even more miles of road network to clear for travelers and first responders. A large portion of Cole County is dedicated to agriculture leaving tender crops susceptible to late season frosts and livestock young potentially exposed to late spring snow storms

The dense nature of Jefferson City leaves a large population vulnerable in the event of a power outage from winter weather. Both Taos and Wardsville have experienced rapid growth opening them up for vulnerability, but also the opportunity to build in resiliency through building codes and the requirement to underground new utilities. St. Martins and Russellville with their moderate growth has similar opportunities to Taos and Wardsville but at a lesser rate.

Lack of growth and aging systems in smaller jurisdictions such as Centertown and Lohman leaves them vulnerable to power outages. Older homes can have trouble carrying snow loads during heavier storms.

PROBLEM STATEMENT

Severe winter weather is one of the most common and costly natural hazards to affect the planning area. In addition, climate data indicates that winter storms are increasing due to changes in the climate. All participating jurisdictions are vulnerable to this hazard.

Some of the worst problems from severe winter weather occur when ice storms affect the area; widespread and lengthy power outages can occur. In addition, traffic accidents are a major source of injuries during severe winter weather.

The further encouragement and effort toward moving utility lines underground will help limit damage to essential utilities during severe winter weather.

3.4.10 Tornado

Hazard Profile

Description of Hazard

A tornado is a violently rotating column of air which is usually generated by a supercell thunderstorm. The movement speed of a tornado is typically around 10-20 mph but can range from almost stationary to more than 60 mph, according to NOAA's National Severe Storms Laboratory. They often travel from southwest to northeast but can move in any direction.

Tornadoes occur most frequently in late afternoon and early evening but can occur at any time; they tend to dissipate as fast as they form. Unlike a hurricane, which can last for multiple hours, tornadoes are often in one place for no more than a few minutes. The seasonal, temporal, and spatial uncertainties surrounding thunderstorms and tornadoes make widespread and year round preparedness essential.

Location

The entire planning area is at risk from tornadoes. All of Missouri is located in the zone known as Tornado Ally where the occurrence of tornadoes of varying intensities are common.

Strength/Magnitude/Extent

The Enhanced Fujita or EF-Scale (Figure 4.18) is currently used in the United States to classify tornadoes. It is based on engineering studies of the wind effects on 28 different types of structures (buildings, towers, poles, trees). This indirect measurement of speed is used because it is currently not possible to measure ground-level speeds in strong tornadoes; the winds destroy the instruments needed for measurement.

In addition to estimated wind speeds, averaged data from tornadoes can give an idea of the length and width of tornadoes in the different classifications.

Table 3.46 Enhanced F Scale for Tornado Damage

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

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

The EF-Scale has been in use since February 1, 2007. It uses the same ratings as the original Fujita Scale (F-Scale) which it replaced, but the wind speeds have been adjusted to reflect current knowledge and give a more realistic estimate of wind speeds for all tornadoes, including

historical ones in the NOAA database. The ratings of tornadoes prior to 2007 were not changed in the NOAA database with the adoption of the EF-Scale.

There continue to be limitations even with the EF-Scale since the scale is based on sustained damage. The table below list damage summaries for their respective EF rating.

Table 3.47 Enhanced Fujita Scale with Potential Damage

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

Another issue with tornadoes is speed of onset. Technological advances, such as Doppler radar, computer modeling, and Emergency Warning Systems, have increased the amount of time the general public has to respond to a tornado. Despite these advances, tornadoes can still strike an area with little warning. Often people have no more than a few minutes to get to safety. Being able to quickly get to a safe place is absolutely imperative in order to prevent loss of life.

Previous Occurrences

The planning area has experienced 11 tornado events since October 1966, as officially recorded by NOAA (Table 3.48). This includes two “significant” F2 tornadoes and an EF3.

The historical record in the planning area over this 60+ year period indicates tornadoes in the EF0 to EF2 range. While history is informative, it is not necessarily predictive of the future. In 2019 after never having had an EF3 tornado in the county before conditions were right to produce such a monster. It tracked from Miller County up through Cole ripping through parts of unincorporated Cole County and slamming Jefferson City. Hundreds of homes and businesses

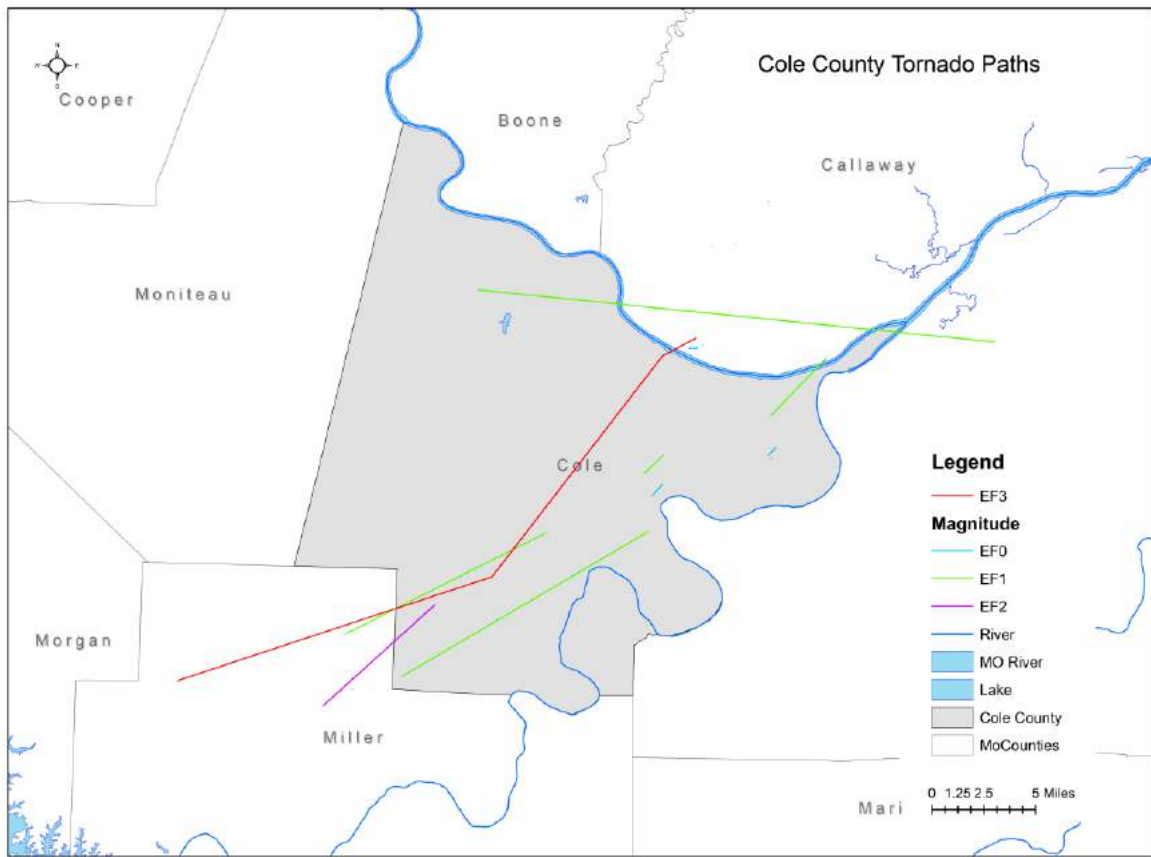
were damaged during the storm. Thousands were left without power and major roads were shut down for a time due to debris and utility lines making them impassible.

Table 3.48 Recorded Tornadoes in Cole County, 1966 – Present

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
10/4/66	Taos	Callaway Co	3.3	50	1	0	0	25k	0
5/12/80	Fortuna	Callaway Co	0	33	2	0	0	25k	0
4/2/82	Taos	Taos	0.5	50	0	0	0	0	0
5/1/83	Wardsville	Wardsville	7	77	1	0	0	250k	0
5/1/83	Spring Garden	Brazito	0.5	50	0	0	0	0	0
3/15/84	Jeff City	Jeff City	0.1	50	0	0	0	0.03k	0
10/3/86	Etterville	Cole Co	3.3	100	2	0	0	2.5m	0
4/15/94	Elston	Callaway Co	25	70	1	0	0	5m	0
4/8/99	Eugene	Cole co	12	200	1	0	0	0	0
5/19/17	Wardsville	Wardsville	0.95	75	1	0	0	0	0
5/22/19	Scrivner	Callaway Co	17.13	1500	3	0	32	170m	0
	Total					0	32	177.800m	0

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

Map 3.14 Cole County Map of Historic Tornado Events



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

Probability of Future Occurrence

For the period 1966-2020, a 55-year period, the NOAA database reports 10 years with at least one tornado event in the planning area. Based on this historical data, the calculated probability of a future tornado event of any magnitude in a year is about 16%.

The probabilities of occurrence of the different magnitudes of tornadoes in any given year, based on historical data, has also been calculated (Table 3.49). While the calculated probabilities for an EF3, EF4, or EF5 tornado are 0%, this does not mean tornadoes of these magnitudes could not occur in the planning area; it just means they have not occurred in the historical record.

Table 3.49			
Probability of Future Tornado Events			
EF-Scale	# of years with tornado event (1966-2020)	Probability	Probability Rating
All	10	18%	High
EF0	3	5%	Moderate
EF1	5	9%	Moderate
EF2	2	3.6%	Moderate
EF3	1	2%	Moderate
EF4	0	0%	Low
EF5	0	0%	Low

Changing Future Conditions Considerations

It is not confidently known how the change in climate could impact the frequency or severity of future tornadic activity. While the activity zone has not expanded according to the State Hazard Mitigation Plan 2018 the number or tornados has gone up since the 1950s. More studies will be needed to know the true impact over time.

Vulnerability

Vulnerability Overview

The entire planning area is highly vulnerable to the potentially devastating impact of tornadoes. Their random nature and potentially quick speed of onset pose particular risks for human life. Tornadoes of the magnitude known to historically occur in the area can wreak extensive and costly structural damage. The destructive effects of a tornado depend on the strength of the winds, proximity to people and structures, the strength of structures, and how well a person is sheltered. They are obviously a hazard with the potential to cause both great loss of life and catastrophic destruction. The whole planning area is located in “Tornado Alley” where historically dangerous and destructive tornados occur frequently.

Figure 3.2 Tornado Alley in the U.S.



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

Potential Losses to Existing Development

Potential Impact to Life

While tornadoes can strike anywhere, there is a greater chance of injury and loss of life (and destruction of property) in population centers. This is especially true of a tornado with a large path.

There have been 32 reported injuries associated with recorded tornadoes in the planning area. A larger population and more extensive built environment increase the risk of injury, loss of life, and damage from tornadoes.

Potential Impact to Existing Structures

It would be wise to consider mitigation strategies for tornadoes and other high wind situations during the planning phase of any new development. The type of construction greatly affects vulnerability to tornadoes and high winds. Design and construction choices and the inclusion of hardened areas for safe rooms can save lives.

Tornadoes cause the most costly physical destruction when they touch ground in urban areas. High winds affect all structure types differently; non-permanent and wood framed structures are especially vulnerable to destruction.

In addition to a direct hit on a building by a tornado, damage to trees poses a serious threat. People, buildings, power lines, and vehicles are all at risk from falling branches, uprooted trees and windblown debris.

Previous and Future Development

There has been strong growth in population and housing in certain parts of the planning area, most notably Wardsville, in recent years. While Census figures indicate an overall population growth rate of 7% in the planning area (Cole County) between 2000 and 2010, the population growth in Wardsville was 54%. Overall housing units increased by 12% during this period, with housing in Wardsville increasing by 52%.

Hazard Summary by Jurisdiction

There are a variety of strategies in place in the planning area by which the public can be informed of severe weather conditions resulting from thunderstorms.

- Cole County has been recognized by the National Weather Service as a StormReady® Community. In order to become recognized as StormReady®, the Emergency Management Agency is evaluated on its abilities to do the following:
 - receive real time weather information from the NWS
 - disseminate that information to the public,
 - transmit real time information to the NWS
 - educate the public regarding weather hazards/protection

Warning Systems The following warning systems are used in the county:

- Local television weather reports
- Local radio weather reports
- 9-1-1 call center and Public Emergency Broadcast Center
- Outdoor warning sirens

The Jefferson City Airport has a small safe room which will accommodate about 8 people, mostly tower personnel. Jefferson City Fire Department Station also has a very small hardened area for a safe room for personnel. Most jurisdictions and schools have safe rooms as a need for their communities.

The State of Missouri regulates manufactured housing and modular units through the Missouri Public Service Commission. This includes enforcing tie down and anchoring requirements.

There are numerous Red Cross Certified Shelters in the planning area should sheltering become necessary.

Centertown has recently added a storm siren so their residents can be better warned of coming storms. The siren works with others already in the county and can easily be activated as needed.

Problem Statement

The entire planning area is highly vulnerable to the potentially devastating impact of tornadoes. Their random nature and potentially quick speed of onset pose particular risks for human life. Tornadoes of the magnitude known to historically occur in the area can wreak extensive and costly structural damage. Public awareness education, excellent weather coverage by the local

media, an excellent outdoor warning system, and regular emergency exercises in the schools help mitigate the risk to human life. However, there is a great need throughout the planning area for more safe rooms to protect from high wind events; this is especially true in the schools. Additionally, more vigorous promotion of NOAA radio use would help protect the general public. Additional generators and power transfer hookups are needed in case of widespread and/or lengthy power outages. All of these identified needs have been targeted for action in the mitigation strategy; funding remains an issue for the more costly safe rooms and generators/power transfer hookups.

4.9 WILDFIRE

HAZARD PROFILE

DESCRIPTION OF HAZARD

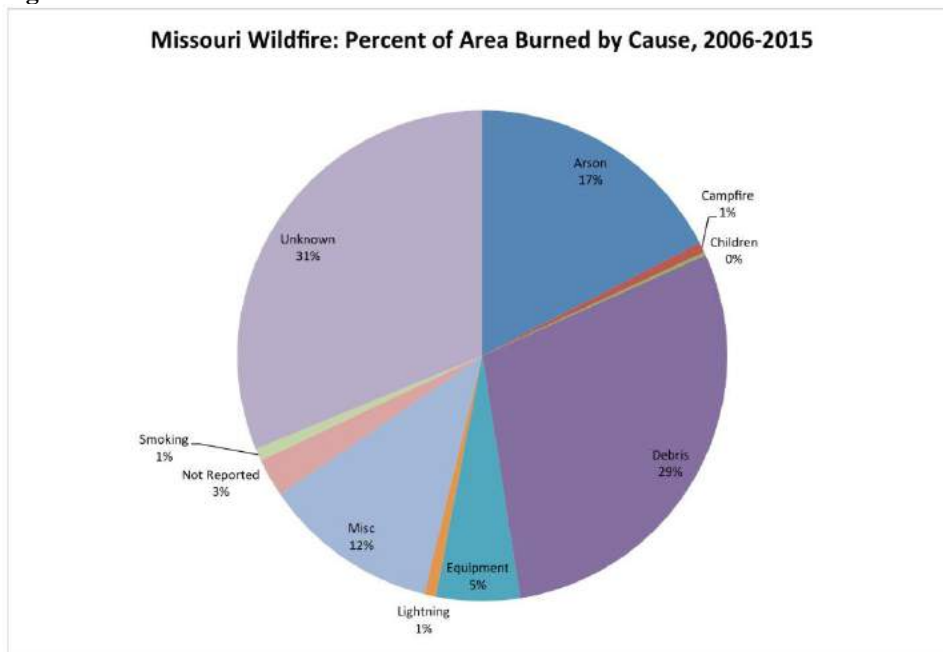
Large and widespread wildfires, such as occur in the western United States, have not been a problem in Cole County in recent history. However, smaller wildfires/natural cover fires occur every year.

These fires may take place at any time of the year but the majority occur during the spring fire season (February 15 - May 10). Spring is the time of the year when rural residents burn garden spots and brush piles. Many landowners also believe it is necessary to burn the woods in the spring to grow more grass, kill ticks, and get rid of brush. These factors, combined with low humidity and high winds, result in higher fire danger at this time of year. The spring fire season abates with the growth of the new season's grasses and other green vegetation.

Numerous fires also occur in October and November due to the dryness associated with fall in Missouri. Many rural residents use this time of year to burn leaves and debris thus raising the possibility of a fire which burns out of control.

The major causes of wildfires in Missouri are various human activities, according to statistics from the Missouri Department of Conservation (Figure 3.3).

Figure 3.3: Missouri Wildfire Source



Source: Missouri Department of Conservation

Location

The planning area as a whole is at some risk for wildfire but the greatest risk is in the rural areas of Cole County where debris burning, the primary causative factor, is most common. Cole R-V School District is also at greater risk due to its location in the unincorporated part of the County.

In addition to the risk faced by rural areas, there is an increased risk of wildfire in areas called the Wildland Urban Interface (WUI). The National Wildfire Coordinating Group (NWCG) defines the WUI as "...the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel."

Within the WUI there are three defined Community types vulnerable to Wildfire:

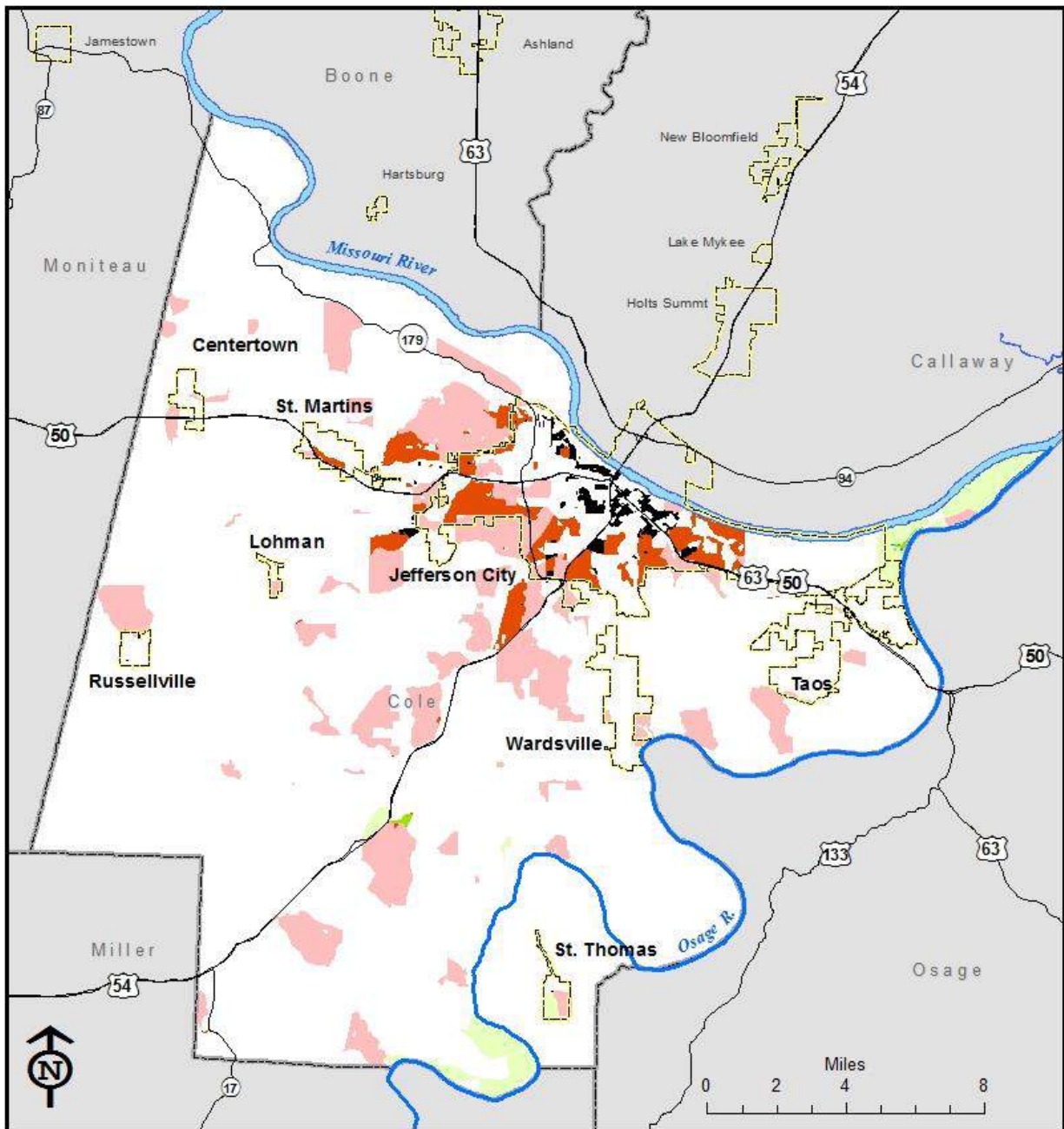
Interface Community - Structures directly abut wildland fuels. There is a clear line of demarcation between wildland fuels and residential, business, and public structures. Wildland fuels do not generally continue into the developed area. The development density for an interface community is usually three or more structures per acre, with shared municipal services.

Intermix Community - Structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres.

Occluded Community - Often found within a city, structures abut an island of wildland fuels (e.g. park or open space). There is a clear line of demarcation between structures and wildland fuels. The development density is usually similar to those found in the interface community, but the occluded area is usually less than 1,000 acres in size.

An overview of the WUI for the planning area is shown in Figure 4.66 and detail maps are shown for the incorporated communities (Map 3.15-3.21). Jefferson City (including Jefferson City Public School District and Lincoln University), St. Martins and St. Thomas are all at greater risk due to WUI.

Map 3.15



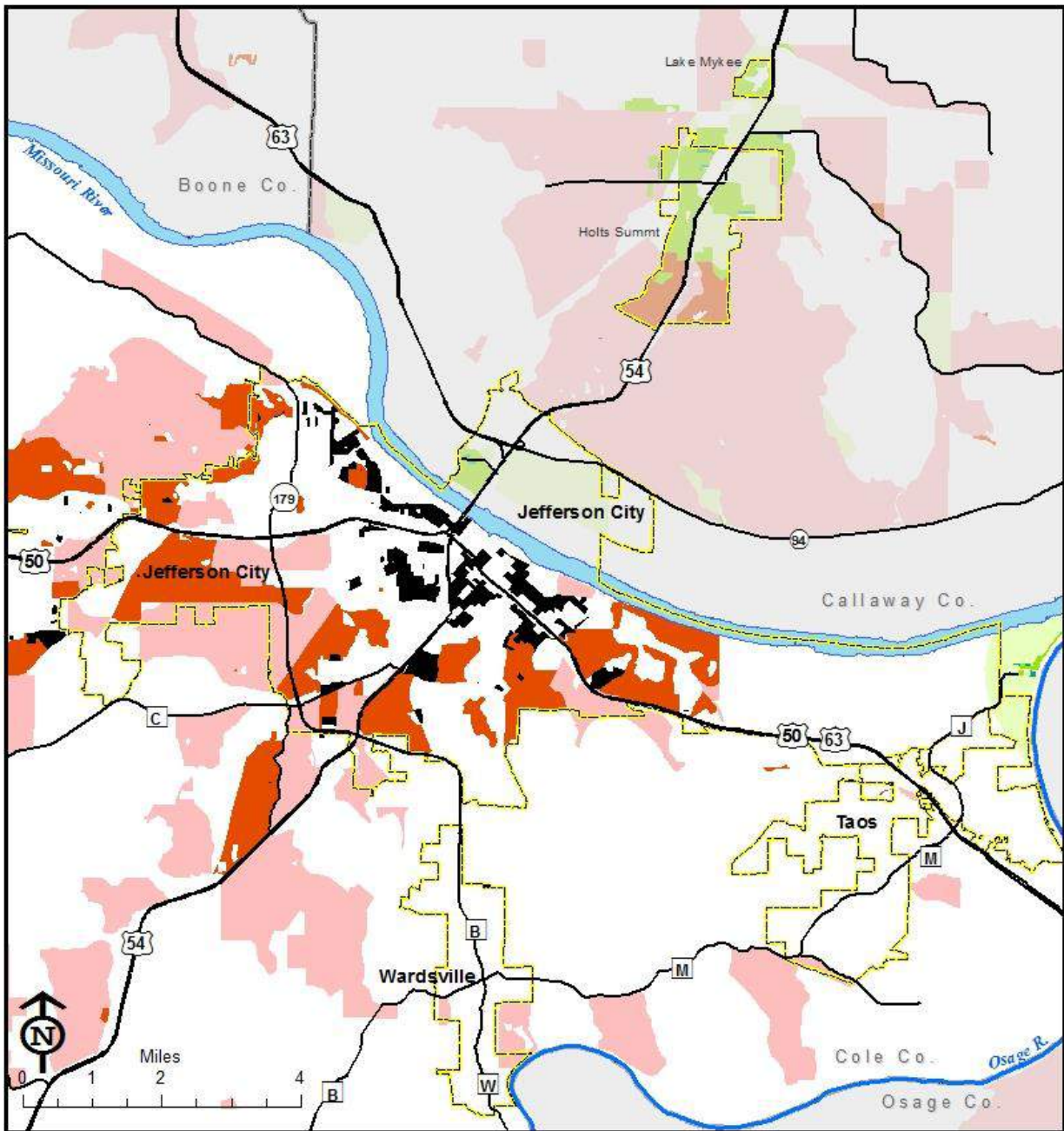
Wildland Urban Interface - Cole County, MO

- | | | |
|----------------------------|--------------------------|-----------------------|
| High Density No Vegetation | Low Density Intermix | Low Density Interface |
| High Density Intermix | High Density Interface | |
| Medium Density Intermix | Medium Density Interface | Missouri River |
| | | Incorporated Area |
| | | Major Road |
- Cole County Hazard Mitigation Plan

Source(s):
 University of Wisconsin - Madison
 Mid-Mo RPC
 January 2016 -KLLW



Map 3.16



Wildland Urban Interface - Jefferson City, MO

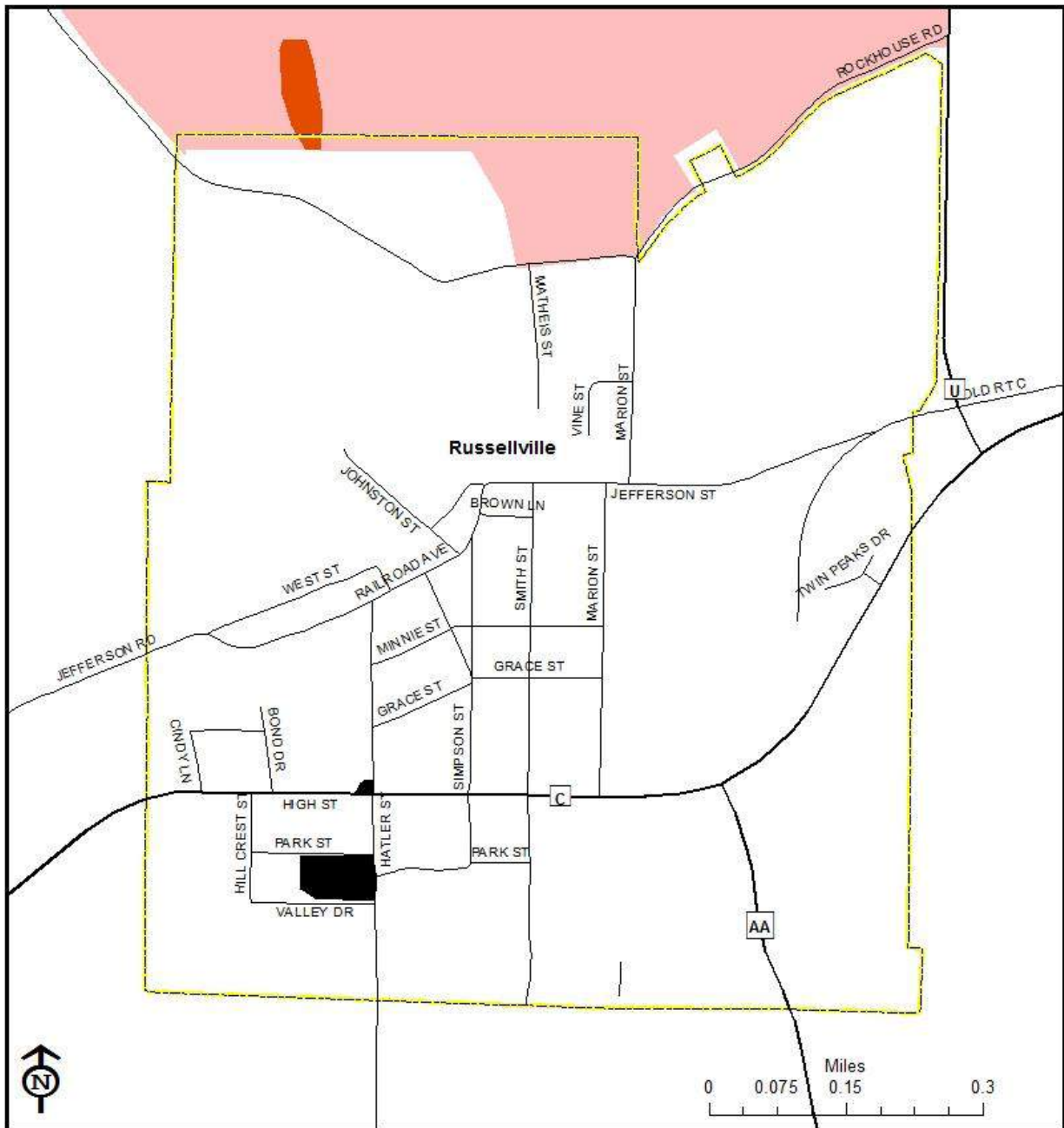
- | | | |
|----------------------------|--------------------------|-----------------------|
| High Density No Vegetation | Low Density Intermix | Low Density Interface |
| High Density Intermix | High Density Interface | |
| Medium Density Intermix | Medium Density Interface | |
| | Missouri River | Incorporated Area |
| | Major Road | |

Cole County Hazard Mitigation Plan

Source(s):
University of Wisconsin - Madison
Mid-Mo RPC
January 2016 -KLW



Map 3.17



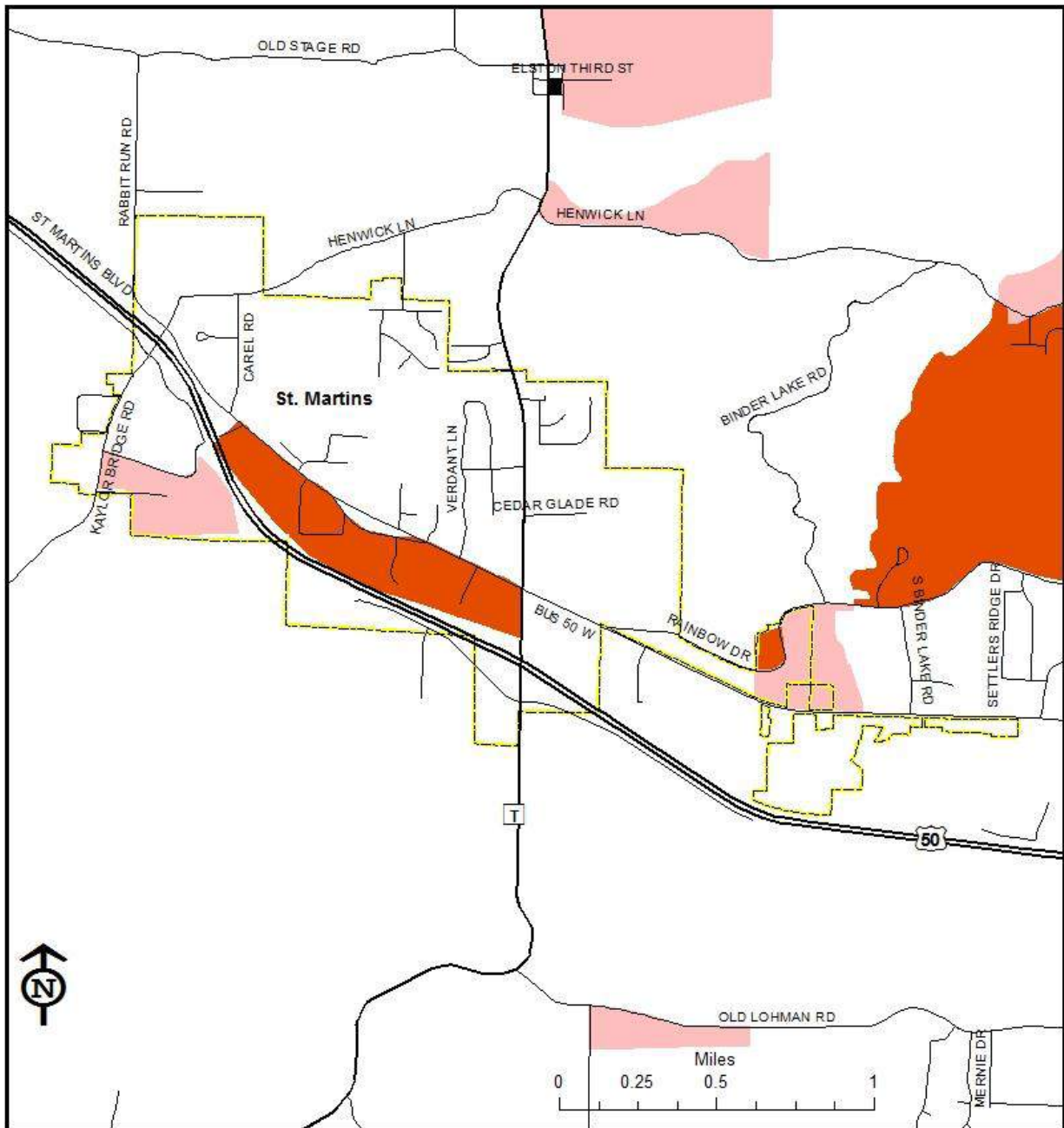
Wildland Urban Interface - Russellville MO

- | | | |
|------------------------------------|--------------------------|-----------------------|
| High Density No Vegetation | Low Density Intermix | Low Density Interface |
| High Density Intermix | High Density Interface | Missouri River |
| Medium Density Intermix | Medium Density Interface | Incorporated Area |
| Cole County Hazard Mitigation Plan | | Major Road |

Source(s):
 University of Wisconsin - Madison
 Mid-Mo RPC
 January 2016 -KLW



Map 3.18



Wildland Urban Interface - St. Martins, MO

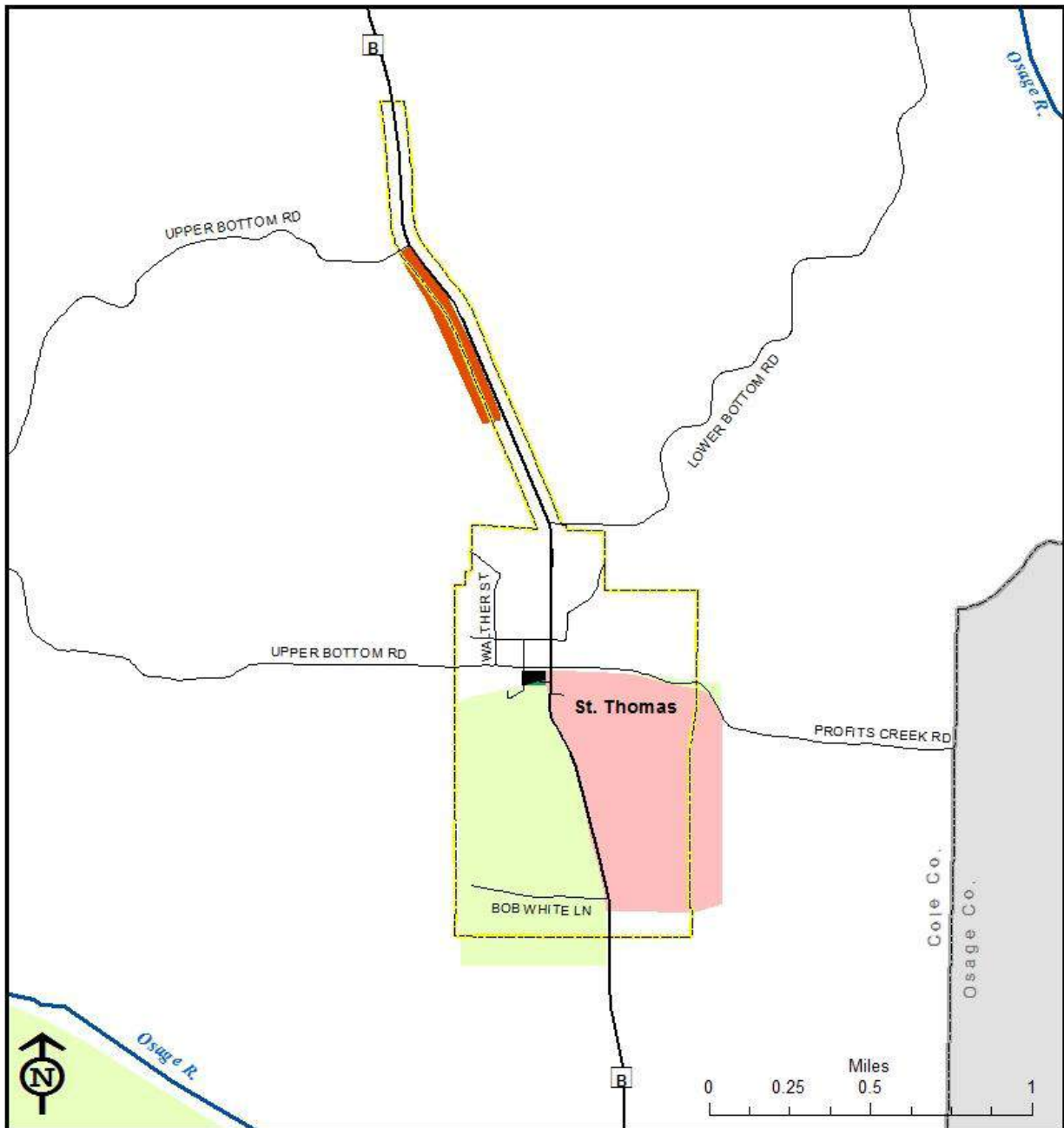
- | | | |
|----------------------------|--------------------------|-----------------------|
| High Density No Vegetation | Low Density Intermix | Low Density Interface |
| High Density Intermix | High Density Interface | Missouri River |
| Medium Density Intermix | Medium Density Interface | Incorporated Area |
| | | Major Road |

Cole County Hazard Mitigation Plan











Source(s):
University of Wisconsin - Madison
Mid-Mo RPC
January 2016 -KLV



Map 3.19



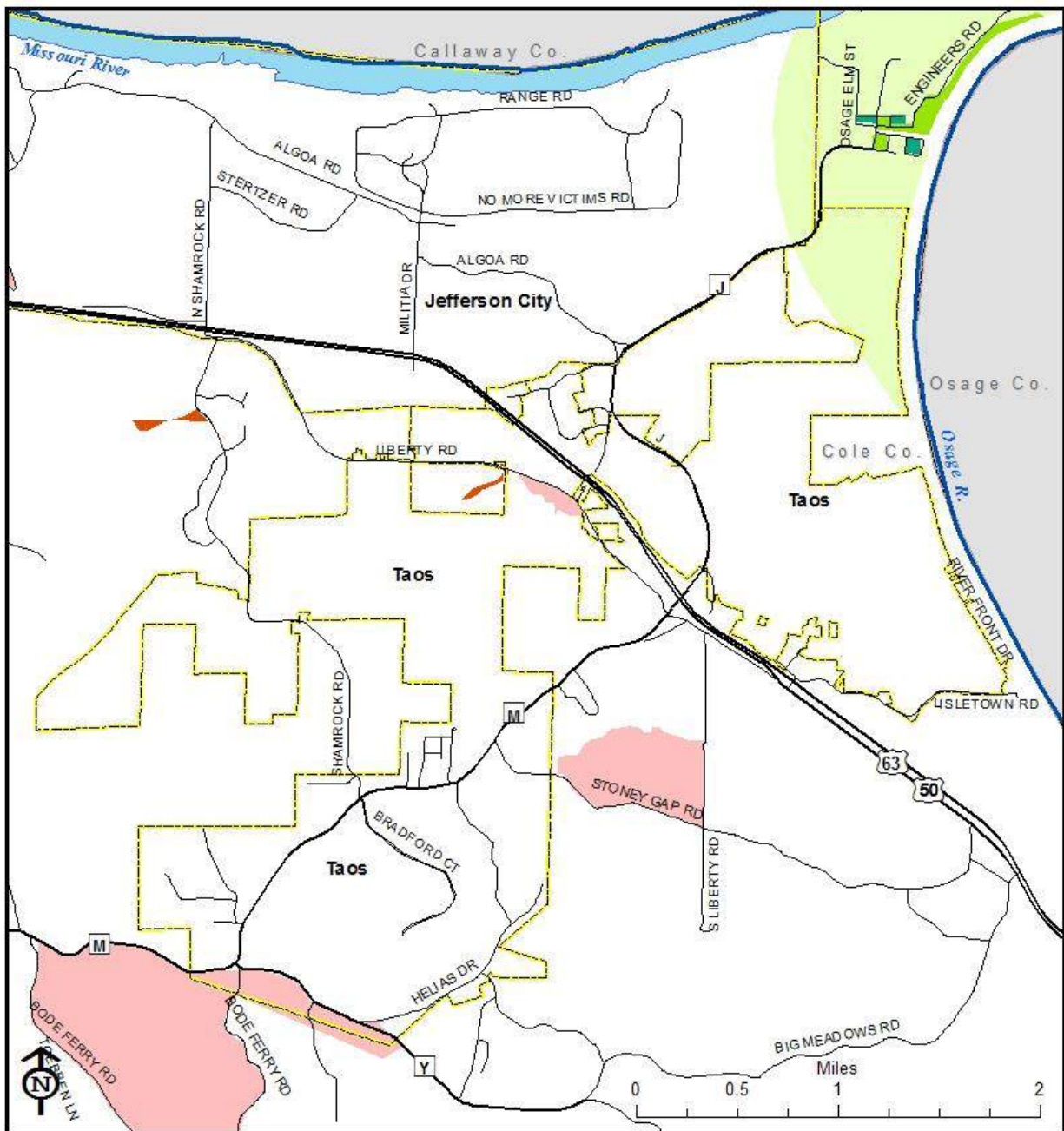
Wildland Urban Interface - St. Thomas, MO

- | | | |
|--|--|---|
|  High Density No Vegetation |  Low Density Intermix |  Low Density Interface |
|  High Density Intermix |  High Density Interface |  Missouri River |
|  Medium Density Intermix |  Medium Density Interface |  Incorporated Area |
| Cole County Hazard Mitigation Plan | |  Major Road |











Source(s):
 University of Wisconsin - Madison
 Mid-Mo RPC
 January 2016 -KLLW



Map 3.20



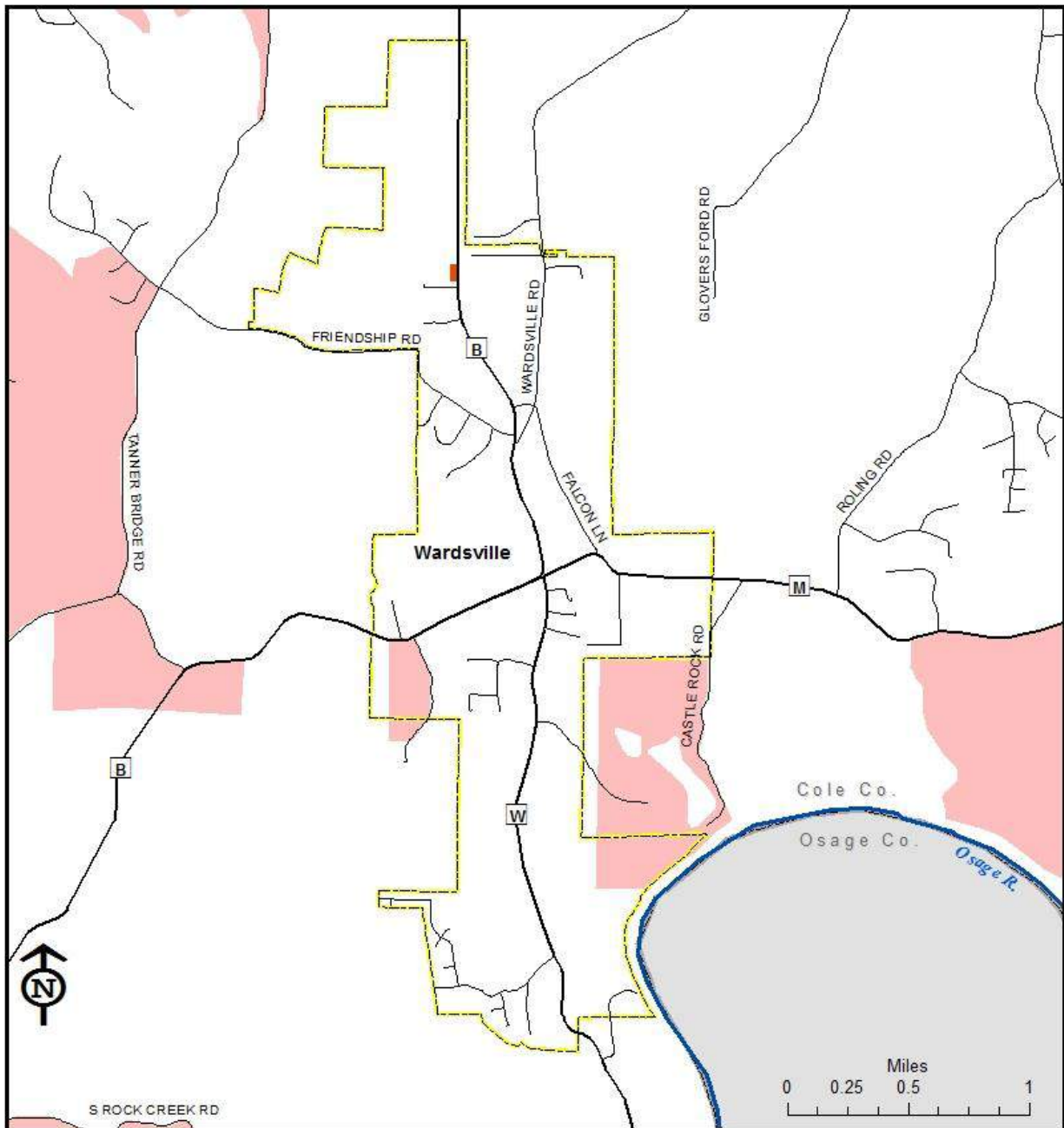
Wildland Urban Interface - Taos, MO

- | | | |
|--|--|---|
|  High Density No Vegetation |  Low Density Intermix |  Low Density Interface |
|  High Density Intermix |  High Density Interface |  Missouri River |
|  Medium Density Intermix |  Medium Density Interface |  Incorporated Area |
| Cole County Hazard Mitigation Plan | |  Major Road |

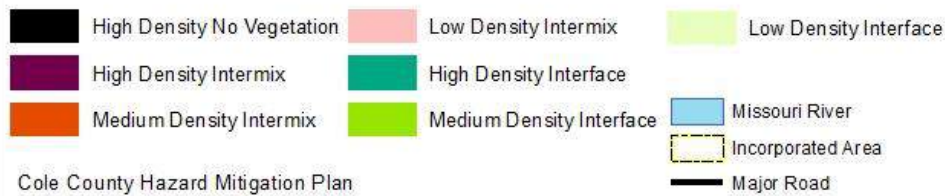
Source(s):
 University of Wisconsin - Madison
 Mid-Mo RPC
 January 2016 -KLLW



Map 3.21



Wildland Urban Interface - Wardsville, MO



Source(s):
 University of Wisconsin - Madison
 Mid-Mo RPC
 January 2016 -KLV



Strength/Magnitude/Extent

Most fires in the planning area are brush fires which are usually dealt with in less than a few hours.

Previous Occurrences

The late 1970s and early 1980s there were many wildfire across the state of Missouri. However, large and widespread wildfires, such as occur in the western United States, have not been a problem in the planning area in recent history.

Probability of Future Occurrences

Probability: Moderate - Cole County (unincorporated), Jefferson City, St. Martins, St. Thomas, Cole R-V Public School District, Jefferson City Public School District, Lincoln University

Low - Russellville, Taos, Wardsville, Blair Oaks School District

The probability of wildfires increases during conditions of excessive heat, dryness, and drought. The probability is also higher in spring and late fall.

Changing Future Conditions Considerations

Raising temperatures and more sporadic rains with longer periods of dry between rain events could affect vegetation and the number of days prescribed burns can safely be performed. With increased rainfall can be expected to come an abundance of plant growth that won't be able to be renewed with less prescribed burns making more fuel for fires that potentially get out of control. An increase in droughts and dry vegetation not only in the forest but around homes in the form of depleted landscaping material creates heightened risk for structures to overtaken by wildfires.

VULNERABILITY

Vulnerability Overview

Severity: Moderate - Cole County (unincorporated), Jefferson City, St. Martins, St. Thomas, Cole R-V Public School District, Jefferson City Public School District, Lincoln University

Low - Russellville, Taos, Wardsville, Blair Oaks School District

There are limitations to the data concerning wildfires. Current presentations utilize data from the National Fire Incident Reporting System (NFIRS) from 2004 to 2008 to determine vulnerability for the State Plan. With only 61 percent of fire departments in Missouri reporting to NFIRS it is hard to get a thorough overview of the rate at which fires happen and how much damage they truly cause.

Potential Losses to Existing Structures

While wildfires in the central Missouri area have the potential to destroy buildings, data from the entire Mid-MO RPC region indicates that this is more the exception than the rule. Wildfires are usually quickly suppressed and the damage to the built environment is minimal.

Potential Losses to Future Development

As development proceeds in the planning area, there is the potential for the increase in the Wildland Urban Interface (WUI); this interface puts more of the built environment at risk for structural damage from wildfire.

Hazard Summary by Jurisdiction

Jefferson City, St. Martins, Taos, and Wardsville all incorporate areas of medium or high-density wildland interface and/or intermix. This makes them more susceptible to damages from out of control burning. Jefferson City has a burning ordinance in place to help control when, where, and what is being burnt in an effort to promote smart burning practices and good communication to responders if a controlled burn were to become less under control.

Many wildfires in the planning area take place in unincorporated Cole County where burning has less oversight in general. The Missouri Revised Statute 49.266, adopted in August 2013, confers the right of county commissions to adopt an order or ordinance issuing a burn ban.

Emergency response systems, well trained fire departments, and numerous county roads improve response times to fire events, thus decreasing the chances of fire spread.

The Missouri Department of Conservation and the State Fire Marshal have published an informational booklet entitled “Living with Wildfire” which educates homeowners on assessing a property’s vulnerability to wildfire and making changes to decrease the risk.

Problem Statement

Wildfire is not a major threat in the planning area; however, all participating jurisdictions are potentially vulnerable. The threat is greatest in unincorporated Cole County but jurisdictions with or near significant Wildland Urban Interface also have a heightened risk.

While wildfires occur on a regular basis, they are usually easily suppressed by a quick response from the fire districts and thus limited in their spread and destruction.

3.5 Technical and Human-Made Risk Assessment

TECHNOLOGICAL AND HUMAN-MADE HAZARDS AFFECTING THE PLANNING AREA

In addition to natural hazards, the following technological/human hazards have been identified as posing potential risk in Cole County and are profiled in this plan in Section 3.5:

- Public Health Emergency
- Hazardous Materials Release
- Transportation Incident
- Nuclear Incident
- Utility Service Disruption
- Cyber Attack
- Armed Intruder
- Terrorism
- Civil Disorder
- Mass Casualty/Fatality Event

3.5.1 PUBLIC HEALTH EMERGENCY

DESCRIPTION OF HAZARD

Public health emergencies can occur as primary events by themselves, such as outbreaks, epidemics and pandemics, or they may be secondary events to another disaster or emergency, such as a flood, tornado, or hazardous material/terrorism incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. They can be local, regional, statewide, or even national or worldwide in scope and magnitude.

The planning area is vulnerable to many hazards, both natural and technological/human-made, which can cause damage and create casualties. These hazards pose potential public health emergencies of various types: environmental, biological, chemical, bacteriological and viral. food and waterborne illness. Emerging contagious diseases, lack of vaccination, and increasing terrorism all pose serious public health concerns.

In addition, many residents from other locations spend vacations or own secondary residential property in the planning area. Food borne and waterborne illness are a high priority public health concern because of the many restaurants and lodging facilities available.

The Cole County Health Department (CCHD) has the lead responsibility for protecting public health in the planning area; it is the local agency primarily responsible for the day-to-day

provisions of many public health services including surveillance and follow up of communicable diseases.

The Local Emergency Medical Planning Committee Coordinator has responsibility for the overall coordination of Public Health and Medical Services in a disaster. The Cole County Health Department is designated to: provide surveillance, assist with laboratory support, assist in the collection and identification of biological, chemical and radiological hazards, coordinate with the joint information center to provide health and safety information to the public, assist and coordinate food and water safety, and provide mass prophylaxis to first responders and the public.

There are numerous health and medical resources available to support health operations in the planning area including medical clinics, funeral homes, veterinary services, a county coroner, and behavioral health counseling services. The CCHD maintains lists of these resources.

Location

The entire planning area is at risk from a public health emergency. Residence halls and student housing associated with the location of Lincoln University in Jefferson City provide the opportunity for a quicker spread of communicable diseases within that city.

Strength/Magnitude/Extent

A public health emergency can range from a short duration event in a small population to a longer duration event involving entire states, regions, the nation, or the world.

Previous Occurrences

In 1918, the planning area was affected by the flu pandemic sweeping the world. The flu pandemic resulted in 9,677 deaths statewide in 1918, according to the *MO State Hazard Mitigation Plan (2013)*; the death rate dropped by half in the subsequent year.

More recently, the planning area has experienced *Shigella* outbreaks, usually associated with childcare facilities, and *Norovirus* outbreaks.

In December 2019 Chinese Health officials reported the first cases of what we would come to know as Covid-19. This new form of Coronavirus would swiftly move into a worldwide pandemic. March 13, 2020 Governor Mike Parson signed an executive order declaring a state of emergency for Missouri. As of May 17, 2021 there had been 9,105 recorded cases of Covid-19 in Cole County that has led to 124 deaths.

Probability of Future Events – Moderate for all participating jurisdictions

VULNERABILITY

Measure of Severity – Low to High for all participating jurisdictions

The measure of severity is variable due to the varying impact of the wide-range of events which could trigger a public health emergency. For example, a limited hazardous material release or a utility disruption might result in only some injuries and property damage. On the other hand, an influenza pandemic would have the high probability of resulting in major injury and death in the planning area.

In addition to direct impacts on life and existing structures, a public health emergency has the potential for large economic effects. A CDC model suggests that about 20% of the work force will be absent due to illness or caring for family at the height of a pandemic. There is also the possibility of the population being asked or required to “shelter at home” and businesses and schools being shut down.

Potential Impact – Life

Public health emergencies come in many different forms and can have a wide range of effects, depending on the source of the emergency. Some emergencies which threaten human or animal well-being might be stopped before any damage occurs; other emergencies, such a pandemic, could result in widespread illness and /or death.

Potential Impact - Existing Structures

The organism which causes Legionnaire’s Disease can reside in hot water systems; a thorough decontamination of the system must take place in this situation. There is the possibility that other existing or emerging diseases may be found to have a relationship to the built environment which results in costs or economic losses.

Potential Impact - Future Development

The past decades have witnessed an incredible increase in air travel and global movement. This new “global community” allows for the introduction of diseases not endemic to the area and the reemergence of previously eradicated diseases. In addition, the growth of terrorism (both domestic and foreign) presents new possible sources of public health emergencies.

In addition, population growth increases the overall risk for communicable diseases, especially in areas where crowding occurs.

Hazard Summary by Jurisdiction

The planning area has a strong base of mitigation and prevention activities in place for public health emergencies.

- The Cole County Health Department (CCHD) is responsible for public health, including the vaccination of individuals to prevent the threat of disease.
- *The Cole County Public Health Emergency Plan (CCPHEP)*– This plan is updated for maintenance yearly and individual sections are worked on according to a schedule set by the Missouri Department of Health and Senior Services. The *CCPHEP* is integrated into Annex M of the *Cole County/Jefferson City EOP*.

- Established Local Emergency Medical Planning Committee
- The Cole County Health Department undertakes the following mitigation and preparedness activities:
 - Annual training and exercises to strengthen public health's role in disaster response and recovery
 - Identification and maintenance of a list of local, regional, state and federal public health resources which is shared with Cole County/Jefferson City Emergency Management
 - Analysis of anticipated situations for potential health problems through weekly surveillance from hospitals and schools
 - Access to a DHHS/SEMA mapping software which allows identification of populations, facilities, etc. within a certain area of an event
 - Sharing of health alerts and available resources with staff and community, as needed
 - Exercise of call down list quarterly
 - Establishment of open and closed PODs in the planning area; some closed PODs have already been established and work continues to establish more
 - Practice of mass dispensing and vaccinating through POD exercises
 - Quarterly testing of communication
 - Updating of current organizations and resources in the community and identification of new ones that could be potential partners on an ongoing basis
 - Establishment of lines of succession within the CCHD to provide continuity of government
 - Attendance at local, regional and state meetings, trainings and exercises concerning emergency preparedness, including having staff trained in Strategic National Stockpile (SNS)
 - Participation in the Show-Me Response Program, a volunteer program run by Missouri SEMA which trains public health volunteers to be deployed across the state when needed
 - Mutual aid agreements with all LPHAs, DHSS, the Missouri Department of Public Safety, and Local Law Enforcement. These established agreements allow CCHD

access a number of resources including but not limited to: medical equipment, medical personnel, and established MOSWIN communication channels.

- MoSWIN (Missouri State Interoperability Network) capability - MOSWIN is a statewide public safety interoperable communications system. The interconnected network of communications towers, base stations and communications software provides all state, county and municipal users the ability to utilize the network and meet their emergency communications needs in response to anywhere in the State.
- The Cole County Public Works Department carries out insect control, in consultation with the CCHD, when needed.
- A Public Information Toolkit has been developed at the State level and distributed to all Local Public Health Agencies (LPHAs) in Missouri to provide resources with consistent messages. The toolkit contains fact sheets and message templates for an extensive range of public health issues.
- The MO Department of Health and Senior Services (DHSS) has developed the Missouri Health Notification System (MO-HNS), an Internet-based portal application designed to provide alerting capabilities, redundant email communications, and a system for information sharing. This system is required by the CDC. The MO-HNS was developed as a partnership with LPHAs to increase redundant communication resources for distributing health alerts or messages of public health significance. The system is built upon an infrastructure that can support other information sharing needs during a public health emergency.

PROBLEM STATEMENT

A public health emergency can come in many sizes and shapes. The entire planning area is vulnerable; the greatest known threats are an epidemic/pandemic or an emergency arising from radiological, chemical or biological terrorism. There is a high chance that a public health emergency might evolve in the midst of another disaster, complicating both response and recovery.

The Cole County Health Department (CCHD) has done extensive planning and provisioning for a wide variety of possible public health emergencies. There are significant medical and hospital resources in the planning area. The coordination between CCHD and local, state and federal agencies is excellent. Nonetheless, a significant risk still exists; the potential sources of a public health emergency are numerous, varied, dangerous, and continually evolving.

3.5.2 HAZARDOUS MATERIALS RELEASE

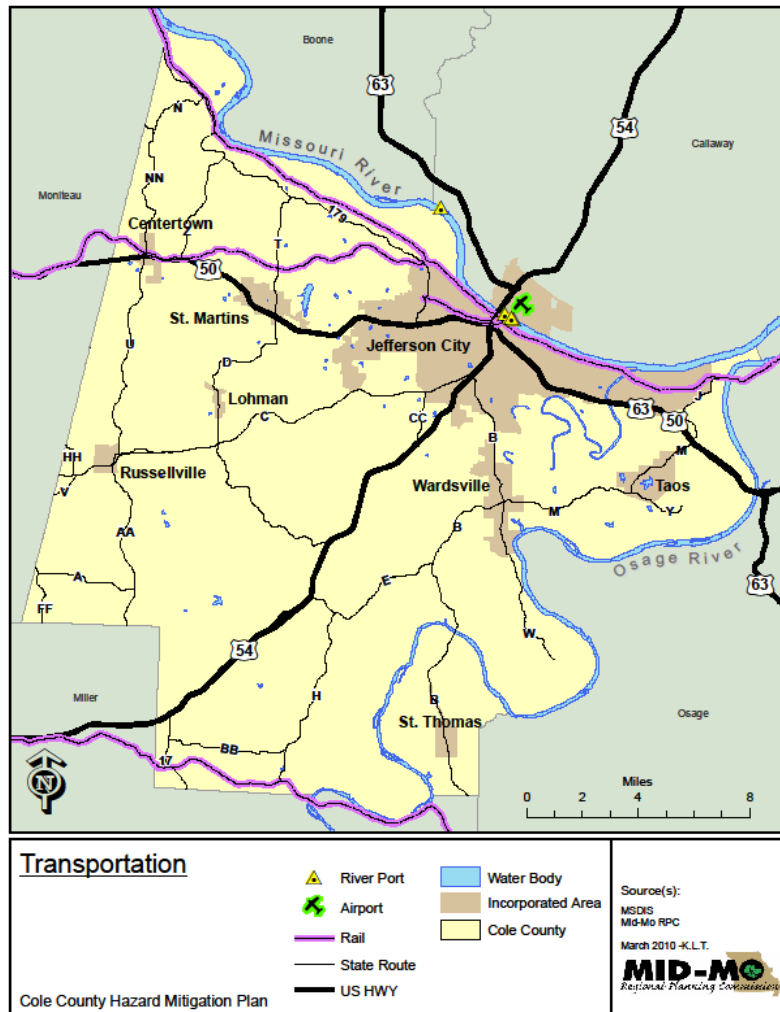
DESCRIPTION OF HAZARD

Location

The entire planning area is at risk from a Hazardous Materials Release. This could originate from a transportation incident along the highway system, railways, or pipelines or at a fixed facility using or generating hazardous materials in its operation. Much of the following information is taken from Annex H of the *Cole County/Jefferson City Emergency Operations Plan*.

Transportation Routes There are multiple transportation modes and routes in the planning area which may be used to transport hazardous materials (Figure 5.2).

Map 3.22



Three major highways, I-54 and Highway 63 (north-south) and Highway 50 (east-west) traverse the planning area. These highways intersect each other in Jefferson City. No qualitative or quantitative information is available regarding the presence of Extremely Hazardous Substances (EHSs) on the transportation routes, the LEPC assumes that hazardous chemicals are transported on nearly all county/city and state roads in the planning area.

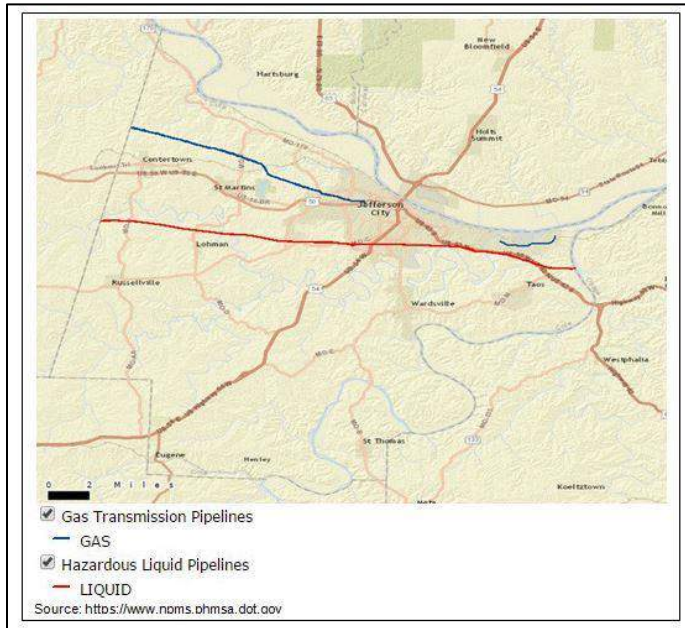
The Union Pacific Railroad has freight rail running through the northern part of the planning area. Information from the railroad indicates the transport of some quantities of EHSs through the planning area.

The Missouri River, which defines the northern boundary of Cole County, is a commercially

navigable river.

Pipelines There are both major natural gas pipelines and petroleum pipelines running through the planning area (Figure 5.3).

Figure 3.4



A double-line branch of the Panhandle Eastern Pipe Line runs in the northern part of the planning area and ends at Jefferson City. There are also three petroleum pipelines, owned by Conoco Phillips, which run together in the northern part of the planning area.

In addition to the major pipelines, a network of pipelines carries natural gas and other materials throughout the county.

Information from the pipeline companies indicates the transport of some quantities of EHSs through the planning area.

Fixed Facilities: There are a large number of fixed facilities in the planning area that use, produce and/or store hazardous materials. There are a smaller number of facilities in the planning area that use or store extremely hazardous substances (EHS). It is important to note that the proximity of some of these facilities to major transportation routes and/or adjacent facilities may compound the effects of a hazardous materials incident.

Strength/Magnitude/Extent

Hazardous materials emergencies can range from small fuel spills to large-scale releases.

Previous Occurrences

Information from the Missouri Environmental Emergency Response Tracking System (MEERTS) indicates a total of 730 reported spills in Cole County between 12/10/1993 and 1/15/2016. It can be seen from the data that incidents in private residences are the most commonly reported, followed by other fixed facilities and roads/highways/ROW.

When the data is examined by the cause of the incident, it can be seen that improper disposal and vehicular accidents are the leading cause of reports (Table 3.50).

Table 3.50			
Cole County - Reported Hazardous Materials Incidents			
12/10/1993 - 1/15/2020			
Cause	Incidents	Cause	Incidents
Unknown/undetermined	106	Fire/explosion	27
Improper disposal	101	Intentional act/vandalism	24
Vehicular accident	83	Railroad accident	22
Other	71	Blockage/bypass	8
Leaking tank system	63	Pipeline release	7
Mercury pickup	60	School lab chemicals	6
Confiscated drug lab material	49	Seepage/leachate	6
Mechanical malfunction/failure	56	Homeland security threat	4
Operator error	44	Ordnance destroyed	2
Discharge/air emission	37	Watercraft accident	2
Weather related	50	Algal bloom	1
Source: http://dnr.mo.gov/env/esp/meerts.htm			

Probability of Future Events – Low for all participating jurisdictions

The historical MEERTS data indicates 829 events in an approximately 27-year period. This averages to ~31 events per year.

Estimates from the fire districts/department in the planning area indicate that they respond to approximately about 5,500 calls per year. If all of these hazardous material incidents resulted in emergency calls, the calls would still only make up 0.6% of the total calls.

VULNERABILITY

Measure of Severity – Low for all participating jurisdictions

According to the Cole County LEPC (Local Emergency Planning Committee), injuries/casualties associated with hazardous material spills in the Planning Area are very low.

The greatest areas of concern from an emergency management perspective are: 1) petroleum releases from commercial vehicles on highways and 2) accidents/spills or fires in residential garages that may contain disproportionate amounts of consumer quantities of hazardous materials. The reporting threshold for a petroleum release is 50 gallons; e.g. a typical accident that might require an emergency response would be when saddle tank(s) get ripped open on a commercial vehicle which may contain greater than 50 gallons of petroleum product.

There are no reporting requirements for releases at private residences; these incidents are only reported if responders are called. Emergency response is usually called once someone has already been affected by the release. One of the main dangers posed in the residential incidents is the potential mixing together of various stored, and possibly out-of-date and degraded, chemicals; this random mixing can result in increased toxicity, flammability or reactivity.

Fixed facilities have a vested economic interest in the responsible management of their hazardous materials in order to prevent accidents and releases. While personnel are typically well trained and good stewards of the materials, the levels of hazardous materials at some facilities still present high risks should an earthquake, tornado, or some other hazard damage the facility. These facilities are monitored to mitigate the impact should an unavoidable disaster affect the facilities.

Potential Impact – Life

According to the LEPC, the risk to human life is very low from most hazardous chemical releases. It would only be extreme situations which would pose a great threat. The potential is there, however, and is explained as follows in the Cole County/Jefferson City Emergency Operations Plan:

A release or threatened release of hazardous material could result in serious and quickly escalating threats to the public. Determination of the type of hazard involves knowing what hazardous material is involved and its potential impact and containment status. The physical or chemical characteristics of hazardous materials may include toxicity, flammability or reactivity. These factors require technical analysis by qualified and approved specialists in order to determine existing hazards, the anticipated course of the incident and any cascading hazards.

Potential Impact - Existing Structures

There is the potential for structures to be impacted by hazardous substance releases. A release involving an explosion could impact the HVAC system and therefore the entire facility. A major release at a fixed facility has the potential to require road closures and restricted access during environmental assessment and cleanup; in addition to inconvenience, this would result in financial losses.

Potential Impact - Future Development

The Planning Committee was not aware of any future development which would impact this hazard.

Hazard Summary by Jurisdiction

- Cole County/Jefferson City collect hazardous household waste March through October.
- The Local Emergency Planning Committee (LEPC):
 - Develops and maintains the Cole County/Jefferson City Hazardous Materials Emergency Plan (HMEP) - Annex H of the EOP; this is reviewed annually

- Compiles the annual Hazardous Materials Inventory for Cole County based on Tier II reporting.
- Coordinates hazardous materials exercises and training as required
- Cole County/ Jefferson City have a (HSRT), Type II for HAZMAT response. This group responds to all chemical, biological, radiological, and nuclear (CBRN) incidents that occur statewide (See Annex H of Cole County EOP for specific response)
- St. Mary's Health Center and Capital Region Medical Center (both in Jefferson City) are haz-mat awareness level trained.
- Fixed Facilities are required by the EPA to prepare a risk management plan.
- The Missouri Spill Bill (RSMo 260.500-260.550) requires reporting of all spills to the Environmental Emergency Response (EER) Hotline or to the National Response Center. All reported incidents are tracked on the Missouri Environmental Emergency Response Tracking System (MEERTS). The threshold for reporting is 50 gallons.
- Processing of hazardous materials emergency 911 calls according to Fire Priority Dispatch protocol developed by the National Academies of Emergency Dispatch (NAED)
- Public warning and emergency notification systems
- Fire Emergency First Responders are all required to be trained at the Operations Level.
- Regional assets include the Homeland Security Response Teams (HSRTs) located in Cole County and the City of Columbia (located in adjacent Boone County to the north). The HSRTs are funded through grant funds from the Missouri Office of Homeland Security via appropriations at the regional level by the RHSOC (Regional Homeland Security Oversight Committee). HSRTs operate at the Technician Level as well as the MoDNR's Emergency Response Team and EPA's response elements.
- The Missouri Department of Natural Resources Emergency Response Team can respond to hazardous materials incidents.
- The Environmental Protection Agency (EPA) oversees the federal hazardous waste program.

Problem Statement

The entire planning area is vulnerable to a hazardous materials release. However, hazardous materials are highly regulated by federal law; multiple safeguards and emergency response teams are in place to mitigate the potential threat of a hazardous material incident.

The Cole County Local Emergency Planning Committee (LEPC) identifies residential garages as one major concern in hazardous material spills. This is due to the potential toxic, flammable, or reactive mix which may be created where numerous chemicals are stored in close proximity. Petroleum-based spills on the highways are the other major area of concern.

3.5.3 TRANSPORTATION INCIDENT

DESCRIPTION OF HAZARD

This section of the plan deals with major accidents involving rail or air transportation which result in injury or death.

- There is significant passenger and freight rail in the planning area (see Section 2.8). Amtrak provides passenger service from Jefferson City to both Kansas City and St. Louis via the *Missouri River Runner* which, as the name implies, runs along the river in the northern part of Cole County. Two trains traveling in each direction stop daily at the Amtrak Station in Jefferson City. There is also a large amount of freight which travels by rail through the northern part of Cole County. Union Pacific operates these tracks which run through the incorporated communities of Jefferson City, St. Martins (and Centertown).

-

- Some common causes of rail accidents include malfunctioning or defective equipment, inadequate track maintenance, unprotected crossings, operator error, and terrorism.

The Jefferson City Memorial Airport, owned and operated by Jefferson City, is located in Callaway County, across the Missouri River from the planning area. The airport has two runways and full Instrument Landing System (ILS) capability. C130s and 727s can be landed there on an emergency basis. The airfield is shared with the Missouri National Guard headquarters, including the Special Troops Battalion-Joint Force Headquarters.

Airport activities include corporate flying, flight training, military exercises, air cargo, recreational flying, emergency medical transports, medical doctor transports, and search and rescue training performed by the Civil Air Patrol. Several of Missouri's state government flight departments are based at the airport, including the Missouri Highway Patrol, Missouri Department of Conservation and Missouri Department of Transportation. There are no scheduled commercial airline flights.

- Some common causes of air accidents include pilot or other human error, mechanical malfunctioning, weather, sabotage, and terrorism.

Location

All participating jurisdictions

While there is a slightly greater probability of a transportation incident in Cole County (unincorporated), Jefferson City, and St. Martins due to the trains passing through those jurisdictions, all jurisdictions would be vulnerable to the random occurrence of plane crash.

Strength/Magnitude/Extent

Extent is defined as "an attribute of the hazard alone which does not include its effect on humans or the built environment"; a transportation incident, for the purpose of this plan, is defined as an accident resulting in injury or death. There is not, therefore, a possible way to describe the extent of a transportation incident.

Previous Occurrences

There have been various train derailments in the planning years over the years, but nothing which resulted in major injury or death.

In 2004, Pinnacle Airlines Flight 3701 crashed in Jefferson City, on its way from Little Rock, Arkansas, to Minneapolis-St. Paul International Airport. The 50-seat regional jet was not carrying any passengers but both crew members were killed. The crash also caused some damages to houses and a garage.

Probability of Future Events

Low - All participating jurisdictions

While there is a slightly greater probability of a transportation incident in Cole County (unincorporated), Jefferson City, and St. Martins due to the trains passing through those jurisdictions, all jurisdictions would be vulnerable to the random occurrence of plane crash. However, the probability is assessed to be low for all jurisdictions.

VULNERABILITY

Measure of Severity

Low to High - All participating jurisdictions

Centertown and St. Martins both have rail that run near or through their communities which make them capable of a rail incident. All communities have roads where vehicle accidents can happen. Those along major freight ways are at risk for incidents that could lead to hazardous materials release or mass casualties.

Potential Impact - Life

By the definition established for this plan, a transportation incident is a rail or air accident which results in injury or death. While airplane accidents are extremely rare given the high volume of traffic, when they do occur they usually result in injuries and at least some loss of life.

Rail accidents are fairly common events but major train derailments or collisions, either with another train or with a vehicle on a road, are much less common. The major rail incidents often result in injury and/or death.

Potential Impact - Existing Structures

There is the possibility of an aircraft crashing into a building. This is a rare event which is impossible to predict or assess.

Potential Impact - Future Development

Local terrorist incidents have become more common in recent decades; if this trend continues, which seems likely at least for the near future, the probability of a terrorist related transportation incident will increase.

Hazard Summary by Jurisdiction

Both the rail and airline industries are highly regulated to ensure safety. Jefferson City Memorial Airport complies with all requirements of the Federal Aviation Administration (FAA) and Transportation Safety Administration (TSA). All jurisdictions are at some risk for some level of transportation incident.

Problem Statement

While the potential exists for a major air or rail transportation incident in the planning area, the probability of its occurrence is quite low. All jurisdictions are potentially at risk. There is a slightly greater probability of a transportation incident in Cole County (unincorporated), Jefferson City, and St. Martins due to the trains passing through those jurisdictions, but all jurisdictions would be vulnerable to the random occurrence of plane crash.

A transportation incident involving a large airplane or passenger train is a low probability/high severity event. More minor rail accidents, such as derailments, may result in few or no injuries. The strict regulation of these industries mitigates against this hazard; the increase in local terrorism incidents, sometimes targeting transportation, is a growing threat.

3.5.4 NUCLEAR INCIDENT

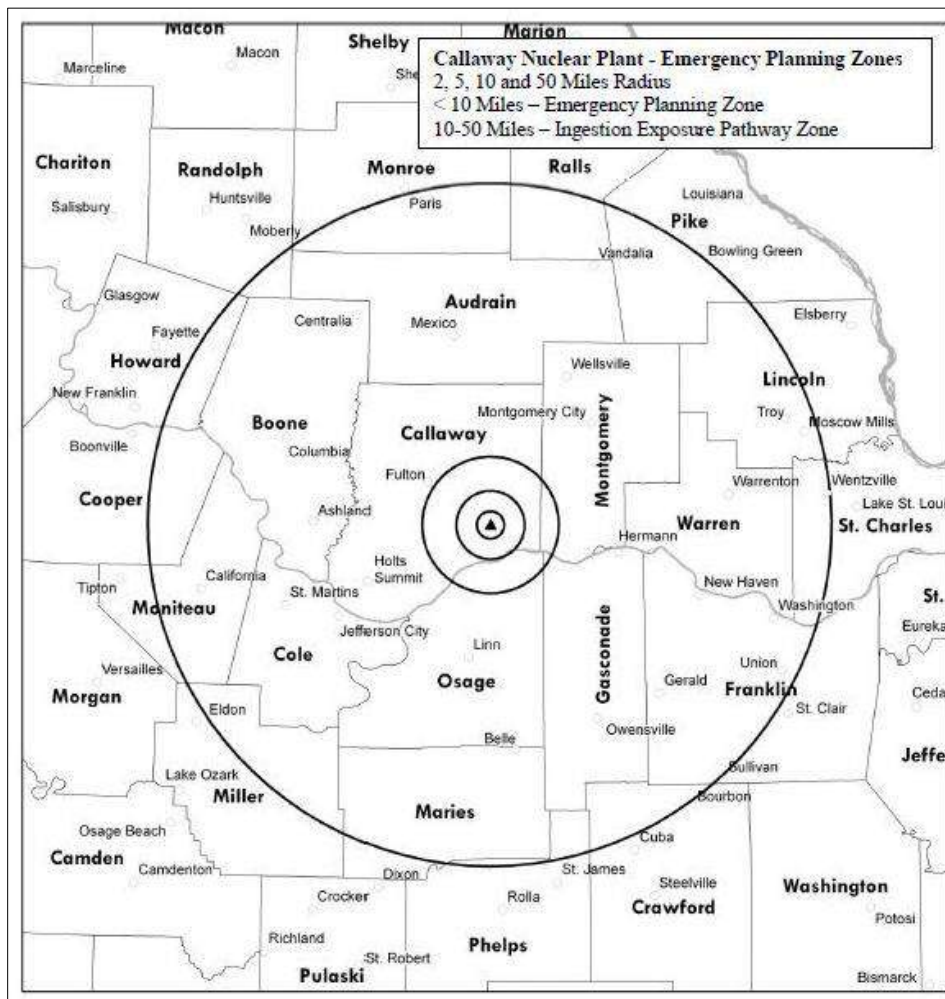
DESCRIPTION OF HAZARD

This section will deal specifically with the risks posed by a nuclear incident at a nuclear reactor. A commercial nuclear power reactor, the Callaway Nuclear Plant, is located northeast of the planning area in Callaway County. The plant is owned and operated by the Ameren Corporation. It was originally licensed to operate until 2024 but the Nuclear Regulatory Commission (NRC) recently extended its operating license to 2044.

Location

The entire planning area is outside of the 10 mile radius Emergency Planning Zone for the Callaway Nuclear Plant in adjacent Callaway County, but it is within the 10-50 mile radius Ingestion Exposure Pathway Zone (Figure 5.7).

Figure 3.5



Source: Missouri Hazard Analysis, 2013

Extent

There are four classes of Emergency Action Levels used for early notification of incidents at nuclear reactors:

A. Notification of Unusual Event - This indicates a potential degradation of the safety level of the plant; no releases of radioactive material requiring off-site response or monitoring are expected unless safety systems are further degraded.

B. Alert - Unusual events are in process or have occurred and indicate a potential degradation of the level of plant safety; any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guideline (PAG) exposure levels.

C. Site Area Emergency – Events are in process or have occurred that involve actual or likely major failures of the plant functions needed to protect the public; no releases are expected to exceed EPA PAG exposure levels except near the site boundary.

D. General Emergency - An event is in process or has occurred that involves actual or imminent substantial core degradation or melting, with the potential for loss of containment integrity; releases can reasonably be expected to exceed the EPA PAG exposure levels off-site for more than the immediate site area

Callaway Nuclear Plant - Only the most serious incident (General Emergency) has the potential to have a direct effect on the planning area. Whether a General Emergency would result in contamination in the planning area would depend on the nature of the incident and meteorological conditions during the release.

Previous Occurrences

The only nuclear incident in the United States equivalent to a General Emergency was the leaking of radioactive materials at Three Mile Island in Pennsylvania in 1979. According to 2013 information from FEMA, there have been five Site Area Emergencies with no release of radioactive materials at commercial nuclear power plants and four at non-commercial reactors.

Callaway Nuclear Reactor - The Callaway Nuclear Reactor has been in operation since 1984 and has had no major safety concerns in that time. During its period of operation there have been a number of Unusual Events declared at the reactor; the most recent two were in 2015 and resulted in temporary shutdowns of the plant.

Probability of Future Events – Low

“The Reactor Safety Study conducted by the NRC rated the chances of a major nuclear disaster as very low (a probability of one in one million per plant operating year). The report concluded that the worst accident type that could affect a nuclear power plant would be one resulting in a meltdown, which could be expected to occur once in 20,000 years of reactor operation. The report also stated that a meltdown would likely cause less than one fatality or injury. This low hazard rating is due to all of the added safety engineered instrumentation used to monitor and shut down nuclear plant systems before any severe damage occurs” (*Missouri Hazard Analysis*).

In addition, following the 2011 nuclear accident at Fukushima in Japan, the NRC increased requirements for nuclear plants in the United States. This has resulted in major upgrades to the Callaway Nuclear Reactor site including a new hardened facility sited next to the original facility; the Callaway Plant now has backup systems for its backup systems.

VULNERABILITY

Measure of Severity – Low

In the case of a General Emergency at the Callaway Nuclear Reactor, the major impact in the planning area (aside from the possible need for some decontamination) would be the sheltering of persons from the exposure zone in Callaway County. Jason Gym at Lincoln University is a designated shelter location for some of the evacuees. Should sheltering and services be required for a lengthy time, this could have an economic effect on the planning area.

The planning area would be involved in other ways should a General Emergency occur: Jefferson City Memorial Airport, located north of the planning area in Callaway County but owned and operated by Jefferson City, would be used to fly in equipment and personnel; law enforcement and public works departments in the planning area might be called upon for assistance.

Potential Impact - Life

If contamination occurred in the planning area, it could pose a threat to the health and safety of humans, animals, and agricultural production. This could affect dairy farms, dairy processing plants, egg processors and distributors, grain warehouses, meat processing plants, commercial fruit and vegetable producers. The agricultural community would be notified and advised on what actions to take in the event of a radiological emergency.

The nature of the incident and extent of contamination would determine the state or federal resources activated to address contamination concerns as well as methods for decontamination, sheltering in place or evacuation of members of the public, and isolation of contaminated areas. While portions of the planning area may be impacted by wind spread radiological contamination, it is expected that the contamination will be minimal due to the distance travelled from source of contamination, nature of particle size and mass, and deposition mechanics of the height of plume, including wind speed and direction.

Should contamination of the planning area occur, it is very likely that the Missouri State Emergency Management Agency, along with initial responders from the Missouri Department of Health and Senior Services, Missouri Department of Natural Resources and other local offsite organizations such as local fire departments and radiological technical experts from the University of Missouri in adjacent Boone County, would be the initial group to begin response and assessment of contamination. This initial response would soon be followed up by a mobilization of numerous response teams from federal agencies such as the EPA and U.S. Nuclear Regulatory Commission, U.S. Department of Agriculture, U.S. FDA etc. to determine

the nature and extent of the radiological contamination as well as recommend “Early” “Intermediate”, and “Late or Recovery” phase response actions.

The initial assessments would attempt to estimate the levels of internal or external exposure for a member of the public from plume contaminants (radioactive iodines, strontiums, etc.) as well as contamination of drinking water supplies and food stuffs. Once those levels of contamination and projected worst case exposures are estimated then it is likely that the state and federal response agencies will make recommendations to local and state policy makers of impacted areas on action to be taken to protect the public, animals, pets, etc. In most cases the guidelines and protective actions as established in the EPA Manual “Protective Action Guides and Protective Actions for Nuclear Incidents” (PAG 400 Manual) would be used.

The EPA PAG is a valuable aid to state and local authorities making radiation protection decisions during an emergency. Decision-makers compare estimates of projected dose (a dose that can be averted by protective actions) with values in the appropriate PAG to determine what actions to take.

The protection action plan can be broken down into three phases:

- Early Phase - can last from hours to days until the release has stopped
- Intermediate Phase - can last from a week to months
- Late Phase - can last from months to years

Early Phase The “Early Phase” of the protection action recommendations would focus on physical action which can be taken to avoid exposure, based upon projected dose to members of the public.

Two primary pathways exist for radiation exposure to the public in the Early Phase. As the radioactive plume moves from the incident site across surrounding areas, members of the public may receive direct exposure to radioactive materials. These materials may be deposited on the skin and clothing. The extent of direct exposure will depend on the radiation source and the particular conditions of the incident.

A second important pathway is inhalation. This can occur when members of the public are directly immersed in the plume. In most cases, the dose from inhalation of radioactive particles is of greater concern than skin or clothing contamination.

Currently the recommendations would be to Evacuate or Shelter in place. As an example, should a projected dose from exposures from a plume approach 1 to 5 rem (REM=Roentgen Equivalent Man) then either an evacuation or shelter in place (depending on individual locations of constituents) would be one of several recommended actions for policy holders to consider. The recommendations would also specifically focus on methods to limit dose and exposures to adults and children’s thyroids (based up FDA age-specific guides) such as the issuance of KI (stable potassium iodine) to first responders and/or members of the public.

Early Phase process:

- Notification of state and/or local authorities
- Immediate evacuation/sheltering (if necessary) based on preliminary information or measurements indicating severity or inability prevent accident from getting worse
- Monitoring of releases and exposure rate measurements
- Estimation of dose consequences
- Implementation of protective actions in other areas, if necessary

Intermediate Phase Activities in the “Intermediate Phase” are intended to reduce or avoid dose to the public, control worker exposures, control the spread of radioactive contamination, and prepare for long-term cleanup operations. This phase covers doses received in the first year and up to 50 years. These would include food and drinking water PAGs to limit uptake or intake of contaminated waters or foods stuffs to avoid a dose of either the 0.5 rem projected dose limit for the whole body or the 5 rem limit to the most exposed organ or tissue.

In addition, recommendations would be provided to local decision-makers on how to protect an area’s local food sources. Such action might be covering exposed food products, moving animals to shelter, and providing protected feed and water to animals. It may also be necessary to place temporary embargoes on food and agricultural products to prevent public consumption of potentially contaminated food.

It is important to remember that these dose limits are based on projected dose for the first year of exposure. Actions are taken to avoid this dose.

The recommended PAG for drinking water is 0.5 rem committed effective dose equivalent in the first year of exposure. A committed effective dose equivalent is used because only one pathway, ingestion, is involved. The drinking water PAG does not apply to all potable water sources. The Intermediate Phase PAG covers other water uses like swimming and bathing.

If the projected dose is expected to exceed this threshold, then alternate sources of drinking water may be necessary. It is also possible that water treatment or other actions may help to reduce the radiation doses received from drinking contaminated water.

A key aspect of the drinking water PAG is that it is not intended to set an acceptable level of contamination of water, nor is it intended to serve as a remediation level in water. This PAG dose is in addition to the primary Intermediate Phase PAG and applies only in an emergency situation.

The “Intermediate Phase” objectives would focus on the need to relocate. The Protective Action Recommendation based on PAG is shown in Figure 5.8.

Figure 3.6

Protective Action Recommendation	PAG (projected dose)	Comments
Relocate the general population	≥ 2 rem (20 mSv) First year	Beta dose to skin may be up to 50 times higher
Apply simple dose reduction techniques	< 2 rem (20 mSv) First year	Reduce doses to as low as practical levels
Longer term objectives	0.5 rem (5 mSv)	In any single year after the first
	≤ 5 rem (50 mSv)	Cumulative dose over 50 years

Additional Objectives:

- Identify high dose rate areas
- Relocate population from high dose rate areas
- Allow return of evacuees to non-contaminated areas
- Establish relocation areas
- Establish procedures for reducing exposure of non-relocated population
- Perform detailed environmental monitoring
- Decontaminate essential facilities and routes
- Begin recovery activities

Surface Contamination Control General Guidance (applies to both Early and Intermediate Phases):

- Do not allow monitoring and decontamination to delay evacuation
- If necessary, establish emergency contamination screening stations
- Establish monitoring and personnel decontamination facilities at evacuation centers
- Set up monitoring and decontamination stations at exits from the relocation area
- Establish auxiliary monitoring in low background areas
- Do not waste effort trying to contain contaminated wash water

Decontamination:

- Decontamination of persons, vehicles, facilities, crops, soils, pets and animals, and water sources will be performed during the intermediate phase. Contaminated individuals will be provided assistance at mass decontamination staging areas such as Jason Gym at Lincoln University which will be used during a Nuclear Incident as a Reception and Care Facility; both monitoring and decontamination will take place at Jason Gym. The staging

area will also be set up to address pets and vehicles driven to the mass decontamination area.

- Decontamination guidelines will be set up initially by local and state agencies. The early and intermediate phases will be based upon gross decontamination of persons to avoid exposures to values indicated above.
- Local and state agencies will make modifications to the decontamination guidelines if necessary during the intermediate, late and recovery phases.

Drinking Water PAG:

- Drinking water— limit to 0.5 rem (5 mSv) first year committed effective dose equivalent
- Applicable to drinking water from any source
- EPA Safe Drinking Water Standards after first year

Some additional protective actions for water:

- Wait for flow-by
- Ration clean water supplies
- Treat contaminated water
- Activate existing connections to neighboring systems
- Establish pipeline connections to closest sources/systems
- Import water in tanker trucks and import bottled water

Late Phase The late phase cleanup process begins sometime after the commencement of the intermediate phase and proceeds independently of intermediate phase protective action activities. The transition is characterized by a change in approach, from strategies predominantly driven by urgency, to strategies aimed at both reducing longer-term exposures and improving living conditions.

The late phase involves the final cleanup of areas and property at which contamination directly attributable to the incident is present. It is in the late phase that final cleanup decisions are made and final recovery efforts are implemented. Unlike the early and intermediate phases of a radiological incident, decision makers will have more time and information during the late phase to allow for better data collection, stakeholder involvement and options analysis. There will be opportunities to involve key stakeholders in providing sound, cost-effective cleanup recommendations.

Generally, emergency phase decisions will be made directly by elected public officials, or their designees, with limited stakeholder involvement due to the need to act within a short timeframe. Longer-term decisions should be made with stakeholder involvement and can also include incident-specific technical working groups to provide expert advice to decision makers on impacts, costs and alternatives. Community members will influence decisions such as if and when to allow people to return home to contaminated areas. There will be people living in contaminated areas, outside the evacuation and relocation zones, where efforts to reduce exposures will be ongoing.

Late Phase Goals:

- The types of contamination; the technical feasibility, cost, timeliness and effectiveness of decontamination measures; and the availability and cost of options for the disposal of wastes.
- The size and character of the areas that are contaminated; past and projected future uses for these areas; and the preservation or destruction of places of historical, national, or regional significance.
- Site-specific natural and anthropogenic background levels of radioactivity.
- Estimates of the impacts of both contamination and options for decontamination, on human health, communities, the economy, ecosystems and ecosystem services.
- Public acceptability and intergenerational equity.

Factors to consider in determining cleanup actions include evaluating:

- areas impacted (e.g., size, location relative to population);
- actions already taken during the early and intermediate phases;
- the ability of a remedy to maintain reliable protection of overall human health and the environment over time;
- assessing the relative performance of treatment technologies on the toxicity, mobility or volume of contaminants;
- the success or effectiveness of the cleanup or remediation as the cleanup progresses (contaminant removal);
- the adverse impacts on human health and the environment that may be posed in the time it takes to implement the remedy and achieve the community-based remediation goals;
- the impacts of alternative levels of clean up on the local and regional economy (e.g., job loss due to closed businesses, job creation due to decontamination and waste handling operations) and on residents' sense of place (e.g., continued limited access to one's home and community until clean up levels have been reached);
- preservation or destruction of places of historical, national, or regional significance;
- the technical and administrative feasibility of the remedy, including the availability of materials and services needed to implement each component of the option in question;
- the cost of each alternative, including the estimated capital and operation and maintenance costs and net present value of capital and operation and maintenance costs;
- state concurrence with the remedy;
- community support for the remedy.

This may be an iterative process. As experience is gained, adjustments may be required to achieve long-term goals.

The goals of late or recovery phase decontamination efforts are:

- Restoration of incident site to conditions as near as possible to pre-existing—creation of a “new normal”
- Remove contamination
- Eliminate access restrictions
- End food and water controls
- Return population to homes and jobs

Potential Impact - Existing Structures

There would be no physical damage to existing structures in the planning area from a nuclear incident. However, buildings would need to be assessed for external and internal contamination and remediated, if needed. This would be supported on the local, state, and federal levels.

Potential Impact - Future Development

Theoretically, population growth in the planning area will put more people at risk from contaminated food and water should there be a General Emergency level incident at the Callaway Nuclear Reactor which results in contamination in the Planning area. However, this needs to be viewed in the context of the likelihood of the occurrence of such an event; the likelihood is extremely low.

Existing Mitigation Activities

The nuclear industry is heavily regulated with many safeguards in place; the Callaway Nuclear Plant is in compliance with all regulations.

The State of Missouri, as well as the utility company, have developed emergency operations plans to ensure the health and safety of the general population within the emergency planning zones. Missouri SEMA and the Callaway Nuclear Plant run exercises/drills throughout the year.

Problem Statement

All jurisdictions in the planning area have a very low vulnerability to adverse effects from a nuclear incident despite the existence of a large commercial reactor in adjacent Callaway County.

There is an extremely low probability of an incident occurring at the Callaway Nuclear Plant due to extensive industry regulations industry and the numerous safeguards in place. Should a major incident occur, there is the possibility of contamination of food and water in the planning area but this would be dependent on the nature of the incident and meteorological conditions at the time of release. There are extensive guidelines in place at the state and federal level to deal with such a possibility.

In the case of a major incident occurring at the Callaway Nuclear Plant, some personnel and facilities in the planning area would potentially function in a supportive role for the emergency response.

3.5.5 UTILITY SERVICE DISRUPTION

DESCRIPTION OF HAZARD

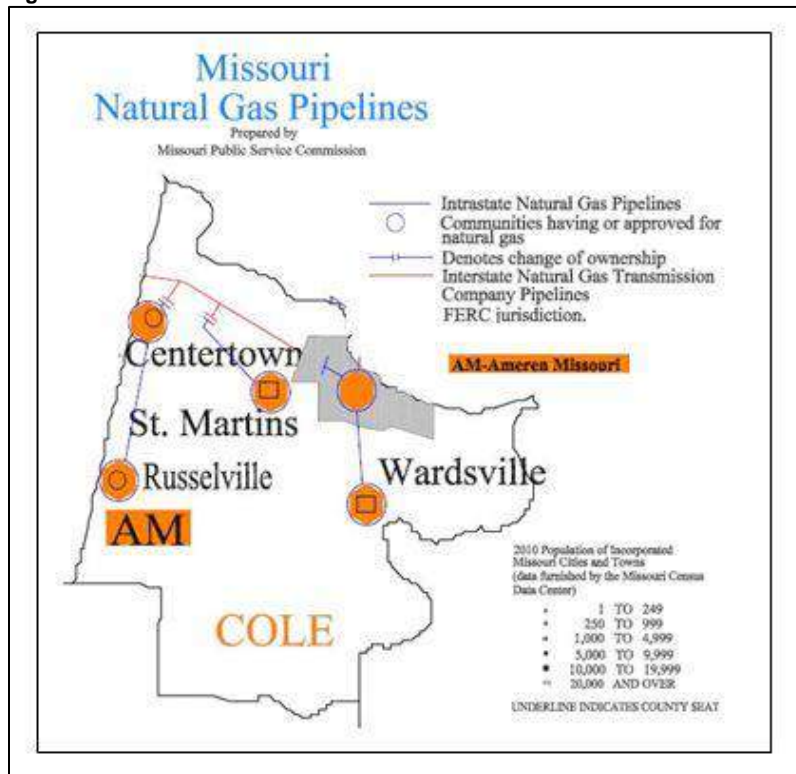
A utility service disruption may involve electrical power, natural gas, public water, wastewater treatment, or telecommunications systems.

Electrical: A number of the natural hazards profiled in this plan, especially severe winter weather, thunderstorms (wind, hail, lightning), and tornadoes, pose threats to above ground electric utilities. Early, heavy snows when leaves are still on the trees and ice storms are the most problematic. Wet snow also poses difficulties in moving equipment in to repair downed lines.

In addition, motor vehicle accidents and animals can cause outages. Solar flares are increasingly being recognized as a threat to the power grid. Digging and construction are a potential threat to buried utilities of all type.

In 2008, the Mid-America Earthquake Center mapped the expected probability of at least moderate damage to electric power facilities from a 7.7 magnitude earthquake in the NMSZ; such damage was considered “highly unlikely” in the planning area.

Figure 3.7



Natural Gas: Natural gas disruption is a very serious concern; it can lead to explosions and fires. Natural gas is protected from some of the threats to aboveground electrical utilities because it is carried in underground pipelines. However, according to the U.S. Energy Department, “Severe storms, flooding, and earthquakes can expose and break pipes....When disruptions do occur, it can take weeks or even months to restore.”

In addition to damage from major events, digging and excavation activities pose a great threat to natural gas lines.

A double-line branch of the Panhandle Eastern Pipe Line runs in the northern part of the planning area and ends at Jefferson City (Figure 3.7). Ameren Missouri is the local natural gas provider for the planning area.

Public Water: There are many hazards (both natural and technological/human-made) which can cause problems for the public water supply.

Drought, earthquakes, and flooding can result in broken pipes and/or other equipment failure.

Electrical power outages will cause problems for most water delivery systems if the power is not restored in a timely fashion. The water supply can also face contamination as a result of internal system failures or hazardous material spills or as a direct target of domestic or foreign terrorism.

The water supply in the planning area is provided through a mix of public water supply districts, municipal governments, private industry, and state and private wells (see Figure 3.3).

Wastewater: Wastewater treatment can be crippled by extended power outages and by flooding; significant ground displacement from a strong earthquake could break wastewater lines.

Telecommunications: Modern telecommunications is a complex system which is both sophisticated and fragile. The sector has undergone massive transformation in the past few decades and each year brings greater expansion and complexity. Almost all aspects of modern life are highly dependent on telecommunications and disruptions of these networks can have large and widespread impacts. This is especially troublesome as the most likely time for a telecommunications disruption is at the time of an emergency or disaster.

New York University conducted an analysis of the interaction of disasters and telecommunications infrastructure through studying large urban disasters of the 1990s and early 2000s. The findings, published in *Telecommunications Infrastructure in Disasters: Preparing Cities for Crisis Communications (April 2005)*, identified the three primary causes of telecommunications disruptions. They are:

1. *Physical destruction of network components:* This can cause severe and lengthy disruptions due to the time and funds needed to repair the infrastructure. In the planning area, aboveground infrastructure is vulnerable to ice storms, damaging winds, tornadoes; underground components are vulnerable to flooding and earthquakes.
2. *Disruption in supporting network infrastructure:* Telecommunication networks rely on many other systems which are often older and lack resiliency. The primary supporting infrastructure is the electrical distribution system; this can fail as can needed cooling systems. In addition, disruption of transportation routes can have a cascading effect whereby fuel is not available for electrical generation and electricity is not available for telecommunications.

While telecommunications disruption from failure of supporting infrastructure is less common it can be more widespread and pose greater challenges for response and recovery.

3. *Network congestion:* Most networks are designed to support peak loads far below those which occur during a crisis or emergency. In times of disaster, there are almost always

problems caused by network congestion as people try to make contact either into or out of the affected area. In addition, network congestion can be a deliberate tactic employed as part of a terrorist attack.

One newer and developing issue regarding telecommunications disruption is the interference posed by some LED and fluorescent lighting system ballasts to radio and wireless communications. An incident of this type of interference was identified in adjacent Boone County when emergency responders were unreachable by radio while eating lunch at a newly opened restaurant. According to an October 2014 posting on the website of the National Public Safety Telecommunications Council (NPSTC), the NPSTC is “working with the American Radio Relay League (ARRL) to learn more about the extent of this problem. ARRL has been doing extensive research and testing into different problems and scenarios. In 2013, the FCC issued an order directing General Electric (GE) to make some changes to their LED lighting transformers after complaints were received about interference.”

This issue with LED interference highlights the continuing nature of potential emergent problems in telecommunications disruptions. Technological innovation is taking place at an incredible speed and there is always the potential for new interferences and problems. Within the telecommunications industry itself there has been an increased focus on redundancy and interoperability which will help mitigate the potential for breakdown; however, as systems get more complex, and the number of interactions multiply, there is always the potential for new interferences and problems to emerge.

Location

The entire planning area is at risk from all types of utility service disruptions.

Strength/Magnitude/Extent

Electrical:

The December 2007 ice storm disrupted electrical service in parts of the planning area for a period of 3 days to 1 week, depending on the location.

Data exists on the maximum duration of recent electrical outages due to ice storms in other parts of Missouri. The *Missouri State Hazard Mitigation Plan (2013)* gives the following information:

- December 1994 – ice storm – power outages, rural areas (northern MO) - 7 days
- December 2007 – ice storm - power outages (northern MO) - almost 2 weeks
- February 2008 – ice storm –power outages (southern MO) - almost 2 weeks
- January 2009 – ice storm – power outages (southern MO) - over 3 weeks

These are worst case scenarios; power is usually restored in a matter of hours, rather than days or weeks. However, a widespread outage with a lot of damage to infrastructure can cause lengthy restore times. This is especially true if large geographical areas are affected at the same time and mutual aid must travel from long distances.

Natural Gas: Major disruptions of natural gas are fairly rare events. When one does occur, it can take weeks or even months to restore service, according to the U.S. Department of Energy. The Missouri River Flood of 1993 disrupted gas lines crossing the Missouri River in the planning area for a few weeks.

Public Water: The duration of a water supply disruption will vary according to the cause of the disruption. Information from water suppliers in the planning area is as follows:

- PWSD #3 – longest outage has been 5 hours
- PWSD #4 – older part of the systems sometimes have outages but they are infrequent and of short duration

Boil orders in Missouri are issued by the MO DNR when there is a question of the safety of the drinking water; these are typically issued due to a major pipe break or other event resulting in low pressure and possible contamination in the system. The duration of these orders vary, but typically last a day or two.

A major disruption of the system due to a natural disaster or terrorism might last many days or even weeks. The CDC recommends that citizens store at least a 72-hour supply of water (1 gallon/person or pet/day) and up to a two week supply, if possible.

Wastewater: Smaller wastewater disruption problems are usually resolved quickly. When wastewater utilities suffer a major infrastructure damage, such as during Hurricane Katrina, full restoration of service can stretch into months.

Telecommunications: A telecommunications disruption can range in length from a short disruption lasting only minutes to one which may take days, weeks, or even months to fully resolve. Many disruptions can be restored rapidly due to the multiple redundancies built into the systems; however, in the case of major disasters where telecommunications infrastructure and supporting infrastructure are damaged or destroyed, it can take much longer.

Previous Occurrences

There is not a definitive reporting system for utility outages in the State of Missouri, so limited data on disruptions is available.

Electrical: Some information on electrical outages is available from SEMA Situation Reports filed at the time of events. The severe winter weather in December 2007 resulted in an estimated 25% of the population in the planning area being without power at one point. Emergency Management reported 22,000 people without power; 11,716 of these were Ameren customers in Jefferson City. Over 1,000 linemen worked to restore power in the Jefferson City area.

Heavy snow falls in February 2013 resulted in widespread power outages throughout the planning area. Some outages lasted 3-4 days. Electric Cooperatives reported at least 6300 customers lost power across parts of 7 counties, including Cole County.

Natural Gas: Natural gas distribution can be disrupted by pipeline failures and accidents. The Pipeline and Hazardous Materials Safety Administration (PHMSA) of the U.S. Department of Transportation has data going back to 1994 on significant and serious accidents involving the nation’s natural gas gathering, transmission, and distribution pipelines. The data shows 13 transmission pipeline incidents and 46 distribution pipeline incidents in the State of Missouri during that 20-year period (Figures 5.11-5.12).

Public Water: Missouri American Water had a main break in Oct. 2012 which affected approximately 11,000 customers in Jefferson City (including St. Mary’s Health Center, Capital Region Hospital, the Cole County Jail, and all the public schools); a second break in a pump station at about the same time compounded the problem. This was a ninety-year old system at the time and an extended drought may have played a role in the breaks. Since that time, Missouri American Water has added a 1.5 million gallon storage facility which has eliminated the potential problem of pressure drops with a main break. In addition, a lot of the older pipe has been replaced in Jefferson City, including that running along High Street, the main thoroughfare through downtown and by the State Capitol building.

Boil advisories/orders sometimes occur in the planning area but are infrequent. They are handled with door knocking and door hangers.

Wastewater: The City of Russellville had some disruption in its wastewater system during a period of heavy rainfall in 2007; the lift stations and pumps were unable to keep up with the additional water in the system.

Telecommunications: Telecommunications systems have been vulnerable to disruption since their inception. Within a few decades of its invention in 1844, the telegraph system was a target for destruction in the Civil War; attempted disruption of communication tools is often one of the first actions in a war.

Some level of telecommunications disruption accompanies most major disasters. There was serious telecommunications disruptions associated with the September 11 attacks in 2001. Much of lower Manhattan was disconnected from the telephone landline grid when a routing hub near the World Trade Center was damaged. In addition, the cellular telephone network in New York City suffered severe disruption; Washington D.C.’s cellular network was also congested but to a lesser degree.

All the major cell phone networks in the Northeastern U.S. failed during Hurricane Sandy (2012). In Hoboken, NJ, officials relied on whiteboards outside City Hall to keep citizens informed. Cellular telephone networks were also overloaded after the bombing at the Boston Marathon (2013).

Probability of Future Events: (This evaluation is for a major event of each type.)

Electrical outage – Moderate

Natural gas disruption – Low

Public Water disruption – Low

Wastewater disruption – Low
Telecommunications disruption – Low

Public Water: Water utility disruption can run the gamut from contamination requiring boil orders to full disruption of service. If all such possible disruptions are considered, then a high probability rating is appropriate. For more widespread disruptions, a moderate probability rating is more appropriate.

A widespread disruption of the water utility is tied to the availability of electrical power.

Wastewater: The wastewater utility is also tied to availability of electrical power.

Telecommunications: The greatest threat for a serious telecommunications problem in the planning area is a disruption of the commercial telecommunications systems. In general, the commercial providers are co-located on towers; damage to one tower can often affect two or three providers.

VULNERABILITY

Measure of Severity:

Electrical outage – Low to moderate
Natural gas disruption – Low to moderate
Public Water disruption – Low to moderate
Wastewater disruption – Low to moderate
Telecommunications disruption – Low to moderate

The severity of a utility disruption event is tethered to its duration.

Potential Impact – Life

Utility service disruption can have widespread and cascading effects on many segments of society. Extended loss of electrical power will affect the ability of the water and wastewater utilities to function at full capacity. Even short-term loss of electrical power is a threat to the home and commercial food supply. Loss of electrical power in the winter months is a threat to life and safety, especially that of the most vulnerable populations.

Natural gas disruption is a very real threat to human and animal life. Disruption of the public water utility poses a risk for fire protection and for health. Disruption of the wastewater utility poses threats to health and the environment.

Telecommunications disruptions can have a serious impact on life through the delay or disruption of emergency services. In addition, a serious lack of symmetry can develop between information coming out of the affected area and that which can reach those within the area. This is a recipe for the spreading of false rumors and panic which may interfere with response and

relief efforts. Telecommunications breakdown can also delay the mobilization of broader relief efforts and thus contribute to greater suffering and loss of life.

Telecommunications disruptions can also put emergency personnel at greater risk due to the lack of accurate and current situational information. A 2013 United Nations Report indicates that at least 300 firefighters in New York City lost their lives due to communication failures.

Potential Impact on Existing Structures

Electrical: Three Rivers Electric Cooperative serves 21,555 accounts in seven counties, including Cole County, according to information provided for the *Multi-Jurisdictional Hazard Mitigation Plan for Missouri's Electric Cooperative (May 2012)*. Over 37% of its meters are located in Cole County, according to data from December 2010.

There are damage estimates for the Three Rivers infrastructure from the two ice storms in 2007 for which there were Federal Disaster Declarations (Table 3.51).

Table 3.51

Event Date	Event Type	Outages Reported	Damage Estimates
1/12/07	Ice storm	6,765	\$597,000
12/8/07	Ice storm	7,865	\$307,000

Natural Gas: The PHMSA data for Missouri indicates that the average property damage cost (in current year dollars) was \$782,660 for a transmission pipeline incident and \$650,526 for a distribution pipeline incident (Figures 3.8-3.9).

**Figure 3.8
Transmission Lines:**

PHMSA Pipeline Incidents: (1994-2013)
Incident Type: Significant **System Type:** GAS TRANSMISSION **State:** MISSOURI **Offshore Flag :** ALL

Calendar Year	Number	Fatalities	Injuries	Property Damage Current Year Dollars
1994				
1995				
1996	1	0	0	\$252,479
1997	1	0	0	\$689,298
1998				
1999				
2000				
2001	1	0	0	\$469,907
2002				
2003	1	0	0	\$4,040,197
2004				
2005	1	0	0	\$110,866
2006	3	0	0	\$523,390
2007				
2008	2	0	0	\$1,096,446
2009	1	0	0	\$745,234
2010				
2011				
2012	1	0	0	\$240,986
2013	1	0	0	\$2,005,775
Grand Total	13	0	0	\$10,174,577

**Figure 3.9
Distribution Lines:**

PHMSA Pipeline Incidents: (1994-2013)
Incident Type: Significant **System Type:** GAS DISTRIBUTION **State:** MISSOURI

Calendar Year	Number	Fatalities	Injuries	Property Damage Current Year Dollars
1994	2	0	0	\$437,904
1995	1	0	0	\$114,368
1996	5	2	3	\$1,837,486
1997	5	0	4	\$372,221
1998	4	0	2	\$786,786
1999	4	1	4	\$116,365
2000	3	1	3	\$250,382
2001	2	0	0	\$1,223,046
2002	1	0	1	\$31,554
2003	2	1	2	\$352,883
2004	2	0	0	\$276,117
2005	2	0	0	\$877,575
2006	3	0	0	\$763,967
2007	1	0	2	\$85,911
2008				
2009	3	0	1	\$230,719
2010	2	0	0	\$338,417
2011	2	0	0	\$267,360
2012	1	0	0	\$93,782
2013	1	1	4	\$0
Grand Total	46	6	26	\$8,456,843

Loss of Use Estimates – Electric Power, Drinking Water, Wastewater Treatment:

The Missouri State Hazard Mitigation Plan (2018) estimated the cost of loss of use of electrical power, drinking water, and wastewater treatment for 10% of the population for one day in each county in Missouri; these estimates for Cole County are shown in Table 3.52. The value assigned to loss of use for each utility was taken from *What is a Benefit? Guidance on Benefit-Cost Analysis of Hazard Mitigation Projects* (FEMA, June 2009). According to the plan, These figures do not take into account physical damages to utility equipment and infrastructure.” However, they would include lost economic opportunities and damages in homes and businesses.

Table 3.52	
Cole County Utility Service Disruption Loss of Use Estimates for One Day Disruption	
Total population (2010 Census)	75,990
Scenario population (10%)	7,672
Electric power (\$126 per person/day)	\$966,672
Drinking water (\$93 per person/day)	\$713,496
Wastewater treatment (\$41 per person/day)	\$314,552
Source: Missouri State Hazard Mitigation Plan (2018)	

Telecommunications: The delay or disruption of emergency response because of telecommunications disruptions can also result in greater than necessary damage to the built environment and infrastructure.

Potential Impact - Future Development

Utility outages can be more problematic in higher population areas; a higher population means more people impacted by a major outage and more people competing for limited local supplies of generators, food, bottled water, blankets, etc. This is just one of the reasons that reliable infrastructure and services must keep pace with development.

Some areas of new development in the planning area are required by law to have underground utilities. Underground utilities are required in both Ashland and Centralia subdivisions. The City of Columbia Water and Light Department continues its policies of undergrounding electric in new developments as well as actively undergrounding approximately one mile of existing overhead electric each year.

Development requires that vigilance is maintained in assuring that new areas of development are fully operational in terms of telecommunications.

Hazard Summary by Jurisdiction

Multiple Utilities:

The purchase of generators has been a major focus of the Region F RHSOC (Regional Homeland Security Oversight Committee) for a number of years. Cole County is one of 13 counties in Region F.

Region F RHSOC has purchased the following for each county in the region:

- 1 towable 65kW generator
- 2 portable 13kW generators

In addition, Region F RHSOC has purchased three 178kW towable generators which are housed in Audrain, Cole, and Cooper Counties and three 100kW towable generators which are housed in Camden, Howard, and Osage Counties. Plans are underway to purchase cabling to accompany these six larger towable generators.

Electrical:

- Tree trimming
- Burying electric lines in appropriate areas
- Shelter system

Central Missouri Electric Cooperative, located in Jefferson City, and Three Rivers Electric Cooperative have been part of a collaborative effort of eight electric coops in central Missouri in the development of a website called BeStormSmart.coop. The site serves to educate the public on differentiating between a storm watch and storm warning, building a storm kit, and safely using a portable generator among other topics. BEC promotes the website in its monthly newsletter.

Natural Gas:

- “Call before you Dig” campaigns and requirements
- Emergency Management personnel participate in a Pipeline Safety seminar annually.
- Ameren Missouri has held or will be holding training on natural gas safety for all fire protection districts/departments in the planning area. The training is part of a collaboration to coordinate responses to natural gas emergencies and help educate the public about natural gas safety.

Public Water:

- Distribution of notices and boil orders when there is a problem or potential problem with drinking water

Telecommunications: There are many industry developments, government programs, and local abilities which help to mitigate the hazards posed by telecommunication disruptions. Some of these are:

- Increased redundancy in newer networks (e.g. “packet switched” networks)
- “Self-healing” networks where repair begins almost immediately after links are broken
- Increased number of wireless networks
- VoIP (Voice over Internet Protocol) in some jurisdictions
- Public Safety Networks

- GETS (Government Emergency Telecommunications Service) – This federal service provides emergency personnel priority access and processing in the landline networks during an emergency or crisis. The Cole County Health Department has two GETS cards.
- WPS (Wireless Priority Service) – This federal program authorizes cellular providers to prioritize calls over their networks during emergencies. The service is available to federal, state, tribal and local emergency service providers and essential healthcare providers. Participation by cellular providers is voluntary.
- Cooperative relationships and mutual aid among emergency service providers within the planning area:
 - Emergency radio interoperability within the planning area
 - Amateur (“ham”) radio – This is the only communications infrastructure which has repeatedly demonstrated its ability to operate when electrical power supplies fail. It is the “last to be destroyed, first to be restored”. There is an active Amateur Radio Emergency Service (ARES®) in the planning area which works with the Cole County/City Of Jefferson Emergency Management Agency when needed.
 - The *Missouri – Region F Regional Communication Interoperability Plan (R-CIP)(2015)* outlines a three to five year plan to “enhance interoperable and emergency communications” within Region F which is composed of 13 counties in central Missouri.
- Major utility providers have their own internal systems of radio communication.

Problem Statement

All participating jurisdictions in the planning area are vulnerable to a utility service disruption. Electrical power is the most commonly disrupted utility; this is usually due to severe winter weather. The duration of these outages can last from hours to a week or more.

Water utilities are infrequently disrupted in the planning area for more than a few hours; boil orders are infrequent but do occur. The water utility is vulnerable to periods of extended electrical outage but these are not frequent. There are interconnections within systems and between major water providers, extra water storage, and various methods of power backup which help to mitigate the overall vulnerability of this utility.

Natural gas and wastewater are also vulnerable to disruption although these are less common occurrences.

The greatest threat for a serious telecommunications disruption is damage to the commercial telecommunications systems. Telecommunications towers are vulnerable to ice storms, damaging winds, tornadoes and terrorism. Commercial providers are often co-located on these towers so damage to one tower can affect two or three providers. Underground telecommunication components are vulnerable to flooding and earthquakes.

Various federal programs and services and mutual aid agreements all help to ensure that communications for emergency services stay intact. An amateur radio network is also active in the planning area.

The numerous backup systems, other mitigation activities, and strong working relationships in the planning area help to lessen the risks associated with all utility disruptions.

3.5.6 TELECOMMUNICATIONS DISRUPTION

HAZARD PROFILE

HAZARD DESCRIPTION

Modern telecommunications is a complex system which is both sophisticated and fragile. The sector has undergone massive transformation in the past few decades and each year brings greater expansion and complexity. Almost all aspects of modern life are highly dependent on telecommunications and disruptions of these networks can have large and widespread impacts. This is especially troublesome as the most likely time for a telecommunications disruption is at the time of an emergency or disaster.

New York University conducted an analysis of the interaction of disasters and telecommunications infrastructure through studying large urban disasters of the 1990s and early 2000s. The findings were published in *Telecommunications Infrastructure in Disasters: Preparing Cities for Crisis Communications (April 2005)* which has been used to frame and inform much of the discussion in this section.

There were three primary causes of telecommunications disruptions identified. They are:

1. Physical destruction of network components: This can cause severe and lengthy disruptions due to the time and funds needed to repair the infrastructure. In the planning area, aboveground infrastructure is vulnerable to ice storms, damaging winds, tornadoes; underground components are vulnerable to flooding and earthquakes.
2. Disruption in supporting network infrastructure: Telecommunication networks rely on many other systems which are often older and lack resiliency. The primary supporting infrastructure is the electrical distribution system; this can fail as can needed cooling systems. In addition, disruption of transportation routes can have a cascading effect whereby fuel is not available for electrical generation and electricity is not available for telecommunications.

While telecommunications disruption from failure of supporting infrastructure is less common it can be more widespread and pose greater challenges for response and recovery.

3. Network congestion: Most networks are designed to support peak loads far below those which occur during a crisis or emergency. In times of disaster, there are almost always problems caused by network congestion as people try to make contact either into or out of the affected area. In addition, network congestion can be a deliberate tactic employed as part of a terrorist attack.

Geographic Location

The entire planning area is at risk from a telecommunications disruption.

Extent

A telecommunications disruption can range in length from a short disruption lasting only minutes to one which may take days, weeks, or even months to fully resolve. Many disruptions can be restored rapidly due to the multiple redundancies built into the systems; however, in the case of major disasters where telecommunications infrastructure and supporting infrastructure are damaged or destroyed, it can take much longer.

Previous Occurrences

Telecommunications systems have been vulnerable to disruption since their inception. Within a few decades of its invention in 1844, the telegraph system was a target for destruction in the Civil War; attempted disruption of communication tools is often one of the first actions in a war.

Some level of telecommunications disruption accompanies most major disasters. There were serious telecommunications disruptions associated with the September 11 attacks in 2001. Much of lower Manhattan was disconnected from the telephone landline grid when a routing hub near the World Trade Center was damaged. In addition, the cellular telephone network in New York City suffered severe disruption; Washington D.C.'s cellular network was also congested but to a lesser degree.

All the major cell phone networks in the Northeastern U.S. failed during Hurricane Sandy (2012). In Hoboken, NJ, officials relied on whiteboards outside City Hall to keep citizens informed. Cellular telephone networks were also overloaded after the bombing at the Boston Marathon (2013). Some users saw impacts to cell and data usage at the start of the 2020 Covid-19 Pandemic in the US as people began working from home on their data plans and using the network more to keep in contact with relatives and employers they would usually see in-person.

Probability of Future Events

As technology changes outages are expected intermittently. 5G now looms on the horizon with a massive expansion of the network needed for it to work by adding towers more frequently and at higher densities. As more towers are added in more locations, many in heavily populated areas, the risk of towers being vulnerable to vandalism and accidents increases which can increase the instances of localized outages. It should however reduce large outages.

VULNERABILITY

Vulnerability Overview

The greatest threat for a serious telecommunications problem in the planning area is a disruption of the commercial telecommunications systems. In general, the commercial providers are co-located on towers; damage to one tower can often affect two or three providers.

Potential Impact to Life

Telecommunications disruptions can have a serious impact on life through the delay or disruption of emergency services. In addition, a serious lack of symmetry can develop between information coming out of the affected area and that which can reach those within the area. This is a recipe for the spreading of false rumors and panic which may interfere with response and relief efforts. Telecommunications breakdown can also delay the mobilization of broader relief efforts and thus contribute to greater suffering and loss of life.

Telecommunications disruptions can also put emergency personnel at greater risk due to the lack of accurate and current situational information. A 2013 United Nations Report indicates that at least 300 firefighters in New York City lost their lives due to communication failures.

Potential Impact to Existing Structures

The delay or disruption of emergency response because of telecommunications disruptions can also result in greater than necessary damage to the built environment and infrastructure.

Potential Impact to Future Development

There has been a rapid growth in population and housing in the planning area in recent years. A larger population and more extensive built environment increase the risk of injury, loss of life, and damage should a serious and widespread telecommunications disruption occur.

In addition, development requires that vigilance is maintained in assuring that new areas of development are fully operational in terms of telecommunications. This issue was highlighted at the start of the Covid-19 Pandemic in the US when students and teachers were forced to go to classes online and students across the planning area had little or no cellular or internet access to continue their learning.

Hazard Summary by Jurisdiction

Areas outside major growth zones like Jefferson city, Taos and Wardsville are vulnerable to gaps in communication as the growth outruns communications expansion.

All of unincorporated Cole is at risk if commercial telecommunication systems were to go down. As the system expands and technology changes rural areas could be at risk for disruptions as current trends in tower blanketing could run into coverage roadblocks in the more rugged rural areas.

PROBLEM STATEMENT

All participating jurisdictions in the planning area are vulnerable to telecommunications disruption. The greatest threat for a serious telecommunications disruption is damage to the commercial telecommunications systems. Telecommunications towers are vulnerable to ice storms, damaging winds, tornadoes and terrorism. Commercial providers are often co-located on

these towers so damage to one tower can affect two or three providers. Underground telecommunication components are vulnerable to flooding and earthquakes.

Various federal programs and services, mutual aid agreements, and an active amateur radio organization in Cole County all help to ensure that communications for emergency services stay intact.

3.5.7 CYBER ATTACK

DESCRIPTION OF HAZARD

Cyber-attack is the targeting of computer systems and networks for malicious purposes. The rapid development and reliance on computers networks and the internet makes this threat a serious concern for government, business, and individuals.

Cyber-attacks are carried out for a variety of reasons: cyber-crime, espionage, political activism (“hacktivism”), and “just for fun”. Local governments are probably most vulnerable to hacktivists seeking to make a statement or individuals just set on disruption; disgruntled employees are a major concern for both government and business.

Location

The entire planning area is at risk from a cyber-attack. While some of the smaller local governments may not use their own networks to carry out local government functions, they still rely on other networked systems to support the health and safety of their citizens.

With that caveat in mind, the purplesec.us site indicates that social media faced the largest number of attacks (56%) followed by government (27%), industries (8%), retail (4%), and technology records (4). In addition, the 2014 statistics indicate the motivation behind the attacks as follows: cybercrime (56%), accidental loss (34%), malicious insider (7%), Hactivism (2%), unknown (1%).

Strength/Magnitude/Extent

There is a broad range of methods used for cyber-attacks. Some of the methods include:

- Phishing
- Malware
- Distributed Denial of Service (DDoS) – this attack floods an internet domain with large amounts of data thus either slowing its service for legitimate use or blocking it all together; often used to make a political statement to or about the owner of the domain
- Advanced Persistent Threat (APT) – this is a high level, coordinated attack which seeks to infiltrate and remain undetected on the target system; often used for corporate and intelligence espionage

Previous Occurrences

Cyber-attacks have been occurring since the very early days of the internet; one of the first known attacks, the Morris worm, took place in 1988. Since that time the number of attacks has increased exponentially and become a very serious concern for government, business, and individuals.

In 2014 alone, there were numerous major attacks on Target, J.P. Morgan, Home Depot, Staples, Healthcare.gov. The year 2015 began with the hacking of two social media accounts run by the U.S. military's Central Command; this was followed by the discovery of a huge breach at Anthem/Blue Cross-Blue Shield with the potential to affect an estimated 80 million customers and employees.

In the planning area, there were numerous DDoS attacks on state offices during the civil unrest associated with the shooting death of a black teenager by a police officer in Ferguson, Missouri, in August 2014.

In 2017 147.9 million consumers were affected by a breach at Equifax.

106 million records were stolen from Capital One in 2019 that contained personal and financial information.

Utility companies in the planning area have also reported numerous phishing attacks and scams targeting their customers.

Probability of Future Events

As more and more information and business is conducted online the more value there will be for hackers to attack and steal that information.

VULNERABILITY

Measure of Severity: Low to High

The severity of a cyber-attack varies depending upon the type of attack and the target. Some damage would be expected from any attack, as staff time and resources are required to deal with an attack and implement higher levels of security for the future.

Successful attacks targeting utilities or hospitals could potentially put public safety at risk, depending upon the type of attack(s) and the backup systems in place. The cascading effects from a serious attack could have wide-ranging impacts.

Potential Impact - Life

There is the potential for a threat to health and safety from a well-planned attack, or series of attacks, on a utility or hospital system.

Potential Impact - Existing Structures

At this point in time, most cyber-attacks have been focused on stealing information, damaging files or shutting down networks. However, there have been two confirmed cases of cyber-attacks which caused actual physical damage:

- Stuxnet, a computer worm discovered in 2010, is thought to be responsible for ruining about one-fifth of all the nuclear centrifuges in Iran.
- In 2014, hackers gained control of a blast furnace at a German steel plant and caused massive damage at the plant.

While these were high level attacks aimed at strategic targets, the developing capability to cause actual physical destruction is of great concern for the future.

Potential Impact - Future Development

As reliance on computer networks increases throughout the planning area, so does the threat of greater disruption of daily life and operations from cyber-attack. Continually updating security measures is vital but cyber criminals' methods and strategies continually evolve to meet new challenges. For this reason, it is extremely important to have backup systems and continuity of operations plans in place for all essential functions potentially disrupted by cyber-attack.

Existing Mitigation Activities:

Just as cyber threats are constantly evolving, mitigation approaches must evolve too. Some of the mitigation strategies currently used in the planning area are:

- Offsite backup of data
- Redundancy built into systems
- Secure server rooms
- Separation in the system between the operating system and the user access portion
- Due diligence in hiring employees
- Training and education of employees regarding cyber security
- Education of the general public on cyber security
- Disaster Recovery Plans and Continuity of Operations Plans
- Identity Theft Insurance for employees

FEMA offers courses on Cyber Security are offered at no cost to individuals and community leaders through SEMA.

SUMMARY OF VULNERABILITY

The entire planning area is vulnerable to cyber-attack in some fashion; it is an increasingly serious threat in the planning area, as it is throughout the developed world. It is important that local governments have both backup systems and continuity of operations plans in place to help mitigate the risk associated with this hazard.

3.5.8 UNWANTED INTRUDER/ACTIVE SHOOTER

DESCRIPTION OF HAZARD

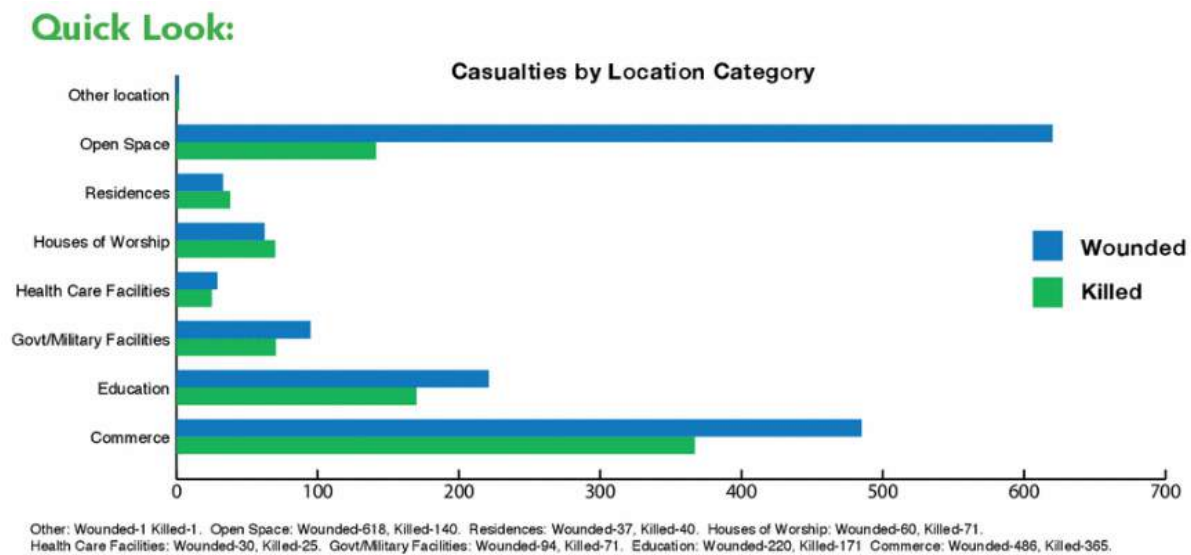
This section will focus primarily on active shooter information and data because at present these are the most common and most studied armed intruder events. However, a variety of destructive agents can and may be used by unwanted intruders intending to cause harm. It is important to keep this in mind when considering mitigation and prevention.

The United States government defines an active shooter as “an individual actively engaged in killing or attempting to kill people in a confined and populated area.” Some government agencies, such as the FBI, now reject the “confined” term in the definition as recent events show that active shooter events can take place in open areas and move between buildings.

Location

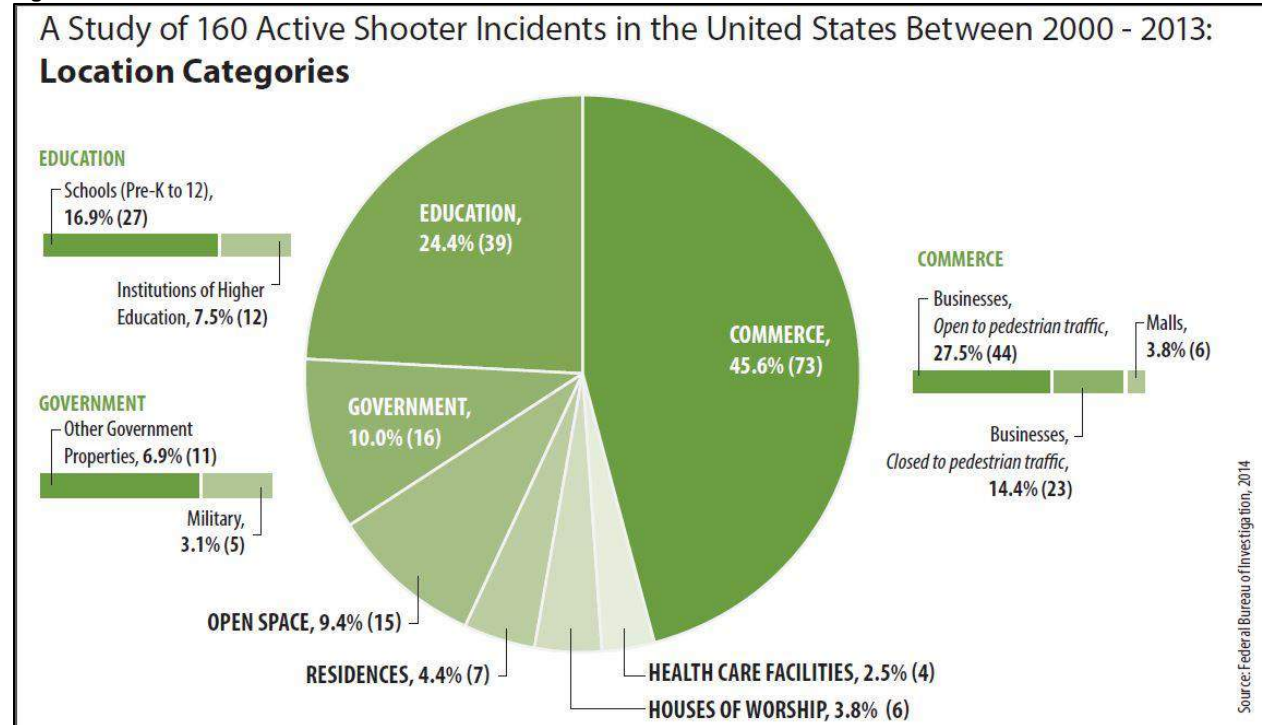
The entire planning area is at risk from an Unwanted Intruder/Active Shooter event. This is of particular concern for the school districts, colleges, and University who are responsible for large numbers of students and staff. However, an active shooter event can take place in any location. The FBI puts out studies and documents that look at active shooter situations across the U.S. The figure below comes from their “Active Shooter Incidents: Topical One-Pager, 2000-2018”.

Figure 3.11



The planning area is perhaps especially vulnerable to such events because of the location of the state government, with its multiple buildings and locations, in Jefferson City.

Figure 3.12



Strength/Magnitude/Extent

The 2013 FBI report had the following key findings regarding the nature of the active shooter events studied:

Evolution of the event -

- Active shooter incidents develop very rapidly. In 64 of the incidents where the duration could be determined, 69% of the incidents ended in 5 minutes or less with 36% of the incidents ending in 2 minutes or less.
- 67% of the events ended before police arrived and could engage the shooter
- In 28% of the incidents, law enforcement and the shooter exchanged gunfire
- In 13% of the incidents, unarmed individuals successfully and safely restrained the shooter.
- In 40% of the incidents, the shooters committed suicide

Characteristics of the shooter -

- 99% of the events involved a single shooter
- 96% of the events were carried out by men
- In incidents occurring in businesses closed to pedestrian traffic (23 incidents), all but one of the incidents were carried out by current or previous employees.
- In incidents in businesses open to pedestrian traffic and malls, the shooters generally had no relationship to the businesses.
- In high school and middle school incidents, the shooter was usually a student; the elementary school incidents did not involve a student at the school.

Previous Occurrences

An active shooter event took place in the planning area in 2003. On July 1 of that year, an employee shot and killed three co-workers and wounded five others at the Modine Manufacturing Company in Jefferson City. The shooter killed himself after driving to police headquarters and exchanging gunfire with officers.

Nationwide, the FBI study identified 277 active shooter events in the nation in the period 2000-2018. This was an average of 15.4 events per year.

Probability of Future Events – High

The location of state government in Jefferson City increases the likelihood of an armed intruder event in the planning area.

VULNERABILITY

Measure of Severity: High

During the period 2000-2013, 160 active shooter events in the U.S. resulted in 486 deaths and 557 injuries, according to the 2014 FBI study. (Shooter deaths were not included in these statistics.)

Potential Impact – Life

The main impact of active shooter events is the loss of and/or injury to human life. In addition, there is the psychological trauma experienced by all those directly involved in an event, by the families of those involved, and by the wider community.

Potential Impact - Existing Structures

Armed intruder events which include active shooting often involve some damage to buildings from the gunfire. In addition, a decision is often made after an event to either renovate areas where most of the incident took place or to totally demolish a building.

Potential Impact - Future Development

Public and commercial developments would be well-advised to consider mitigation for armed intruder events in the early stages of design; it is necessary to strike a balance between aesthetics and safety. Architects/engineering firms should be alerted to this necessity, if they are not already aware of the issue.

One of the biggest assistances to law enforcement when responding to an armed intruder event is the numbering of exterior doors and windows. This may be rejected by businesses on the basis of aesthetics. Education is needed in this area.

Hazard Summary by Jurisdiction

- A Civilian Response to Armed Intruders training course has been offered to the following:
 - Jefferson City city staff
 - Jefferson City Police Department (offered annually)
 - Jefferson City Public Schools
 - Some businesses in Jefferson City
- Training is beginning at some of the state agencies
- Active shooter and intruder response training for schools program was established by RSMo 170.315. The statute includes the following:

“...All school personnel shall participate in a simulated active shooter and intruder response drill conducted and led by law enforcement professionals....The training shall require each participant to know and understand how to respond in the event of an actual emergency on school property or at a school event...Public schools shall foster an environment in which students feel comfortable sharing information they have regarding a potentially threatening or dangerous situation with a responsible adult.”
- All school districts have some type of annual training
- Jefferson City Public Schools have a secure vestibule in each school through which visitors must enter.
- Lincoln University has emergency call boxes in all residential halls.

There are a variety of other mitigation and preparedness actions being used in educational institutions in the planning area.

Problem Statement

The entire planning area is vulnerable to an armed intruder event. While armed intruder event at educational institutions are most familiar to members of the general public, data indicates that over 75% of incidents actually occur outside of school settings. The prevention, mitigation, and preparedness activities in the planning area are addressing this reality through the widespread training of all emergency personnel and a widening focus beyond the schools.

There is still a need for more joint agency training on this issue and the resolution of some radio interoperability issues.

3.5.9 TERRORISM

DESCRIPTION OF HAZARD

The Federal Bureau of Investigation (FBI) defines terrorism as “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.”

The RAND Corporation, which has been compiling data on terrorism since 1968, provides the following definition for the acts included in its Database of Worldwide Terrorism Incidents (RDWTI):

Terrorism is defined by the nature of the act, not by the identity of the perpetrators or the nature of the cause; key elements include:

- Violence or the threat of violence
- Calculated to create fear and alarm
- Intended to coerce certain actions
- Motive must include a political objective
- Generally directed against civilian targets
- Can be a group or an individual

Terrorism can be perpetrated by either domestic or international/internationally-directed individuals or groups. International terrorism is an evolving threat which, due to recent events, has come into greater focus for local communities.

Location

The entire planning area is vulnerable to terrorism. Jefferson City, the largest population center, is the capital of the State of Missouri and houses numerous state government buildings. Major highway systems, allowing easy access, intersect in Jefferson City.

Large gatherings are a potential target for terrorists. There are numerous festivals and gatherings held in Jefferson City and also in some of the smaller communities.

Major pipelines, a potential target, run through the northern part of the planning area.

Strength/Magnitude/Extent

Terrorist acts can take many forms. Many of the methods of terrorism have been addressed separately in other sections of this plan: armed intruder incident, hazardous materials release causing a public health emergency, transportation incident, utility service disruption, telecommunications disruption, cyber-attack, and bombing causing a mass casualty/fatality event; civil unrest may generate terrorist acts. In addition, terrorist acts may take the form of arson, kidnapping, and assassination.

Previous Occurrences

There is a long history of terrorist acts, both domestic and international, in the United States. Domestic terrorist incidents have been perpetrated from both sides of the political spectrum and by religious groups, white supremacist groups, and disaffected individuals.

While not the first international terrorist incidents in the U.S., the 1993 bombing of the World Trade Center in New York City and subsequent Sept. 11, 2001 attacks brought international terrorism into the spotlight for the general public. Events following the 9/11 attacks ushered in a dramatic increase in global terrorism.

There have been no known terrorist attacks in the planning area.

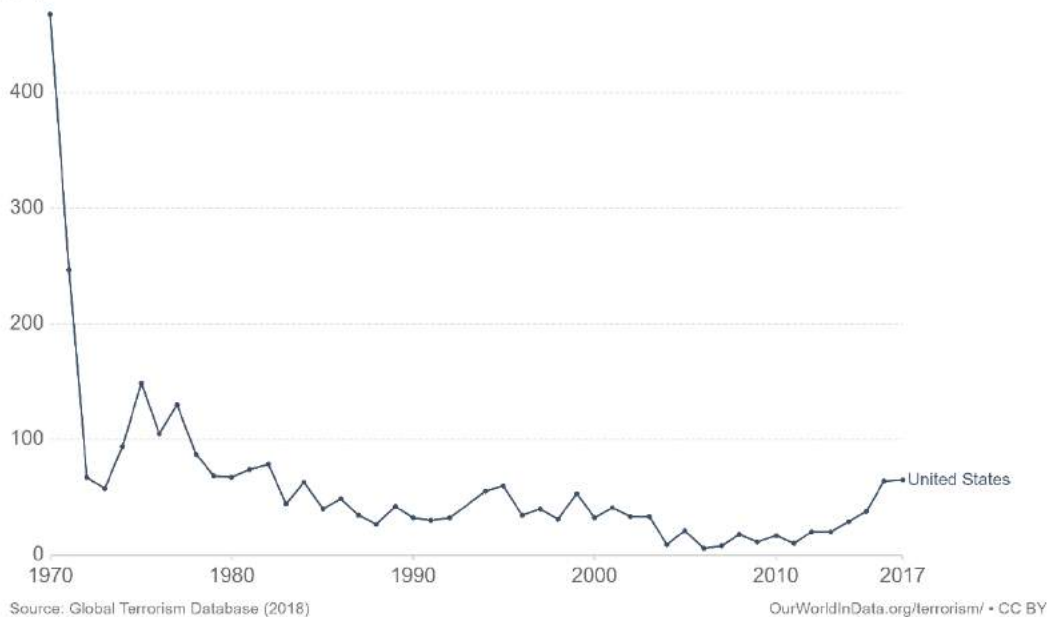
Probability of Future Events - Medium

While terrorism has been increasing dramatically worldwide since about 2004, incidents in the U.S. have actually declined since the 1990s, according to data from the Global Terrorism Database. The database, which was created by the Center for Terrorism and Intelligence Studies in collaboration with academic institutions and government agencies, currently has data available for the years 1970-2017.

Figure 3.13

Number of terrorist attacks, 1970 to 2017

The source defines a terrorist attack as: "the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation." The perpetrators of the incidents must be sub-national actors; data does not include acts of state terrorism.



VULNERABILITY

Measure of Severity – Low to High

While the potential for a terrorist attack is low in the planning area Jefferson City's role in the State Government and location at the crossroads of major transportation avenues make it a possible target. Damage to the road network running through Jefferson City could cause large delays in transportation of goods and services, not only in Central Missouri, but across the state and for the Central U.S. An attack on the capital could cause major disruptions in state government functions.

Potential Impact – Life

Terrorism is a serious threat to life. Even if a terrorist event is thwarted and does not result in injury or death, it is still a great psychological trauma for a population.

Potential Impact - Existing Structures

Terrorism is a serious threat to existing structures. Bombs have been and continue to be a frequent tactic of both domestic and international terrorists.

Potential Impact - Future Development

Future development could provide new structural targets for terrorism but, overall, does not really impact the threat.

Existing Mitigation Activities

Information gathering and surveillance of suspected terrorists are major mitigation actions for this hazard. However, due to the nature of the hazard, information on this type of mitigation is not publicly available. All mitigation activities in place in the planning area for hazards which might be used as tools by terrorists also serve as mitigation for this hazard.

The CCHD Emergency Operations Plan indicates that in the event of certain types of terrorism incidents, CCHD will coordinate public health assistance with local, state, and federal law enforcement agencies.

Problem Statement

Terrorism within the U.S. is a fairly rare event when looked at from the perspective of the size of the country. While terrorism has been dramatically increasing worldwide since about 2004, it has been declining in the U.S. since the 1990s. But terrorism is, by its nature and continual evolution, unpredictable. It can take many forms and all jurisdictions in the planning area are vulnerable.

Given that Jefferson City is the seat of state government for the State of Missouri, the planning area may be more vulnerable to this hazard than similar locales without state government offices. It is important to be aware of and monitor any potential threats on the local level.

3.5.10 CIVIL DISORDER

DESCRIPTION OF HAZARD

The rights of free assembly and free speech are protected under the U.S. Constitution. However, at times throughout history, such assemblies have turned destructive and violent; such behavior conflicts with the government’s role, outlined in the Preamble of the Constitution, to “promote domestic tranquility”. This transformation of a peaceful gathering to a violent crowd or mob is almost always preceded by some actual or perceived triggering event.

The Revised Statutes of MO, Section 574.070, define civil disorder as “any public disturbance involving acts of violence by assemblages of three or more persons, which causes an immediate danger of or results in damage or injury to the property or person of any other individual”.

Location

While the entire planning area is vulnerable to civil disorder, the following jurisdictions are the most probable locations: Jefferson City (the capital of the State of Missouri), Lincoln University and the school districts.

Strength/Magnitude/Extent

Civil disorder can range from minor infractions of law to large scale rioting.

Previous Occurrences

According to historical documents from the Missouri Highway Patrol, there was civil unrest on the campus of Lincoln University in 1969:

On May 12, over 200 members of the Patrol were called to Lincoln University in Jefferson City to help quell a disturbance on the campus. About 200 students refused to leave the Student Union until a list of demands was met by the administration. The demonstrators did leave voluntarily, however, when helmeted officers appeared and an injunction was read ordering them to vacate the premises. Later in the month, violence erupted once more when arson, sniper fire, and vandalism occurred on the campus. Troopers patrolled the campus for several days until the school term ended.

In 2014, there was prolonged civil unrest resulting in deaths, injuries, and destroyed property in Ferguson, Missouri, in the wake of the shooting death of a black teenager, Michael Brown, by a police officer. (Ferguson is located approximately 125 miles to the east of Jefferson City.)

Activists organized by the NAACP (National Association for the Advancement of Colored People) undertook a 7-day march from Ferguson to the State Capitol in Jefferson City to protest the shooting; a rally was held upon arrival at the Capitol. A small contingent of protestors, most probably not associated with the NAACP, blocked High Street in Jefferson City by lying down in the street. They were quickly dispersed by the Jefferson City Police SWAT team which had been activated prior to the event. (The Jefferson City Police Department had trained specifically for this march for a week before it took place.)

There were other incidents at Lincoln University after the Ferguson incident. Multiple police officers have been assaulted. In one case, an officer was pinned in his car with rocks being thrown. Cole County mobilized its SWAT team during this incident.

In 2020, protests across the country over the police killing of a man in Minneapolis brought small protests to the streets of Jefferson City. While protests elsewhere occasionally broke out in looting, riots, and the burning of local business, protest in Jefferson City remained calm and brief.

There have been other protests in Jefferson City in recent history where some level of civil disorder occurred. Notable among these were incidents with counter protestors at events organized by Neo-Nazis and the Westboro Baptist Church.

Probability of Future Events – High for Jefferson City and Lincoln University

Low for other participating jurisdictions

There have been numerous incidents of some level of civil disorder in the planning area in the recent past, specifically in Jefferson City and at Lincoln University. Given the location of the State Capitol and state government offices in Jefferson City, it is reasonable to expect the same in the future.

VULNERABILITY

Measure of Severity – Low to High

There is a large range of impacts which could occur with civil disorder based on many variable factors. Some disturbances might result in minor infractions/property damage while large disturbances can result in major injuries, death, extensive property damage, high economic losses and high emergency management costs.

Potential Impact - Life

Civil disorder poses a risk of injury and possibly even death in large scale rioting.

Potential Impact - Existing Structures

There is the potential for significant damage to buildings and property from civil disorder which becomes violent. Economically, training and preparation for possible civil disorder requires time and funding from law enforcement agencies.

Potential Impact - Future Development

Development, in and of itself, should not impact civil unrest. However, it is very important that citizens feel they have a voice in any development which will impact their lives and homes. Unfair treatment, real or perceived, could become a triggering event for civil unrest.

Existing Mitigation Activities

The planning area is well prepared for a multi-agency response should civil unrest pose a threat. Some of the preparation includes:

- The Jefferson City Police Department, Cole County Sheriff's Department, and Lincoln University Police Department train yearly on civil disobedience and riot control.
- The Jefferson City SWAT Team trains once a year.
- There is multi-agency training before any announced event.
- Both the Jefferson City and Lincoln University Police Departments have invested in riot gear.

Problem Statement

The historical record indicates that civil disorder can be expected in the planning area. While all the jurisdictions are vulnerable to civil disorder, Jefferson City, Lincoln University and the school districts are the most vulnerable to this hazard.

The planning area takes the potential for civil disorder seriously; the law enforcement agencies train regularly and have purchased riot gear.

3.5.11 MASS CASUALTY/FATALITY EVENT

DESCRIPTION OF HAZARD

Mass casualty/fatality is a potential cascading effect from many of the hazards profiled in this plan. Notably, an earthquake, damaging winds, tornado, public health emergency, transportation incident, armed intruder, terrorism, and civil disorder have the potential to cause mass casualties/fatalities in the planning area.

Vehicular accidents are another potential cause of a mass casualty/fatality event. Three major highways (U.S. 54, U.S. 50, and U.S. 63) intersect in Jefferson City. Busloads of schoolchildren and other tourist groups come to visit the state capital in Jefferson City on a regular basis. In addition, Highway 54 is a major route leading south to the Lake of the Ozarks, a popular vacation destination, and other areas.

Mass casualty/fatality is being profiled as its own event to allow for specific analysis of potential effects of multiple injury/loss of life in the planning area and mitigation for the hazard itself.

Location

The entire planning area is vulnerable to a mass casualty/fatality event.

Strength/Magnitude/Extent

The term “extent” is meaningless for a mass casualty/fatality event by the definition used in this plan which is “an attribute of the hazard alone ... (which) does not include its effect on humans”. By definition, a mass casualty/fatality event has affected humans.

Previous Occurrences

Four people died and five were wounded in an active shooter event at a manufacturing company in Jefferson City in July 2003.

During the Covid-19 Pandemic medical centers prepared for an influx of coronavirus patients from all over the region. Luckily, they did not see crippling levels of patients.

VULNERABILITY

Measure of Severity – High

The entire jurisdiction is vulnerable to mass casualties. A major accident strains emergency personnel in the vicinity of the accident, road crews if a road is shut down or damaged, and the medical professionals who have to triage and help those coming in injured. Jurisdictions where medical and first responder facilities are located and well-traveled roads that run through towns or blind intersections are vulnerable to mass casualties.

Potential Impact – Life

By definition, a mass casualty/fatality event has caused injury and/or loss of life. In analyzing further effects of mass casualties/fatalities, the psychological effect is paramount. In addition to traumatic shock to the population as a whole, those who have lost loved ones will be dealing with grief and potential loss of income for life maintenance. There will be a great need for a variety of types of support for those directly affected.

Potential Impact - Existing Structures

Mass casualty/fatality events are not a threat to infrastructure although there may have been structural damage from the precipitating incidents. However, mass casualty/fatality events do put a strain on emergency and medical personnel/facilities.

Potential Impact - Future Development

As populations grow and increase in density, it is important that supporting infrastructure and services increase accordingly; this is important at all times but lack of appropriate balance will be highlighted in times of extreme duress such as mass casualty/fatality events.

Existing Mitigation Activities

All of the mitigation activities for the other hazards in this plan help to mitigate mass casualty/fatality events. Specific mitigation for mass casualty events includes:

- Cole County Emergency Services has a fully equipped mass casualty trailer
- Local hospitals in Jefferson City are equipped to set up field services teams
- Cole County Emergency Medical Services, an Advanced Life Support Ambulance service, serves the planning area from five locations
- Extensive training of emergency personnel in mass casualty, mass care, sheltering, and other areas
- Availability of morgue space in a cooler at Cole County Emergency Services and MOUs with local businesses for provision of refrigerated trucks, if and when needed
- The State of Missouri is prepared to bring in body bags, if and when needed
- Numerous mental health and behavioral resources in the planning area to assist with resulting psychological trauma and stress

Problem Statement

Mass casualty/fatality events are a fairly uncommon occurrence in the planning area but all participating jurisdictions are vulnerable to such events. Historically, the majority of mass casualty/fatality events have been related to vehicular accidents on roads and highways. However, many of the hazards profiled in this plan could cause mass casualties or fatalities; mitigation for those hazards also helps to mitigate for these events.

Chapter 4: Mitigation Strategy

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Chapter 4: Mitigation Strategy

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

This section presents the mitigation strategy updated by the Mitigation Planning Committee based on the updated risk assessment. The following definitions are taken from FEMA's *Local Hazard Mitigation Review Guide* (October 1, 2012)

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

The original Project Steering Committee (2003-2004) was charged with developing a comprehensive range of mitigation actions to promote the agreed upon mitigation goals. Objectives were defined under each goal and the mitigation actions were then developed to promote each objective. The following six categories of mitigation were considered in developing the mitigation actions:

- **Prevention tools** - regulatory methods such as planning and zoning, building regulations, open space planning, land development regulations, and storm water management.
- **Property protection measures** - acquisition of land, relocation of buildings, modifying at-risk structures, and flood proofing at-risk structures.
- **Natural resource protection** - erosion and sediment control or wetlands protection.
- **Emergency services measures** – warning systems, response capacity, critical facilities protection, and health and safety maintenance.
- **Structural mitigation** - reservoirs, levees, diversions, channel modifications and storm sewers.
- **Public information** - providing hazard maps and information, outreach programs, real estate disclosure, technical assistance and education.

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.

The hazard mitigation goals first developed during the 2003-2004 planning process were updated in 2016 to reflect the inclusion of technological and human-made disasters in the mitigation plan. The planning committee chose to not change the goals for this update as they felt they were still feasible and relevant to challenges facing the planning area. The five county hazard mitigation goals for the Cole County/Jefferson City Hazard Mitigation Plan (2021) are:

- Goal 1: Mitigation Planning – Mitigate effects of future natural, man-made, and technological hazards throughout the County through public and private cooperation.
- Goal 2: Mitigation Policy – Develop policies that limit the impact of natural, man-made, and technological hazards on lives and property.
- Goal 3: Mitigation Programs – Implement cost effective and feasible mitigation programs to protect lives and property of Cole County jurisdictions.
- Goal 4: Public Awareness – Increase public awareness of natural, man-made, and technological hazards in order to make the public a greater partner in hazard mitigation planning.
- Goal 5: Future Development – Promote natural, man-made, and technological hazard-proof development in the jurisdictions of Cole County.

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.

Update of Mitigation Actions

The Planning Committee were given lists of their previous action items at meeting #2 to be reviewed and evaluated. They were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction. They were also provided a link to the FEMA's publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)*. This document was developed by FEMA as a resource for identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters. In order to ensure that there was a comprehensive mitigation approach to each hazard the MPC reviewed 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 assessments, including the problem statements concluding each hazard profile and vulnerability analysis,
- State priorities established for HMA grants, and
- Public input during meetings, responses to data collection questionnaires, and other efforts to involve the public in the plan development process.

Meeting #3 of the 2021 update, the actions in the plan were reviewed by the planning committee and categorized as follows:

- Completed with a description of the progress.
- Remove-some uncompleted actions were removed from the strategy action plan for various reasons.
- On-going with a description of the progress.

Many of the 2016 actions were kept in the 2021 strategy action plan either because they have not yet been completed or because they are ongoing actions which the committee wanted to highlight in the overall plan.

Table 4.1 Action Status Summary

Jurisdiction	Completed Actions	Continuing Actions (ongoing or modify)	Deleted Actions
Cole County	4	5	19
Jefferson City	3	31	8
Centertown	0	2	0
Lohman	0	2	0
Russellville	0	5	5
St. Martins	1	5	3
Taos	1	6	3
Wardsville	0	2	8
Blair Oaks SD	0	2	4
Cole R-1	0	2	0
Cole R-V	0	2	4
JC Public Schools	0	2	4
Lincoln University	0	3	3

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

Completed Actions	Completion Details (date, amount, funding source)
Cole-Hotel Tornado Safety Education	Health Dep. Inspection for information on tornado sheltering
Cole-Debris Removal Plan	Put together regional debris removal plan
Cole-Add flood warning signs	All low water crossings have signs
Cole-Building codes	Building codes adopted and enforced through permit process
Jc-alternative water supply for fire/water dist.	Mutual aid agreements
Jc-road access above floodplain	Ordinance requirement

Jc-Building codes	Building codes adopted and enforced through P&Z
St. Martins	Building codes adopted and enforced
Taos-Land Use Code for dam failure	Added land use information to zoning process
Deleted Actions	Reason for Deletion
55	Actions were deleted due to them being required tasks and not mitigation items.
6	Actions were deleted due to them being infeasible.

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

4.3 Implementation of Mitigation Actions

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

Jurisdictional MPC members were encouraged to meet with members of their community to finalize actions to be submitted for the updated mitigation strategy. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The committee was asked to take this into account when discussing actions for their jurisdiction. It was decided that projects will be prioritized by when and where damage occurs, available funding, and political will. Details of projects at the planning stage are not in-depth benefit/cost reviews and further details will be refined as there is project development.

STAPLEE AND BENEFIT/COST REVIEWS

STAPLEE Review – The process for selecting and prioritizing action items did not change for the update. The Planning Committee conducted a STAPLEE review of the ongoing and possible new mitigation actions using key questions for each of the STAPLEE categories:

Table 4.3 Blank STAPLEE Worksheet

STAPLEE Worksheet		
Name of Jurisdiction:		
Action or Project		
Action/Project Number:	Insert a unique action number for this action for future tracking purposes. This can be a combination of the jurisdiction name, followed by the goal number and action number (i.e. Joplin1.1)	
Name of Action or Project:		
Mitigation Category:	Prevention; Structure and Infrastructure Projects; Natural Systems Protection; Education and Outreach; Emergency Services	
STAPLEE Criteria	Evaluation Rating	Score
	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0	
S: Is it Socially Acceptable		
T: Is it Technically feasible and potentially successful?		
A: Does the jurisdiction have the Administrative capacity to execute this action?		
P: Is it Politically acceptable?		
L: Is there Legal authority to implement?		
E: Is it Economically beneficial?		
E: Will the project have either a neutral or positive impact on the natural Environment ?		
Will historic structures be saved or protected?		
Could it be implemented quickly?		
STAPLEE SCORE		
Mitigation Effectiveness Criteria	Evaluation Rating	Score
Will the implemented action result in lives saved?	Assign from 5-10 points based on the likelihood that lives will be saved.	
Will the implemented action result in a reduction of disaster damages?	Assign from 5-10 points based on the relative reduction of disaster damages.	
MITIGATION EFFECTIVENESS SCORE		
TOTAL SCORE (STAPLEE + Mitigation Effectiveness)		
<input type="checkbox"/> High Priority (30+ points)	<input type="checkbox"/> Medium Priority (25 - 29 points)	<input type="checkbox"/> Low Priority (<25 points)

Completed by
(Name, Title, Phone Number) _____

After the actions were evaluated, the following formula was used to calculate the percentage of points scored out of points available for each individual action: % score = (total points/total of applicable criteria) * 100

Benefit/Cost Review

The benefit of each action was evaluated by awarding two (2) points for each of the following *avoided* damages (8 points maximum = highest benefit):

- Injuries and/or casualties (IC)
- Property damages (PD)
- Loss-of-function (LF) – includes loss of utility services, impact of road/bridge closures, loss of income, cost of displacement
- Emergency management costs/community costs (EM)

The cost of each action was according to the following scale (-4 points maximum = highest cost):

- Already in place or easily put into work program (-1)
- Low/moderate cost – could be worked into operating budget (-2)
- Moderate/high cost –help with funding possibly needed depending on specifics of project (-3)
- High cost – outside help with funding definitely needed (-4)

Prioritization

The Planning Committee reviewed the % STAPLEE score and benefit/cost review for all of the actions and prioritized them according to the following scale:

- High – Work should begin as soon as possible; action should be accomplished in the next 5 years
- Medium – Work could begin within the next 5 years, if time and resources allow
- Low – Long-range goal, if time and resources allow; work within the next 5 years is possible but not probable

It was understood that some of these priorities might be changed by the individual jurisdictions due to funding or staffing constraints as they developed their plans for action implementation.

It should be noted that a number of high priority actions scored somewhat low on both the STAPLEE review and the benefit/cost review due to their high cost which figures into both reviews. These actions remain a high priority with the hope that funding will become available. The mitigation actions suggested for the specific participating jurisdictions were handed over to the representatives or governing bodies of those jurisdictions for implementation and administration decisions.

It was recognized that participating jurisdictions might choose to either change the prioritization of or exclude some suggested mitigation actions based on current specifics of time, resources, and capabilities. In addition, new mitigation actions might be added based on specific issues.

The mitigation actions for which each participating jurisdiction is the lead are shown in the following pages. The Cole County Office of Emergency Management is the lead on many actions which mitigate hazards for the entire planning area.

COLE COUNTY

Action Worksheet	
Name of Jurisdiction	Cole County
Risk / Vulnerability	
Hazard(s) Addressed	Wildfire/winter storm/tornado
Problem Being Mitigated	Alternate Power Supply
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.1.1
Name of Action or Project	Critical facilities Alternate Power
Action or Project Description	ensure generators and hookup equipment are purchased as funding is available for critical facilities such as police, fire, water, etc. American Water has a system and can supply water to other areas with placed valving systems to other districts if needed.
Estimated Cost	\$100,000 to \$500,000
Benefits	I/C PD,LF, EMCC
Plan for Implementation	
Responsible Organization / Department	EMC
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	Private
Local Planning Mechanism to be Used	Grants
Action Status	
Status	Ongoing-modified
Report on Progress	
Completed By	

Action Worksheet	
Name of Jurisdiction	Cole County
Risk / Vulnerability	
Hazard(s) Addressed	All Hazards
Problem Being Mitigated	Preparedness during disaster
Action or Project	
Applicable Goal Statement	1
Action/Prj. #	1.1.2
Name of Action or Project	Update COOP plan
Action or Project Description	Hold informational meeting to discuss importance of COOP, current status of continuity planning in various departments and encourage each department to develop a thorough plan.
Estimated Cost	Less than \$10,000
Benefits	I/C PD,LF, EMCC
Plan for Implementation	
Responsible Organization / Department	Cole County/Jefferson City EMA
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	3-5 years
Potential Funding Source	Internal
Local Planning Mechanism to be Used	
Action Status	
Status	Ongoing
Report on Progress	
Completed By	

Action Worksheet	
Name of Jurisdiction:	Cole County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding
Problem being Mitigated:	Prevents development in floodplain
Action or Project	
Applicable Goal Statement:	2
Action/Project Number:	1.1.3
Name of Action or Project:	NFIP continued compliance
Mitigation Category:	Prevention
Action or Project Description:	Enforce floodplain management requirements, regulate new construction in the SFHAs, floodplain identification for mapp.
Estimated Cost:	\$0
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Resource Management Dept.
Supporting Organization/Department:	
Action/Project Priority:	High
Timeline for Completion:	Ongoing
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinance.
Progress Report	
Action Status:	Ongoing
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Cole County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding
Problem being Mitigated:	Prevents road flooding
Action or Project	
Applicable Goal Statement:	2
Action/Project Number:	1.1.4
Name of Action or Project:	Stormwater Management Ordinance
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Adopt new regulation to comply with national storm water mandate requirements in defined urban areas.
Estimated Cost:	\$0
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Public Works Dep.
Supporting Organization/Department:	
Action/Project Priority:	High
Timeline for Completion:	Ongoing
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	This is an ongoing activity within the Planning and Building Department.
Progress Report	
Action Status:	Ongoing
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Cole County
Risk / Vulnerability	
Hazard(s) Addressed:	Road building on dams
Problem being Mitigated:	Dam failure
Action or Project	
Applicable Goal Statement:	2
Action/Project Number:	1.1.5
Name of Action or Project:	Roads on Dams
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Adoption of MO DNR and FEMA recommendations for infrastructure located on lake dams.
Estimated Cost:	\$0
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Public Works Dep.
Supporting Organization/Department:	
Action/Project Priority:	High
Timeline for Completion:	Ongoing
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	This is an ongoing activity within the Planning and Building Department.
Progress Report	
Action Status:	Ongoing
Report of Progress:	

Village of Centertown

Action Worksheet	
Name of Jurisdiction:	Centertown
Risk / Vulnerability	
Hazard(s) Addressed:	Tornadoes
Problem being Mitigated:	Water distribution
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.2.1
Name of Action or Project:	Backup water supplies
Mitigation Category:	Prevention;; Emergency Services
Action or Project Description:	Develop distribution backup water system that interconnects with an established distribution system.
Estimated Cost:	\$500,000 to \$1,000,000
Benefits:	ensure clean drinking water to the village
Plan for Implementation	
Responsible Organization/Department:	Village of Centertown Waterworks
Action/Project Priority:	H
Timeline for Completion:	3-5 years.
Potential Fund Sources:	HMA, BRIC.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	new
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Centertown
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding (Riverine and Flash)
Problem being Mitigated:	Stormwater capacity issue
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.2.2
Name of Action or Project:	alley way resurfacing
Mitigation Category:	Prevention; Emergency Services
Action or Project Description:	Resurface or elevate alley way to prevent stormwater erosion damage, or upgrade to larger culvert.
Estimated Cost:	\$100,000 to \$500,000
Benefits:	mitigates flash flood damage
Plan for Implementation	
Responsible Organization/Department:	Village of Centertown
Action/Project Priority:	High
Timeline for Completion:	3-5 years
Potential Fund Sources:	HMA, BRIC
Local Planning Mechanisms to be Used in Implementation, if any:	Cole Co Road Repair / sales tax from gasoline
Progress Report	
Action Status:	new
Report of Progress:	

Jefferson City

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	Structure flooding due to non-compliance
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.1.3
Mitigation Category	Prevention
Name of Action or Project	NFIP continued compliance
Action or Project Description	Enforce floodplain management requirements, regulate new construction in the SFHAs, floodplain identification for mapping.
Estimated Cost	Little or no cost
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	Other
Potential Funding Source	City
Local Planning Mechanism to be Used	Storm water Regulations
Action Status	
Status	KEEP - Ongoing
Report on Progress	City is reviewing facilities and properties for accordance with floodplain regulations and NFIP compliance.

Completed By	
Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	Reduction of impacts on drainage structures and critical infrastructure.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.2
Name of Action or Project	Stabilize soils in flood prone areas.
Action or Project Description	Stabilize soils in flood prone areas.
Estimated Cost	Over \$1,000,000
Benefits	Avoidance of the following: Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	Bonds, FEMA Grants
Local Planning Mechanism to be Used	Stormwater Regulations
Action Status	
Status	KEEP - Modify
Report on Progress	Progress includes stabilization of multiple transportation, wastewater, and stormwater structures.
Completed By	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Severe Winter Weather, Severe Thunderstorms, Tornadoes, Levee Failure, Dam Failure, Earthquakes
Problem Being Mitigated	Organization and efficient Debris cleanup after storm events.
Action or Project	
Applicable Goal Statement	1
Action/Prj. #	1.3.3
Name of Action or Project	Develop a Debris Removal Plan.
Action or Project Description	Develop a Debris Removal Plan.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	Internal Budget
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	KEEP - Not Started
Report on Progress	An official plan has not been adopted but components of a plan exist due to recent tornado and flood events

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes
Problem Being Mitigated	Need for education and awareness.
Action or Project	
Applicable Goal Statement	4
Action/Prj. #	1.3.4
Name of Action or Project	Encourage local hotels/motels have a plan in place regarding proper emergency procedures.
Action or Project Description	Inspection staff provides support in development of plans
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage.
Plan for Implementation	
Responsible Organization / Department	Fire
Action / Project Staplee Score / Priority	M
Timeline for Completion	1 year
Potential Funding Source	Local Businesses
Local Planning Mechanism to be Used	Incorporate as part of inspection process or development process
Action Status	
Status	KEEP - Modify
Report on Progress	No official program has been implemented. Staff would like to create a more consistent program for achieving this action. Language updated.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes, Earthquakes
Problem Being Mitigated	Needs for more certified staff
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.5
Name of Action or Project	SAVE Coalition staff training so qualified staff can assist in emergency inspecting and evaluating the safety of buildings after a disaster.
Action or Project Description	Enroll staff in necessary Certification trainings
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works / Planning
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	2-3 years
Potential Funding Source	Internal Budget
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	KEEP - Modify
Report on Progress	Some staff have been certified, but there is a desire by city to increase training and participation. Language updated.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	Staying current with adopted code.
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.3.6
Name of Action or Project	Update flood damage prevention ordinance as flood maps are revised.
Action or Project Description	Staff will review and update flood damage prevention ordinances as flood maps are revised.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	H
Timeline for Completion	3-5 years
Potential Funding Source	FEMA Grants/City
Local Planning Mechanism to be Used	Stormwater Regulations
Action Status	
Status	KEEP - Modify
Report on Progress	No new maps have been release, which would trigger this to occur. Language updated.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	private property flash flooding and damages associated with flash flooding.
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.7
Name of Action or Project	Develop a program or policy to assist private property owners in making their properties compliant with current stormwater codes.
Action or Project Description	Staff will develop a program or policy to assist private property owners in making their properties compliant with current stormwater codes.
Estimated Cost	\$10,000 to \$50,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	1 year
Potential Funding Source	FEMA Grants/City
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	KEEP - Modify
Report on Progress	Some education does exist, but there is a need for a defined program or policy to achieve this action. Language updated.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes, Wildfire, Earthquakes
Problem Being Mitigated	Injury and structural damage during storms/earthquakes
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.3.8
Name of Action or Project	Adopt current model building codes and national engineering standards according to ISO standards.
Action or Project Description	Staff will review and recommend adoption of pertinent codes.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning / Fire
Action / Project Staplee Score / Priority	M
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Adopted City Codes
Action Status	
Status	KEEP - Modify
Report on Progress	Some 2018 codes have been adopted. New codes take multiple years to be published, vetted, and adopted. Language updated.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash), Levee Failure, Dam Failure
Problem Being Mitigated	Rapid inundation hampers response time.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.9
Name of Action or Project	Monitor public infrastructure for any flooding issues and mitigate as needed.
Action or Project Description	Staff will monitor and mitigate as needed.
Estimated Cost	\$500,000 to \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	City
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	KEEP - Ongoing
Report on Progress	Part of regular operations, but funding is necessary to properly mitigate. Staff continues to monitor.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All Hazards
Problem Being Mitigated	Destruction of essential equipment
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.10
Name of Action or Project	Require the bracing of high value equipment such as furnaces, water heaters, and above ground tanks.
Action or Project Description	Staff will provide technical assistance as needed and/or requested.
Estimated Cost	Little or no cost
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning / Fire
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Incorporate as part of inspection process or development process
Action Status	
Status	KEEP - Ongoing
Report on Progress	Some education does exist, but there is a need for a defined program, policy, or code change to achieve this action. Staff provides input as requested or needed on a case by case basis.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All Hazards
Problem Being Mitigated	Power outage during inclement weather
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.11
Name of Action or Project	Install alternate and/or backup power at all critical infrastructure and facilities such as police, fire, hospitals, utilities, and local government buildings.
Action or Project Description	Inventory current capacities and install backup or alternate power as needed.
Estimated Cost	\$100,000 to \$500,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works / Planning / Fire
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	Grants, internal funds
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	KEEP - Modify
Report on Progress	Many facilities and infra-structure has been provided back-up or alternative power including City Hall and several fire stations. Language updated.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Wildfire
Problem Being Mitigated	Damages by fire
Action or Project	
Applicable Goal Statement	4
Action/Prj. #	1.3.12
Name of Action or Project	Develop an education program or initiative about removal of vegetation and combustible materials around homes, businesses, and critical infrastructure using information from Firewise.org.
Action or Project Description	Staff will implement an education program.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Fire
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	1 year
Potential Funding Source	City/Private
Local Planning Mechanism to be Used	Incorporate as part of inspection process or development process
Action Status	
Status	KEEP - Ongoing
Report on Progress	Some education does exist, but there is a need for a defined program or policy to achieve this action. More education is promoted during red flag conditions.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes
Problem Being Mitigated	Injuries to people camping
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.3.13
Name of Action or Project	Require camping and RV facilities and mobile home parks to have safe rooms on the premises.
Action or Project Description	Staff will provide technical assistance as needed and/or requested as well as assist in pursuit of funding.
Estimated Cost	\$500,000 to \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning / Fire / EMD
Action / Project Staplee Score / Priority	H
Timeline for Completion	3-5 years
Potential Funding Source	Businesses
Local Planning Mechanism to be Used	Incorporate as part of inspection process or development process
Action Status	
Status	KEEP - Ongoing
Report on Progress	Some education does exist, but there is a need for a defined program or policy to achieve this action. Need still exists to improve awareness and assist with accessing funding.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes
Problem Being Mitigated	Need for safe rooms or hardened facilities to protect life and protect capabilities.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.14
Name of Action or Project	Construction of tornado safe rooms or hardened facilities that meet FEMA standards.
Action or Project Description	Construct tornado safe rooms or hardened facilities that meet FEMA standards.
Estimated Cost	Over \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning / Fire
Action / Project Staplee Score / Priority	H
Timeline for Completion	3-5 years
Potential Funding Source	FEMA/Private
Local Planning Mechanism to be Used	EOP
Action Status	
Status	KEEP - Modify
Report on Progress	New highschool includes FEMA standard hardening. Old highschool included some hardening. A need for funding still exists in the community. Language changed in regard to FEMA standards and hardening

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flood
Problem Being Mitigated	Need for education and awareness of the potential dangers of flash flooding.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.15
Name of Action or Project	Install new flood warning signs at known flooding locations.
Action or Project Description	Post signs as needed.
Estimated Cost	\$10,000 to \$50,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	City/County
Local Planning Mechanism to be Used	Stromwater Regulations
Action Status	
Status	KEEP - Ongoing
Report on Progress	Some new signs have been installed due to annexation and resent flooding events. New signs are being installed.

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All Hazards
Problem Being Mitigated	Emergency access is imperative to function of government.
Action or Project	
Applicable Goal Statement	1
Action/Prj. #	1.3.16
Name of Action or Project	Develop a plan for emergency access to public facilities.
Action or Project Description	Staff will develop a plan for emergency access to public facilities.
Estimated Cost	\$10,000 to \$50,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works/ Fire/ EMD
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City/County
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	Broadway street is a main transportation collector for down town and state government access.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.17
Name of Action or Project	Elevate Broadway street to provide access to downtown and seat of state government.
Action or Project Description	Raise the grade of Broadway street to 1 foot above BFE.
Estimated Cost	\$500,000 to \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works/ State
Action / Project Staplee Score / Priority	High
Timeline for Completion	More than 5 years
Potential Funding Source	FEMA Grants/City/State Funds
Local Planning Mechanism to be Used	City/County Sales Tax
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All hazards
Problem Being Mitigated	Many structures and properties were constructed prior to current code regulations.
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.18
Name of Action or Project	Provide technical assistance to property owners in constructing or rehabilitating properties to be more resilient to all hazards.
Action or Project Description	Staff will provide technical assistance to property owners as needed or requested.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning/Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Incorporate as part of inspection process or development process
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash), Dam Failure
Problem Being Mitigated	Need for more staff certifications
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.19
Name of Action or Project	Ensure that an adequate amount of trained staff is available for swift water response.
Action or Project Description	Provide staff with the training necessary to receive certification.
Estimated Cost	\$10,000 to \$50,000
Benefits	Avoidance of the following: Injuries/Casualties, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Fire/Police
Action / Project Staplee Score / Priority	H
Timeline for Completion	2-3 years
Potential Funding Source	City/Grants
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash), Dam Failure
Problem Being Mitigated	Need for education and awareness about availability of flood insurance.
Action or Project	
Applicable Goal Statement	4
Action/Prj. #	1.3.20
Name of Action or Project	Encourage property owners outside of the regulatory floodplain to purchase flood insurance by using Floodfactor.com or other tools.
Action or Project Description	Staff will provide technical assistance to property owners as needed or requested.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning/Public Works
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	City
Local Planning Mechanism to be Used	Incorporate as part of inspection process, development process, or public education campaign
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Dam Failure
Problem Being Mitigated	For the safety of those downstream, dams must be inspected and compliant with state regulations.
Action or Project	
Applicable Goal Statement	1
Action/Prj. #	1.3.21
Name of Action or Project	Require dams be inspected in accordance with State law.
Action or Project Description	Staff will comply with timely inspections.
Estimated Cost	Little or no cost
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	City/State
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	New
Report on Progreass	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	Existing structure has reached the end of its service life. It is the only access downtown and state government during major flood events.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.22
Name of Action or Project	Replace or rehabilitate the High Street viaduct to maintain access to downtown and seat of state government.
Action or Project Description	Replace or rehabilitate the High Street viaduct.
Estimated Cost	Over \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	More than 5 years
Potential Funding Source	FEMA Grants/City/State Funds
Local Planning Mechanism to be Used	City/County Sales Tax
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding (Riverine and Flash)
Problem Being Mitigated	Multiple privately owned repetitive loss properties exist in the city.
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.23
Name of Action or Project	Fund buyout of repetitive loss properties and/or properties in the floodplain as needed.
Action or Project Description	Buyout repetitive loss properties as needed.
Estimated Cost	\$500,000 to \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning
Action / Project Staplee Score / Priority	H
Timeline for Completion	3-5 years
Potential Funding Source	FEMA Grants/City/State Funds
Local Planning Mechanism to be Used	Stormwater Regulations
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All hazards
Problem Being Mitigated	Need for more efficient virtual technology.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.24
Name of Action or Project	Install technology and provide training for staff to ensure all public meetings can be held via virtual access during hazard events.
Action or Project Description	Install technology and provide training for staff as needed.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	All City Departments
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	FEMA Grants/City/State Funds
Local Planning Mechanism to be Used	Internal City Planning
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All hazards
Problem Being Mitigated	Need for more staff certification and training.
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.3.25
Name of Action or Project	Require all staff complete FEMA ICS 100 and 200 training.
Action or Project Description	Create a training program.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	All City Departments
Action / Project Staplee Score / Priority	M
Timeline for Completion	1 year
Potential Funding Source	City
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All hazards
Problem Being Mitigated	Need for public education and awareness.
Action or Project	
Applicable Goal Statement	4
Action/Prj. #	1.3.26
Name of Action or Project	Engage the citizenry to fully participate in Smart911
Action or Project Description	Promote existing program for public education and awareness.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Emergency Management
Action / Project Staplee Score / Priority	High
Timeline for Completion	1 year
Potential Funding Source	City/County/State
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All hazards
Problem Being Mitigated	Need for enhanced fire suppression.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.27
Name of Action or Project	Install fire suppression systems in low and/or moderate income multi-family housing.
Action or Project Description	Install or provide technical assistance in the installation of fire suppression systems.
Estimated Cost	\$500,000 to \$1,000,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Fire
Action / Project Staplee Score / Priority	High
Timeline for Completion	More than 5 years
Potential Funding Source	FEMA Grants/City
Local Planning Mechanism to be Used	Incorporate as part of inspection process, development process, or public education campaign
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	All hazards
Problem Being Mitigated	Need for enhanced fire suppression.
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.28
Name of Action or Project	Identify areas for improved water supply access for fire suppression.
Action or Project Description	Identify areas for improved water access beyond 1000 feet from a credited water source.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Fire
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	flooding
Problem Being Mitigated	Stormwater backups
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.29
Name of Action or Project	Stormwater development
Action or Project Description	Continue development of storm water programs and ensure adequate maintenance of drainage systems.
Estimated Cost	Low
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	In progress
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding
Problem Being Mitigated	Flash Flooding
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.3.30
Name of Action or Project	Culvert Maintenance
Action or Project Description	Maintain bridge and culvert standards to prevent debris from clogging waterways.
Estimated Cost	Moderate \$100k
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	In progress
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Jefferson City
Risk / Vulnerability	
Hazard(s) Addressed	Flooding
Problem Being Mitigated	Flood damage
Action or Project	
Applicable Goal Statement	4
Action/Prj. #	1.3.31
Name of Action or Project	Infrastructure flooding
Action or Project Description	Monitor public infrastructure for any potential flooding issues and mitigate as needed.
Estimated Cost	\$50,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	Public Works
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Internal City Planning/EOP
Action Status	
Status	In progress
Report on Progress	

LOHMAN

Action Worksheet	
Name of Jurisdiction	Lohman
Risk / Vulnerability	
Hazard(s) Addressed	Tornadoes
Problem Being Mitigated	life safety and preservation
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.14
Name of Action or Project	Safe Room
Action or Project Description	if grant funds become available we would like to work towards creating a safe room for the vulnerable population
Estimated Cost	\$100,000 to \$500,000
Benefits	Life and safety preservation during tornado
Plan for Implementation	
Responsible Organization / Department	Lohman
Action / Project Staplee Score / Priority	
Timeline for Completion	3-5 years
Potential Funding Source	HMA Grant Fund
Local Planning Mechanism to be Used	
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Lohman
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms
Problem Being Mitigated	Storm warning
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.4.1
Name of Action or Project	New siren
Action or Project Description	need to get additional sirens in the area as they cannot be heard outside over half the area. There is currently only one siren in the area.
Estimated Cost	\$50,000 to \$100,000
Benefits	life safety during severe storm
Plan for Implementation	
Responsible Organization / Department	Lohman
Action / Project Staplee Score / Priority	
Timeline for Completion	3-5 years
Potential Funding Source	HMA grant or any other
Local Planning Mechanism to be Used	
Action Status	
Status	New
Report on Progress	

RUSSELLVILLE

Action Worksheet	
Name of Jurisdiction	Russellville
Risk / Vulnerability	
Hazard(s) Addressed	tornado
Problem Being Mitigated	Injury from storms
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.14
Name of Action or Project	COMMUNITY SAFE ROOM
Action or Project Description	Working to construct a tornado saferoom
Estimated Cost	\$500k
Benefits	Save lives and prevent injuries during turbulent weather
Plan for Implementation	
Responsible Organization / Department	Administration
Action / Project Staplee Score / Priority	High
Timeline for Completion	2030
Potential Funding Source	Seeking grant funding and technical expertise
Local Planning Mechanism to be Used	Annual Budget
Action Status	
Status	Not started
Report on Progress	Awaiting implementation

Action Worksheet	
Name of Jurisdiction	Russellville
Risk / Vulnerability	
Hazard(s) Addressed	All
Problem Being Mitigated	Governmental disruption
Action or Project	
Applicable Goal Statement	1
Action/Prj. #	1.5.1
Name of Action or Project	Develop a COOP plan
Action or Project Description	Develop a COOP plan for city government activity during all hazards
Estimated Cost	\$5,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	City Clerk and City Administrator
Action / Project Staplee Score / Priority	High
Timeline for Completion	2026
Potential Funding Source	grants
Local Planning Mechanism to be Used	Annual budget
Action Status	
Status	Not Started
Report on Progress	Researching Grants

Action Worksheet	
Name of Jurisdiction	Russellville
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes, Wildfire, Earthquakes
Problem Being Mitigated	Injury and structural damage during storms/earthquakes
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.3.8
Name of Action or Project	Adopt current model building codes and national engineering standards according to ISO standards.
Action or Project Description	Staff will review and recommend adoption of pertinent codes.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning and zoning board
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Adopted City Codes
Action Status	
Status	Not started
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Russellville
Risk / Vulnerability	
Hazard(s) Addressed	Extreme Temperature
Problem Being Mitigated	Injury from extreme temperature
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.5.8
Name of Action or Project	Cooling and Heating Room
Action or Project Description	Provide a safe space for those without adequate cooling or heating source during times of extreme temperatures, especially for seniors and those with pre-existing conditions
Estimated Cost	\$10k
Benefits	will provide protection for those without adequate cooling or heat source during extreme temperatures
Plan for Implementation	
Responsible Organization / Department	City of Russellville/Ministerial Alliance
Action / Project Staplee Score / Priority	High
Timeline for Completion	2026
Potential Funding Source	Grants/Donations
Local Planning Mechanism to be Used	Comprehensive Plan
Action Status	
Status	Not started
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Russellville
Risk / Vulnerability	
Hazard(s) Addressed	Flood
Problem Being Mitigated	Flooding/Flash Flooding
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.6.2
Name of Action or Project	Upgrade stormwater system
Action or Project Description	Upgrade and fix culverts and stormwater drains to meet DNR MS4 permit compliance and mitigate flooding of drainage ditches.
Estimated Cost	
Benefits	Maintain compliance with DNR MS4 permit regulations
Plan for Implementation	
Responsible Organization / Department	Street Supervisor
Action / Project Staplee Score / Priority	High
Timeline for Completion	2026
Potential Funding Source	City Revenue, grants
Local Planning Mechanism to be Used	Maintenance Policy
Action Status	
Status	In-progress
Report on Progress	Partially implemented

St. Martins

Action Worksheet	
Name of Jurisdiction	St. Martins
Risk / Vulnerability	
Hazard(s) Addressed	Flooding
Problem Being Mitigated	Contaminated Stormwater Outflows
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.6.1
Name of Action or Project	Stormwater Compliance
Action or Project Description	Bring stormwater up to DNR compliance. Monitor Stormwater Outflows by training personnel, mapping outflows and monitoring them at least once annually.
Estimated Cost	\$100,000+
Benefits	Clean, Compliant outflows
Plan for Implementation	
Responsible Organization / Department	Luebbert Engineering & St. Martins Street Supervisor
Action / Project Staplee Score / Priority	High
Timeline for Completion	3-5 years
Potential Funding Source	City Revenue
Local Planning Mechanism to be Used	Luebbert Engineering & St. Martins Street Supervisor
Action Status	
Status	On-going
Report on Progress	Annually

Action Worksheet	
Name of Jurisdiction	St Martins
Risk / Vulnerability	
Hazard(s) Addressed	All
Problem Being Mitigated	Governmental disruption
Action or Project	
Applicable Goal Statement	1
Action/Prj. #	1.5.1
Name of Action or Project	Develop a COOP plan
Action or Project Description	Develop a COOP plan for city government activity during all hazards
Estimated Cost	\$5,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	City Clerk and City Administrator
Action / Project Staplee Score / Priority	High
Timeline for Completion	2026
Potential Funding Source	grants
Local Planning Mechanism to be Used	Annual budget
Action Status	
Status	Not Started
Report on Progress	Researching Grants

Action Worksheet	
Name of Jurisdiction	St. Martins
Risk / Vulnerability	
Hazard(s) Addressed	Flood
Problem Being Mitigated	Flooding/Flash Flooding
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.6.2
Name of Action or Project	Upgrade stormwater system
Action or Project Description	Upgrade and fix culverts and stormwater drains to meet DNR MS4 permit compliance and mitigate flooding of drainage ditches.
Estimated Cost	
Benefits	Maintain compliance with DNR MS4 permit regulations
Plan for Implementation	
Responsible Organization / Department	Lubbert Engineering and Street Supervisor
Action / Project Staplee Score / Priority	High
Timeline for Completion	2021
Potential Funding Source	City Revenue, grants
Local Planning Mechanism to be Used	Training manual and stormwater outflows map being developed
Action Status	
Status	In-progress
Report on Progress	Partially implemented

Action Worksheet	
Name of Jurisdiction	St. Martins
Risk / Vulnerability	
Hazard(s) Addressed	tornado
Problem Being Mitigated	Injury from storms
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.14
Name of Action or Project	COMMUNITY SAFE ROOM
Action or Project Description	Working to construct a tornado saferoom
Estimated Cost	\$500k
Benefits	Save lives and prevent injuries during turbulent weather
Plan for Implementation	
Responsible Organization / Department	City Administrator
Action / Project Staplee Score / Priority	High
Timeline for Completion	2030
Potential Funding Source	Seeking grant funding and technical expertise
Local Planning Mechanism to be Used	Annual Budget
Action Status	
Status	Not started
Report on Progress	Awaiting implementation

Action Worksheet	
Name of Jurisdiction	St. Martins
Risk / Vulnerability	
Hazard(s) Addressed	All
Problem Being Mitigated	Death/injury during hazardous events
Action or Project	
Applicable Goal Statement	3
Action/Prj. #	1.6.3
Name of Action or Project	SMART 911 Implementation
Action or Project Description	Work with Sheriff and MMRPC to implement and encourage citizen participation
Estimated Cost	\$50k
Benefits	Better equip First Responders and save lives
Plan for Implementation	
Responsible Organization / Department	City Administrator
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	2026
Potential Funding Source	City Revenue
Local Planning Mechanism to be Used	Begin education citizens about Smart 911. Annual Budget
Action Status	
Status	In-Progress
Report on Progress	Awaiting Implementation

TAOS

Action Worksheet	
Name of Jurisdiction	City of Taos
Risk / Vulnerability	
Hazard(s) Addressed	Flooding
Problem Being Mitigated	Repetitive Flooding
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.7.1
Mitigation Category	Prevention
Name of Action or Project	NFIP continued compliance
Action or Project Description	Enforce floodplain management requirements, regulate new construction in the SFHAs, floodplain identification for mapping.
Estimated Cost	Less than \$10,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	Board of Alderman
Action / Project Staplee Score / Priority	Low
Timeline for Completion	1 year
Potential Funding Source	Internal
Local Planning Mechanism to be Used	Floodplain ordinance
Action Status	
Status	Ongoing
Report on Progress	All codes are reviewed and updated as necessary.

Action Worksheet	
Name of Jurisdiction	Taos
Risk / Vulnerability	
Hazard(s) Addressed	Flood
Problem Being Mitigated	Flooding/Flash Flooding
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.6.2
Name of Action or Project	Upgrade stormwater system
Action or Project Description	Upgrade and fix culverts and stormwater drains to meet DNR MS4 permit compliance and mitigate flooding of drainage ditches.
Estimated Cost	
Benefits	Maintain compliance with DNR MS4 permit regulations
Plan for Implementation	
Responsible Organization / Department	Administration
Action / Project Staplee Score / Priority	High
Timeline for Completion	2021
Potential Funding Source	City Revenue, grants
Local Planning Mechanism to be Used	Training manual and stormwater outflows map being developed
Action Status	
Status	In-progress
Report on Progress	Partially implemented

Action Worksheet	
Name of Jurisdiction	Taos
Risk / Vulnerability	
Hazard(s) Addressed	tornado
Problem Being Mitigated	Injury from storms
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.14
Name of Action or Project	COMMUNITY SAFE ROOM
Action or Project Description	Working to construct a tornado saferoom
Estimated Cost	\$500k
Benefits	Save lives and prevent injuries during turbulent weather
Plan for Implementation	
Responsible Organization / Department	City Administrator
Action / Project Staplee Score / Priority	High
Timeline for Completion	2030
Potential Funding Source	Seeking grant funding and technical expertise
Local Planning Mechanism to be Used	Annual Budget
Action Status	
Status	Not started
Report on Progress	Awaiting implementation

Action Worksheet	
Name of Jurisdiction	Taos
Risk / Vulnerability	
Hazard(s) Addressed	Severe Thunderstorms, Tornadoes, Wildfire, Earthquakes
Problem Being Mitigated	Injury and structural damage during storms/earthquakes
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.3.8
Name of Action or Project	Adopt current model building codes and national engineering standards according to ISO standards.
Action or Project Description	Staff will review and recommend adoption of pertinent codes.
Estimated Cost	Less than \$10,000
Benefits	Avoidance of the following: Injuries/Casualties, Property Damage, Loss of Function/displacement impacts, Emergency Management Costs/Community Costs
Plan for Implementation	
Responsible Organization / Department	Planning and zoning board
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	3-5 years
Potential Funding Source	City
Local Planning Mechanism to be Used	Adopted City Codes
Action Status	
Status	In progress
Report on Progress	Reviewing

Action Worksheet	
Name of Jurisdiction	City of Taos
Risk / Vulnerability	
Hazard(s) Addressed	Flood
Problem Being Mitigated	Repetitive loss to flooding
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.1.3
Mitigation Category	Prevention
Name of Action or Project	NFIP Continued compliance
Action or Project Description	Enforce floodplain management requirements, regulate new construction the SFHAs, floodplain identification for mapping.
Estimated Cost	Less than \$10,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	City Clerk, Board of Alderman
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	Internal
Local Planning Mechanism to be Used	Floodplain ordinance
Action Status	
Status	Ongoing
Report on Progress	Code revision and implementation.

Action Worksheet	
Name of Jurisdiction	City of Taos
Risk / Vulnerability	
Hazard(s) Addressed	Flash Flooding
Problem Being Mitigated	Flash flooding from storms
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.8.1
Name of Action or Project	Stormwater Retention Facilities
Action or Project Description	Require developers to include adequate storm water retention facilities on new builds.
Estimated Cost	Less than \$10,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	Zoning, Cole County
Action / Project Staplee Score / Priority	Medium
Timeline for Completion	1 year
Potential Funding Source	Internal
Local Planning Mechanism to be Used	Building codes. Coordinate efforts with Cole County.
Action Status	
Status	In progress
Report on Progress	Developers are encouraged to evaluate and implement storm water detention with new development.

Wardsville

Action Worksheet	
Name of Jurisdiction	Wardsville
Risk / Vulnerability	
Hazard(s) Addressed	Tornadoes
Problem Being Mitigated	life safety and preservation
Action or Project	
Applicable Goal Statement	5
Action/Prj. #	1.3.14
Name of Action or Project	Safe Room
Action or Project Description	if grant funds become available we would like to work towards creating a safe room for the vulnerable population
Estimated Cost	\$100,000 to \$500,000
Benefits	Life and safety preservation during tornado
Plan for Implementation	
Responsible Organization / Department	Lohman
Action / Project Staplee Score / Priority	
Timeline for Completion	3-5 years
Potential Funding Source	HMA Grant Fund
Local Planning Mechanism to be Used	
Action Status	
Status	New
Report on Progress	

Action Worksheet	
Name of Jurisdiction	Wardsville
Risk / Vulnerability	
Hazard(s) Addressed	Flood
Problem Being Mitigated	Repetitive loss to flooding
Action or Project	
Applicable Goal Statement	2
Action/Prj. #	1.1.3
Name of Action or Project	Enforce Flood Damage Prevention/Floodplain Management Ordinances
Action or Project Description	Enforce flood damage prevention/floodplain management ordinances in compliance with NFIP requirements.
Estimated Cost	Less than \$10,000
Benefits	I/C, PD, LF, EMCC
Plan for Implementation	
Responsible Organization / Department	City Clerk, Board of Alderman
Action / Project Staplee Score / Priority	H
Timeline for Completion	1 year
Potential Funding Source	Internal
Local Planning Mechanism to be Used	Review and update ordinances per NFIP requirements (changes).
Action Status	
Status	In Progress
Report on Progress	Code revision and implementation.

BLAIR OAKS SCHOOL DISTRICT

Action Worksheet	
Name of Jurisdiction:	Blair Oaks School District
Risk / Vulnerability	
Hazard(s) Addressed:	All Hazards
Problem being Mitigated:	Potential weaknesses in response to all hazards
Action or Project	
Applicable Goal Statement:	1
Action/Project Number:	1.5.1
Name of Action or Project:	Blair Oaks School District COOP
Mitigation Category:	Preparedness
Action or Project Description:	Develop a Continuity of Operations Plan (COOP).
Estimated Cost:	\$5,000
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Blair Oaks Administration
Supporting Organization/Department:	School Board
Action/Project Priority:	High
Timeline for Completion:	2026
Potential Fund Sources:	Internal, FEMA, grants
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	In Progress
Report of Progress:	This is in progress; most documents are now backed up on the Cloud;

Action Worksheet	
Name of Jurisdiction:	Blair Oaks School District
Risk / Vulnerability	
Hazard(s) Addressed:	Severe Thunderstorms, Tornados
Problem being Mitigated:	Loss of life from storms
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.3.14
Name of Action or Project:	Safe Room
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Build tornado safe room(s) or harden part(s) of existing structure(s) to FEMA 361 standards.
Estimated Cost:	\$2 million
Benefits:	IC,EM
Plan for Implementation	
Responsible Organization/Department:	Blair Oaks Administration
Supporting Organization/Department:	City of Wardsville
Action/Project Priority:	Medium
Timeline for Completion:	2026
Potential Fund Sources:	FEMA, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	Not Started
Report of Progress:	

Cole R-I School District

Action Worksheet	
Name of Jurisdiction:	Cole Co. R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	All Hazards
Problem being Mitigated:	Potential weaknesses in response to all hazards
Action or Project	
Applicable Goal Statement:	1
Action/Project Number:	1.5.1
Name of Action or Project:	Cole R-I School District COOP
Mitigation Category:	Preparedness
Action or Project Description:	Develop a Continuity of Operations Plan (COOP).
Estimated Cost:	\$5,000
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Cole R-I Administration
Supporting Organization/Department:	School Board
Action/Project Priority:	High
Timeline for Completion:	2026
Potential Fund Sources:	Internal, FEMA, grants
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	In Progress
Report of Progress:	Portions written

Action Worksheet	
Name of Jurisdiction:	Cole Co. R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	Severe Thunderstorms, Tornados
Problem being Mitigated:	Loss of life from storms
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.3.14
Name of Action or Project:	Safe Room
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Build tornado safe room(s) or harden part(s) of existing structure(s) to FEMA 361 standards.
Estimated Cost:	\$2 million
Benefits:	IC,EM
Plan for Implementation	
Responsible Organization/Department:	Cole R-I Administration
Supporting Organization/Department:	City of Russellville
Action/Project Priority:	Medium
Timeline for Completion:	2026
Potential Fund Sources:	FEMA, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	Not Started
Report of Progress:	

COLE R-V SCHOOL DISTRICT

Action Worksheet	
Name of Jurisdiction:	Cole Co. R-V School District
Risk / Vulnerability	
Hazard(s) Addressed:	All Hazards
Problem being Mitigated:	Potential weaknesses in response to all hazards
Action or Project	
Applicable Goal Statement:	1
Action/Project Number:	1.5.1
Name of Action or Project:	Cole R-V School District COOP
Mitigation Category:	Preparedness
Action or Project Description:	Develop a Continuity of Operations Plan (COOP).
Estimated Cost:	\$5,000
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Cole R-V Administration
Supporting Organization/Department:	School Board
Action/Project Priority:	High
Timeline for Completion:	2026
Potential Fund Sources:	Internal, FEMA, grants
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	In Progress
Report of Progress:	Portions written

Action Worksheet	
Name of Jurisdiction:	Cole Co. R-V School District
Risk / Vulnerability	
Hazard(s) Addressed:	Severe Thunderstorms, Tornados
Problem being Mitigated:	Loss of life from storms
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.3.14
Name of Action or Project:	Safe Room
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Build tornado safe room(s) or harden part(s) of existing structure(s) to FEMA 361 standards.
Estimated Cost:	\$2 million
Benefits:	IC,EM
Plan for Implementation	
Responsible Organization/Department:	Cole R-I Administration
Supporting Organization/Department:	
Action/Project Priority:	Medium
Timeline for Completion:	2026
Potential Fund Sources:	FEMA, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	Not Started
Report of Progress:	

JEFFERSON CITY PUBLIC SCHOOLS

Action Worksheet	
Name of Jurisdiction:	Jefferson City Public Schools
Risk / Vulnerability	
Hazard(s) Addressed:	All Hazards
Problem being Mitigated:	Potential weaknesses in response to all hazards
Action or Project	
Applicable Goal Statement:	1
Action/Project Number:	1.5.1
Name of Action or Project:	Jefferson City Public Schools COOP
Mitigation Category:	Preparedness
Action or Project Description:	Develop a Continuity of Operations Plan (COOP).
Estimated Cost:	\$5,000
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	JCP Administration
Supporting Organization/Department:	School Board
Action/Project Priority:	High
Timeline for Completion:	2026
Potential Fund Sources:	Internal, FEMA, grants
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	In Progress
Report of Progress:	Majority written

Action Worksheet	
Name of Jurisdiction:	Jefferson City Public Schools
Risk / Vulnerability	
Hazard(s) Addressed:	Severe Thunderstorms, Tornados
Problem being Mitigated:	Loss of life from storms
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.3.14
Name of Action or Project:	Safe Room
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Add tornado safe room(s) in middle schools and elementary schools, or harden part(s) of existing structure(s) to FEMA 361 standards.
Estimated Cost:	\$2 million
Benefits:	IC,EM
Plan for Implementation	
Responsible Organization/Department:	JCP Administration
Supporting Organization/Department:	
Action/Project Priority:	Medium
Timeline for Completion:	2026
Potential Fund Sources:	FEMA, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	Not Started
Report of Progress:	

LINCOLN UNIVERSITY

Action Worksheet	
Name of Jurisdiction:	Lincoln University
Risk / Vulnerability	
Hazard(s) Addressed:	Unwanted Intruder
Problem being Mitigated:	Unwanted Intruder in school buildings
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.13.1
Name of Action or Project:	Active Shooter Mitigation
Mitigation Category:	Preparedness
Action or Project Description:	Increase capacity to prevent and respond to unwanted intruder/active shooter events.
Estimated Cost:	\$20,000
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Campus Security and the Emergency Management Team
Supporting Organization/Department:	Jefferson City Police and Cole County Sheriff's Department
Action/Project Priority:	High
Timeline for Completion:	2025
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	School Policy
Progress Report	
Action Status:	In Progress
Report of Progress:	Lockdown procedures. Limited entry points.

Action Worksheet	
Name of Jurisdiction:	Lincoln University
Risk / Vulnerability	
Hazard(s) Addressed:	All Hazards
Problem being Mitigated:	Potential weaknesses in response to all hazards
Action or Project	
Applicable Goal Statement:	1
Action/Project Number:	1.5.1
Name of Action or Project:	Lincoln University COOP
Mitigation Category:	Preparedness
Action or Project Description:	Develop a Continuity of Operations Plan (COOP).
Estimated Cost:	\$5,000
Benefits:	IC,PD,LF,EM
Plan for Implementation	
Responsible Organization/Department:	Campus Security and the Emergency Management Team
Supporting Organization/Department:	School Board
Action/Project Priority:	High
Timeline for Completion:	2025
Potential Fund Sources:	Internal, FEMA, grants
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	In Progress
Report of Progress:	Several portions of the plan are in place waiting to be combined into one reviewable document.

Action Worksheet	
Name of Jurisdiction:	Lincoln University
Risk / Vulnerability	
Hazard(s) Addressed:	Severe Thunderstorms, Tornados
Problem being Mitigated:	Loss of life from storms
Action or Project	
Applicable Goal Statement:	5
Action/Project Number:	1.3.14
Name of Action or Project:	Safe Room
Mitigation Category:	Hazard Mitigation
Action or Project Description:	Build tornado safe room(s) or harden part(s) of existing structure(s) to FEMA 361 standards.
Estimated Cost:	\$2 million
Benefits:	IC,EM
Plan for Implementation	
Responsible Organization/Department:	Campus Security and the Emergency Management Team
Supporting Organization/Department:	
Action/Project Priority:	Medium
Timeline for Completion:	2025
Potential Fund Sources:	FEMA, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	Not Started
Report of Progress:	

Table 4.4 Mitigation Action Matrix

#	Action	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
Prevention Public Education							
1.1.2	Update/Develop COOP plan	M	1	All	X	X	X
1.3.5	SAVE coalition staff training	M	2	All			
1.3.8	Adopt building codes	M	2	Storms	X	X	
1.3.12	Combustible materials education program	M	4	Wildfire	X	X	
1.3.13	Require campground safe rooms	H	2	Storms	X	X	
1.3.18	Tech assistance with building rehab	H	3	All	X		
1.3.20	Flood insurance education	H	4	Flooding	X	X	X
1.3.26	Engage citizens in smart 911	H	3	All			
1.3.28	Identify water supply gaps for fire suppression	H	5	All	X		
1.6.3	Smart 911 implementation	M	3	All			
Structure and Infrastructure Projects							
1.2.2	Resurface Alley to prevent stormwater damage	H	5	Flooding	x		
1.3.3	Debris removal plan	H	1	Storms	X	x	
1.3.9	Inventory flood prone infrastructure	H	5	Flooding	X		
1.3.10	Brace high value equipment	H	5	All	X	X	
1.3.14	Create community safe rooms	H	5	Storms	X	X	
1.3.17	Elevate Broadway	H	5	Flooding	X		
1.3.22	Rehab High Street viaduct	H	5	Flooding	X		
1.3.27	Install fire suppression system in multi-fam housing	H	5	Wildfire/storm	X	X	
1.6.1	Stormwater compliance	H	5	Storms/Flood	X	X	
1.6.2	Upgrade stormwater system	H	5	Storms/Flood	X	X	
1.8.1	Stormwater retention facility	M	5	Flood	X	X	
1.5.8	Create Cooling/heating center	H	5	Extreme Temp	X		
Natural Systems Protection							
1.1.3	Enforce Floodplain prevention	H	2	Flooding	X	X	X
1.3.6	Update flood ordinance	H	2	Flooding	X	X	X
1.3.2	Stabilize soils in flood prone areas	H	5	Flooding	X	X	
1.3.15	Flood warning signs	H	5	Flooding	X		
1.3.21	Dam inspections	H	2	Dam Failure	X	X	
1.3.23	Fund flood buyout properties	H	3	Flooding	X		X

#	Action	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
Emergency Services							
1.1.1	Purchase generators and hookups for backup power	H	5	All	X	X	
1.2.1	Create Backup water supply	H	5	Fire/Storms	X	X	
1.2.16	Develop plan for emergency public access	H	1	All	X	X	
1.3.19	Train staff for water rescue	H	3	Flash Flooding			
1.3.24	Add technology to continue public meetings during event	H	5	All			
1.4.1	New Storm Siren	H	5	Tornado	X	X	
Education and Outreach							
1.3.4	Encourage local hotels to have emergency plans	M	1	All	X	X	
1.3.7	Develop program for stormwater compliance of private property	H	3	Flooding	X	X	X
1.3.25	FEMA staff training	M	3	All			
1.13.1	Increase capacity to deal with active shooter	H	5	Active Shooter	X	X	

Chapter 5: PLAN MAINTENANCE PROCESS

- 5.1 Monitoring, Evaluating, and Updating the Plan.....377
 - 5.1.1 Responsibility for Plan Maintenance
 - 5.1.2 Plan Maintenance Schedule
 - 5.1.3 Plan Maintenance Process
- 5.2 Incorporation into Existing Planning Mechanisms.....379
- 5.3 Continued Public Involvement.....381

CHAPTER 5: PLAN MAINTENANCE PROCESS

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

5.1 Monitoring, Evaluating, and Updating the Plan

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

5.1.1 Responsibility for Plan Maintenance

The Cole County/Jefferson City Natural Hazard Mitigation Plan will be monitored and evaluated on a yearly basis following its approval and adoption. These evaluations will begin approximately one year after the final approval of the plan and continue until the next 5-year update begins.

The monitoring and evaluation will be facilitated through the Mid-MO Regional Planning Commission. It will consist of the following:

1. A meeting of the Hazard Mitigation Planning Committee convened by planners at the Mid-MO Regional Planning Commission to discuss any general hazard mitigation issues
2. A survey emailed to all participating jurisdictions on such topics as changes/developments in the jurisdictions and implementation of mitigation actions.
3. A yearly addendum to the plan summarizing information from the planning meeting and the Surveys
4. Entry of any direct changes to the plan in the "Log of Changes Made to the Plan following Approval" (which follows the Executive Summary)

5.1.2 Plan Maintenance Schedule

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

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

5.1.3 Plan Maintenance Process

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

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

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

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

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

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC member on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdictional MPC member will determine necessary remedial action, making any required modifications to the plan.

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

5.2: Incorporation into Existing Planning Mechanisms

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

Where possible, plan participants, including school and special districts, will use existing plans and/or programs to implement hazard mitigation actions. Based on the capability assessments of the participating jurisdictions, communities in Cole 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:

- Ordinances of participating jurisdictions;
- Cole County Emergency Operations Plan;
- Capital improvement plans and budgets;
- Other community plans within the County, such as water conservation plans, storm water management plans, and parks and recreation plans;
- School and Special District Plans and budgets; and
- Other plans and policies outlined in the capability assessment sections for each jurisdiction in Chapter 2 of this plan.

The MPC members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC is also responsible for monitoring this integration and incorporation of the appropriate information in to the five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual review of the Hazard Mitigation Plan, the Cole 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.

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 Cole County	County Emergency Operations Plan,	Attended transportation meetings about road	Annual budget process.

	Comprehensive Economic Development Strategy, Zoning ordinances	flooding. Annual budget process. Floodplain ordinances, building codes	
Centertown	Comprehensive Plan, zoning ordinances	Did not participate in previous plan. Worked with county on needs.	Comprehensive plan update, annual budget process
Jefferson City	Comprehensive Plan, Transportation Improvement Plan, Emergency Operations Plan, Comprehensive Economic Development Strategy	Attended transportation meetings about road flooding. Annual budget process. Floodplain ordinances, building codes	Comprehensive Plan update, annual budget process, TIP update
Lohman	Regional Transportation Plan	Annual Budget Process	Annual Budget process, capital improvement process
Russellville	Comprehensive Plan, Zoning ordinances, Regional Transportation Plan	Attended transportation meetings about road flooding. Annual budget process	Comprehensive plan update, annual budget process
St. Martins	Regional Transportation Plan, zoning ordinances	Annual budget process, zoning ordinances	Annual Budget process, Capital Improvement Process
Taos	Regional Transportation Plan, zoning ordinances	Annual budget process, building codes	Annual Budget process, Capital Improvement Process
Wardsville	Regional Transportation Plan, zoning ordinances	Annual budget process, zoning ordinances	Annual Budget process, Capital Improvement Process
Blair Oaks R-II	Blair Oaks R-II Planning committee & board of education	Annual Budget process, updated policy, system testing	Attended meetings. Safety committee annual budget meeting, building policy updates, staff training
Cole Co. R-I	Cole Co. R-I District Planning Committee & Board of Education	Annual Budget process, updated policy, system testing	Attended 1 meeting. Safety committee annual budget meeting, building policy updates, staff training
Cole Co R-V	Cole Co R-V Planning Committee & Board of Education	Policy updated, staff training, notification system upgrade	Attended 1 meeting. Cole Co R-V Long-Range Plan update

Jefferson City Public School	JCP Planning Committee & Board of Education	Updated policy, notification system upgrade	Phone/Email meeting. JCP Planning Committee & Planning/Facilities Documents
Lincoln University	LU Planning Committee & Board of Education	Updated policy, notification system upgrade	Attended 1 meeting. Emergency management department policies. Budget process.

5.3 Continued Public Involvement

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

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan’s implementation and seek additional public comment. Information about the annual reviews will be posted on the Cole county 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: Adoption Resolutions

SAM BUSHMAN
Presiding Commissioner
(573) 634-9113

JEFF HOELSCHER
Eastern District Commissioner
(573) 634-9112

HARRY OTTO
Western District Commissioner
(573) 634-9111



DEBBIE MALZNER
Finance Officer
(573) 634-9162

JILL C. LAHUE
County Counselor
(573) 634-9107

MELODY WELSCHMEYER
Administrative Assistant
(573) 634-9110

Cole County Commission

311 East High Street, Jefferson City, MO 65101
(573) 634-9110 FAX (573) 634-8031

A RESOLUTION OF THE COLE COUNTY COMMISSION ADOPTING THE COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN.

WHEREAS the Cole County Commission recognizes the threat that natural hazards pose to people and property within Cole County; and

WHEREAS the Cole County Commission has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County Multi-Jurisdictional Hazard Mitigation Plan, 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 Cole County from the impacts of future hazards and disasters; and

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

WHEREAS adoption by the Cole County Commission demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

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

In accordance with Section 44.080, RSMo., the Cole County Commission adopts the final FEMA-approved plan.

ADOPTED by a vote of 3 in favor and 0 against, and 0 abstaining, this 15th day of June, 2021.

By: Sam Bushman
Presiding Commissioner

ATTEST:
By: Steve Korumeyer
Cole County Clerk

VILLAGE OF CENTERTOWN, MISSOURI

RESOLUTION NO. 01-2021

A RESOLUTION OF THE VILLAGE OF CENTERTOWN, MISSOURI ADOPTING THE COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS the Village of Centertown, Missouri, recognizes the threat that natural hazards post to people and property within the Village of Centertown, Missouri, and

WHEREAS the Village of Centertown, Missouri, has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*.

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Village of Centertown, Missouri, from the impacts of future hazards and disasters; and

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

WHEREAS adoption by the Village of Centertown, Missouri, demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*..

NOW THEREFORE, BE IT RESOLVED by the Village of Centertown, in the State of Missouri, THAT:

The Village of Centertown, Missouri, adopts the final FEMA-*approved plan*.

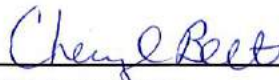
Resolved this 16TH day of May, 2021 by the following vote

	Aye	Nay
Adam Brown	<u> X </u>	_____
Paula Hinshaw	<u> X </u>	_____
Heather Hunger	<u> X </u>	_____
Travis LePage	<u>ABSENT</u>	_____
Debra Baker	<u> X </u>	_____



CHAIRMAN

ATTEST:



VILLAGE CLERK

RESOLUTION

RS2021-6

Sponsored by Councilman Schreiber

A RESOLUTION AUTHORIZING THE CITY OF JEFFERSON TO ADOPTING THE DRAFT COLE COUNTY/JEFFERSON CITY HAZARD MITIGATION PLAN

WHEREAS, the Cole County / Jefferson City Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and

WHEREAS, the City of Jefferson participated in the preparation of the Cole County/Jefferson City Hazard Mitigation Plan; and

WHEREAS, the State Emergency Management Agency requires the City of Jefferson to adopt a draft version of the Cole County/Jefferson City Hazard Mitigation Plan prior to agency approval; and

WHEREAS, the citizens of the City of Jefferson are able to review and provide comment on the draft plan prior to approval by the State Emergency Management Agency and Federal Emergency Management Agency; and

WHEREAS, the City of Jefferson affirms that, once approved, the Plan will be updated no less than every five years.


NOW, THEREFORE, BE IT RESOLVED by the Council of the City of Jefferson that the City of Jefferson adopts the draft Cole County/Jefferson City Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

Adopted this 7th day of June, 2021



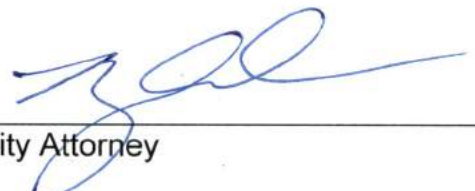
Mayor Carrie Tergin

ATTEST:



City Clerk

APPROVED AS TO FORM:



City Attorney

(City of Lohman), Missouri RESOLUTION NO. 2021-1

A RESOLUTION OF THE (City of Lohman) ADOPTING THE Cole Hazard Mitigation Plan 2021.

WHEREAS the City of Lohman recognizes the threat that natural hazards pose to people and property within the (City of Lohman); and

WHEREAS the (City of Lohman) has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Cole Hazard Mitigation Plan 2021 hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the (City of Lohman) from the impacts of future hazards and disasters; and

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

WHEREAS adoption by the (City of Lohman) demonstrates their endeavor to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE (City of Lohman), in the State of Missouri, THAT:

In accordance with (local rule for adopting resolutions), the (City of Lohman) adopts the final FEMA-approved *Plan*.

ADOPTED by a vote of 4 in favor and 0 against, and 0 abstaining, this 20 day of July, 2021.

By (Sig.): Jason S. Wood
Print name: Jason Wood (Mayor)

ATTEST:
By (Sig.): David Viles
Print name: David Viles (Alderman)

ATTEST:
By (Sig.): Patty Duncan
Print name: Patty Duncan (Alderwoman)

ATTEST:
By (Sig.): Frank Chapman
Print name: Frank Chapman (Alderman)

ATTEST:
By (Sig.): Shawn Higgins
Print name: Shawn Higgins (Alderman)

CITY OF RUSSELLVILLE, MISSOURI

RESOLUTION NO. R 2021.02

A RESOLUTION OF THE CITY OF RUSSELLVILLE, MISSOURI, ADOPTING THE COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION *PLAN*

WHEREAS, the City of Russellville recognizes the threat that natural hazards pose to people and property within the City of Russellville; and

WHEREAS, the City of Russellville has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County Multi-Jurisdictional Hazard Mitigation Plan, 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 City of Russellville from the impacts of future hazards and disasters; and

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

WHEREAS, adoption by the City of Russellville Board of Aldermen demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

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

In accordance with rules governing fourth class cities for the adoption of ordinances and resolutions, RSMo Chapter 79.130, the City of Russellville Board of Aldermen hereby adopts the final FEMA-approved plan.

ADOPTED by a vote of 4 in favor and 0 against, and 0 abstaining, this 17th day of June, 2021

By (Sig): Sharon Morgan

Print name: Sharon Morgan, Mayor

ATTEST:
By (Sig.): Jan Wyatt

Print name: Jan Wyatt, City Clerk

APPROVED AS TO FORM:
By (Sig.): Jan Wyatt

Print name: Jan Wyatt, City Clerk

CITY OF ST. MARTINS, MISSOURI

RESOLUTION NO. 2021-01

A RESOLUTION OF THE CITY OF ST. MARTINS ADOPTING THE COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION *PLAN*

WHEREAS the City of St. Martins recognizes the threat that natural hazards pose to people and property within the City of St. Martins; and

WHEREAS the City of St. Martins has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County Multi-Jurisdictional Hazard Mitigation Plan, 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 City of St. Martins from the impacts of future hazards and disasters; and


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

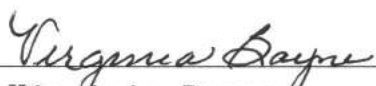
WHEREAS adoption by the City of St. Martins demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

NOW THEREFORE, BE IT RESOLVED BY THE CITY OF ST. MARTINS, in the State of Missouri, THAT:

In accordance with the City of St. Martins adopts the final FEMA-*approved plan*.

ADOPTED by a vote of 4 in favor and 0 against, and 0 abstaining, this 8th day of June, 2021.

By (Sig): 
Print name: Daryl Raithel, Mayor

ATTEST:
By (Sig.): 
Print name: Virginia Bayne



The City of Taos, Missouri RESOLUTION NO. 207

A RESOLUTION OF THE CITY OF TAOS ADOPTING THE Cole Hazard Mitigation Plan 2020.

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

WHEREAS the City of Taos has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Cole Hazard Mitigation Plan 2020 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 City of Taos from the impacts of future hazards and disasters; and

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

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

NOW THEREFORE, BE IT RESOLVED BY THE City of Taos, in the State of Missouri, THAT:

In accordance with the City Council, the City of Taos adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 4 in favor and 0 against, and 0 abstaining, this 7th day of December, 2020.

By (Sig): Tony Forck Mayor
Print name: Tony Forck

ATTEST:
By (Sig.): Matthew Forck
Print name: Matthew Forck Alderman

APPROVED AS TO FORM:
By (Sig.): Linda Heckman
Print name: Linda Heckman, City Clerk

**IN THE VILLAGE OF WARDSVILLE, MISSOURI
BOARD OF TRUSTEES**

RESOLUTION NO. 1

A RESOLUTION OF THE BOARD OF TRUSTEES OF THE VILLAGE OF WARDSVILLE ADOPTING THE COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN.

WHEREAS, the Board of Trustees recognizes the threat that natural hazards pose to people and property within the Board of Trustees;

WHEREAS, the Board of Trustees has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County Multi-Jurisdictional Hazard Mitigation Plan, 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 Village of Wardsville from the impacts of future hazards and disasters; and

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

WHEREAS, adoption by the Board of Trustees of the Village of Wardsville demonstrates their commitment to hazard mitigation and achieving the goals outlined in the Plan; and

NOW THEREFORE, BE IT RESOLVED BY The Board of Trustees of the Village of Wardsville; in the State of Missouri, THAT;

In accordance with the Board of Trustees, adopts the final FEMA-approved plan.

ADOPTED by a vote of 5 in favor and 0 against, and 0 abstaining, this 2nd day of June, 20 .

William W. Gratz
William Gratz, Chairman
Board of Trustees

Attest:

Shirley Stockman
Shirley Stockman, Village Clerk

APPROVED AS TO FORM:

/s/ David G. Bandrè, Village Attorney



Blair Oaks R-II School District
6214 Falcon Lane
Jefferson City, MO 65101

COLE COUNTY / JEFFERSON CITY HAZARD MITIGATION PLAN RESOLUTION

A RESOLUTION OF THE BLAIR OAKS R-II SCHOOL DISTRICT ADOPTING THE COLE COUNTY / JEFFERSON CITY HAZARD MITIGATION HAZARD MITIGATION PLAN 2021

WHEREAS the Blair Oaks R-II School District recognizes the threat that natural hazards pose to people and property within the Blair Oaks R-II School District; and

WHEREAS the Blair Oaks R-II School District has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County / Jefferson City Hazard Mitigation Plan 2021, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Blair Oaks R-II School District from the impacts of future hazards and disasters; and


WHEREAS the Blair Oaks R-II School District recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Blair Oaks R-II School District will endeavor to integrate the *Plan* into the comprehensive planning process and


WHEREAS adoption by the Blair Oaks R-II School District demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

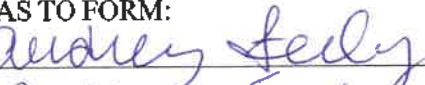
NOW THEREFORE, BE IT RESOLVED BY THE Blair Oaks R-II School District, in the State of Missouri, THAT:

In accordance with an affirmative vote by the Board of Education, the Blair Oaks R-II School District adopts the final FEMA-approved plan.

ADOPTED by a vote of 7 in favor and against 0, and 0 abstaining, this 8th day of June, 2021.

By (Sig): 
Print name: Nicki E. Russell

ATTEST:
By (Sig.): 
Print name: Greg D. Russell

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

Cole County R-1 School District, Russellville Missouri

A RESOLUTION OF THE Cole R1 School District ADOPTING THE COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION *PLAN*

WHEREAS the Cole R-1 recognizes the threat that natural hazards pose to people and property within the (*local governing body/school district*); and

WHEREAS the Cole R-1 has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County Multi-Jurisdictional Hazard Mitigation Plan, 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 Cole R-1 from the impacts of future hazards and disasters; and

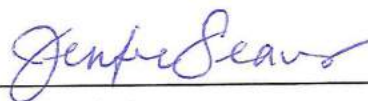
WHEREAS the Cole R-1 recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Cole R-1 will endeavor to integrate the *Plan* into the comprehensive planning process and

WHEREAS adoption by the Cole R-1 demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

NOW THEREFORE, BE IT RESOLVED BY THE COLE R-1 in the State of Missouri, THAT:
In accordance with board policy, the Cole R-1 adopts the final FEMA-*approved plan*.

ADOPTED by a vote of 7 in favor and 0 against, and _____ abstaining, this 21st day of June, 2021.

By (Sig.): 
Print name: Shawn Ehrhardt

ATTEST:
By (Sig.): 
Print name: Jennifer Seaver

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

COLE COUNTY R-V SCHOOL DISTRICT

Administration:

Dawna Burrow, Superintendent

Mark Richard, HS Principal

Teresa Messersmith, ES Principal

Jennifer Statler, SPED



14803 Hwy. 17 Eugene, MO 65032
573-498-4000 FAX 573-498-4090

Board of Education:

Ryan Carrender, President

Spencer Hoskins, V. President

Deanna Smith, Treasurer

Karen Schulte, Secretary

Chuck Angerer, Member

Matt Hale, Member

Derek Sommerer, Member

Sarah Strobel, Member

June 2, 2021

To Whom It May Concern:

The Cole County R-V School District Administration has participated in the preparation and review of the Cole County/Jefferson City Missouri Hazard Mitigation Plan over the past few months. This plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R 201.6.

The Cole County R-V School District hereby adopts the Cole County/Jefferson City Missouri Hazard Mitigation Plan as the jurisdiction's Hazard Mitigation Plan and resolves to execute the actions in the plan.

Respectfully,

A handwritten signature in cursive script that reads "Dawna Burrow".

Dawna Burrow
Superintendent



Jefferson City School District
315 East Dunklin
Jefferson City, MO 65101

FRANK UNDERWOOD
DIRECTOR OF FACILITIES, SAFETY AND SECURITY

(573)659-1190
FAX (573)659-3031
frank.underwood@jcschools.us

June 14, 2021

To Whom It May Concern:

The Jefferson City School District Administration has participated in the preparation and review of the Cole County/Jefferson City Missouri Hazard Mitigation Plan over this past year. This plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirement 44 C.F.R 2016.

The Jefferson City School District hereby adopts the Cole County/Jefferson City Missouri Hazard Mitigation Plan as the jurisdiction's Hazard Mitigation Plan and resolves to execute the actions in the plan to the best of our ability.

Respectfully,

A handwritten signature in black ink, appearing to read 'Frank Underwood', written over a horizontal line.

Frank Underwood
Director of Facilities, Safety and Security

**RESOLUTION OF THE BOARD OF CURATORS OF LINCOLN UNIVERSITY
ADOPTING THE COLE COUNTY / JEFFERSON CITY
HAZARD MITIGATION PLAN 2021**

WHEREAS Lincoln University recognizes the threat that natural hazards pose to people and property within Lincoln University; and

WHEREAS the Lincoln University has participated in the preparation of a multi-hazard mitigation plan, hereby known as the Cole County / Jefferson City Hazard Mitigation Plan 2021, hereafter referred to as the Plan, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the Plan identifies the mitigation goals and actions to reduce or eliminate long-term risk to people and property at Lincoln University from the impacts of future hazards and disasters; and

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

WHEREAS adoption by Lincoln University demonstrates its commitment to hazard mitigation and achieving the goals outlined in the Plan.

NOW THEREFORE, BE IT RESOLVED BY the Board of Curators of Lincoln University THAT Lincoln University adopts the final FEMA-approved Plan.

ADOPTED this 24 day of June, 2021.

By: _____

Printed name: Victor B. Pasley, President, Board of Curators

ATTEST:

By: _____

Printed name: Richard G. Callahan, Secretary, Board of Curators

Appendix B: Sign-In Sheets

COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE KICKOFF MEETING—SIGN-IN SHEET

Project: Cole County, Missouri Multi-Jurisdictional Hazard Mitigation Plan Update
Facilitator: Melissa Stafford, Regional Planner / Procurement Officer
 Mid-MO Regional Planning Commission

Meeting Date/Time: September 9, 2020 10:00am
Place/Room: Cole Co Fire District 5206 Monticello Rd, Jefferson City MO 65109

Name	Title	Department/Agency	Email	Phone #	Signature
John White	Staff	CCSO	johnwhite@ccso.org	680-4420	
Greg Gire	CCERT Act Unit ASAC	CCERT	bgire@colecoun.org	291-7981	
Keith Buscher	OSagefire	OSage fire	OSagefire1@gmail.com	378-2354	
Butch Brown	OSagefire chief	OSage fire	OSagefire21@gmail.com	615-7763	
Jen Wyatt	City Clerk	Russellville	russellville@embarq.net	783-3511	
Sierra Thomas	EMD Director	Cole CO Jefferson City	stomas@colecoun.org	573-698-0002	
Eric Landwehr	Director Director	Cole County Public Works	elandwehr@colecoun.org	636-3614	
Bin Wood	ER Surveillance	CAPITOL REGION MAD CENTER	Wood@emc.org	633-5207	
Mike Hyde	CNO	ST. Mary's	michael.hyde@smhealthn.com	573-353-9450	
AHINNA NANOSKI	CITY PLANNER	CITY OF JEFF. PPS	ANANSKI@jeffcitymo.org		
Debbie HENSEN	Police CAPTAIN	JCPD	dhens@jeffcitymo.org	573-341-6374	

COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE KICKOFF MEETING—SIGN-IN SHEET

Project: Cole County, Missouri
Multi-Jurisdictional Hazard Mitigation Plan Update

Facilitator: Melissa Stafford, Regional Planner / Procurement Officer
Mid-MO Regional Planning Commission

Meeting Date/Time: September 9, 2020
10:00am


Place/Room: Cole Co Fire District
5206 Monticello Rd, Jefferson City MO 65109

Name	Title	Department/Agency	Email	Phone #	Signature
Doug Rees	City Administrator	St. Mary's	roung45@gmail.com	230-9105	
	Director of Health Services District	St. Charles School District	chad.sotter@schools.k12.sc.mo.us	573-468-0244 cell 573-632-3417 office	
Steve Keull Phone		St. Charles City			Phone
Betsy Luebbeck Phone					Phone
Adam Brown		Centertown			Phone
R. Miller Phone					Phone
Matt Schofield Phone		Fire Safety			Phone
Nalozie Phone		CEMEX			Phone
Perry Gossell on phone	Supervisor	Cole R-1			Phone

COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE KICKOFF MEETING—SIGN-IN SHEET

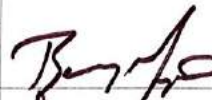
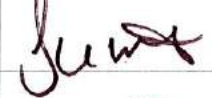




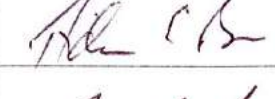



Project: Cole County, Missouri
 Multi-Jurisdictional Hazard Mitigation Plan Update
Facilitator: Melissa Stafford, Regional Planner / Procurement Officer
 Mid-MO Regional Planning Commission

Meeting Date/Time: September 9, 2020
 10:00am
Place/Room: Cole Co Fire District
 5206 Monticello Rd, Jefferson City MO 65109

Name	Title	Department/Agency	Email	Phone #	Signature
Neil Mahmar	Chief	Cole County Emergency Response Team	neil.kathym2@embarqmail.com	573-230-2316	
Renee Senze	Neighborhood Services	City of Jefferson PDS	rsenze@jeffcitymo.org	573-634-6305	Renee Senze
Tim Jones	Superintendent	Blue Oaks Pitt School District	jones@blueoaks.org	573-636-2020	
Melissa Stafford	Regional Planner	mid-mo RPPC		573-358-1607	Melissa Stafford

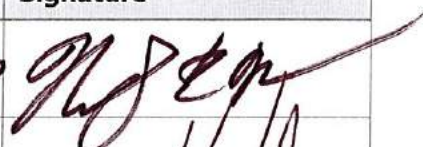
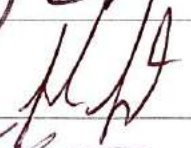




COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE MEETING #2—SIGN-IN SHEET

Project:	Cole County, Missouri Multi-jurisdictional Hazard Mitigation Plan Update	Meeting Date/Time:	October 7, 2020 10:00am – 12:00pm
Facilitator:	Melissa Stafford, Regional Planner & Procurement Officer Mid-MO Regional Planning Commission	Place/Room:	Cole County Fire District 5206 Monticello Rd, Jefferson City, MO 65109

Name	Title	Department/Agency	Email	Phone #	Signature
BARRY GIPIE	ASST. CHIEF	COLE COUNTY EMERGENCY RESPONSE TEAM	bgipe@colcounty.org	573-291-7981	
Sierra Thomas	Director	COLLEGE	stomas@colcounty.org	573-658-0002	
Doug Reece		ST MARTIN	-	573-230-9105	
Anne Stratman		City of Jefferson	astratman@jeffcitymo.org	573-634-6358	
Katrina Williams	Planner	City of Jefferson	kawilliams@jeffcitymo.org	634-6336	
Jan Wyatt	City Clerk	Russellville	russellville@embargmail.com	595782-3511	
Adam Brown	Chairman	Centertown	centertown.calen@gmail.com	573-634-3345	
Jim Jones	Superintendent	Blair Oaks R-II	jjones@blairoaks.org	573-291-6027	
John Whole	Sherriff	CCSD	on-file	on-file	
Stephanie Kiethe	Senior Planner	CCPW	skiethe@colcounty.org	573-636-3614	

COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE MEETING #2—SIGN-IN SHEET

Project:	Cole County, Missouri Multi-jurisdictional Hazard Mitigation Plan Update	Meeting Date/Time:	October 7, 2020 10:00am – 12:00pm
Facilitator:	Melissa Stafford, Regional Planner & Procurement Officer Mid-MO Regional Planning Commission	Place/Room:	Cole County Fire District 5206 Monticello Rd, Jefferson City, MO 65109

Name	Title	Department/Agency	Email	Phone #	Signature
Neil Muhimra	Chief	Cole ^{Co} Emer. Resp T		573-230-2310	
Jonathan Johnson		Cap Region Med Cntr	JJohnson5@CRMC.ORG		
MATTHEW LINDEWIRTH	CHIEF	COLE COUNTY EMS	MLINDEWIRTH@COLECOUNTY.ORG	573-680-1770	
David Boyles	D. CHIEF	Cole County EMS	DBoyles@ColeCounty.ORG	573-680-1940	
Eric Landwehr	CO Engr Director	Cole Co. P.W.	elandwehr@ colecounty.org	636-3614	
Melissa Stafford	Mid-MO Regional RPC Planner	Mid-MO RPC	melissastafford@midmorpc.org	353-1007	

COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

MEETING #2—SIGN-IN SHEET

Project:	Cole County, Missouri Multi-jurisdictional Hazard Mitigation Plan Update	Meeting Date/Time:	November 18, 2020 10:00am – 12:00pm
Facilitator:	Melissa Stafford, Regional Planner & Procurement Officer Mid-MO Regional Planning Commission	Place/Room:	Cole County Fire District 5206 Monticello Rd, Jefferson City, MO 65109








Name	Title	Department/Agency	Email	Phone #	Signature
Derek H.		JCPD			635-9127 ⁶³⁷⁴ 634-6400
G Hill		Lincoln			
Britt Smith					
- Doug Reece		St Martins			230-9105
- Brent Smith		JE Public Works			634-6450
- Erin Vander		Diocese JE.			634-9107 ⁹¹²⁷
Erin Crawford		light house			691-7378
Cassie Turgen		JE Mayor			230-7645
Katerina William					634- 9127 ⁶⁵³⁶
Rachael S.		City Jefferson			634-6305

~~Galep Hill~~
 Sierza Thomas EMD Cole Co. 4127
658-6002

COLE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

MEETING #2—SIGN-IN SHEET

Project:	Cole County, Missouri Multi-jurisdictional Hazard Mitigation Plan Update	Meeting Date/Time:	November 18, 2020 10:00am – 12:00pm
Facilitator:	Melissa Stafford, Regional Planner & Procurement Officer Mid-MO Regional Planning Commission	Place/Room:	Cole County Fire District 5206 Monticello Rd, Jefferson City, MO 65109

Name	Title	Department/Agency	Email	Phone #	Signature
Frank Underwood	DIF	Jeff City Schools	frank.underwood@jcschools.us	573-659-1190	
Lawna Burrow	Superintendent	Cole R-V	lawna.burrow@coler5.us	573-498-4000	
Adam Brown	Chairman	Village of Carterton	carterton.adam@gmail.com	573-634-3345	
Shannon Kieffer	Senior Planner	CCPLW	skieffer@ccplw.org	573-636-3014	
Brenda Gerlach	Region F Coord	SEMA	brenda.gerlach@sema.dps.mo.gov	573-644-3728	
Eric Landwehr	Director	Cole County PW	elandwehr@colecouny.org	636-3614	
Jan Wyatt	City Clerk	City of Russellville	russellville@embargo.net	782-3511	
Melissa Stafford	Planner	RPC	melissastafford@midmwrpc.org	573-353-1007	