DADE COUNTY
MISSOURI
2024 Multi-Jurisdictional
Natural Hazard Mitigation Plan

Prepared by:

SMCOG
Southwest Missouri
COUNCIL OF GOVERNMENTS

U.S. Department of Homeland Security
FEMA Region 7
11224 Holmes Road
Kansas City, MO 64131

FEMA

February 21, 2024

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

Subject: Approval of the Dade County Hazard Mitigation Plan

Director Remillard:

In accordance with applicable[1] laws, regulations and policy, the Risk Analysis Branch of the Federal Emergency Management Agency (FEMA) Region 7 has approved the Dade County Hazard Mitigation Plan. The attached Local Mitigation Plan Review Tool lists participants receiving approval that have submitted required adoption documentation.

The approval period for this plan is from February 15, 2024, through February 14, 2029. The same official plan expiration date applies to all participating jurisdictions, regardless of adoption date.

An approved mitigation plan is one of the conditions for applying for and receiving FEMA mitigation grants from the following programs:

- Hazard Mitigation Grant Program (HMGP)
- HMGP Post-Fire
- Building Resilient Infrastructure and Communities
- Flood Mitigation Assistance
- Rehabilitation of High Hazard Potential Dams Grant Program

Based on FEMA's review, the plan did not meet all elements required for the Rehabilitation of High Hazard Potential Dams (HHPD) grant program. Thus, the participating jurisdictions are not eligible for assistance from the HHPD Grant Program at this time. If any participating jurisdictions with HHPDs are interested in this assistance, they should contact the FEMA regional mitigation planner identified below to learn more about how to meet the required mitigation planning elements for this program.

Having an approved mitigation plan does not mean that mitigation grant funding will be awarded. Specific application and eligibility requirements for the programs listed above can be found in each FEMA grant program's respective policies and annual Notice of Funding Opportunities, as applicable.

To avoid a lapsed plan, the next plan update must be approved before the end of the approval period, including adoption by the participating jurisdictions. Before the end of the approval period, please allow sufficient time to secure funding for the update, including the review and approval process. Please include

[1] Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and National Dam Safety Program Act, as amended; 44 CFR Part 201, Mitigation Planning; and Local Mitigation Planning Policy Guide (FP-206-21-0002).

time for any revisions, if needed, and for the jurisdiction to formally adopt the plan after the review, if not adopted prior to submission. This will enable them to remain eligible to apply for and receive funding from FEMA's mitigation grant programs with a mitigation plan requirement. Local governments, including special districts, with a plan status of "Approvable Pending Adoption" are not eligible for FEMA's mitigation grant programs with a mitigation plan requirement.

We look forward to discussing options for implementing this mitigation plan. If you should have any questions or concerns, please contact Joe Chandler, Planning Team Lead, at (816) 808-9016 or joe.chandler@fema.dhs.gov.

Sincerely,

LAURIE L BESTGEN

Digitally signed by LAURIE L BESTGEN
Date: 2024.02.21 19:15:27 -06'00'

Laurie L. Bestgen, Director
Mitigation Division

CONTRIBUTORS

Dade County Hazard Mitigation Planning Committee

Jurisdictional Representatives

Name	Title	Organization
Darren Gallup	Emergency Management Director/Floodplain Administrator	Dade County
Kim Kinder	Presiding Commissioner	Dade County
Cyndi Trapp	Village Clerk	Arcola
Warren Beasley	Chairman	Arcola
Tim Larkin	Police Chief	Greenfield
Dave Engroff	Mayor	Greenfield
Mark Davis	City Clerk	Greenfield
Isaac Dodd	City Superintendent	Lockwood
Joy Finley	City Clerk	Lockwood
Linda Schilling	Acting Mayor	Lockwood
Kitty Ayres	Chairman	South Greenfield
Carrie Taylor	City Clerk	South Greenfield
Cassy Farmer	Superintendent	Dadeville R-II School District
Chris Kell	Superintendent	Greenfield R-IV School District
Clay Lasater	Superintendent	Lockwood R-I School District
Lori Sneed	Director/Secretary	Dade County Emergency Services 911/Dadeville Rural Fire Protection District

Stakeholder Representatives

Name	Title	Organization
Darren Gallup	Emergency Management Director/Floodplain Administrator	Dade County
Warren Beasley	Floodplain Administrator	Arcola
Dave Engroff	Floodplain Administrator	Greenfield
Isaac Dodd	City Superintendent	Lockwood
Linda Schilling	Floodplain Administrator	Lockwood
Tina Brownsberger	Administrative Assistant	MU Extension

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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Dade County and the participating municipalities/schools/special districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to the county and its communities. This plan is an update of the previous plan that was approved on May 1, 2019. The plan and the update were prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to result in eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

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

- Dade County
- Arcola
- Greenfield
- Lockwood
- South Greenfield
- Dadeville R-II School District
- Greenfield R-IV School District
- Lockwood R-I School District
- Dade County Emergency Services 911
- Dadeville Rural Fire Protection District

Local jurisdictions that were invited to participate but did not include:

- Dadeville
- Everton
- Everton R-III School District
- Dade County First Responders
- Dade County R-IV Rural Fire Protection District
- Everton Rural Fire Department
- Lockwood Fire Protection District

When the future five-year update is developed for this plan, these jurisdictions will be invited again to participate.

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

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

1. Protect the lives and livelihoods of all citizens.

2. Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
3. Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster.

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

Table I. Mitigation Action Matrix

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
Prevention								
1.2	NOAA weather radios	Dade County	32	1	Severe thunderstorm, tornado	X		
1.4	Alert systems	Dade County	29	1	Severe thunderstorm, tornado			
2.6	NFIP enforcement	Dade County	31	2	flooding	X	X	X
2.7	Burn restrictions	Dade County	30	2	Wildfire			
2.8	Ditches	Dade County	28	2	Flooding, severe thunderstorm	X		
2.2	NFIP Enforcement	Arcola	35	2	Flooding, severe thunderstorm	X	X	X
1.1	NOAA weather radios	Greenfield	18	1	Severe thunderstorm, tornado	X		
1.2	Alert systems	Greenfield	34	1	Severe thunderstorm. tornado			
2.2	NFIP enforcement	Greenfield	42	2	Flooding	X	X	X
2.2	NFIP enforcement	Lockwood	30	2	Flooding	X	X	X
1.2	Construction standards	Dadeville R-II School District	35	1	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather, wildfire		X	
2.2	Goals integration	Dadeville R-II School District	34	2	Flooding, earthquake, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
1.1	NOAA weather radios	Greenfield R-IV School District	39	1	Severe thunderstorm, tornado	X		

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.1	Alert system	Lockwood R-I School District	32	1	Earthquake, severe thunderstorm, tornado			
Structure and Infrastructure Projects								
1.1	Low water crossing markers	Dade County	37	1	Flooding, severe thunderstorm	X		X
1.3	Outdoor storm sirens	Dade County	24	1	Tornado, severe thunderstorm		X	
1.7	Retrofit existing facilities	Dade County	25	1	Severe thunderstorm, tornado,	X		
1.8	Safe room construction	Dade County	33	1	Tornado, severe thunderstorm	X	X	
2.1	Backup generators	Dade County	32	2	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X	X	
2.2	Low water crossing upgrades	Dade County	27	2	Flooding, severe thunderstorm	X		X
2.3	Storm water improvements	Dade County	28	2	Flooding, severe thunderstorm	X		X
2.9	Hulston bridge	Dade County	32	2	Flooding, severe thunderstorm	X		X
3.3	Equipment upgrades	Dade County	34	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire	X		
2.1	Backup generator	Arcola	43	2	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X		

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.4	Safe room construction	Greenfield	27	1	Severe thunderstorm, tornado	X	X	
1.5	Construction standards	Greenfield	42	1	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather			
2.1	Storm water management	Greenfield	13	2	Flooding, severe thunderstorm	X		X
1.1	Backup generator	Lockwood	30	1	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X		
2.1	Equipment upgrades	Lockwood	25	2	Flooding, earthquake, drought, extreme temp, severe thunderstorm, severe winter weather, tornado			
1.1	Safe room construction	South Greenfield	30	1	Tornado, severe thunderstorm, earthquake	X		
2.1	Highway 39 bridge	South Greenfield	41	2	Flooding, severe thunderstorm, severe winter weather	X		
2.2	City road improvements	South Greenfield	43	2	Flooding, severe thunderstorm, severe winter weather	X		
1.1	Safe room construction	Dadeville R-II School District	37	1	Tornado, severe thunderstorm	X		
2.1	Backup generator	Dadeville R-II School District	36	2	Tornado, severe thunderstorm, wildfire	X		

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.3	Retrofit existing facilities	Greenfield R-IV School District	31	1	Severe thunderstorm, tornado	X		
1.4	Safe room construction	Greenfield R-IV School District	30	1	Severe thunderstorm, tornado	X		
1.5	Construction standards	Greenfield R-IV School District	27	1	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather			
2.1	Backup generator	Greenfield R-IV School District	29	2	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X		
1.3	Retrofit existing facilities	Lockwood R-I School District	35	1	Tornado, severe thunderstorm	X		
2.1	Backup generator	Lockwood R-I School District	29	2	Flooding, severe thunderstorm, severe winter weather, tornado, earthquake	X		
3.1	Backup generator	Dade County Emergency Services 911	40	3	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire	X		
3.2	Backup mobile communications system	Dade County Emergency Services 911	39	3	Flooding, earthquake, drought, severe thunderstorm, severe winter weather, tornado, wildfire	X		
1.1	Outdoor storm siren	Dadeville Rural Fire Protection District	33	1	Tornado, severe thunderstorm, severe winter weather		X	

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
Natural Systems Protection								
-	-	-	-	-	-	-	-	-
Emergency Services								
3.2	Emergency response access	Dade County	28	3	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire	X	X	X
3.4	Evacuation and emergency access	Dade County	28	3	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire	X	X	X
3.3	Evacuation and emergency access	Greenfield R-IV School District	45	3	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather, tornado, wildfire	X	X	X
Education and Outreach								
1.5	Public awareness	Dade County	29	1	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.6	Information website	Dade County	35	1	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
1.9	Community programs	Dade County	28	1	Extreme temps, severe thunderstorm, tornado, severe winter weather			
2.4	Drought-resistant practices	Dade County	31	2	Drought, wildfire			
2.5	Goal integration	Dade County	28	2	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
3.1	Information sharing	Dade County	28	3	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
1.1	Public awareness	Arcola	35	1	Dam failure, sinkhole, drought, extreme temperatures, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.3	Public awareness	Greenfield	34	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.6	Community programs	Greenfield	8	1	Extreme temp, severe thunderstorm, tornado, severe winter weather			
1.2	Public Awareness	Lockwood	30	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Public Awareness	South Greenfield	30	1	Dam failure, sinkhole, drought, extreme temps, wildfire			
3.1	Information sharing	Dadeville R-II School District	37	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.2	Annual review	Dadeville R-II School District	36	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Public awareness	Greenfield R-IV School District	32	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
2.2	Goal integration	Greenfield R-IV School District	31	2	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.1	Information sharing	Greenfield R-IV School District	40	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.2	Annual review	Greenfield R-IV School District	40	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Public awareness	Lockwood R-I School District	26	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.1	Annual review	Lockwood R-I School District	34	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.3	Information Sharing	Dade County Emergency Services 911	30	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.2	Funding identification	Dadeville Rural Fire Protection District	33	1	Flooding, drought, severe thunderstorm, severe winter weather, tornado, wildfire			
3.3	Information Sharing	Dadeville Rural Fire Protection District	30	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			

PREREQUISITES

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

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

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

Model Resolution

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

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

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

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

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

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

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

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

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

ADOPTED by a vote of_____in favor and__against, and__abstaining, this_____day of _____,_____.

By (Sig): _____
Print name: _____

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

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

1 INTRODUCTION AND PLANNING PROCESS

1.1 PURPOSE

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

By participating in the planning process and meeting the necessary requirements to do so, communities, school districts, and other special districts become eligible to apply for mitigation grant funding.

FEMA has implemented various hazard mitigation provisions through the Code of Federal Regulations (CFR) at 44 CFR Part 201. The CFR provisions set forth the mitigation plan requirements for local and tribal governments as a condition of receiving FEMA hazard mitigation assistance. Local governments, schools, or other publicly funded districts that do not participate or adopt a hazard mitigation plan will not be eligible to apply for grants as stated under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288) as amended by the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007.

1.2 BACKGROUND AND SCOPE

As required by 44 CFR §201.6(d)(3), a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts and changes in priorities, and resubmit it for approval every five (5) years in order to continue to be eligible for mitigation project grant funding. The 2024 Dade County Multi-Jurisdictional Natural Hazard Mitigation Plan, from here on referred to as the Plan, is a revision of the previous five-year update approved on May 1, 2019.

The 2024 Plan is a major rewrite of the previous plan and reflects changes in priorities and development, and the continued commitment of local governments to mitigate the impact of natural hazards in Dade County. Local participating jurisdictions include:

- Dade County
- Arcola

- Greenfield
- Lockwood
- Greenfield
- Dadeville R-II School District
- Greenfield R-IV School District
- Lockwood R-I School District
- Dade County Emergency Services 911
- Dadeville Rural Fire Protection District

All jurisdictions received email and phone communications notifying representatives of upcoming meetings and participation requirements.

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

1.3 PLAN ORGANIZATION

The Plan is organized into five chapters. The format of the Plan was changed to conform to the local hazard mitigation plan outline template released by the Missouri State Emergency Management Agency (SEMA). The Plan chapters include:

- Chapter 0: Executive Summary
- Chapter 1: Introduction and Planning Process
- Chapter 2: Planning Area Profile and Capabilities
- Chapter 3: Risk Assessment
- Chapter 4: Mitigation Strategy
- Chapter 5: Plan Implementation and Maintenance
- Appendices

Table 1.1 summarizes the changes made in the Plan by chapter.

Table 1.1. Changes Made in Plan Update

Plan Section	Summary of Updates
Chapter 1 - Introduction and Planning Process	• Updated list of participating jurisdictions • Updated list of mitigation planning committee members • Removed Department column from Table 1.2 • Added Table 1.3 – MPC Capability with Six Mitigation Categories • An online community survey was conducted regarding hazard threats and mitigation activities in the community
Chapter 2 - Planning Area Profile and Capabilities	• Updated demographics information • Incorporated revisions to community profiles as draft sections were reviewed by local officials • Added Table 2.5 – Agriculture Overview • Added a table for FEMA HMA Grants

	• Added a summary table for Special District Mitigation Capabilities • Added narrative describing school district mitigation capabilities • Added Table 2.16 – Summary of Special District Mitigation Capabilities
Chapter 3 - Risk Assessment	• Updated NCEI tables to show 2003-2022 data • Used Lightcast.io to for Table 3.11 – Major Non-Government Employers in Dade County • Removed Building Permit table • Used a combination of Dade County Assessor, National Structure Inventory, and MSDIS data for mapping, building counts, and exposure data • Added a table summarizing community perception of hazards to each hazard under the Community Comments section • Added insurance payment info to many hazards under the Previous Occurrences section • Added a tornado siren map to the Tornado section • Added a wildfire hazard potential map to the Wildfire section
Chapter 4 - Mitigation Strategy	• Reformatted STAPLEE and action worksheets • Changed order of mitigation actions • Added mitigation action matrix table
Chapter 5 - Plan Implementation and Maintenance	• No significant changes were made

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.

The Southwest Missouri Council of Governments (SMCOG) was contracted to facilitate the plan development process. SMCOG staff met with the Dade County EMD during an initial scoping meeting to develop contact information for area stakeholders and local jurisdiction representatives to establish the Mitigation Planning Committee (MPC). Meeting locations and schedules were discussed, and the most effective way to inform and include the public was determined. Also discussed was previous plan maintenance and any updates made over the past five years. It was determined that the document had not been officially updated.

The planning process included the kick-off meeting and four subsequent MPC meetings. SMCOG staff were responsible for producing the draft and final plan update in a FEMA-approvable document, as well as coordinating with SEMA and FEMA plan reviewers. Specific information about agenda items for the MPC meetings is presented in **Section 1.4.2**. SMCOG also assisted in soliciting public involvement in the planning process by creating a community survey. Notification of all five MPC meetings were sent via mail, phone, and/or email to all jurisdictions within the county. Meeting dates were posted on the SMCOG website in advance. Appendix B provides documentation of the planning process including public involvement solicitations and

meeting notices.

Input from jurisdiction officials was solicited through distribution of drafts of plan elements for discussion and review at scheduled meetings and other communications with individual community representatives and elected officials.

A complete listing of agencies invited to participate in the planning process and what meetings they were invited to attend is included in Appendix B.

Tables 1.2 and 1.3 show the jurisdictional and stakeholder MPC members.

Table 1.2. Jurisdictional Representatives

Name	Title	Organization
Darren Gallup	Emergency Management Director/Floodplain Administrator	Dade County
Kim Kinder	Presiding Commissioner	Dade County
Cyndi Trapp	Village Clerk	Arcola
Warren Beasley	Chairman	Arcola
Tim Larkin	Police Chief	Greenfield
Dave Engroff	Mayor	Greenfield
Mark Davis	City Clerk	Greenfield
Isaac Dodd	City Superintendent	Lockwood
Joy Finley	City Clerk	Lockwood
Linda Schilling	Acting Mayor	Lockwood
Kitty Ayres	Chairman	South Greenfield
Carrie Taylor	City Clerk	South Greenfield
Cassy Farmer	Superintendent	Dadeville R-II School District
Chris Kell	Superintendent	Greenfield R-IV School District
Clay Lasater	Superintendent	Lockwood R-I School District
Lori Sneed	Director/Secretary	Dade County Emergency Services 911/Dadeville Rural Fire Protection District

Table 1.3. Stakeholder Representatives

Name	Title	Organization
Darren Gallup	Emergency Management Director/Floodplain Administrator	Dade County
Warren Beasley	Floodplain Administrator	Arcola
Dave Engroff	Floodplain Administrator	Greenfield
Isaac Dodd	City Superintendent	Lockwood
Linda Schilling	Floodplain Administrator	Lockwood
Tina Brownsberger	Administrative Assistant	MU Extension

Table 1.4. MPC Capability with Six Mitigation Categories

Community Department/Office	Preventive Measures	Structure and Infrastructure Projects		Natural Resource Protection	Public Information	Emergency Services
		Property Protection	Structural Flood Control Projects			
Dade County OEM	X	X	X	X	X	X
Dade County Commission	X	X			X	X
Arcola Administration	X	X			X	
Greenfield Police	X	X			X	X
Greenfield Administration	X	X			X	
Lockwood Administration	X	X			X	
Lockwood City Superintendent	X	X	X	X	X	X
South Greenfield Administration	X	X			X	
Dadeville R-II Superintendent					X	
Greenfield R-IV Superintendent					X	
Lockwood R-I Superintendent					X	
Dade County Emergency Services 911 Administration	X	X		X	X	X
Dadeville Rural Fire Protection District Administration	X	X		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.

The Plan serves as a written document of the planning process. Active participation of local jurisdiction representatives and stakeholders in the hazard mitigation planning process is essential if the Plan is to have value. To be eligible for mitigation funding, local governments must adopt the FEMA-approved update of the Plan. The participation of the local government stakeholders in the planning process is considered critical to successful implementation of this plan. Each jurisdiction that is seeking approval for the Plan must have its governing body adopt the updated plan, regardless of the degree of modifications. SMCOG collaborated with the local governments in Dade County to ensure participation in the planning process and the development of a plan that represents the needs and interests of the county and its local jurisdictions. Appendix D contains resolutions for jurisdictions adopting the Plan.

County Commissioners, incorporated communities, public schools, special districts, and various other stakeholders in mitigation planning were invited to a kick-off meeting for the Plan update on March 29, in Lockwood. At this meeting it was explained that the Disaster Mitigation Act (DMA) requires each jurisdiction participating in the planning process officially adopt the Plan. The criteria for participation that each jurisdiction must meet in order to be considered a "participant" in the Plan was established at this meeting and includes the following:

- Attend at least two MPC meetings, by either direct participation or authorized representation
- Provide to the MPC sufficient information to support plan development by completing the Data Collection Questionnaire
- Provide documentation to show time donated to the planning effort
- Complete the STAPLEE and Action Sheets
- Formally adopt the mitigation plan

Some jurisdictions were able to adopt the plan before it received final SEMA/FEMA approval, while others had to wait for SEMA/FEMA to first approve the plan before they could formally adopt it. Jurisdictions that met the minimum requirements are considered to have satisfactorily participated in the planning process. In addition to public outreach solicited through SMCOG, each participating jurisdiction was strongly encouraged to seek public input at an open public meeting or through various forms of input solicitation.

Table 1.5 shows the representation of each participating jurisdiction at the planning meetings and the provision of responses to the data collection questionnaire. All jurisdictions participating in the Plan either reviewed or commented on the draft Plan, participated in the update and development of mitigation actions, documented the donation of time, completed all required documents, and passed an adoption resolution. Meeting sign-in sheets are located in Appendix B.

Table 1.5. Jurisdictional Participation in the Planning Process

Jurisdiction	Mtg #1	Mtg #2	Mtg #3	Mtg #4	Mtg #5	Data Collection Questionnaire	Documented Donated Time	Adoption Resolution
Dade County	X	X	X	X	X	X	X	X
Village of Arcola	X	X		X		X	X	X
Greenfield	X	X	X	X		X	X	X
Lockwood	X	X		X	X	X	X	X
Village of South Greenfield			X		X	X	X	X
Dadeville R-II		X	X			X	X	X
Everton R-III		X	X			X	X	X
Greenfield R-IV	X	X			X	X	X	X
Lockwood R-I		X			X	X	X	X
Dade County Emergency Services 911		X	X			X	X	X
Dadeville Rural Fire Protection District		X	X			X	X	X

1.4.2 The Planning Steps

FEMA's Local Mitigation Planning Handbook (March 1, 2013), Local Mitigation Plan Review Guide (October 1, 2011), and Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013) were used as the sources for developing the Plan update process. The development of the plan followed the 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. The 10-step process allows the Plan to meet funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program.

Table 1.6 is a summary of how SMCOG staff used the Nine Task Process to develop the update to the Plan.

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 the Planning Team

In February 2023, SMCOG entered into cooperative agreements with SEMA and Dade County to prepare this multi-jurisdictional plan for public entities in Dade County. Discussions on the development of the Dade County Multi-Jurisdictional Natural Hazard Mitigation Plan began in early 2023 with an introductory scoping meeting attended by SMCOG staff and the Dade County Emergency Management Director. This meeting was conducted to discuss the timeline for developing the hazard mitigation plan, the planning process, identification of stakeholders and community organizations to include in the planning process, and dates for five planning committee meetings, beginning with a kick-off meeting on March 29, 2023, to initiate participation of

jurisdictions and public entities in the planning process. The Emergency Management Director (EMD) and SMCOG staff identified prospective participant representatives and stakeholders and a contact list was prepared for the kick-off meeting. The list of invitees included local elected officials, municipal government staff, county government staff, emergency services personnel, public school administrators, members from health and social services organizations, and utility providers. A complete list of invites is in Appendix B.

The MPC met on several occasions from March through July 2023 to collaborate on the development of the Plan update. Participants assisted in data collection; reviewed and revised the Plan's goals and mitigation strategies; and provided reviews and comments on the Plan throughout the update process. Communication with MPC members occurred throughout the planning process through phone conversations, letters, and email correspondence in addition to committee meetings. **Table 1.7** shows the meeting schedule and items discussed for MPC meetings.

Table 1.7. Schedule of MPC Meetings

Meeting	Topic	Date
Kick-off Meeting	Introduction to hazard mitigation planning, participation requirements, and the planning process	3/29/23
Planning Meeting #2	Participation overview, process recap, and risk assessment	4/25/23
Planning Meeting #3	Mitigation goals and actions	5/30/23
Planning Meeting #4	Mitigation goals and actions	6/29/23
Planning Meeting #5	Funding and implementation mechanisms, plan adoption, and maintenance	8/08/23

Step 2: Plan for 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.

Options for soliciting public input on the Plan were discussed with the MPC at the kick-off meeting. SMCOG staff explained the importance of public involvement during the planning process. Meeting invitations were sent to all committee members around a month before each meeting took place. It was also discussed at the kick-off meeting that solicitation of public input would be sought by members of the MPC through announcements at gatherings and other public meetings, such as board of aldermen, county commission, board of education, and local emergency planning committee meetings. Progress on the plan was shared at each meeting in order to keep the committee involved in the update process.

The MPC also decided that SMCOG staff would assist in developing an online community survey. The survey was posted on the SMCOG website and SMCOG staff encouraged jurisdictions to

post it on their social media pages. 48 responses were received in the two-month timeframe the survey was open. A summary of responses to the survey can be found in chapter 3 in each hazard profile.

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.

As stated in **Section 1.4**, neighboring communities and local stakeholders were contacted via email, letters, and/or phone calls. A notification was sent to adjacent emergency management offices in Polk, Greene, Lawrence, Jasper, Barton, and Cedar counties. The Dade County Senior Center, the Missouri University Extension Office in Greenfield, and various religious organizations were also notified of the update and encouraged to provide feedback on mitigation actions and areas of interest. A complete listing of all agencies invited to participate in the planning process is included in Appendix B.

Integration of Other Data, Reports, Studies, and Plans

A significant amount of information presented in the Plan has been updated and revised based on the review and incorporation of existing plans, studies, reports, and technical information. Appendix A contains a list of references to plans, studies, reports, and technical information to incorporate into hazard profiles, risk assessment, and profile and capability sections. Plan participants and stakeholders were asked to provide any relevant information and data for inclusion in the document. A few examples of information incorporated from the review of existing plans, etc. include:

- 2023 Missouri State Hazard Mitigation Plan
- The National Inventory of Dams (NID)
- Missouri Department of Conservation (MDC) wildfires statistics
- Wildland/Urban Interface and Intermix areas from the SILVIS Lab
- Previous Dade County Hazard Mitigation Plan

Step 4: Assess the Hazard: Identify and Profile Hazards

At the second MPC meeting, profiles of identified hazards from the previous Hazard Mitigation Plan were presented. Storm event data from the National Centers for Environmental Information for the 20-year period from 2003-2022 were included in the hazard profiles. The presentation incorporated data from studies, reports, and technical information available through internet research. During the process of identifying hazards the MPC reviewed:

- Previous disaster declarations in the county

- Hazards in the most recent State Hazard Mitigation Plan
- Hazards identified in the previously approved hazard mitigation plan

The MPC was asked to prioritize the identified hazards based on probability of occurrence, human impact, and property impact. Additional information about the conclusions drawn can be found in the Risk Assessment chapter of the Plan.

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

Identified assets in the planning area include population, structures, critical facilities and infrastructure, and other important assets that may be at risk to hazards. The inventory of assets for each jurisdiction was derived from parcel data from the County Assessor, the Dade County Structures GIS dataset from MSDIS, local jurisdiction data collection questionnaires, and the U.S. Census. Potential losses to existing development were estimated based on hazard event scenarios. In most cases the assessor values were used to estimate structure losses in impacted areas for structure occupancy types. The methodology for estimating losses varies by hazard. Loss estimates are included in each hazard profile of the Risk Assessment chapter.

Most jurisdictions estimated local capabilities and assets based on the best available data and staff knowledge. In some cases, MPC members were not able to fully complete questionnaires due to limited local information being available.

Step 6: Set Goals

The MPC conducted a discussion session during the third meeting to review the Plan goals. It was determined that the goals from the previous would be used.

The Plan update goals are as follows:

Goal 1: Protect the lives and livelihood of all citizens.
Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Goal 3: Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster.

These goals and the identified mitigation actions are discussed in more detail in Chapter 4.

Step 7: Review Possible Mitigation Actions and Activities

In addition to discussing the overall goals at the third and fourth meetings, the MPC also reviewed mitigation actions from the previous plan and any potential new actions. For a comprehensive range of mitigation actions to consider, the MPC reviewed the following information during the meeting:

- A list of actions proposed in the previous mitigation plan
- Input during meetings
- Responses to Data Collection Questionnaires where jurisdictions had reported progress made on previous actions
- FEMA publications *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)* and *Hazard Mitigation Assistance Guidance (2015)*

Jurisdiction representatives on the MPC were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction, as well as the previously identified mitigation actions prior to the meeting. Representatives were provided a link to the FEMA's publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)* prior to the meeting. 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. Additionally, survey responses which identified community support for specific mitigation actions were reviewed and discussed.

During these meetings, a few new actions were proposed by the committee and numerous actions were reworded. Much of the discussion surrounded making actions SMART: Specific, Measurable, Achievable, Relevant, and Time-bound.

Step 8: Draft an Action Plan

At the fourth MPC meeting, representatives were provided with blank STAPLEE scoring sheets. Those who could not attend the meeting were emailed the sheets. The method was used to develop a priority score for proposed actions. During the meeting, SMCOG staff provided an overview of scoring criteria and example scoring for an action. MPC members were encouraged to use the STAPLEE scoring to determine which actions applied to their jurisdiction. Some actions were eliminated due to non-applicability or low feasibility scores.

MPC members were also given action sheets that corresponded to the STAPLEE sheets. SMCOG staff reviewed the action sheets in detail and discussed what department or position would be responsible for implementing the action, potential funding sources, timeline for completion, and local planning mechanisms for implementation. The action plans are listed for each jurisdiction in the Mitigation Strategy chapter.

Step 9: Adopt the Plan

The final meeting provided a wrap-up and opportunity to answer any questions pertaining to plan adoption. The final plan must be approved by the governing body of each jurisdiction by resolution to be eligible for hazard mitigation assistance. Adoption resolutions are included in Appendix D.

Step 10: Implement, Evaluate, and Revise the Plan

At the final meeting, MPC members briefly reviewed potential funding sources for mitigation projects and the process for reviewing and monitoring the plan. It was determined that Dade County Emergency Management will be charged with scheduling and staffing annual meetings and keeping the plan updated. The overall strategy has been updated and is presented in the Plan Maintenance chapter.

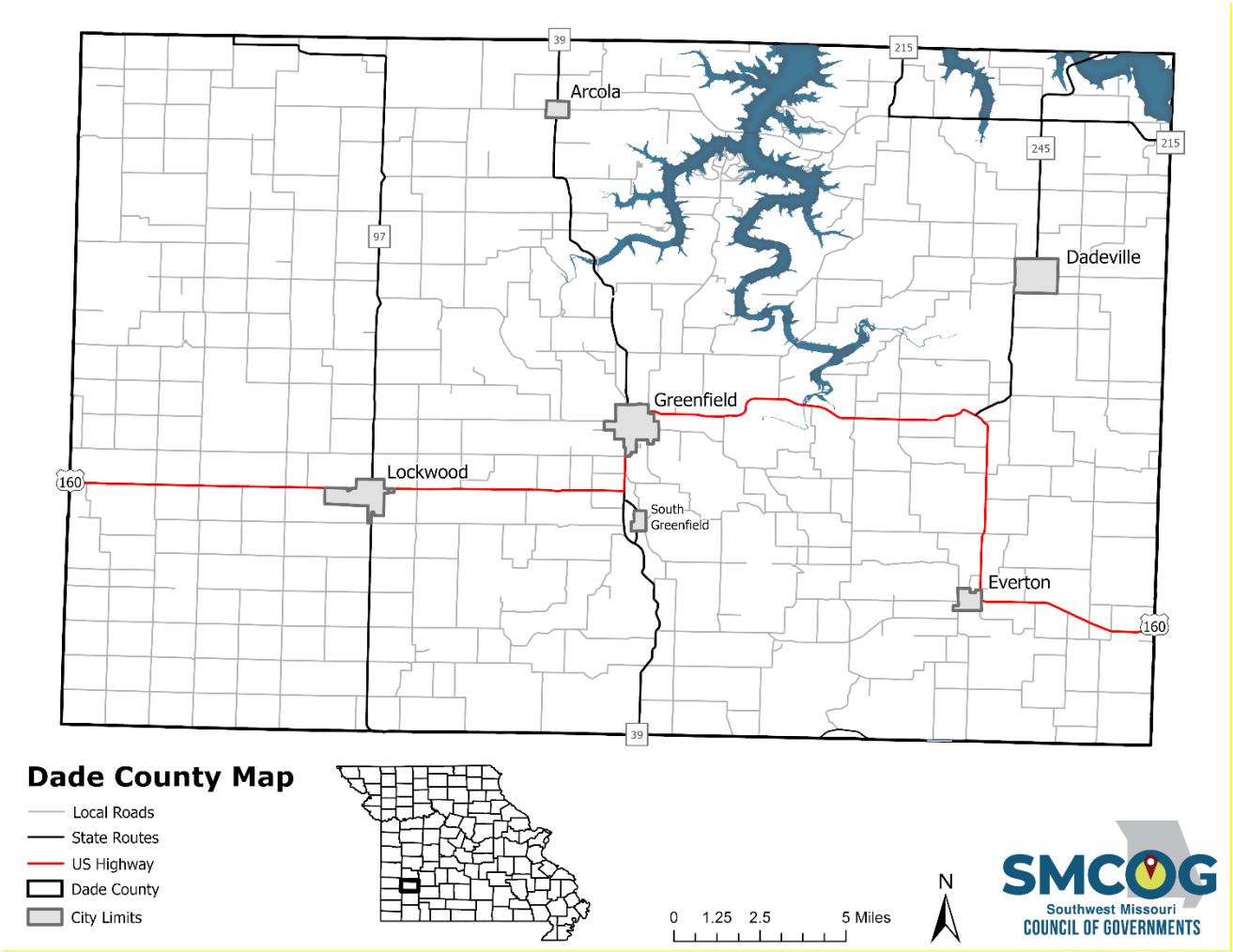
2 PLANNING AREA PROFILE AND CAPABILITIES

2.1 DADE COUNTY PLANNING AREA PROFILE

Dade County is located in Southwest Missouri. It is bordered by Barton, Cedar, Polk, Greene, Lawrence, and Jasper Counties. Incorporated municipalities include the Cities of Dadeville, Greenfield, and Lockwood, as well as the Villages of South Greenfield and Arcola. The county has a total area of 506 square miles, of which 490 square miles are land and 16 square miles are water. Greenfield is the county seat.

Figure 2.1 is a map of Dade County showing the cities, village, and overall location of the county within the state.

Figure 2.1. Map of Dade County



According to the 2020 US Census, the population of Dade County is 7,569. This is a 4% decrease compared to 2010 US Census, which was 7,883. During this same time, the State of Missouri increased 2.7% and the nation increased 7.3%.

From 2010 to 2020, the median household income (MHI) rose from $32,714 to $42,117, an increase of 28.7%. During this time, median household income increased 23.8% statewide and 25.2% nationwide. The median household value (MHV) for Dade County increased 39.4% from $73,000 to $101,800 – higher than both the statewide increase of 18.8% and the nationwide increase of 22.0%.

2.1.1 Geography, Geology and Topography

Dade County covers 490 square miles of land and 16 square miles of water located in southwest Missouri. The majority of residents live in rural areas. Greenfield (1,401) and Lockwood (1,078) are the only cities with a population above 1,000.

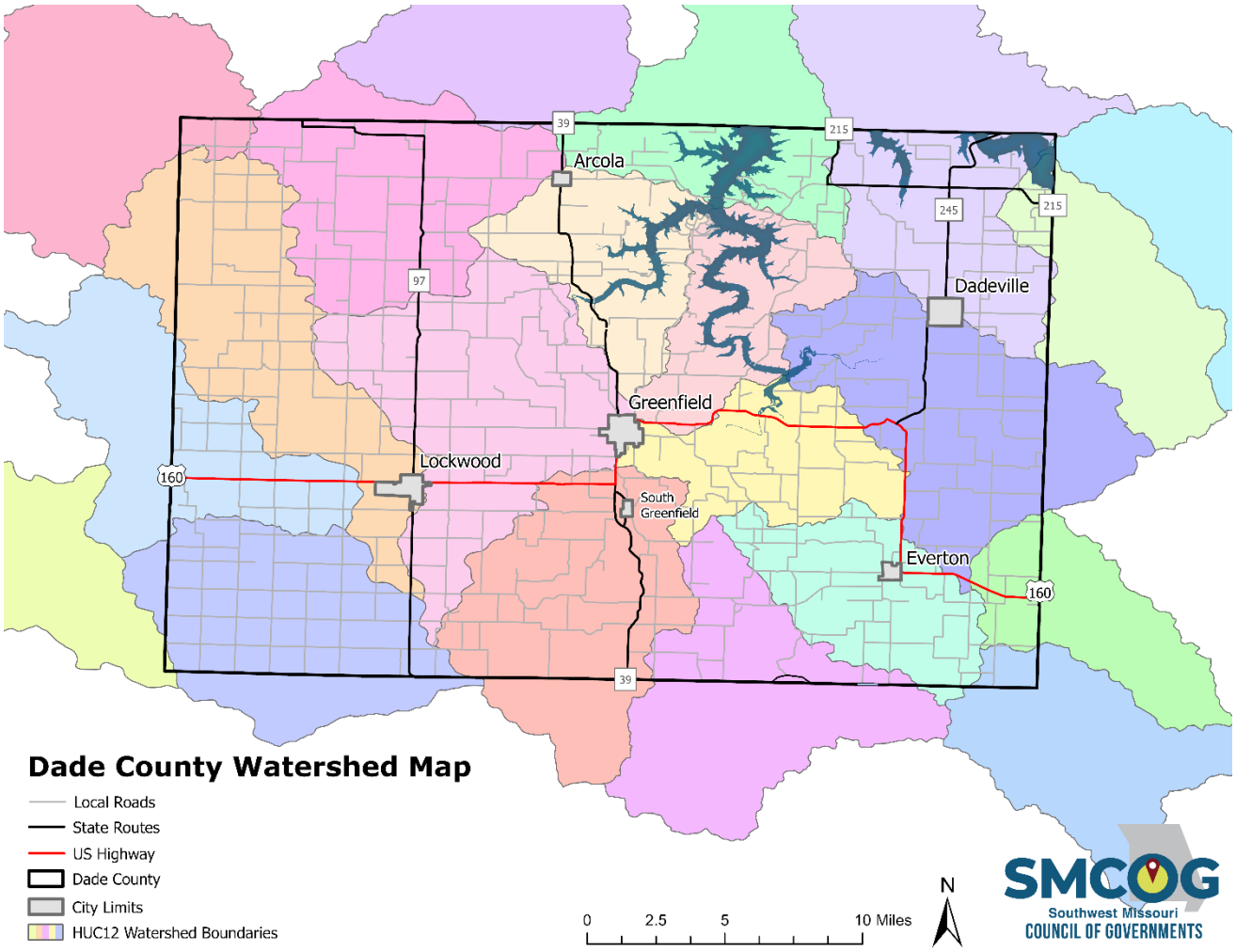
Nearly all of Dade County is situated in the Interior Highlands Physiographic Province of the United States. Most of the county lies on the Springfield Plateau, a subdivision of the Ozarks Plateau physiographic region. The northeastern corner of the county lies on the Salem Plateau subdivision of the Ozarks Plateau. The extreme northwest corner of the county is located on the Osage Plains subdivision of the Central Lowlands Physiographic Province.

Dade County's topography transitions from nearly level to gently rolling plains in the western area to more hilly landscapes in the central and eastern section of the county. The landscape varies in response to the underlying bedrock formations and the process of weathering of the bedrock. Resistant sandstone and/or cherty limestone usually cap the mounds and prairies in the western and southern parts of the county. The slopes below the caps are usually developed on less resistant shale. The bedrock consists mainly of sedimentary rock ranging from Jefferson City dolomite of Ordovician age to sandstone, shale, and conglomerates of Pennsylvanian age.

Several old and geologically inactive faults exist in the county. The most prominent is the Dadeville fault that trends in a southeast-northwest direction. Highway Y crosses the Dadeville fault approximately seven miles west of Bona. Several small faults and folds parallel with the Dadeville fault, but these faults are geologically inactive and pose no seismic risk.

Figure 2.2 provides a map of Dade County Watersheds

Figure 2.2. Dade County Watersheds



2.1.2 Climate

Dade County has a continental climate with mild winters and hot, humid summers. Based on information from the Midwest Regional Climate Center, the Lockwood, MO area has an average annual temperature of 56 degrees Fahrenheit. The average high in July is 89 Fahrenheit and the average low in January is 22 Fahrenheit. It averages 44.04 inches of precipitation, with snow accounting for an average of 14.9 inches annually. This is based on a 20-year time period of 2003 to 2022.

2.1.3 Population/Demographics

Table 2.1 provides population statistics for Dade County and the participating municipalities.

Table 2.1. Dade County Population 2000-2020

Jurisdiction	2010 Population	2020 Population	# Change (2010-2020)	% Change (2010-2020)
Dade County	7,883	7,569	-314	-4.0%
Arcola	43	65	22	51.2%
Greenfield	1,554	1,401	-153	-9.8%
Lockwood	976	1,078	102	10.5%
South Greenfield	68	49	-19	-27.9%

Source: US Census Bureau Decennial Census https://data.census.gov/

Table 2.2 provides a full breakdown of the age composition for Dade County, the State of Missouri, and the United States.

Table 2.2. Dade County, Missouri, and United States Population Age Composition

Age Group	Dade County Number	Dade County Percent	Missouri Percent	United States Percent
Under 5	384	5.1%	6.1%	6.1%
5 to 9	420	5.5%	6.2%	6.2%
10 to 14	463	6.1%	6.4%	6.4%
15 to 19	471	6.2%	6.5%	6.5%
20 to 24	351	4.6%	6.8%	6.8%
25 to 29	349	4.6%	6.8%	7.1%
30 to 34	354	4.7%	6.5%	6.8%
35 to 39	419	5.5%	6.3%	6.5%
40 to 44	432	5.7%	5.7%	6.1%
45 to 49	456	6.0%	6.1%	6.4%
50 to 54	471	6.2%	6.5%	6.6%
55 to 59	629	8.3%	7.0%	6.7%
60 to 64	587	7.7%	6.5%	6.2%
65 to 69	635	8.4%	5.3%	5.2%
70 to 74	445	5.9%	4.1%	3.9%
75 to 79	235	3.1%	3.0%	2.7%
80 to 84	244	3.2%	2.0%	1.9%
85 and over	239	3.2%	2.0%	1.9%

Source: US Census Bureau American Community Survey 2021 5 Year Estimates https://data.census.gov/

The University of South Carolina developed an index to evaluate and rank the ability to respond to, cope with, recover from, and adapt to disasters. The index synthesizes 29 socioeconomic variables which research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards. SoVI® data sources include primarily those from the United States Census Bureau.

The index is a comparative metric that facilitates the examination of the differences in social vulnerability among counties. SoVI® is a valuable tool for policy makers and practitioners. It graphically illustrates the geographic variation in social vulnerability. It shows where there is uneven capacity for preparedness and response and where resources might be used most effectively to reduce the pre-existing vulnerability. SoVI® also is useful as an indicator in determining the differential recovery from disasters.

Dade County's 2019 SoVI® score is 1.02. This score was 1.340000033 in 2014, which placed it in the 72.1 percentile. This means that 72.1% of the country was more resilient to hazards and disasters than Dade County at that time. The percentile score was not provided for 2019 data. The main determinants of the score are qualities of the population based on race and class, wealth, elderly residents, Hispanic ethnicity, special needs individuals, Native American ethnicity, and the service industry employment.

Table 2.3 shows employment statistics for Dade County and the participating municipalities.

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

Jurisdiction	Total in labor force	Unemployment rate	Families below the poverty level	High school graduate (age 18-24)	Bachelor's degree or higher (age 25 and over)	Spoken language other than English
Dade County	3351	8.4	11.9	46.1	13.8	1.9
Arcola	5	0.0	0.0	0.0	0.0	21.9
Greenfield	526	19.0	17.9	44.9	9.9	3.0
Lockwood	517	5.6	11.5	66.2	12.8	0.0
South Greenfield	27	0.0	29.4	0.0	6.3	0.0
Missouri	3107007	4.6	8.4	33.5	31.7	6.0
United States	168236937	6.3	9.1%	34.8	35.0	21.6

Source: US Census Bureau American Community Survey https://data.census.gov/

2.1.4 History

Dade County was part of the area claimed by France until purchased by the United States in 1803 as part of the Louisiana Purchase. The area was first inhabited by the Sac, Delaware and Osage Indians; the Osage ceded the territory in 1808. The first settlers arrived in the early 1830s from Kentucky and Tennessee and found fertile prairie soils, walnut timber, wild game, and rivers and creeks which provided drinking water for their animals.

Dade County was created on January 29, 1841, from Barry County territory and was named after Major Francis L. Dade, who was killed in the Seminole Wars. Greenfield was named the county seat (Aldrich, Dade County Soil Survey, p. 10). Growth of the cities was stimulated by railroad construction in 1881. The Kansas City, Fort Scott & Gulf Railroad was constructed through the southern part of the county, running through the communities of Everton, South Greenfield, and Lockwood. The construction of a rail spur from the main line to Greenfield was privately financed by Greenfield residents and businessmen. The Greenfield Northern Railroad solidified Greenfield's position as the county seat. Dade County's economy began to expand and diversify following construction of the railroad.

Mining of coal, zinc, iron, lead, and silica contributed to a population boom in the late 1800s as investors and workers migrated to the county. However, mining ceased in the early 1900s and the population declined as mining boom towns, such as Corry, faded away. Agriculture dominated the local economy during the early 1900s. Chief crops produced in the county were oats, wheat, corn, and fruits. Animal production included dairy and beef cattle, horses, poultry, and sheep. The dairy industry was strong through the 1940s, but beef cattle became more dominant through the latter part of the century.

Dade County's landscape changed significantly in the early 1960s with the construction of Stockton Dam on the Sac River in Cedar County and the creation of Stockton Lake. Nearly 26,000 acres of land in Cedar, Dade and Polk counties were inundated with the formation of Stockton Lake. The U.S. Army Corps of Engineers (USACE) maintains a policy of limiting access to federal lands and Stockton Lake to only power generation, flood control, and recreational purposes, and there is minimal commercial and residential development around the lake area in Dade County. While Stockton Lake is a popular

attraction for fishing and water sports, it has not been a major catalyst for diversifying the Dade County economy to the extent experienced by other counties in Southwest Missouri with USACE maintained lakes in their jurisdictions (Table Rock Lake in Stone and Taney Counties, for example).

2.1.5 Occupations

Occupation information for the Dade County labor force comes from the American Community Survey 5-year Estimates. Management, Business, Science, and Arts Occupations includes education and healthcare practitioner and technician occupations among others. Service Occupation includes healthcare support and protective services, such as firefighters and law enforcement in addition to food preparation and personal care services. The other occupation classifications are well defined. **Table 2.4** contains occupation statistics for the incorporated cities and county, as well as a comparison for Missouri and the United States.

Table 2.4. Dade County Occupation Statistics

Jurisdiction	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Dade County	24.1%	15.0%	17.9%	16.4%	26.6%
Arcola	0.0%	0.0%	0.0%	0.0%	100.0%
Greenfield	20.4%	24.9%	16.7%	12.0%	26.1%
Lockwood	22.1%	18.2%	12.7%	13.3%	33.6%
South Greenfield	29.6%	7.4%	7.4%	0.0%	55.6%
Missouri	40.8%	15.2%	20.7%	8.4%	14.9%
United States	42.2%	16.1%	20.0%	8.5%	13.1%

Source: US Census Bureau American Community Survey 2021 5 Year Estimates https://data.census.gov/

2.1.6 Agriculture

According to the United States Department of Agriculture 2017 Agricultural Census, there were 699 farms covering 265,802 acres across Dade County. The average farm size was 380 acres, which is a 14% increase from 2012. Table 2.5 provides further agriculture information.

Table 2.5. Agriculture Overview

	2017	Change Since 2012
Number of farms	699	-5%
Land in farms (acres)	265,802	+8%
Average size of farm (acres)	380	+14%
Totals		
Market value of products sold	$70,192,000	+1%
Government payments	$1,928,000	+16%
Farm-related income	$3,017,000	-19%
Total farm production expenses	$58,549,000	+6%
Net cash farm income	$16,587,000	-17%
Per farm average		
Market value of products sold	$100,418	+6%
Government payments	$11,015	+36%
Farm-related income	$10,123	-26%
Total farm production expenses	$83,761	+12%
Net cash farm income	$23,730	-12%

Source: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Missouri/index.php

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

Since 2000, jurisdictions within Dade County received only one FEMA HMA Grants totaling $1,660,660. **Table 2.6** provides a summary of this project.

Table 2.6. FEMA HMA Grants in Dade County, 2000 – Current

Disaster Declaration	Program Area	Project Type	Sub-Grantee	Date Approved	Project Total
DR-4451-0036-R	HMGP	Safe Room (Tornado and Severe Wind Shelter) – Public Structures	Lockwood	05/03/2022	$1,660,660

Source: Federal Emergency Management Agency

2.1.8 FEMA Public Assistance (PA) Grants in Dade County

Since 2000, jurisdictions in Dade County have received $2,865,419.62 in public assistance due to natural hazard damages. **Table 2.7** shows a summary of these payments. Data was retrieved from the FEMA public assistance dataset.

Table 2.7. FEMA PA Grants in Dade County 2000 - Current

Disaster Number	Declaration Date	Project Title	Applicant	Project Amount
4451	7/9/2019	118104 - County Wide Culverts	Dade County	$55,828.84
4451	7/9/2019	118103 - County Wide Chip and Seal Roads	Dade County	$16,031.00
4451	7/9/2019	118098 - South East Quadrant Gravel Roads	Dade County	$198,551.26
4451	7/9/2019	118097 - North West Quadrant Gravel Roads	Dade County	$172,578.44
4451	7/9/2019	117748 - Northeast Quadrant Gravel Roads	Dade County	$225,094.87
4451	7/9/2019	118096 - South West Quadrant Gravel Rds	Dade County	$152,455.25
4451	7/9/2019	135557 - Dade County Management Costs	Dade County	$8,146.04
4144	9/6/2013	DCRM01C Cedar Township Damaged Gravel Roads	Dade County	$35,257.54
4144	9/6/2013	DCRM05C SAC Township Damaged Gravel Roads	Dade County	$14,051.00
4144	9/6/2013	DCRA01G - Village of Lockwood Municipal Golf Course	Dade County	$34,149.12
4144	9/6/2013	DCFY01C Washington Twp, Dade Co.	Dade County	$35,002.34
4144	9/6/2013	DCFY02C - North Morgan Twp, Dade Co.	Dade County	$32,376.05
4144	9/6/2013	DCFY03C - South Morgan Twp, Dade Co.	Dade County	$61,420.40
4144	9/6/2013	Birchwood Twp, Dade Co. DCFY04C	Dade County	$22,701.50
4144	9/6/2013	DCRM04C Rock Prairie Township Damaged Gravel Roads	Dade County	$56,220.95
4144	9/6/2013	DCRM03C Polk Township Damaged Gravel Roads	Dade County	$28,005.10
4144	9/6/2013	DCRM02C Pilgram Township Damaged Gravel Roads	Dade County	$53,945.92
4144	9/6/2013	DCRM06C South Township Damaged Gravel Rds and Chip Seal	Dade County	$64,139.09
4144	9/6/2013	DCJG01C - Smith Township Roads	Dade County	$48,131.36
4144	9/6/2013	DCJG02C Marion Township Gravel Roads	Dade County	$13,493.20
4144	9/6/2013	DCJG03C Earnest Township Damaged Gravel Roads	Dade County	$28,950.00

4144	9/6/2013	DCJG04C-Bona Special Road Dist.-Repair Aggregate Roads	Dade County	$27,652.84
4144	9/6/2013	DCRA02C - Village of South Greenfield	Dade County	$17,174.74
4144	9/6/2013	DCFY08C - Sac Twp Special Road District 2, Dade Co.	Dade County	$1,094.69
4144	9/6/2013	DCJG08C - Maze Creek Special Rd. Dist.	Dade County	$12,122.62
4144	9/6/2013	DCJG05C - Center Township Roads	Dade County	$10,019.27
4144	9/6/2013	DCJG06C Dry Bone Township Road Damage	Dade County	$23,820.00
4144	9/6/2013	DCFY07C - Sac Twp, Special Road District 1, Dade Co.	Dade County	$22,728.38
4144	9/6/2013	DCJG09C-Road Repair Lockwood Township	Dade County	$33,643.38
4144	9/6/2013	DCJG07C-Grant Township Road Damage	Dade County	$50,311.57
4144	9/6/2013	DCFY05C North Township, Dade Co.	Dade County	$59,694.80
4238	8/7/2015	WWS012C - North Morgan Roads	Dade County	$6,125.78
4238	8/7/2015	WWS009C - Maze Creek Roads	Dade County	$16,804.50
4238	8/7/2015	WWS003C Countywide WC & WTBC Birchwood Roads	Dade County	$8,199.90
4238	8/7/2015	WWS004C Bona Special Township Dade County Roads	Dade County	$6,945.84
4238	8/7/2015	WWS005C - Dry Bone Township Dade County Roads	Dade County	$3,600.00
4238	8/7/2015	WWS011C - South Morgan Township	Dade County	$10,633.43
4238	8/7/2015	WWS006C - Southeast Township Roads 42 and 231	Dade County	$3,683.20
4238	8/7/2015	WWS007C - Polk Township Dade County Greenfield, MO	Dade County	$16,185.72
4238	8/7/2015	WWS013C North Township - Roads	Dade County	$12,174.12
4238	8/7/2015	WWS008C Sac & Sac Special Township - Roads	Dade County	$66,543.20
4238	8/7/2015	WWS010C - Southeast Township Roads 36 and 247	Dade County	$4,481.95
4238	8/7/2015	RHH001C DADE COUNTY - PILGRIM TOWNSHIP GRAVEL ROADS	Dade County	$36,018.45
4238	8/7/2015	EOM001C - Polk Township - Roads	Dade County	$15,214.00
4238	8/7/2015	EOM002C - SAC, Birchwood & South MorgaTownships - Roads	Dade County	$51,472.50
4250	1/21/2016	057DM01C - Rock Prairie Roads	Dade County	$24,270.00
4250	1/21/2016	057DM02 - Smith Township Road Damage	Dade County	$28,995.00
4250	1/21/2016	057DM04 - Lockwood and Marion Township Road Damage	Dade County	$5,693.00
4250	1/21/2016	057DM05 - South Township Road Damage	Dade County	$35,055.20
4250	1/21/2016	057NA01 ANTIOCH BRIDGE EMBANKMENT	Dade County	$56,647.01
4250	1/21/2016	057DM03 - Polk Township Road Damage	Dade County	$7,433.90
4250	1/21/2016	057DM06C - Ernest Township - Roads	Dade County	$19,132.00
4250	1/21/2016	057DM07 - Pilgrim Township - Roads	Dade County	$5,413.10
4250	1/21/2016	057DM10 - Center Township - Roads	Dade County	$7,168.00
4250	1/21/2016	057AP14C - SAC Special 1 Township - Roads	Dade County	$11,100.00
4250	1/21/2016	057AP16C - Bona Special Township - Roads	Dade County	$19,400.00
4250	1/21/2016	057AP15C - Dry Bone Township - Roads	Dade County	$14,200.00
4250	1/21/2016	057DM11 - Washington Township - Roads	Dade County	$77,598.84

4250	1/21/2016	057DM08 - South Morgan Township - Roads	Dade County	$36,292.00
4250	1/21/2016	057DM09 - Grant Township - Roads	Dade County	$27,904.17
4250	1/21/2016	057AP13C - North Township - Roads	Dade County	$117,066.14
4317	6/2/2017	ST01371 - Dade County Tier 6	Dade County	$34,963.41
4317	6/2/2017	ST01370 - Dade County Tier 5	Dade County	$32,386.63
4317	6/2/2017	ST01284 - Dade County Culverts	Dade County	$6,876.52
4317	6/2/2017	ST01372 - Dade County Tier 7	Dade County	$44,044.25
4317	6/2/2017	ST01280 - Dade County Tier 1	Dade County	$85,485.25
4317	6/2/2017	ST01383 - Dade County Tier 8	Dade County	$16,645.48
4317	6/2/2017	ST01282 - Dade County Tier 2	Dade County	$117,646.25
4317	6/2/2017	ST01710 - Dade County Tier 9	Dade County	$5,592.75
4317	6/2/2017	ST02150 - Road Damage Throughout South Greenfield Villa	South Greenfield	$14,717.04
4317	6/2/2017	ST02229 - Dade County Tier 10	Dade County	$21,150.25
4317	6/2/2017	ST01283 - Dade County Tier 3	Dade County	$91,938.25
4317	6/2/2017	ST03756 - Dade County Road 135	Dade County	$27,731.03
Total				**$2,865,419.62**

Source: Federal Emergency Management Agency

2.2 JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES

2.2.1 County, City, and Village Jurisdictions

Dade County

Dade County's jurisdiction includes all unincorporated areas within the county boundaries and is classified as a Class III County in Missouri. It is governed by a three-member Commission consisting of a presiding commissioner, a western commissioner, and an eastern commissioner. Commissioners serve four-year terms.

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

Dade County Emergency Management manages an active social media presence through Facebook and Instagram, where they post regular updates and educational information. There are five outdoor warning sirens in the county operated by the 911 center in Greenfield.

Table 2.8 provides a full summary of the county's planning and mitigation capabilities.

Table 2.8. Unincorporated Dade County Mitigation Capabilities

Element	Yes, No, N/A	Comments and/or Weblink
Planning Capabilities		
Comprehensive Plan	N	
Builder's Plan	N	
Capital Improvement Plan	N	
City Emergency Operations Plan	N	
County Emergency Operations Plan	Y	
Local Recovery Plan	N	
County Recovery Plan	Y	
City Mitigation Plan	N	
County Mitigation Plan	Y	
Debris Management Plan	Y	
Economic Development Plan	N	
Transportation Plan	N	
Land-use Plan	N	
Flood Mitigation Assistance (FMA) Plan	N	
Watershed Plan	Y	
Firewise or other fire mitigation plan	N	
Critical Facilities Plan (Mitigation/Response/Recovery)	N	
Policies/Ordinance		
Zoning Ordinance	N	
Building Code	N	
Floodplain Ordinance	Y	
Subdivision Ordinance	N	
Tree Trimming Ordinance	N	
Nuisance Ordinance	N	
Stormwater Ordinance	N	

Element	Yes, No, N/A	Comments and/or Weblink
Drainage Ordinance	N	
Site Plan Review Requirements	N	
Historic Preservation Ordinance	N	
Landscape Ordinance	N	
Program		
Zoning/Land Use Restrictions	N	
Codes Building Site/Design	N	
Hazard Awareness Program	N	
National Flood Insurance Program (NFIP)	Y	
NFIP Community Rating System (CRS) program	N	
National Weather Service (NWS) Storm Ready Certification	N	
Firewise Community Certification	N	
Building Code Effectiveness Grading (BCEGs)	N	
ISO Fire Rating	N	
Economic Development Program	N	
Land Use Program	N	
Public Education/Awareness	N	
Property Acquisition	N	
Planning/Zoning Boards	N	
Stream Maintenance Program	N	
Tree Trimming Program	N	
Engineering Studies for Streams (Local/County/Regional)	N	
Mutual Aid Agreements	N	
Studies/Reports/Maps		
Hazard Analysis/Risk Assessment (City)	N	
Hazard Analysis/Risk Assessment (County)	Y	
Evacuation Route Map	N	
Critical Facilities Inventory	Y	
Vulnerable Population Inventory	Y	
Land Use Map	Y	
Staff/Department		**Full Time or Part Time?**
Building Code Official	N	
Building Inspector	N	
Mapping Specialist (GIS)	N	
Engineer	N	
Development Planner	N	
Public Works Official	Y	
Emergency Management Coordinator	Y	
NFIP Floodplain Administrator	Y	
Emergency Response Team	N	
Hazardous Materials Expert	N	
Local Emergency Planning Committee	N	
County Emergency Management Commission	N	
Sanitation Department	N	
Transportation Department	N	
Economic Development Department	N	
Housing Department	N	
Historic Preservation	N	
Non-Governmental Organizations (NGOs)	**Is there a local chapter? Yes or No**	
American Red Cross	N	
Salvation Army	N	
Veterans Groups	Y	
Local Environmental Organization	N	

Element	Yes, No, N/A	Comments and/or Weblink
Homeowner Associations	N	
Neighborhood Associations	N	
Chamber of Commerce	Y	
Community Organizations (Lions, Kiwanis, etc.	N	
Financial Resources		**Is your jurisdiction able to? Yes or No**
Apply for Community Development Block Grants		Y
Fund projects thru Capital Improvements funding		Y
Authority to levy taxes for specific purposes		Y
Fees for water, sewer, gas, or electric services		N
Impact fees for new development		N
Incur debt through general obligation bonds		Y
Incur debt through special tax bonds		Y
Incur debt through private activities		N
Withhold spending in hazard prone areas		N

Source: Data Collection Questionnaire

Arcola

The Village of Arcola is located in the northern part of Dade County. The Village is governed by a Board of Trustees made up of three members. Due to the small size of the community, Arcola has very limited staff and mitigation capabilities, but they are working towards expanding these resources. There is a storm siren located within the community, and the Lions Club building serves as a safe room. The village also has a high number of elderly, disabled, and low-income individuals, which increases the overall vulnerability of the community.

Table 2.9 provides a full summary of the village's planning and mitigation capabilities.

Table 2.9. Village of Arcola Mitigation Capabilities

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

Element	Yes, No, N/A	Comments and/or Weblink
Economic Development Program	N	
Land Use Program	N	
Public Education/Awareness	N	
Property Acquisition	N	
Planning/Zoning Boards	N	
Stream Maintenance Program	N	
Tree Trimming Program	N	
Engineering Studies for Streams (Local/County/Regional)	N	
Mutual Aid Agreements	N	
Studies/Reports/Maps		
Hazard Analysis/Risk Assessment (City)	N	
Hazard Analysis/Risk Assessment (County)	N	
Evacuation Route Map	N	
Critical Facilities Inventory	N	
Vulnerable Population Inventory	N	
Land Use Map	N	
Staff/Department		**Full Time or Part Time?**
Building Code Official	N	
Building Inspector	N	
Mapping Specialist (GIS)	N	
Engineer	N	
Development Planner	N	
Public Works Official	N	
Emergency Management Coordinator	N	
NFIP Floodplain Administrator	Y	
Emergency Response Team	N	
Hazardous Materials Expert	N	
Local Emergency Planning Committee	N	
County Emergency Management Commission	N	
Sanitation Department	N	
Transportation Department	N	
Economic Development Department	N	
Housing Department	N	
Historic Preservation	N	
Non-Governmental Organizations (NGOs)	**Is there a local chapter? Yes or No**	
American Red Cross	N	
Salvation Army	N	
Veterans Groups	N	
Local Environmental Organization	N	
Homeowner Associations	N	
Neighborhood Associations	N	
Chamber of Commerce	N	
Community Organizations (Lions, Kiwanis, etc.	N	
Financial Resources		**Is your jurisdiction able to? Yes or No**
Apply for Community Development Block Grants		N
Fund projects thru Capital Improvements funding		N
Authority to levy taxes for specific purposes		N
Fees for water, sewer, gas, or electric services		Y
Impact fees for new development		N
Incur debt through general obligation bonds		N
Incur debt through special tax bonds		N
Incur debt through private activities		N
Withhold spending in hazard prone areas		N

Source: Data Collection Questionnaire

Greenfield

The City of Greenfield is located in central Dade County and serves as the county seat. It is a 4th class city with a Mayor-Board of Aldermen structure. The city is governed by a mayor and Board of Aldermen made up for four members.

The city regularly distributes flyers to the public regarding general mitigation topics like water conservation, storm siren preparedness, debris cleanup events, and other hazards, as well as specialized topics like new fertilizer plant operations. They also installed lightning rods to reduce water well pump damage. There are multiple outdoor warning sirens located within city limits activated by the 911 dispatch center and mobile police units. There is a safe room built to FEMA standards located at the high school.

Table 2.10 provides a full summary of the city's planning and mitigation capabilities.

Table 2.10. City of Greenfield Mitigation Capabilities

Element	Yes, No, N/A	Comments and/or Weblink
Planning Capabilities		
Comprehensive Plan	Y	
Builder's Plan	N	
Capital Improvement Plan	Y	
City Emergency Operations Plan	Y	
County Emergency Operations Plan	N	
Local Recovery Plan	Y	
County Recovery Plan	N	
City Mitigation Plan	Y	
County Mitigation Plan	Y	
Debris Management Plan	Y	
Economic Development Plan	N	
Transportation Plan	N	
Land-use Plan	N	
Flood Mitigation Assistance (FMA) Plan	N	
Watershed Plan	N	
Firewise or other fire mitigation plan	Y	
Critical Facilities Plan (Mitigation/Response/Recovery)	Y	
Policies/Ordinance		
Zoning Ordinance	Y	
Building Code	Y	IBC 2012
Floodplain Ordinance	Y	
Subdivision Ordinance	N	
Tree Trimming Ordinance	N	
Nuisance Ordinance	Y	
Stormwater Ordinance	N	
Drainage Ordinance	N	
Site Plan Review Requirements	N	
Historic Preservation Ordinance	N	
Landscape Ordinance	Y	
Program		
Zoning/Land Use Restrictions	Y	
Codes Building Site/Design	N	
Hazard Awareness Program	N	
National Flood Insurance Program (NFIP)	Y	
NFIP Community Rating System (CRS) program	N	

Element	Yes, No, N/A	Comments and/or Weblink
National Weather Service (NWS) Storm Ready Certification	N	
Firewise Community Certification	N	
Building Code Effectiveness Grading (BCEGs)	Y	
ISO Fire Rating	N	
Economic Development Program	N	
Land Use Program	N	
Public Education/Awareness	Y	
Property Acquisition	Y	
Planning/Zoning Boards	Y	
Stream Maintenance Program	Y	
Tree Trimming Program	Y	
Engineering Studies for Streams (Local/County/Regional)	Y	
Mutual Aid Agreements	Y	
Studies/Reports/Maps		
Hazard Analysis/Risk Assessment (City)	Y	
Hazard Analysis/Risk Assessment (County)	N	
Evacuation Route Map	Y	
Critical Facilities Inventory	Y	
Vulnerable Population Inventory	Y	
Land Use Map	Y	
Staff/Department		**Full Time or Part Time?**
Building Code Official	Y	PT
Building Inspector	Y	PT
Mapping Specialist (GIS)	Y	
Engineer	Y	PT
Development Planner	Y	City Council
Public Works Official	Y	
Emergency Management Coordinator	Y	Police Chief, Mayor
NFIP Floodplain Administrator	Y	
Emergency Response Team	Y	Police, Fire and Rescue
Hazardous Materials Expert	Y	Fire Chief
Local Emergency Planning Committee	Y	
County Emergency Management Commission	Y	
Sanitation Department	Y	GFL
Transportation Department	Y	Police Chief
Economic Development Department	N	
Housing Department	N	
Historic Preservation	N	
Non-Governmental Organizations (NGOs)	**Is there a local chapter? Yes or No**	
American Red Cross	N	
Salvation Army	N	
Veterans Groups	Y	
Local Environmental Organization	N	
Homeowner Associations	N	
Neighborhood Associations	N	
Chamber of Commerce	Y	
Community Organizations (Lions, Kiwanis, etc.	Y	
Financial Resources		**Is your jurisdiction able to? Yes or No**
Apply for Community Development Block Grants		Y
Fund projects thru Capital Improvements funding		Y
Authority to levy taxes for specific purposes		N
Fees for water, sewer, gas, or electric services		Y
Impact fees for new development		N

Element	Yes, No, N/A	Comments and/or Weblink
Incur debt through general obligation bonds		Y
Incur debt through special tax bonds		N
Incur debt through private activities		N
Withhold spending in hazard prone areas		N

Source: Data Collection Questionnaire

Lockwood

Lockwood is located in the southwestern portion of the county. Lockwood is a 4th class city governed by a mayor and city council made up of four members.

There is a FEMA-approves safe room located in the city, as well as one storm siren that can be activated by 911.

Table 2.11 provides a full summary of the city's planning and mitigation capabilities.

Table 2.11. City of Lockwood Mitigation Capabilities

Element	Yes, No, N/A	Comments and/or Weblink
Planning Capabilities		
Comprehensive Plan	Y	2022
Builder's Plan	N	
Capital Improvement Plan	N	
City Emergency Operations Plan	N	
County Emergency Operations Plan	Y	
Local Recovery Plan	N	
County Recovery Plan	N	
City Mitigation Plan	Y	
County Mitigation Plan	N	
Debris Management Plan	N	
Economic Development Plan	N	
Transportation Plan	N	
Land-use Plan	N	
Flood Mitigation Assistance (FMA) Plan	N	
Watershed Plan	N	
Firewise or other fire mitigation plan	N	
Critical Facilities Plan (Mitigation/Response/Recovery)	N	
Policies/Ordinance		
Zoning Ordinance	N	
Building Code	Y	
Floodplain Ordinance	Y	
Subdivision Ordinance	N	
Tree Trimming Ordinance	Y	
Nuisance Ordinance	Y	
Stormwater Ordinance	N	
Drainage Ordinance	Y	
Site Plan Review Requirements	N	
Historic Preservation Ordinance	N	
Landscape Ordinance	N	
Program		
Zoning/Land Use Restrictions	N	
Codes Building Site/Design	Y	
Hazard Awareness Program	N	
National Flood Insurance Program (NFIP)	Y	
NFIP Community Rating System (CRS) program	N	
National Weather Service (NWS) Storm Ready Certification	Y	
Firewise Community Certification	N	
Building Code Effectiveness Grading (BCEGs)	Y	
ISO Fire Rating	N	
Economic Development Program	N	

Element	Yes, No, N/A	Comments and/or Weblink
Land Use Program	N	
Public Education/Awareness	N	
Property Acquisition	N	
Planning/Zoning Boards	Y	
Stream Maintenance Program	N	
Tree Trimming Program	Y	
Engineering Studies for Streams (Local/County/Regional)	N	
Mutual Aid Agreements	Y	
Studies/Reports/Maps		
Hazard Analysis/Risk Assessment (City)	N	
Hazard Analysis/Risk Assessment (County)	N	
Evacuation Route Map	N	
Critical Facilities Inventory	N	
Vulnerable Population Inventory	N	
Land Use Map	N	
Staff/Department		**Full Time or Part Time?**
Building Code Official	Y	Part Time
Building Inspector	Y	
Mapping Specialist (GIS)	N	
Engineer	Y	Part Time
Development Planner	N	
Public Works Official	Y	Part Time
Emergency Management Coordinator	N	
NFIP Floodplain Administrator	Y	Part Time
Emergency Response Team	N	
Hazardous Materials Expert	N	
Local Emergency Planning Committee	N	
County Emergency Management Commission	N	
Sanitation Department	N	
Transportation Department	N	
Economic Development Department	N	
Housing Department	N	
Historic Preservation	N	
Non-Governmental Organizations (NGOs)	**Is there a local chapter? Yes or No**	
American Red Cross	N	
Salvation Army	N	
Veterans Groups	Y	
Local Environmental Organization	N	
Homeowner Associations	N	
Neighborhood Associations	N	
Chamber of Commerce	Y	
Community Organizations (Lions, Kiwanis, etc.	Y	
Financial Resources		**Is your jurisdiction able to? Yes or No**
Apply for Community Development Block Grants		Y
Fund projects thru Capital Improvements funding		Y
Authority to levy taxes for specific purposes		Y
Fees for water, sewer, gas, or electric services		Y
Impact fees for new development		Y
Incur debt through general obligation bonds		Y
Incur debt through special tax bonds		Y
Incur debt through private activities		N
Withhold spending in hazard prone areas		N

Source: Data Collection Questionnaire

South Greenfield

The Village of South Greenfield is located in the southern portion of the county and is governed by a Board of Trustees made up of five members.

There is one outdoor warning siren in the village activated by county 911.

Table 2.12 provides a full summary of the village's planning and mitigation capabilities.

Table 2.12. Village of South Greenfield Mitigation Capabilities

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

Element	Yes, No, N/A	Comments and/or Weblink
Public Education/Awareness	N	
Property Acquisition	N	
Planning/Zoning Boards	N	
Stream Maintenance Program	N	
Tree Trimming Program	N	
Engineering Studies for Streams (Local/County/Regional)	N	
Mutual Aid Agreements	N	
Studies/Reports/Maps		
Hazard Analysis/Risk Assessment (City)	N	
Hazard Analysis/Risk Assessment (County)	N	
Evacuation Route Map	N	
Critical Facilities Inventory	N	
Vulnerable Population Inventory	N	
Land Use Map	N	
Staff/Department		**Full Time or Part Time?**
Building Code Official	N	
Building Inspector	N	
Mapping Specialist (GIS)	N	
Engineer	N	
Development Planner	N	
Public Works Official	N	
Emergency Management Coordinator	Y	
NFIP Floodplain Administrator	N	
Emergency Response Team	N	
Hazardous Materials Expert	N	
Local Emergency Planning Committee	Y	
County Emergency Management Commission	Y	
Sanitation Department	N	
Transportation Department	N	
Economic Development Department	N	
Housing Department	N	
Historic Preservation	N	
Non-Governmental Organizations (NGOs)	**Is there a local chapter? Yes or No**	
American Red Cross	N	
Salvation Army	N	
Veterans Groups	Y	
Local Environmental Organization	N	
Homeowner Associations	N	
Neighborhood Associations	N	
Chamber of Commerce	N	
Community Organizations (Lions, Kiwanis, etc.	N	
Financial Resources		**Is your jurisdiction able to? Yes or No**
Apply for Community Development Block Grants		N
Fund projects thru Capital Improvements funding		N
Authority to levy taxes for specific purposes		N
Fees for water, sewer, gas, or electric services		Y
Impact fees for new development		N
Incur debt through general obligation bonds		N
Incur debt through special tax bonds		N
Incur debt through private activities		N
Withhold spending in hazard prone areas		N

Source: Data Collection Questionnaire

Summary of County, City, and Village Jurisdictional Capabilities

Table 2.13. Mitigation Capabilities Summary Table

CAPABILITIES	Dade County	Arcola	Greenfield	Lockwood	South Greenfield
Planning Capabilities					
Comprehensive Plan	N	N	Y	Y	N
Builder's Plan	N	N	N	N	N
Capital Improvement Plan	N	N	Y	N	N
City Emergency Plan	N	N	Y	N	N
County Emergency Plan	Y	N	N	Y	N
City Recovery Plan	N	N	Y	N	N
County Recovery Plan	Y	N	N	N	N
Local Mitigation Plan	N	N	Y	Y	N
County Mitigation Plan	Y	Y	Y	N	N
Debris Management Plan	Y	N	N	N	N
Economic Development Plan	N	N	N	N	N
Transportation Plan	N	N	N	N	N
Land-use Plan	N	N	N	N	N
Flood Mitigation Assistance (FMA) Plan	N	N	N	N	N
Watershed Plan	Y	N	N	N	N
Firewise or other fire mitigation plan	N	N	Y	N	N
Critical Facilities Plan (Mitigation/Response/Recovery)	N	N	Y	N	N
Policies/Ordinances					
Zoning Ordinance	N	N	Y	N	N
Building Code	N	N	Y	Y	N
Floodplain Ordinance	Y	Y	Y	Y	N
Subdivision Ordinance	N	N	N	N	N
Tree Trimming Ordinance	N	Y	N	Y	N
Nuisance Ordinance	N	N	Y	Y	Y
Storm Water Ordinance	N	N	N	N	N
Drainage Ordinance	N	N	N	Y	N
Site Plan Review Requirements	N	N	N	N	N
Historic Preservation Ordinance	N	N	N	N	N
Landscape Ordinance	N	N	Y	N	N
Programs					
Zoning/Land Use Restrictions	N	N	Y	N	N
Codes Building Site/Design	N	N	N	Y	N
Hazard Awareness Program	N	N	N	N	N
National Flood Insurance Program (NFIP)	Y	Y	Y	Y	N
NFIP Community Rating System (CRS) Participating Community	N	N	N	N	N
National Weather Service (NWS) Storm Ready	N	N	N	Y	N
Firewise Community Certification	N	N	N	N	N
Building Code Effectiveness Grading (BCEGs)	N	N	Y	Y	N
ISO Fire Rating	N	N	N	N	N
Economic Development Program	N	N	N	N	N
Land Use Program	N	N	N	N	N
Public Education/Awareness	N	N	Y	N	N
Property Acquisition	N	N	Y	N	N
Planning/Zoning Boards	N	N	Y	Y	N
Stream Maintenance Program	N	N	Y	N	N
Tree Trimming Program	N	N	Y	Y	N

CAPABILITIES	Dade County	Arcola	Greenfield	Lockwood	South Greenfield
Engineering Studies for Streams (Local/County/Regional)	N	N	Y	N	N
Mutual Aid Agreements	N	N	Y	Y	N
Studies/Reports/Maps					
Hazard Analysis/Risk Assessment (Local)	N	N	Y	N	N
Hazard Analysis/Risk Assessment (County)	Y	N	N	N	N
Evacuation Route Map	N	N	Y	N	N
Critical Facilities Inventory	Y	N	Y	N	N
Vulnerable Population Inventory	Y	N	Y	N	N
Land Use Map	Y	N	Y	N	N
Staff/Departments					
Building Code Official	N	N	Y	Y	N
Building Inspector	N	N	Y	Y	N
Mapping Specialist (GIS)	N	N	Y	N	N
Engineer	N	N	Y	Y	N
Development Planner	N	N	Y	N	N
Public Works Official	Y	N	Y	Y	N
Emergency Management Coordinator	Y	N	Y	N	Y
NFIP Floodplain Administrator	Y	Y	Y	Y	N
Emergency Response Team	N	N	Y	N	N
Hazardous Materials Expert	N	N	Y	N	N
Local Emergency Planning Committee	N	N	Y	N	Y
County Emergency Management Commission	N	N	Y	N	Y
Sanitation Department	N	N	Y	N	N
Transportation Department	N	N	Y	N	N
Economic Development Department	N	N	N	N	N
Housing Department	N	N	N	N	N
Historic Preservation	N	N	N	N	N
Non-Governmental Organizations					
American Red Cross	N	N	N	N	N
Salvation Army	N	N	N	N	N
Veterans Groups	Y	N	Y	Y	Y
Local Environmental Organization	N	N	N	N	N
Homeowner Associations	N	N	N	N	N
Neighborhood Associations	N	N	N	N	N
Chamber of Commerce	Y	N	Y	Y	N
Community Organizations (Lions, Kiwanis, etc.	N	N	Y	Y	N
Financial Resources					
Apply for Community Development Block Grants	Y	N	Y	Y	N
Fund projects through Capital Improvements funding	Y	N	Y	Y	N
Authority to levy taxes for specific purposes	Y	N	N	Y	N
Fees for water, sewer, gas, or electric services	N	Y	Y	Y	Y
Impact fees for new development	N	N	N	Y	N
Incur debt through general obligation bonds	Y	N	Y	Y	N
Incur debt through special tax bonds	Y	N	N	Y	N
Incur debt through private activities	N	N	N	N	N
Withhold spending in hazard prone areas	N	N	N	N	N

Source: Data Collection Questionnaires

2.2.2 Public School District Profiles and Mitigation Capabilities

This section provides general information about the participating school districts. There are six school districts in the county, but only four with facilities located in Dade County. Three districts participated in this plan update. Stockton County R-I participates in the Cedar County Hazard Mitigation Planning process, while Ash Grove R-IV participates in the Greene County Hazard Mitigation Planning process.

Figure 2.3 is a map of school district boundaries in Dade County.

Figure 2.3. Dade County School Districts

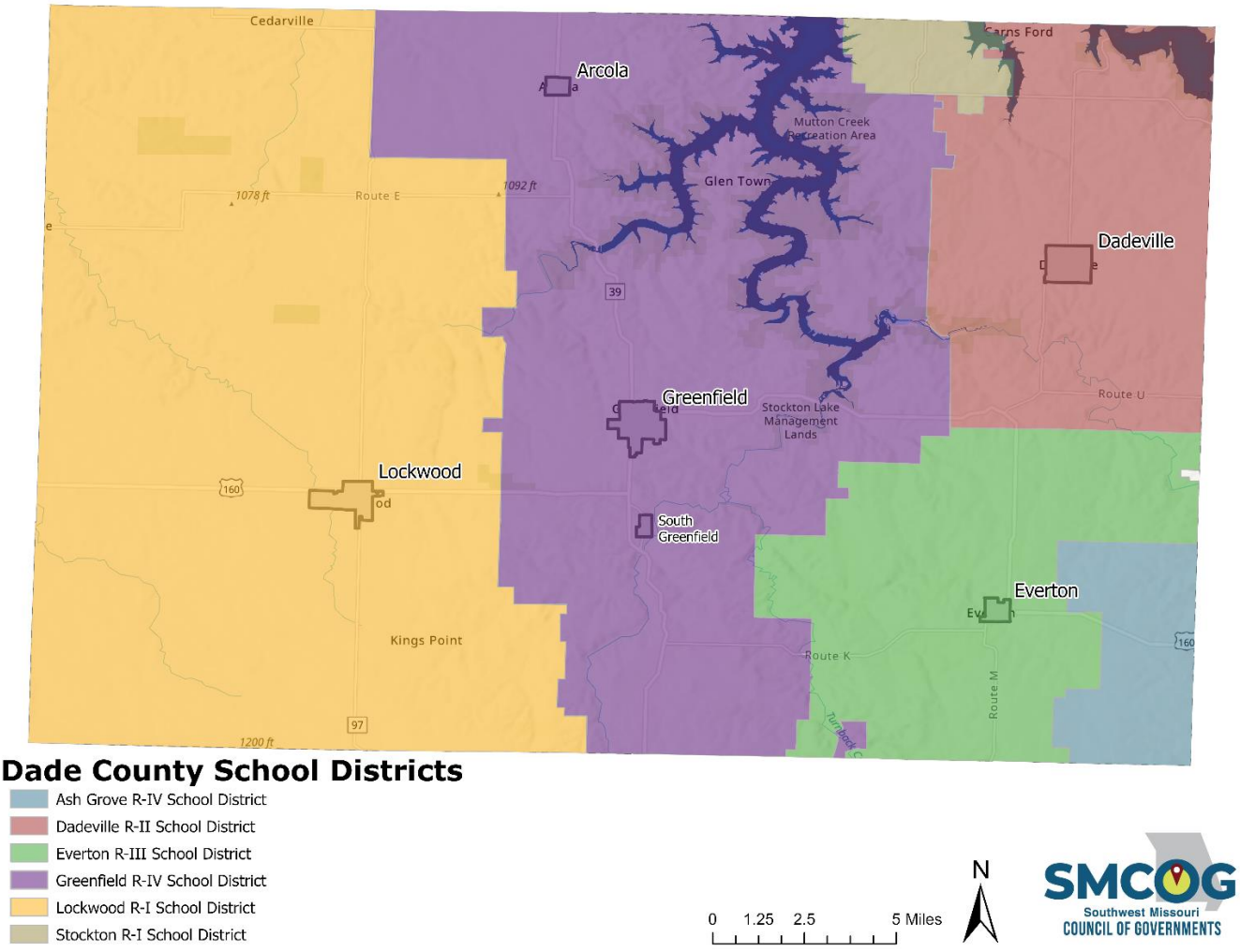


Table 2.12 shows the total enrollment numbers for each district.

Table 2.14. Participating School District Enrollment, 2022

District Name	District Enrollment
Dadeville R-II	187
Greenfield R-IV	352
Lockwood R-I	280
Total	**819**

Source: https://apps.dese.mo.gov/MCDS/Visualizations.aspx?id=22

Dadeville R-II

All Dadeville R-II school facilities are equipped with a PA system to provide emergency notifications. The district has a safe room that can be used by the student body but not the community and all exterior doors are equipped with safety locks. Enrollment is expected to increase by 20% over the next five years.

Refer to **Table 2.15** provides a summary of the district's mitigation capabilities.

Greenfield R-IV

All Greenfield R-IV school facilities are equipped with a PA system and NOAA weather radios to provide emergency notifications. The roof was repaired in Spring 2021 and new electric lighting poles were installed at the football field to replace wooden poles. Safety training is provided for all district employees. There is a safe room, but it is not FEMA approved. Enrollment is expected to remain steady with no significant increases or decreases over the next five years.

Refer to **Table 2.15** provides a summary of the district's mitigation capabilities.

Lockwood R-I

All Lockwood R-I school facilities are equipped with a PA system and NOAA weather radios to provide emergency notifications. The district recently completed construction of a FEMA-approved safe room at the high school. Enrollment is not expected to change over the next five years.

Refer to **Table 2.15** provides a summary of the district's mitigation capabilities.

Summary of Public School District Capabilities

Table 2.15. Summary of Public School District Mitigation Capabilities

Capability	Dadeville R-II	Greenfield R-IV	Lockwood R-I
Planning Elements			
Master Plan/ Date	Y, 2021	N	N
Capital Improvement Plan/Date	N	N	Y, 2023
School Emergency Plan / Date	Y, 2022	Y, 2016	Y
Weapons Policy/Date	Y, 2022	Y, 2016	Y, 2009
Personnel Resources			
Full-Time Building Official (Principal)	Y	Y	Y
Emergency Manager	Y	Y	Y
Grant Writer	N	Y	N
Public Information Officer	Y	Y	Y
Financial Resources			
Capital Improvements Project Funding	Y	Y	Y
Local Funds	Y	Y	Y
General Obligation Bonds	Y	Y	Y
Special Tax Bonds	N	Y	N
Private Activities/Donations	Y	Y	Y
State and Federal Funds/Grants	Y	Y	Y
Other			
Public Education Programs	Y	Y	Y
Privately or Self- Insured?	Y	Y	Y
Fire Evacuation Training	Y	Y	Y
Tornado Sheltering Exercises	Y	Y	Y
Public Address/Emergency Alert System	Y	Y	Y
NOAA Weather Radios	N	Y	Y
Lock-Down Security Training	Y	Y	Y
Mitigation Programs	Y	Y	Y
Tornado Shelter/Saferoom	Y	Y	Y
Campus Police	N	N	N

Source: Data Collection Questionnaire

2.2.3 Special Districts

Dade County Emergency Services 911

Dade County Emergency Services 9011 is managed by a Board of Directors. The district conducts fire safety and 911 awareness presentations at local schools and community events. They maintain a main facility as well as multiple radio antennas/repeaters.

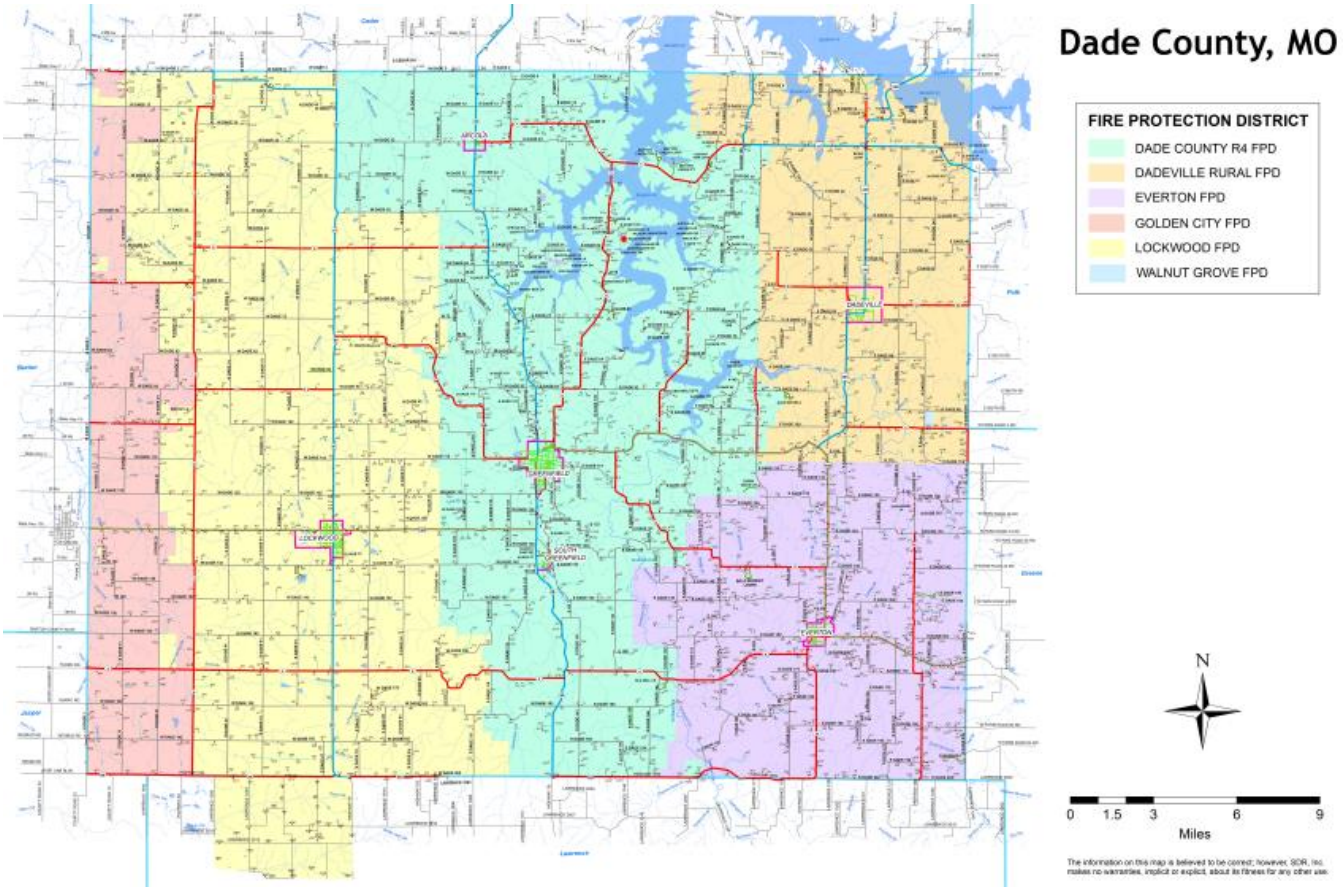
Refer to **Table 2.16** for a complete summary of the district's mitigation capabilities.

Dadeville Rural Fire Protection District

The Dadeville Rural Fire Protection District is managed by a Board of Directors made up of three members. Fire planning is conducted with interested citizens on an as-requested basis, while fire safety is held at school facilities. The district has one main station located in Dadeville.

Figure 2.4 shows a map of all fire districts in Dade County. The Dadeville Rural Fire Protection District is located in the northeastern portion of the county.

Figure 2.4. Dade County Fire Protection Districts



Refer to **Table 2.16** for a complete summary of the district's mitigation capabilities.

Summary of Special District Mitigation Capabilities

Table 2.16. Summary of Special District Mitigation Capabilities

Element	Dade County Emergency Services 911	Dadeville Rural Fire Protection District
Planning Capabilities		
Capital Improvement Plan	N	N
Emergency Operations Plan	Y, 2023	N
Continuity of Operations Plan	Y, 2020	N
Community Wildfire Protection Plan	N	N
Programs		
Cross-Connection Program	N	N
Hydrant Flushing Program	N	N
Public Education/Awareness	N	Y
Tree Trimming Program	N	N
Mutual Aid Agreements	N	Y
Studies/Reports/Maps		
Evacuation Route Map	N	N
Critical Facilities Inventory	N	N
Financial Resources		
Fund projects through Capital Improvement funding	N	N
Fees for water, sewer, gas, or electric services	N	N
Incur debt through general obligation bonds	Y	N
Incur debt through special tax bonds	Y	N
Incur debt through private activities	N	N
Withhold spending in hazard prone areas	N	N

Source: Data Collection Questionnaire

3 RISK ASSESSMENT

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

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

This chapter is divided into four main parts:

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

3.1 HAZARD IDENTIFICATION

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

The Plan profiles all natural hazards that can impact Dade County. These hazards were also identified in the previous county plan and the 2023 Missouri State Hazard Mitigation Plan. Natural hazards are naturally-occurring climatological, hydrological, or geologic events that have a negative effect on people and the built environment. Natural hazards identified include:

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

3.1.1 Review of Existing Mitigation Plans

The State Plan also includes levee failure. Levee failure was excluded from the mitigation planning process as there are no mapped levees nor associated levee protected areas within or immediately upstream of Dade County.

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

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

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

3.1.2 Disaster Declaration History

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

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

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

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

Since 2000, Dade County has been included in 19 disaster declarations. The most recent occurred in 2020**. Table 3.1** provides more details.

Table 3.1. FEMA Disaster Declarations in Dade County, 2000 - Present

Disaster Number	Description	Declaration Date	Incident Period	Individual Assistance (IA) or Public Assistance (PA)
4409	COVID-19 Pandemic	03/26/2020	01/20/2020 – 05/11/2023	IA and PA
3482	COVID-19	03/16/2020	01/20/2020 – 05/11/2023	PA
4451	Severe storms, tornadoes, and flooding	07/09/2019	04/29/2019 – 07/05/2019	PA
4317	Severe storms, tornadoes, straight line winds, flooding	06/02/2017	04/28/2017 – 05/11/2017	PA
4250	Severe storms, tornadoes, straight-line winds, flooding	01/21/2016	12/23/2015 – 01/09/2016	PA
4238	Severe storms, tornadoes, straight-line winds, flooding	08/07/2015	05/15/2015 – 07/27/2015	PA
4144	Severe storms, straight-line winds, flooding	09/06/2013	08/02/2013 – 08/14/2013	PA
1961	Severe winter storm and snowstorm	03/23/2011	01/31/2011 – 02/05/2011	PA
3317	Severe winter storm	02/03/2011	01/31/2011 – 02/05/2011	PA
1847	Severe storms, tornadoes, and flooding	06/19/2009	05/08/2009 – 05/16/2009	IA and PA
3303	Severe winter storm	01/30/2009	01/26/2009 – 01/28/2009	PA
1749	Severe storms and flooding	03/19/2008	03/17/2008 – 05/09/2008	PA
1736	Severe ice storm	12/27/2007	12/06/2007 – 12/15/2007	PA
3281	Severe ice storm	12/12/2007	12/08/2007 – 12/15/2007	PA
1728	Severe storm	09/21/2007	08/19/2007 – 08/21/2007	PA
1676	Severe ice storm	01/15/2007	01/12/2007 – 01/22/2007	PA
3232	Hurricane	09/10/2005	08/29/2005 – 10/01/2005	PA
1463	Severe Storm	05/06/2003	05/04/2003 – 05/30/2003	IA
1412	Severe Storm	05/06/2002	04/24/2002 – 06/10/2002	IA and PA

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

3.1.3 Research Additional Sources

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

- Missouri Hazard Mitigation Plans (2023)
- Previously approved Dade County Hazard Mitigation Plan (2019)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (Hazus)
- Missouri Department of Transportation
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI)
- County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA
- Flood Insurance Study, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- U.S. Department of Transportation
- United States Geological Survey (USGS)

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

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

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

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

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

3.1.4 Hazards Identified

The natural hazards that may impact or have impacted Dade County are profiled below. All hazards do not necessarily affect every jurisdiction participating in the same way. **Table 3.2** provides a summary of the jurisdictions that may be affected by each hazard. An "X" in the table indicates that jurisdiction is affected by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction.

Table 3.2. Hazards Identified for Each Jurisdiction

Jurisdiction	Flooding	Dam Failure	Earthquake	Land Subsidence/Sinkholes	Drought	Extreme Temperatures	Severe Thunderstorms	Severe Winter Weather	Tornado	Wildfire
Dade County	X	X	X	X	X	X	X	X	X	X
Arcola	X	-	X	-	-	-	X	X	X	-
Greenfield	X	-	X	-	X	X	X	X	X	-
Lockwood	X	-	X	-	X	X	X	X	X	-
South Greenfield	X	-	X	-	-	-	X	X	X	-
Dadeville R-II School District	X	-	X	-	-	-	X	X	X	-
Greenfield R-IV School District	X	-	X	-	-	-	X	X	X	-
Lockwood R-I School District	X	-	X	-	-	-	X	X	X	-
Dade County Emergency Services 911	X	-	-	-	X	-	X	X	X	-
Dadeville Rural Fire Protection District	X	-	-	-	X	-	X	X	X	X

3.1.5 Multi-Jurisdictional Risk Assessment

The risk assessment profiles each participating jurisdiction's vulnerability to each hazard. Many of the hazards identified in the risk assessment have the same probability of occurrence throughout the entire county, while others are more localized. These differences are detailed in each hazard profile under geographic location and vulnerability.

Dade County has a continental climate with mild winters and hot summers. The Cities of Greenfield and Lockwood are the most urbanized, experiencing more construction and development than most other portions of the county. Naturally, the urbanized areas of Dade County have a greater density of important assets, which are more vulnerable to weather-related hazards. As communities expand, their exposure and overall vulnerability increases. These increases can be mitigated through a number of methods, including updated building codes and land use planning among others.

Agricultural uses are primarily located in the rural, unincorporated parts of Dade County. These areas are especially vulnerable to damage caused by hail and drought.

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

3.2 ASSETS AT RISK

This section assesses Dade County's population, structures, critical facilities and infrastructure, and other important assets that may be at risk to hazards. The inventory of assets for each jurisdiction were derived from parcel data from the Dade County Assessor, the Dade County Structures dataset downloaded from Missouri Spatial Data Information Service (MSDIS), and local jurisdiction data collection questionnaires. The Missouri Mitigation Viewer was also referenced to confirm that total counts looked accurate.

3.2.1 Total Exposure of Population and Structures

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

Unincorporated County and Incorporated Cities

In the following three tables, building counts and exposure values are based on parcel data developed by the University of Missouri GIS Department (MSDIS). Data from FEMA's National Structure Inventory (NSI) and the Dade County Assessor were also referenced.

Contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type – Residential 50%, Commercial 50%, Industrial 150%, and Agricultural 100%. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Note that public school district assets and special districts assets are included in the total exposure tables assets by community and county.

Table 3.3 shows the building count, estimated value of buildings, estimated value of contents, and

estimated total exposure to parcels for each participating municipal jurisdiction. **Table 3.4** provides the building value exposures broken down by usage type. Finally, **Table 3.5** provides the building count totals broken down by building usages types (residential, commercial, industrial, and agricultural). To accommodate for mixed-use parcels, the data has been based on the lowest class of use for each parcel (e.g. residential-agricultural mixture is considered residential).

Table 3.3. Total Building Count and Exposure

Jurisdiction	Total Building Count	Building Exposure	Contents Exposure	Total Exposure
Unincorporated Dade County	7,844	$292,111,000	$155,993,000	$448,111,844
Arcola	91	$6,684,000	$3,580,000	$10,264,091
Greenfield	745	$74,730,000	$45,739,000	$120,469,745
Lockwood	541	$52,650,000	$31,690,000	$84,340,541
South Greenfield	59	$5,130,000	$2,631,000	$7,761,059
Total	**9,280**	**$431,305,000**	**$239,633,000**	**$670,947,280**

Source: University of Missouri GIS Department (MSDIS)

Table 3.4. Building Exposure by Usage Type

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Total
Unincorporated Dade County	$13,156,000	$13,695,000	$0	$927,000	$9,205,000	$255,129,000	$292,111,000
Arcola	$44,000	$522,000	$0	$0	$0	$6,118,000	$6,684,000
Greenfield	$6,000	$11,216,000	$3,695,000	$794,000	$4,219,000	$54,800,000	$74,730,000
Lockwood	$83,000	$8,608,000	$3,695,000	$530,000	$2,685,000	$37,050,000	$52,650,000
South Greenfield	$0	$0	$0	$132,000	$0	$4,997,000	$5,130,000
Total	**$13,289,000**	**$34,041,000**	**$7,390,000**	**$2,383,000**	**$16,109,000**	**$358,094,000**	**$431,305,000**

Source: University of Missouri GIS Department (MSDIS)

Table 3.5. Building Counts by Usage Type

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Total
Unincorporated Dade County	4,747	105	0	7	24	2,961	7,844
Arcola	16	4	0	0	0	71	91
Greenfield	2	86	4	6	11	636	745
Lockwood	30	66	4	4	7	430	541
South Greenfield	0	0	0	1	0	58	59
Total	**4,795**	**261**	**8**	**18**	**42**	**4,159**	**9,280**

Source: University of Missouri GIS Department (MSDIS)

Table 3.6 provides the building count and exposure for public school districts. This information was provided by the school districts in the data collection questionnaire.

Table 3.6. Building Exposure for Public School Districts

Public School District	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Dadeville R-II	6	$4,415,726.60	$590,995.42	$5,006,722.02
Greenfield R-IV	15	$24,304,654.00	$6,277,426.00	$30,632,080.00
Lockwood R-I	6	$18,062,000.00	$3,217,000.00	$21,279,000.00
Total	**27**	**$46,782,380.60**	**$10,085,421.42**	**$56,917,802.02**

Source: Data collection questionnaires

3.2.2 Critical and Essential Facilities and Infrastructure

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

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

Table 3.7 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area.

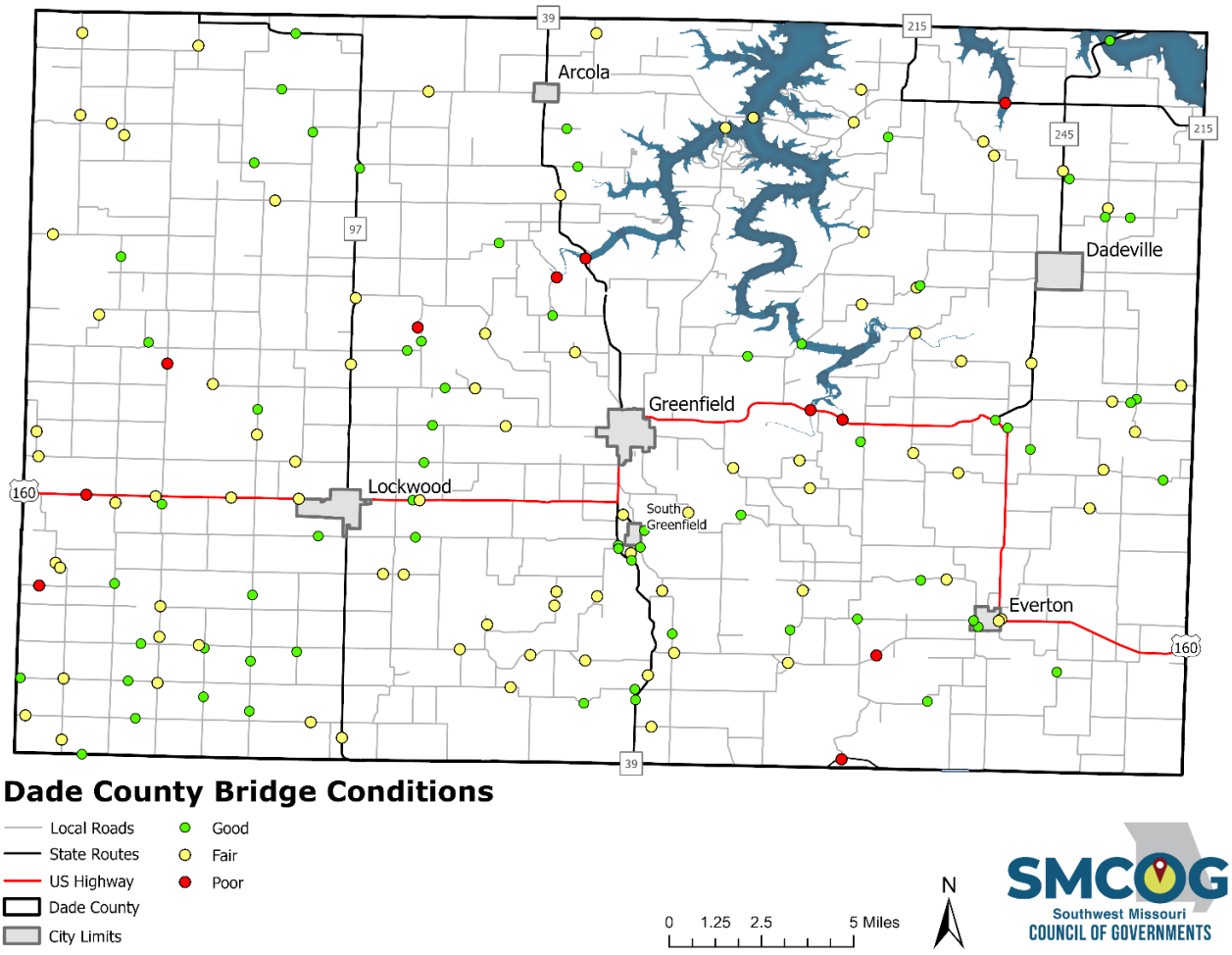
Table 3.7. Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

Jurisdiction	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	TOTAL
Unincorporated Dade County	-	-	-	-	-	-	1	42	2,287	-	6	-	-	-	-	-	-	-	-	2	-	-	-	**2,338**
Arcola	-	-	-	-	-	-	1	1	49	-	-	-	-	-	-	-	1	-	-	-	-	-	-	**52**
Greenfield	-	-	2	10	-	1	1	24	729	-	-	1	-	-	1	2	2	-	-	2	-	-	1	**776**
Lockwood	-	-	1	8	-	1	1	12	479	-	1	2	-	-	2	1	5	-	2	5	-	-	1	**521**
South Greenfield	-	-	-	-	-	-	-	-	24	-	-	-	-	-	-	-	1	19	-	-	-	-	2	**46**
Totals			**3**	**18**		**2**	**4**	**79**	**3,568**		**7**	**3**			**3**	**3**	**9**	**19**	**2**	**9**			**4**	**3,733**

Source: Missouri 2023 State Hazard Mitigation Plan and Hazard Mitigation Viewer, US Census Bureau, FEMA National Structure Inventory, Dade County Assessor, MSDIS

Figure 3.1 is a map that shows the locations of bridges in Dade County included in the National Bridge Inventory (NBI) data set. There are 11 classified as "poor" condition, 84 as "fair" condition, and 65 as "good" condition. These bridges and additional low water crossings are further explored in section 3.4.1.

Figure 3.1. Dade County Bridges



3.2.3 Other Assets

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

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

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

Table 3.8. Threatened and Endangered Species in Dade County

Common Name	Scientific Name	Status
Gray Bat	Myotis grisescens	Endangered
Indiana Bat	Myotis sodalis	Endangered
Northern Long-eared Bat	Myotis Septentrionalis	Endangered
Tricolored Bat	Perimyotis subflavus	Proposed endangered
Ozark cavefish	Amblyosis rosae	Threatened
Neosho Mucket	Lampsilis rafinesqueana	Endangered
Monarch butterfly	Danaus plexisppus	Candidate
Geocarpon minimum	-	Threatened
Mead's Milkweed	Asclepias meadii	Threatened
Missouri Bladderpod	Physaria filiformis	Threatened

Source: U.S. Fish and Wildlife Service https://ecos.fws.gov/ipac/

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

Table 3.9. Conservation Areas in Dade County

Conservation Area	Location	Things to Do When You Visit
Stockton Lake Management Lands	This 24,900-acre lake extends into Cedar, Dade, and Polk Counties and has many accesses.	Trails, biking, horseback, hiking, bird watching, waterfowl hunting, open hunting, field trials, special use permit, fishing, and hunting
Corry Flatrocks Conservation Area	From Dadeville, take Highway W west 2 miles, continue west at curve on County Road 62 and go 0.5 miles, turn south on County Road 191 for 0.5 miles	Bird watching, fishing, and hunting
Fiddlers Ford Access	From Greenfield, take Highway 160 east 2 miles, then Route O south 3 miles, then County Road 621 west 1 mile, and County Road 540 south 1 mile across old iron bridge to the area.	Bird watching, fishing, and hunting
Niawathe Prairie Conservation Area	From Lockwood, take Highway 97 north 8 miles, then Route E west 1 mile, and County Road 61 north 0.50 mile.	Bird watching
Stony Point Prairie Conservation Area	From Lockwood, take Highway 160 west 4 miles, then Route D north 8 miles.	Bird watching, and hunting
Dr. O. E And Eloise Sloan Conservation Area	From Lockwood, take Highway 160 east 3 miles.	Bird watching, fishing, and hunting
Indigo Prairie Conservation Area	From Lockwood, take Highway 97 1 mile south, and 560th road east 2.50 miles.	Bird watching, and hunting
Wade And June Shelton Memorial Conservation Area	From Lockwood, take Highway 97 north 4 miles, then Route VV west 2 miles, and Dade 51 north 0.75 mile.	Bird watching, and hunting
Horse Creek Prairie Conservation Area	From Lockwood, take Highway 160 west 2 miles, then North Dade 51 north 1 mile.	Bird watching, and hunting

Source: https://mdc.mo.gov/discover-nature/places

Historic Resources: The National Register of Historic Places is the official list of registered cultural resources worthy of preservation. It was authorized under the National Historic Preservation Act of 1966 as part of a national program. The purpose of the program is to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings, structures and objects that are significant in American history, architecture, archeology, engineering, and culture.

There are three registered historic properties in Dade County. **Table 3.10** provides the details.

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

Property	Address	City	Date Listed
Greenfield Opera House Building	Jct. of Water and Allison Sts.	Greenfield	12/10/1998
Washington Hotel	2 S. Main St.	Greenfield	10/16/2002
Dilday Mill	SE of South Greenfield on Turnback Creek	South Greenfield	10/16/2002

Source: National Park Service Register of Historic Places https://www.nps.gov/subjects/nationalregister/index.htm

Economic Resources: The top ten major non-government employers in Dade County are provided in **Table 3.11**.

Table 3.11. Major Non-Government Employers in Dade County

Employer Name	Product or Service	Employees
Prairie Mountain Screening	Commercial Screen Printing	114
S & H Farm Supply	Farm and Garden Machinery and Equipment Merchant Wholesalers	85
Ash Grove Mfa	Farm Management Services	50
Empire District Electric	Other Electric Power Generation	49
Wholesale Supply Co	Other Millwork (including flooring)	40
United Nations	Automobile and Other Motor Vehicle Merchant Wholesalers	38
Lockwood Golf Course	Golf Courses and Country Clubs	34
Nothum Manufacturing Inc	Fabricated Structural Metal Manufacturing	30
Legacy Farm and Lawn	Farm and Garden Machinery and Equipment Merchant Wholesalers	28
Contract Carrier Inc	Temporary Help Services	24

Source: Lightcast https://www.lightcast.io

Agriculture: **Table 3.12** provides a summary of the agriculture-related jobs in Dade County.

Table 3.12. Agriculture-Related Jobs in Dade County

	2017	Change Since 2012
Number of farms	699	-5%
Land in farms (acres)	265,802	+8%
Average size of farm (acres)	380	+14%
Totals		
Market value of products sold	$70,192,000	+1%
Government payments	$1,928,000	+16%
Farm-related income	$3,017,000	-19%
Total farm production expenses	$58,549,000	+6%
Net cash farm income	$16,587,000	-17%
Per farm average		
Market value of products sold	$100,418	+6%
Government payments	$11,015	+36%

Farm-related income	$10,123	-26%
Total farm production expenses	$83,761	+12%
Net cash farm income	$23,730	-12%

Source: 2017 Census of Agriculture,
https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Missouri/index.php

3.3 LAND USE AND DEVELOPMENT

3.3.1 Development Since Previous Plan Update

Table 3.13 provides population growth statistics for participating municipalities in Dade County.

Table 3.13. Dade County Population Growth, 2010-2020

Jurisdiction	Population 2010	Population 2020	2010-2020 # Change	2000-2020 % Change
Dade County	7,883	7,569	-314	-4.0%
Arcola	43	65	+22	+51.2%
Greenfield	1,554	1,401	-153	-9.8%
Lockwood	976	1,078	+102	+10.5%
South Greenfield	68	49	-19	-27.9%

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

Population growth or decline is generally accompanied by increases or decreases in the number of housing units. Increases in population add to the built environment and increase risk and exposure to hazard events. **Table 3.14** provides the change in numbers of housing units in Dade County from 2010 to 2020.

Table 3.14. Change in Housing Units, 2010-2020

Jurisdiction	Housing Units 2010	Housing Units 2020	2010-2020 # Change	2000-2020 % Change
Dade County	3961	3955	-6	-0.15%
Arcola	29	69	+40	+137.93%
Greenfield	845	757	-88	-10.41%
Lockwood	463	465	+2	+0.43%
South Greenfield	55	18	-37	-67.27%

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

From 2010 to 2020, Dade County experienced an overall population decrease of -4% and a very minimal decrease of -0.15% in the total number of housing units. The growth rate is not expected to change drastically in the near future.. **Figures 3.2** and **3.3** show population density for Dade County in 2010 and 2020.

Figure 3.2. Dade County Population Density (2010)

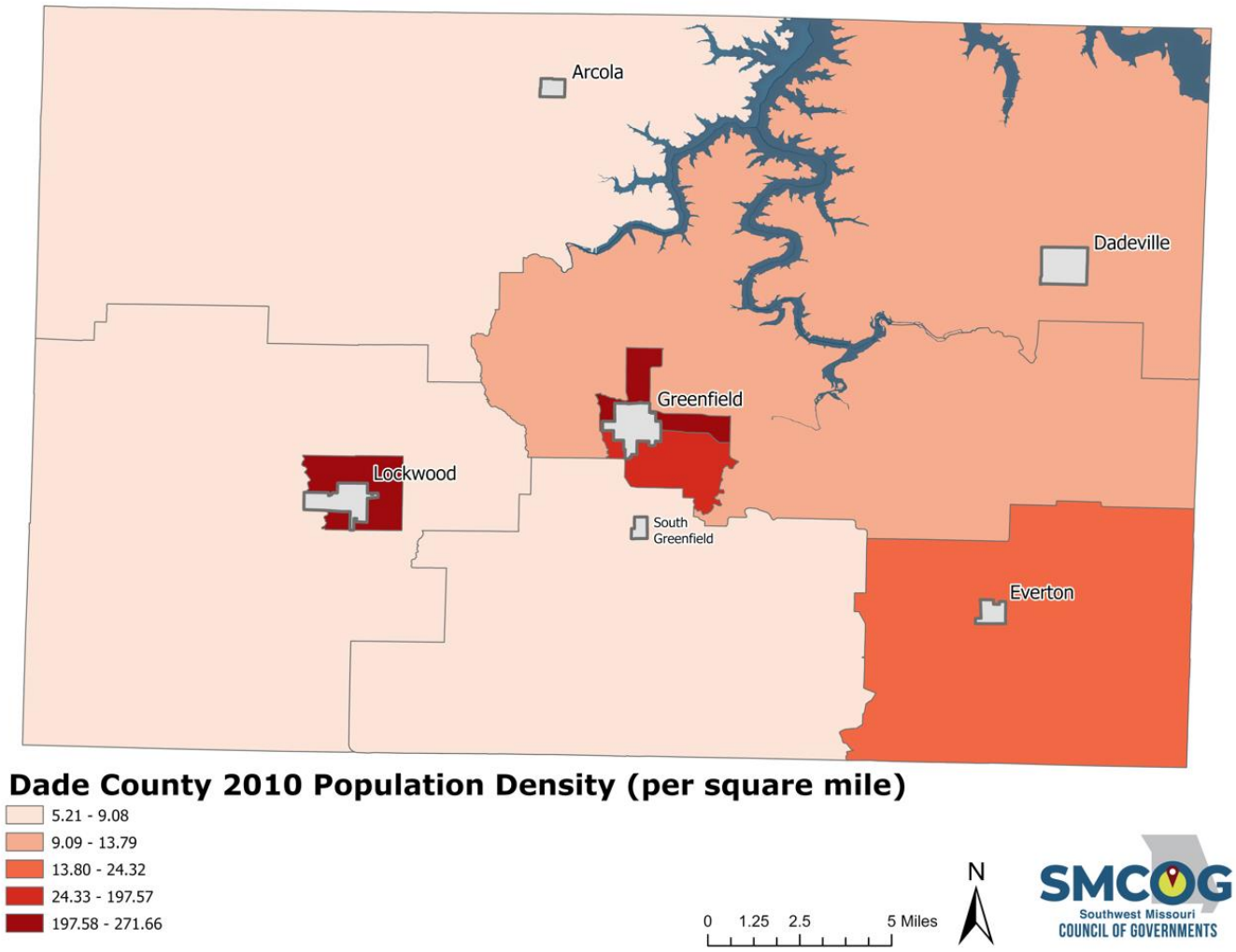
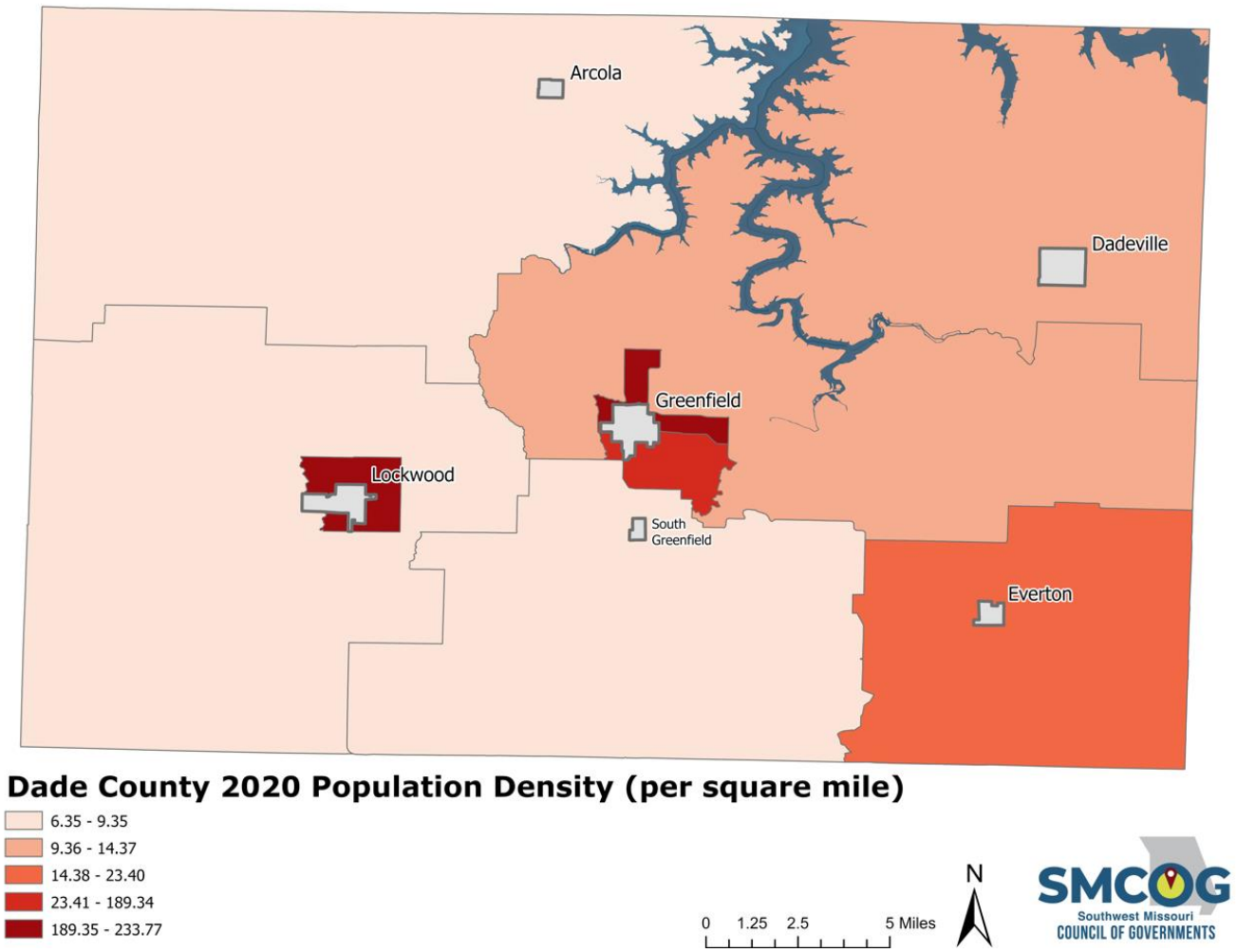


Figure 3.3. Dade County Population Density (2020)



The following section describes each participating jurisdiction's development since the previous plan update five years ago as indicated by their questionnaires. While none of this development took place in a known hazard area, new development, by its very nature, increases a community's total exposure and thus increases the overall vulnerability to hazards. Additionally, general construction trends are less equitable towards vulnerable populations (including the elderly, those under 5 years old, and low-income individuals).

Dade County

The county noted that new homes have been built sporadically throughout the county, no complete residential projects were made.

Arcola

The Village of Arcola indicated that no new development has been completed since the previous plan update.

Greenfield

The City of Greenfield added new public and private businesses include a dental office, pipe welding business, packing plant, addition to the fire station, city hall building, water well, electrical substation, lumber yard, school gymnasium, and additions to the Pennington Seed Fertilizer plant.

Lockwood

New development since the previous plan update for the City of Lockwood includes a Dollar General, Prairie Mountain Manufacturing, and Lockwood Packing House. The city also applied for and received HMGP funds to construct a safe room in 2022.

South Greenfield

The Village of South Greenfield indicated that no new development has been completed since the previous plan update.

Dadeville R-II School District

The gymnasium was renovated and a four-classroom addition was built to replace leased modular units.

Greenfield R-IV School District

No significant development was completed over the last five years.

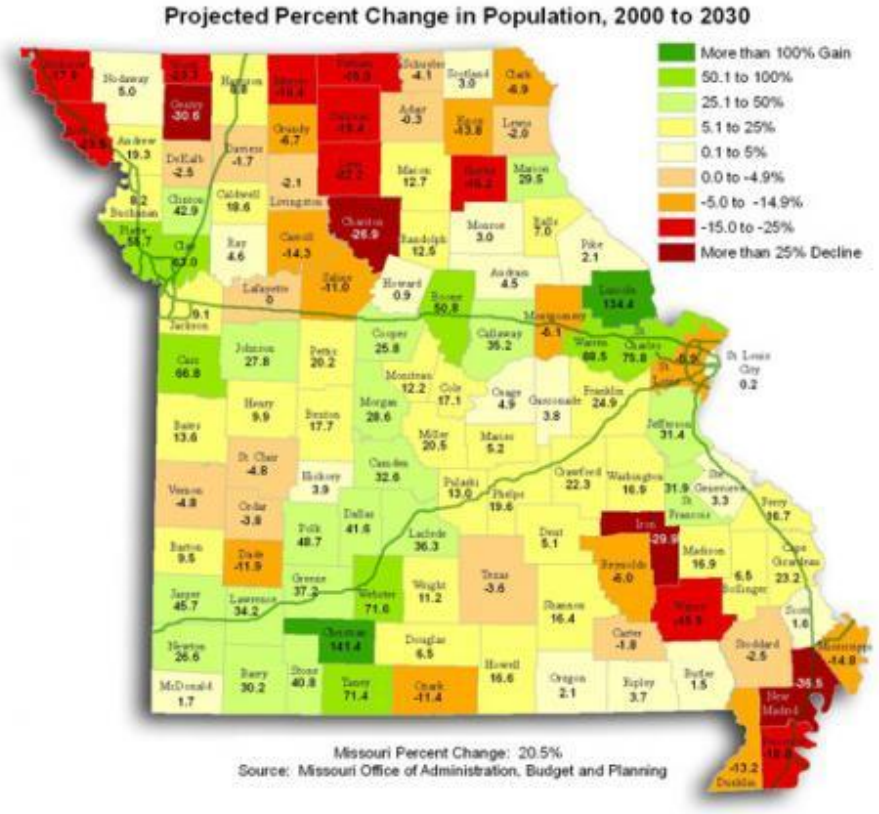
Lockwood R-I School District

The district added a new FEMA-approved safe room.

3.3.2 Future Land Use and Development

Dade County is expected to decrease in population in the next decade. This is consistent with the trend over the last decade. **Figure 3.4** shows the expected population change for each county in the state of Missouri.

Figure 3.4. Projected Percent Change in Population, 2000 to 2030



The remaining discussion in this section provides future growth and development information, where available, relative to each participating jurisdiction. Much of the information included is from the community data collection questionnaires, or where incomplete questionnaires were returned presumptions were made for future development based on past trends.

Dade County

Pennington Seed Company is expected to add several new buildings in future. The county participates in the NFIP and enforces a floodplain ordinance. Based on growth trends from the US Census and Missouri Office of Administration, the county is expected to see a decrease in overall population, which may affect the overall number of housing units.

Arcola

The village does not expect any new and significant development to occur over the next five years. The village participates in the NFIP and enforces a floodplain ordinance. Based on growth data, the village increased in both population and total number of housing units from 2010 to 2020. If this trend continues, the exposure and overall vulnerability will increase.

Greenfield

Greenfield expects most of the new growth to occur along the highway corridor, including medical facilities and commercial growth. Anticipated infrastructure improvements include a new water well and tower, storm shelter, addition to the city municipal building, RV parks, and mental health facility. The city participates in the NFIP and enforces a floodplain ordinance. The city both decreased in population and lost a number of housing units from 2010 to 2020.

Lockwood

The City of Lockwood does not expect any new and significant development to occur over the next five years. The city participates in the NFIP and enforces a floodplain ordinance. Lockwood is one of two participating municipalities in the county that increased in population and total number of housing units from 2010 to 2020, which in turn increases the city's overall vulnerability. It will be important for the city's housing unit increases to keep pace with population increases in the future.

South Greenfield

The Village of South Greenfield does not expect any new and significant development to occur over the next five years. The village does not participate in the NFIP. The village experienced the largest percentage decrease in total housing units (-67.27%, or -37 units) from 2010 to 2020. If this trend continues, the village's overall vulnerability will decrease. However, this many have a more significant impact on vulnerable populations, including the elderly and low income individuals.

Dadeville R-II School District

The district plans to explore the addition of a community storm shelter and replacement of an old building which houses two classrooms. The district expects a 20% increase in enrollment over the next five years. Such a large increase in enrollment will put additional stress on the district's mitigation capabilities, including the district's FEMA-approved safe room.

Everton R-III School District

The district plans to use funds from a no tax levy increase to replace the elementary school roof, add security cameras, add control access points to exterior doors, and update the doors in the high school hallway. The district does not expect enrollment to significantly change in the next five years.

Greenfield R-IV School District

There are currently no plans for new development. The district does not expect enrollment to significantly change in the next five years.

Lockwood R-I School District

There are currently no plans for new development and enrollment is expected to remain steady over the next five years. The district does have a FEMA-approved safe room.

3.4 HAZARD PROFILES, VULNERABILITY, AND PROBLEM STATEMENTS

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

Hazard Profiles

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

Each hazard identified in **Section 3.1.4** will be profiled individually in this section. The level of information presented in the profiles will vary by hazard based on the information available. With each update of this plan, new information will be incorporated to provide better evaluation and prioritization of the hazards that affect the planning area. Detailed profiles for each of the identified hazards include information categorized as follows:

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

Vulnerability Assessments

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

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

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

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

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

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments should be based on the best available data, including data collected from the 2023 State Hazard Mitigation Plan.

The vulnerability assessments in this plan will also be based on:

- Written descriptions of assets and risks provided by participating jurisdictions
- Existing plans and reports
- Personal interviews with planning committee members and other stakeholders
- Other sources as cited.

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

- **Vulnerability Overview**: An overall summary of each jurisdiction's vulnerability to the identified hazards. The overall summary of vulnerability identifies structures, systems, populations, or other community assets as defined by the community that are susceptible to damage and loss for hazard events.
- **Potential Losses to Existing Development**: Includes the types and numbers of building and critical facilities
- **Previous and Future Development**: This section will include information on how changes in development have impacted the community's vulnerability to this hazard. It also includes a description of how changes in development that occurred in known hazard prone areas since the previous plan have increased or decreased the community's vulnerability, and any anticipated future development in the county, and how that would impact hazard risk in the County.
- **Hazard Summary by Jurisdiction**: For hazard risks that vary by jurisdiction, this section will provide an overview of the variation and the factual basis for that variation. For example, a community that has adopted more recent building codes and constructed safe rooms would be less vulnerable to the impact of tornados.

Problem Statements

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

3.4.1 Flooding (Riverine and Flash)

Hazard Profile

Hazard Description

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

Flooding caused by dam failure is discussed in **Section 3.4.2**. It will not be addressed in this section.

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

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

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

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

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

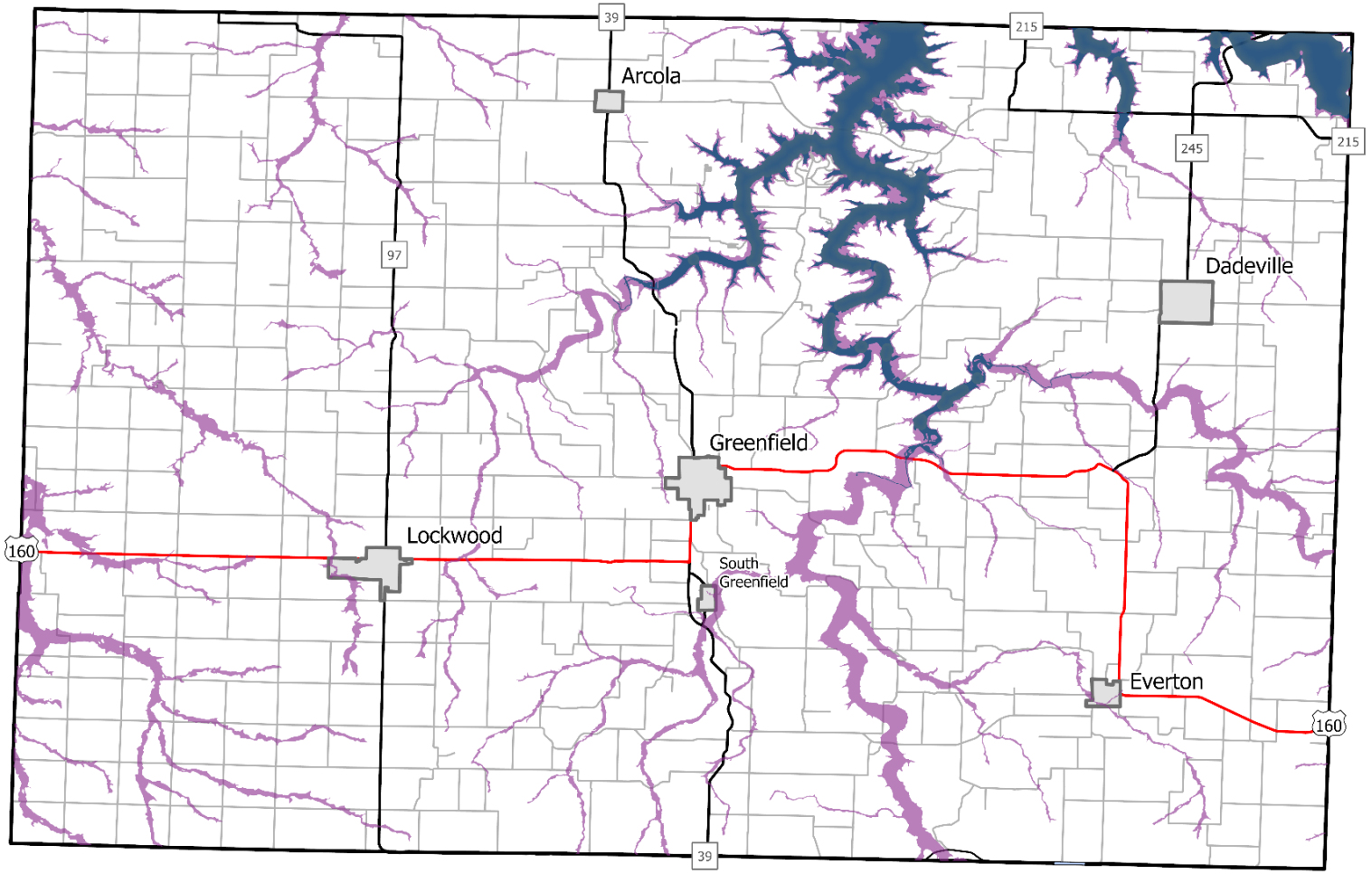
Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of watershed characteristics, modeling techniques,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

Geographic Location

Riverine flooding is most likely to occur in Special Flood Hazard Areas (SFHAs) where the 100-year floodplain has been mapped. Areas surrounding the southern arms of Stockton Lake, as well as the Sac River and its branches, are at the greatest risk of impact from riverine and flash floods, though several areas throughout Dade County contain numerous creeks and streams with the potential to flood.

According to NCEI storm event data from 2013 to 2022, there were 36 flash flood events and 12 riverine flood events recorded in the county. These events are typically regional in nature; however, flash floods can be contained to one area, specifically portions of highways or roads. **Figures 3.5** through **Figure 3.9** are mapped SFHAs for the participating jurisdictions within Dade County.

Figure 3.5. Dade County SFHA



Dade County Flood Hazard Map

- Local Roads
- State Routes
- US Highway
- Dade County
- City Limits
- 1% Annual Chance Flood Hazard

0 2.5 5 Miles

N

SMCOG
Southwest Missouri
COUNCIL OF GOVERNMENTS

Figure 3.6. Arcola SFHA

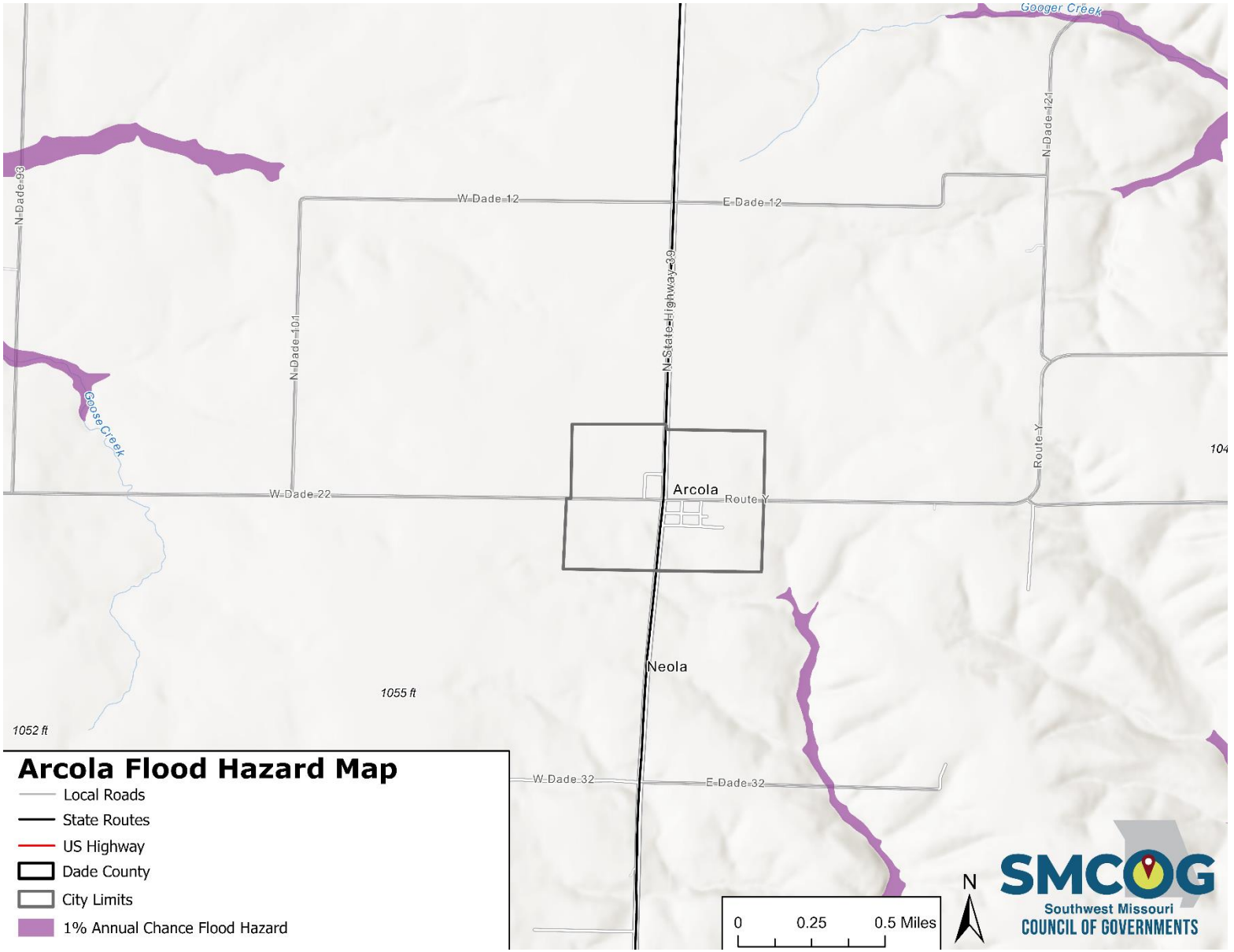


Figure 3.7. Greenfield SFHA

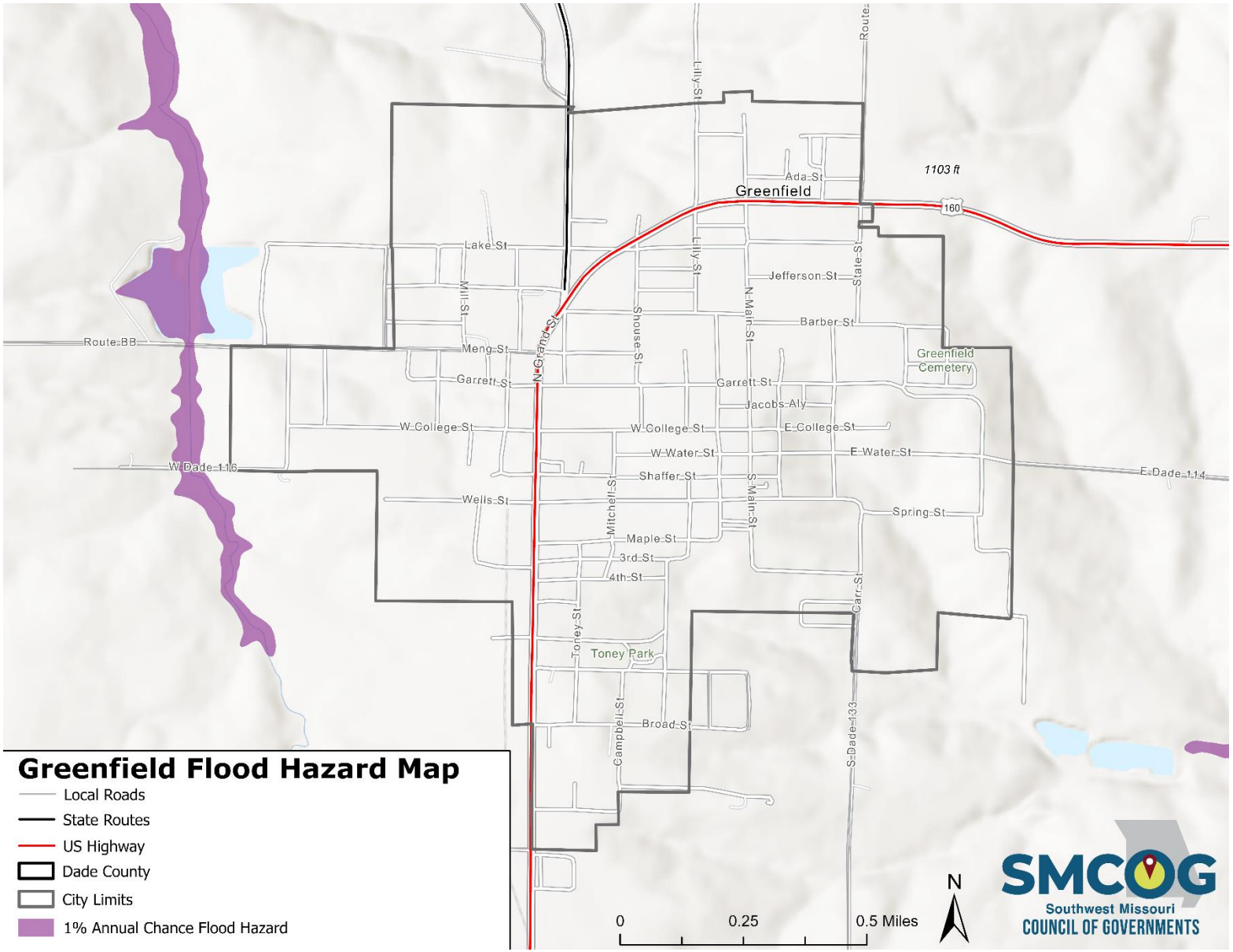


Figure 3.8. Lockwood SFHA

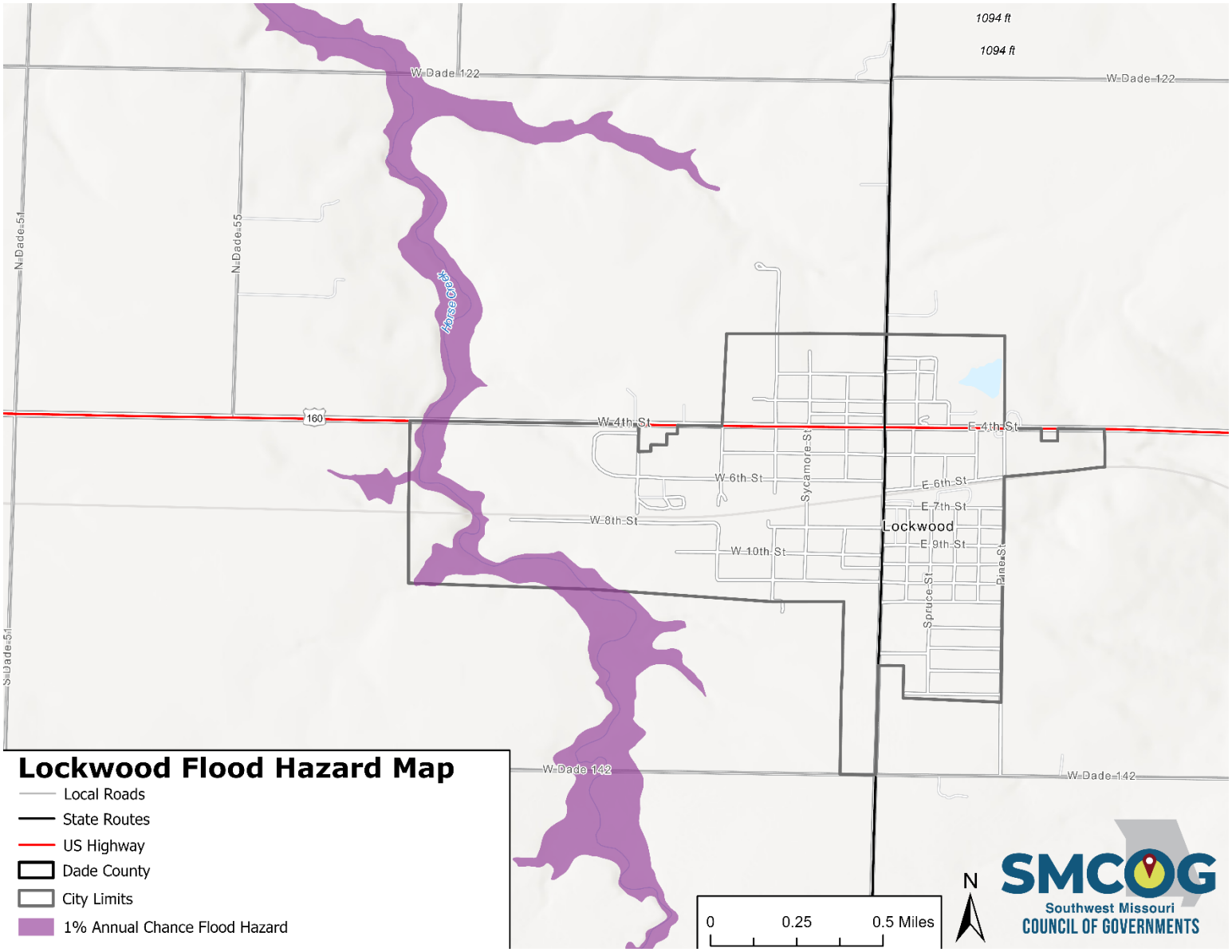
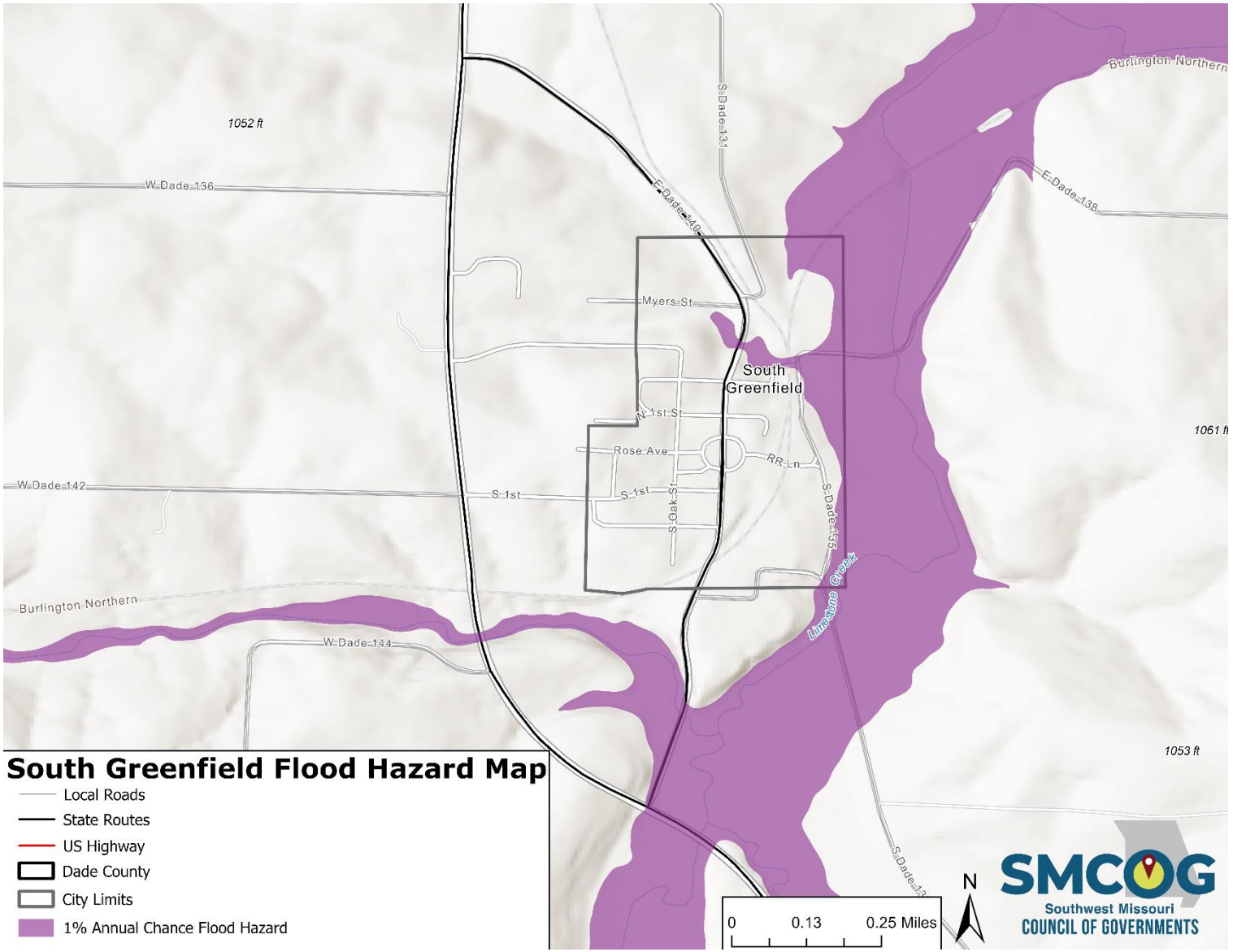


Figure 3.9. South Greenfield SFHA



Flash flooding events pose the most pervasive hazard of the two flood types in the county due to permeability of soils, slopes, increasing urban development, and an extensive network of streams and rivers. Sustained rainfall or downpours at the rate of one inch per hour have caused street flooding in incorporated areas and made a significant number of low-water crossings impassable. Flash flooding occurs in the floodplain while low-lying areas in all jurisdictions are susceptible to flash floods outside the 100-year floodplain. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events.

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

Table 3.15 shows all flash flood and riverine flood events within the county from 2003 to 2022.

Table 3.15. Dade County Flood Events by Location, 2003-2022

Location	Flash Floods	Riverine Floods
Unincorporated Dade County	22	9
City of Dadeville	0	0
City of Everton	2	2
City of Greenfield	4	0
City of Lockwood	5	1
Village of Arcola	1	0
Village of South Greenfield	2	0
Total	**36**	**12**

Source: National Centers for Environmental Information

Strength/Magnitude/Extent

Missouri has a long and active history of flooding over the past century, according to the 2023 State Hazard Mitigation Plan. Flooding along Missouri's major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing communities downstream sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, floods exact a heavy toll in terms of human suffering and losses to public and private property. By contrast, flash flood events in recent years have caused a higher number of deaths and major property damage in many areas of Missouri.

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

National Flood Insurance Program (NFIP) Participation

Table 3.16 provides details on NFIP participation for communities in Dade County. **Table 3.17** shows the number of policies in force, amount of insurance in force, number of closed losses, and total payments, where applicable.

Table 3.16. NFIP Participation in Dade County

Community Name	Community ID Number	NFIP Participant (Y/N/Sanctioned)	Current Effective Map Date	Regular-Emergency Program Entry Date
Dade County	290796#	Y	05/24/2011	12/22/2003
Arcola	290930#	Y	NSFHA	10/22/2003
Greenfield	290710#	Y	NSFHA	02/09/2011
Lockwood	290682#	Y	NSFHA	10/22/2003
South Greenfield	209929#	N	05/24/2011	07/17/2003

Source: NFIP Community Status Book, https://www.fema.gov/cis/MO.html. NSFHA = No Special Flood Hazard Area

Table 3.17. NFIP Policy and Claim Statistics as of Date

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Dade County	1	$350,000	0	$0
Arcola	0	$0	0	$0
Greenfield	0	$0	0	$0
Lockwood	0	$0	0	$0
South Greenfield	0	$0	0	$0
Total	**1**	**$350,000**	**0**	**$0**

Source: FEMA

Repetitive Loss

Repetitive Loss properties are those properties with at least two flood insurance payments of $1,000 or more in a 10-year period. According to the Flood Insurance Administration, there are no Repetitive Loss properties in Dade County.

Severe Repetitive Loss (SRL)

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

Previous Occurrences

Table 3.18 and **Table 3.19** reflect storm event data for riverine flooding and flash flood events in Dade County during the 20-year period of 2003-2022. There were 12 riverine flood events and 36 flash flood events resulting in $3,120,000 in property damages, one death, and no injuries. The majority of property damage ($2,300,000 or 74% of total damage) occurred in 2007 when the remnants of Tropical Storm Eric caused flash flooding across central and southern sections of the county damaging multiple roadways. The one death occurred in 2022 in when a vehicle with two occupants was swept off a low water crossing on County Road 143 at Limestone Creek. One occupant was able to make it to safety but the second, a 65-year-old male, drowned.

Table 3.18. Dade County Flash Flood Events Summary, 2003-2022

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2003	-	-	-	-	-
2004	-	-	-	-	-
2005	4	-	-	-	-
2006	1	-	-	-	-
2007	9	-	-	$2,300,000	-
2008	4	-	-	$100,000	-
2009	2	-	-	-	-
2010	1	-	-	-	-
2011	-	-	-	-	-
2012	-	-	-	-	-
2013	4	-	-	$200,000	-
2014	1	-	-	-	-
2015	1	-	-	$10,000	-
2016	1	-	-	-	-
2017	3	-	-	$500,000	-
2018	-	-	-	-	-
2019	1	-	-	-	-
2020	1	-	-	-	-
2021	-	-	-	-	-
2022	3	1	-	$10,000	-
Total	**36**	**1**	**0**	**$3,120,000**	**$0**

Source: National Centers for Environmental Information

Table 3.19. Dade County Riverine Flood Events Summary, 2003-2022

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2003	-	-	-	-	-
2004	-	-	-	-	-
2005	2	-	-	-	-
2006	-	-	-	-	-
2007	1	-	-	-	-
2008	1	-	-	-	-
2009	-	-	-	-	-
2010	-	-	-	-	-
2011	-	-	-	-	-
2012	-	-	-	-	-
2013	-	-	-	-	-
2014	-	-	-	-	-
2015	-	-	-	-	-
2016	-	-	-	-	-
2017	-	-	-	-	-
2018	1	-	-	-	-
2019	1	-	-	-	-
2020	1	-	-	-	-
2021	1	-	-	-	-
2022	4	-	-	-	-
Total	**12**	**0**	**0**	**$0**	**$0**

Source: National Centers for Environmental Information

Probability of Future Occurrence

There were 48 flood events reported in Dade County from 2003 to 2022. Of the 48 total, 12 were riverine floods. In this 20-year time-period, there were 12 years without a riverine flood and 20 years without any property or crop damage. This equates to a 40% probability for a riverine flood in any given

year and a 0% probability that a damaging event will occur. Based on the number of events and years, the average number of riverine flood events per year is 0.6.

During the same time-period, there were 36 flash floods reported in the county. These floods occurred in 14 of the 20 years, giving a 70% probability of occurrence in any given year. Damages occurred in six years, giving a 30% probability of a damaging event occurring in any given year. The average amount of flash floods per year was 1.5 and the average cost of damages was $156,000.

Changing Future Conditions Considerations

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

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

Vulnerability

Vulnerability Overview

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

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

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Poor conditioned bridges identified in **Figure 3.1** show specific locations that might be more vulnerable to high- or fast-moving floods. Floodwaters can also cause erosion undermining roadbeds. In some instances, steep slopes that are saturated with water may cause mud or rockslides onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

Potential Losses to Existing Development

Flood loss estimates were developed by selecting all parcels located in a floodplain. Building counts of the selected parcels were then sorted by participating jurisdictions and type. **Table 3.20** presents the building counts for each type of use that are located within a floodplain for each participating jurisdiction. “Residential-Sub” refers to sheds and outbuildings with structure-areas less than 400 square ft.

Table 3.20. Potential Flood Losses for Structures Within a Floodplain

Jurisdiction	Agriculture	Commercial	Government	Residential	Residential-Sub	Total
Dade County	16	30	1	19	21	87
Arcola	0	0	0	0	0	0
Greenfield	0	0	0	0	0	0
Lockwood	0	0	0	0	0	0
South Greenfield	0	0	0	0	0	0
Total	**16**	**30**	**1**	**19**	**21**	**87**

Source: Source: University of Missouri GIS Department (MSDIS)

It's also important to note that flash flooding damage has the potential to impact all structures in a community, whether they are located in a floodplain or not. A damage factor of 5% was applied to the overall exposure for each participating jurisdiction to simulate this damage. These numbers are provided below in **Table 3.21.**

Table 3.21. Total Flood Exposure and Estimated Losses by Jurisdiction

Jurisdiction	Agriculture	Commercial	Education	Government	Industrial	Residential	Total
Dade County	$657,800	$684,750	$0	$46,350	$460,250	$12,756,450	**$14,605,550**
Arcola	$2,200	$26,100	$0	$0	$0	$305,900	**$334,200**
Greenfield	$300	$560,800	$184,750	$39,700	$210,950	$2,740,000	**$3,736,500**
Lockwood	$4,150	$430,400	$184,750	$26,500	$134,250	$1,852,500	**$2,632,500**
South Greenfield	$0	$0	$0	$6,600	$0	$249,850	**$256,500**
Total	**$664,450**	**$1,702,050**	**$369,500**	**$119,150**	**$805,450**	**$17,904,700**	**$21,565,250**

Source: Source: University of Missouri GIS Department (MSDIS)

Low Water Crossings

Damage to low water crossings due to flooding is a significant problem for communities. In 2017/18, an inventory of all low water crossings in Dade County was conducted. Data gathered included condition, type of structure, measurements, and flooding risk. The inventory showed that there are 232 county-maintained crossings of all types in Dade County. At the time of the inventory, there were 138 in good condition, 87 in fair condition, and 7 in poor condition. **Figure 3.10** shows the crossing type, while **Figure 3.11** shows the conditions of all crossings at the time of the inventory.

The data from the inventory was used to determine the top ten priority crossings for replacement and/or upgrading based on several factors including condition, evidence of flooding, distance from incorporated community, number of nearby structures, location within an MDC priority watershed, and commissioner priority. **Figure 3.12** shows the location of the ten priority crossings and includes a picture of each crossing. Many of these crossings are repeatedly damaged during heavy rain events and need substantial improvements or upgrades in order to increase resiliency towards flooding.

Figure 3.10. Dade County Low Water Crossing Type

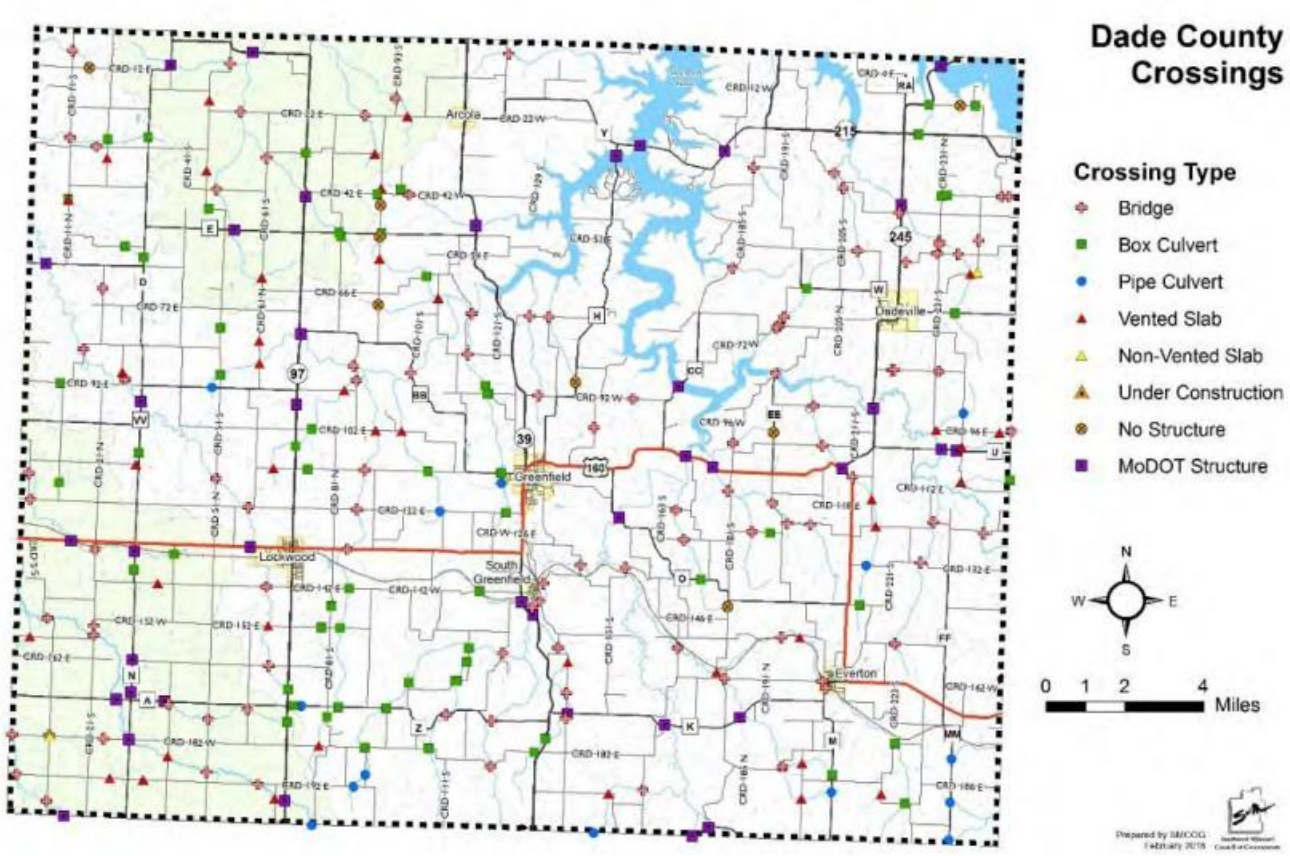


Figure 3.11. Dade County Low Water Crossing Condition

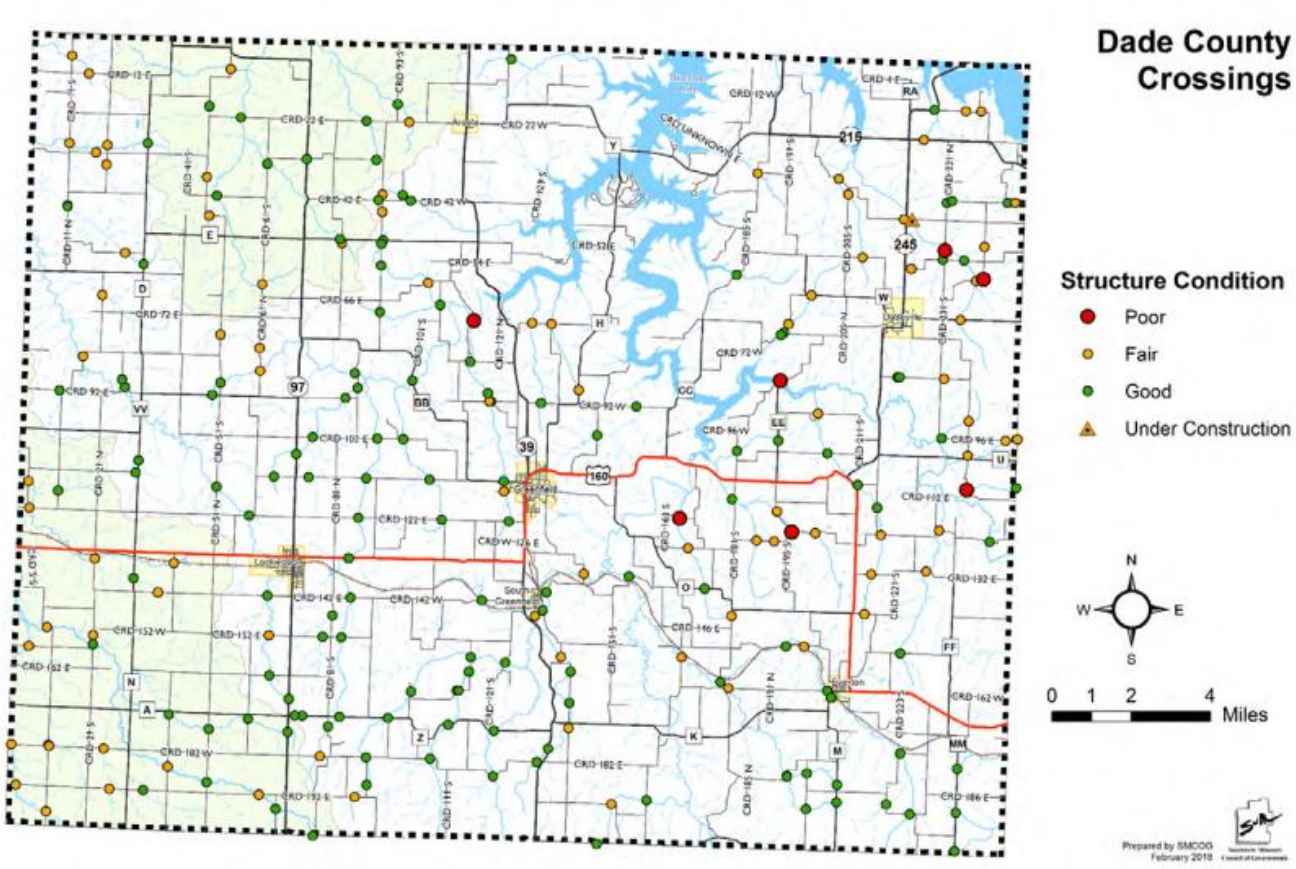
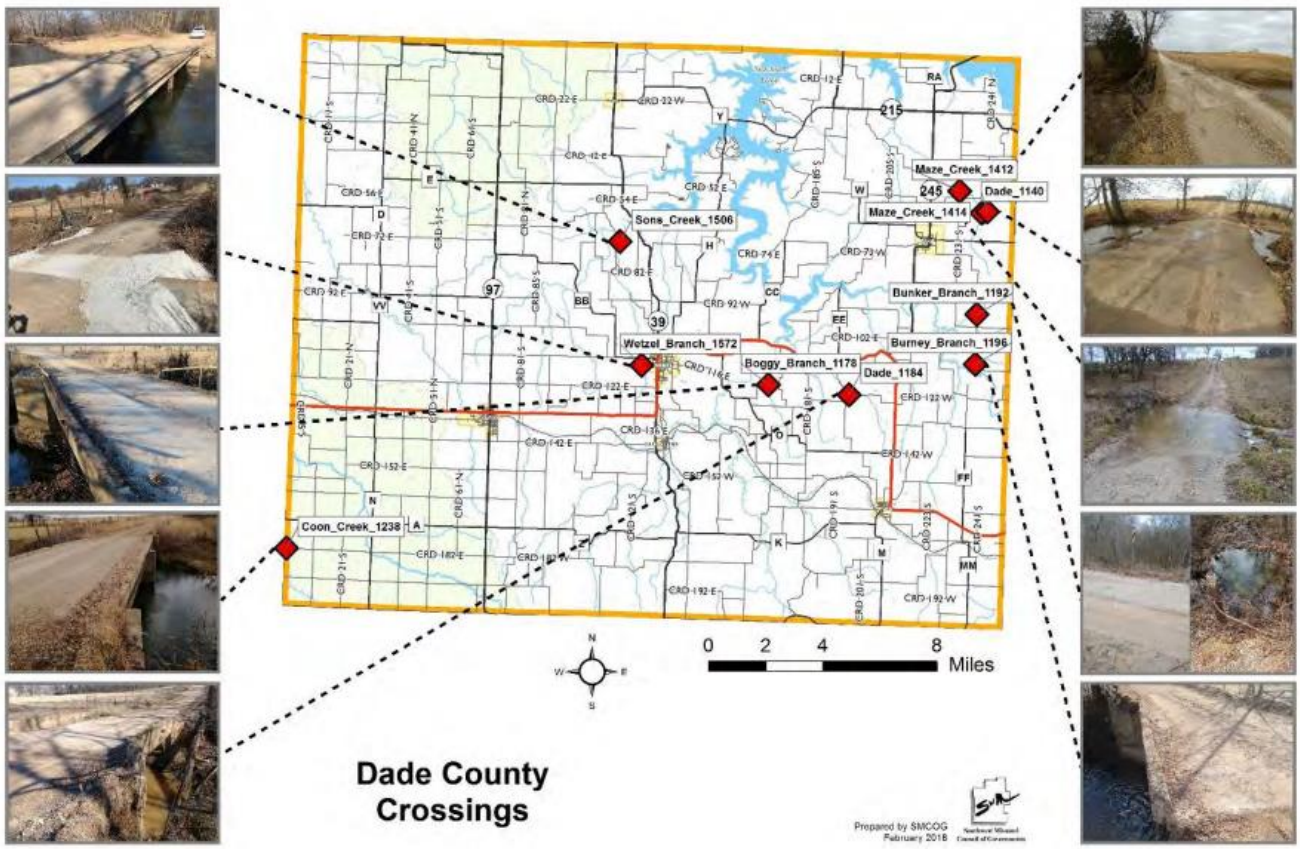


Figure 3.12. Dade County Low Water Crossing Priorities



Impact of Previous and Future Development

Future development could impact flash and riverine flooding in Dade County. Development in low-lying areas near rivers and streams or where interior drainage systems are not adequate to provide drainage during heavy rainfall events will be at risk to flash flooding. Future development would also increase impervious surfaces causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

All jurisdictions within the county are at risk of flood hazards. However, as demonstrated in **Table 3.20** and **3.21** exposure of assets near SFHAs varies among jurisdictions. More exposure leads to higher risk. Based on **Figures 3.5 – 3.9** demonstrating the flood areas for each jurisdiction, the unincorporated portions of Dade County are at the highest risk of flood damage. Communities like Arcola and Greenfield do not have any parts of their boundaries overlap SFHAs. Lockwood and Greenfield do, but these areas are small and do not overlap with any structures. Dade County, Arcola, Lockwood, and Greenfield participate in the NFIP, which should help reduce the overall risk of this hazard.

Community Comments on Hazard

Community survey responses to the topic of flooding were mixed. Only 2 of the 48 total responders mentioned they had been impacted by flooding in the past. However, when presented with a list of ten possible projects that may be funded with FEMA hazard mitigation grants, flood related projects scored

relatively well. “Minor localized flood reduction projects”, “Low water crossing replacement”, and “Flood-prone structure elevation” were the third, fourth, and fifth place projects.

Several comments mentioned flood-related transportation issues within the county. “Small back road bridges need more attention along with drainage pipes that cross the road”, said one responder. “Safer routes on rural roads prone to washouts for buses.” One even mentioned specific locations that are dangerous to drivers, “There are several low water crossings, one in particular at Farm Road 101 and 74… many cars get stuck or damaged driving up across or over the Sons Creek crossing.”

The survey included questions gauging the public’s perception of each hazard. **Table 3.22** below provides a summary of these responses.

Table 3.22. Flooding Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	6.3%	Not at all Concerned	2.1%	No Impact	2.1%
Occasionally	41.7%	Not so Concerned	37.5%	Limited Impact	37.5%
Likely	37.5%	Somewhat Concerned	41.7%	Critical Impact	50%
Highly Likely	14.6%	Very Concerned	16.7%	Catastrophic Impact	10.4%
-	-	Extremely Concerned	2.1%	-	-

Problem Statement

Floods are frequent events and have been listed in seven out of 19 presidential disaster declarations for Dade County dating back to 2000. From 2003 to 2022, flooding caused $3,120,000 in property damage and resulted in one fatality. Significant debris accumulation and damage at low water crossings are a regular occurrence due to flash flooding throughout the county.

All participating municipal jurisdictions except for South Greenfield are participants in the National Flood Insurance Program (NFIP). These communities have passed floodplain management ordinances and have the ability to substantially regulate development in the floodplain. Their participation in the NFIP enables residents to purchase flood insurance. Street flooding in incorporated areas can be addressed through storm water management projects and enforcement of storm water management regulations, where applicable.

Several low water crossings at numerous locations throughout the county have been affected by floods and flash flooding. All warning signs and gauges should be installed and replaced at frequently flooded low water crossings to provide warning to motorists. Hazard awareness programs and education during and prior to flood events in the county broadcasted by the media can mitigate future risks to motorists at low water crossings.

3.4.2 Dam Failure

Hazard Profile

Hazard Description

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

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

According to the 2023 State Plan, Missouri has 5,363 total dams recording in the National Inventory of Dams. Dam owners are charged with the primary responsibility for the safe design, operation, and maintenance of their dams. They are also responsible for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials.

Missouri's topography allows lakes to be built easily and inexpensively, contributing to the high number of dams. Despite the large number of total dams in the state, there are only 699 (13%) state regulated dams, with an additional 59 federally regulated dams. The remaining 4,605 dams are un-regulated.

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

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

The Missouri Dam and Reservoir Safety Council Rules and Regulations uses three classes of downstream environmental zone used when considering permits. The downstream environment zone is the area below the dam that would become inundated should the dam fail. Inundation is defined as water two feet or more over the submerged ground outside of the stream channel. These classes are based on the number of structures and types of development contained within the inundation area as presented in **Table 3.23**. The downstream environment zone classification is also used to prescribe the frequency of inspection.

Table 3.23. MoDNR Dam Hazard Classification Definitions

Hazard Class	Definition
Class I	The area downstream from the dam that would be affected by inundation contains ten (10) or more permanent dwellings or any public building. Inspection of these dams must occur every two yeas
Class II	The area downstream from the dam that would be affected by inundation contains one to nine permanent dwelling, or one (1) or more campgrounds with permanent water, sewer and electrical services or one (1) or more industrial buildings. Inspection of these dams must occur once every three years.
Class III	The area downstream from the dam that would be affected by inundation does not contain any of the structures identified for Class I or Class II dams. Inspection of these dams must occur once every five years

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

Dams in the NID are classified according to hazard potential, an indicator of the consequences of dam failure. A dam's hazard potential classification, presented in **Table 3.24**, does not indicate its condition. Dams assigned to the high hazard potential classification are those where failure will potentially result in loss of human life. Significant hazard potential are those dams where failure results in no probable loss of human life but can cause economic loss. Dams assigned to the low hazard potential classification are those where failure or results in no probable loss of human life and low economic or environmental losses. Losses are principally limited to the owner's property.

Table 3.24. NID Dam Hazard Classification Definitions

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

Source: National Inventory of Dams

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

Geographic Location

Dams Located Within the Planning Area

There are 11 recorded dams in Dade County according to the NID. One is classified as significant hazard (Spain Lake Dam), while the rest are low hazard. **Table 3.25** provides a summary of the dams located in the county and **Figures 3.13** through **3.24** provide the locations of each dam.

Table 3.25. Dams in Dade County

Dam Name	Emergency Action Plan (EAP)	Dam Height (Ft)	NID Storage (Acre-Ft)	Last Inspection Date	River	Dam Owner	Hazard Potential Classification	Primary Purpose
Spain Lake Dam	Not required	18	70	Unknown	Tr-South Prong Sons Creek	Edwin Spain	Significant	Irrigation
Rector Lake Dam	Not required	30	23	Unknown	Tr-Sons Creek	Keith Rector	Low	Recreation
Giddings Lake Dame	Not required	25	67	Unknown	Cave Spring Branch	Dr F C Giddings	Low	Fire protection, stock or small fish pond
Campbell Lake Dam	Not required	25	87	Unknown	Tr-Chaney Branch, Horse Crk	Rex Campbell	Low	Irrigation
Winningham Lake Dam	Not required	25	361	Unknown	Tr To Chaney Br, Horse Creek	Gerald Winningham	Low	Irrigation
Davis Lake Dam	Not required	20	113	Unknown	Tr-North Fork, Spring River	Ivan Davis	Low	Irrigation
Habeyle Dam	Not required	17	109	Unknown	Kyle Creek	Unknown	Low	Irrigation
Schilling Lake Dam	Not required	17	182	Unknown	Tr-North Fork, Spring River	Clinton Schilling	Low	Irrigation
Townley Lake Dam	Not required	16	60	Unknown	TR-Coon Creek	Robert Townley	Low	Irrigation
Hedeman Farms Lake Dam	Not required	14	105	Unknown	Tr To Horse Creek	Hedeman Farms Inc	Low	Irrigation
Mononame790	Not required	10	59	Unknown	Tr-South Prong	Unknown	Low	Recreation

Source: National Inventory of Dams https://nid.sec.usace.army.mil/#/

Figure 3.13. Dams in Dade County

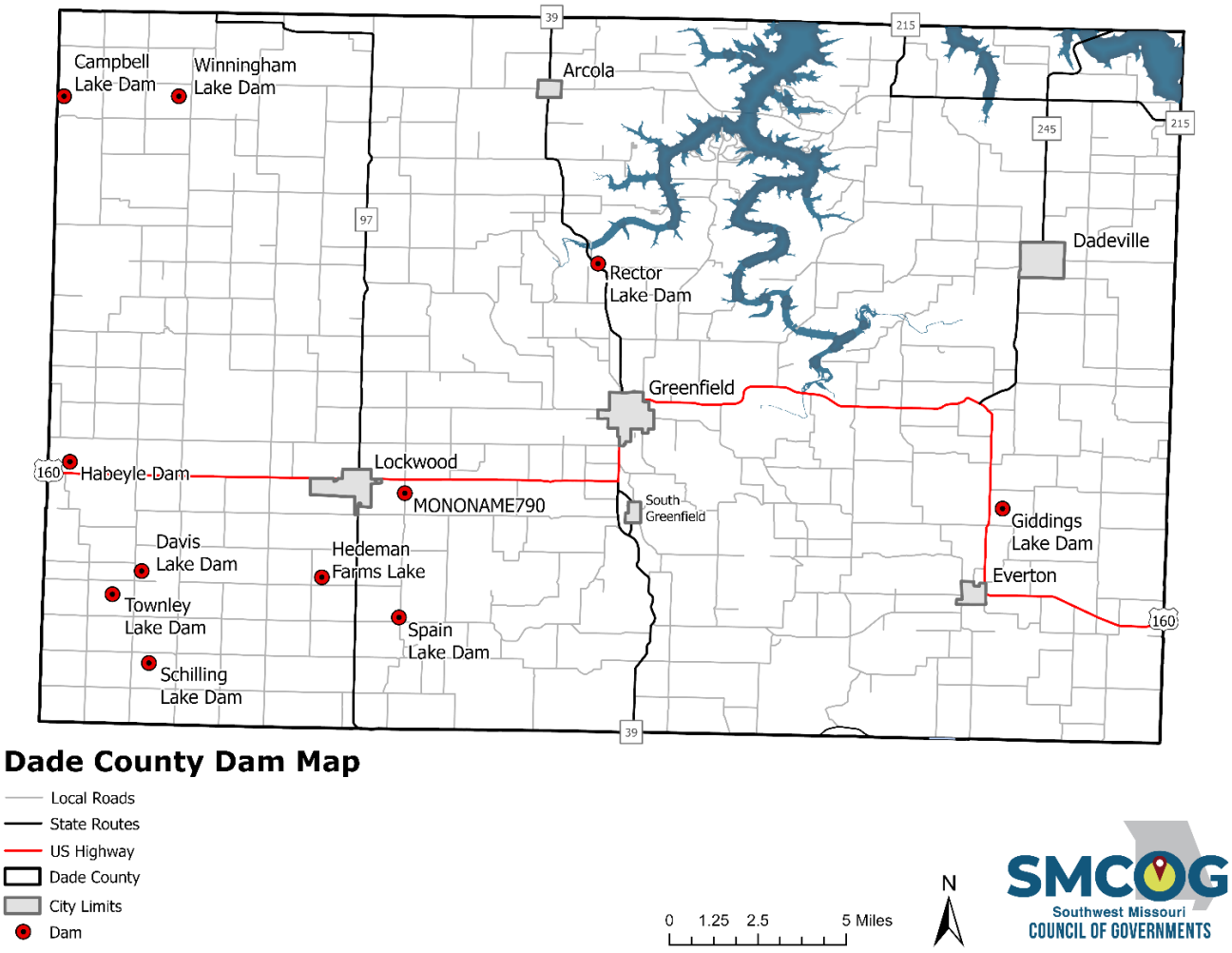


Figure 3.14. Spain Lake Dam

Figure 3.15. Rector Lake Dam

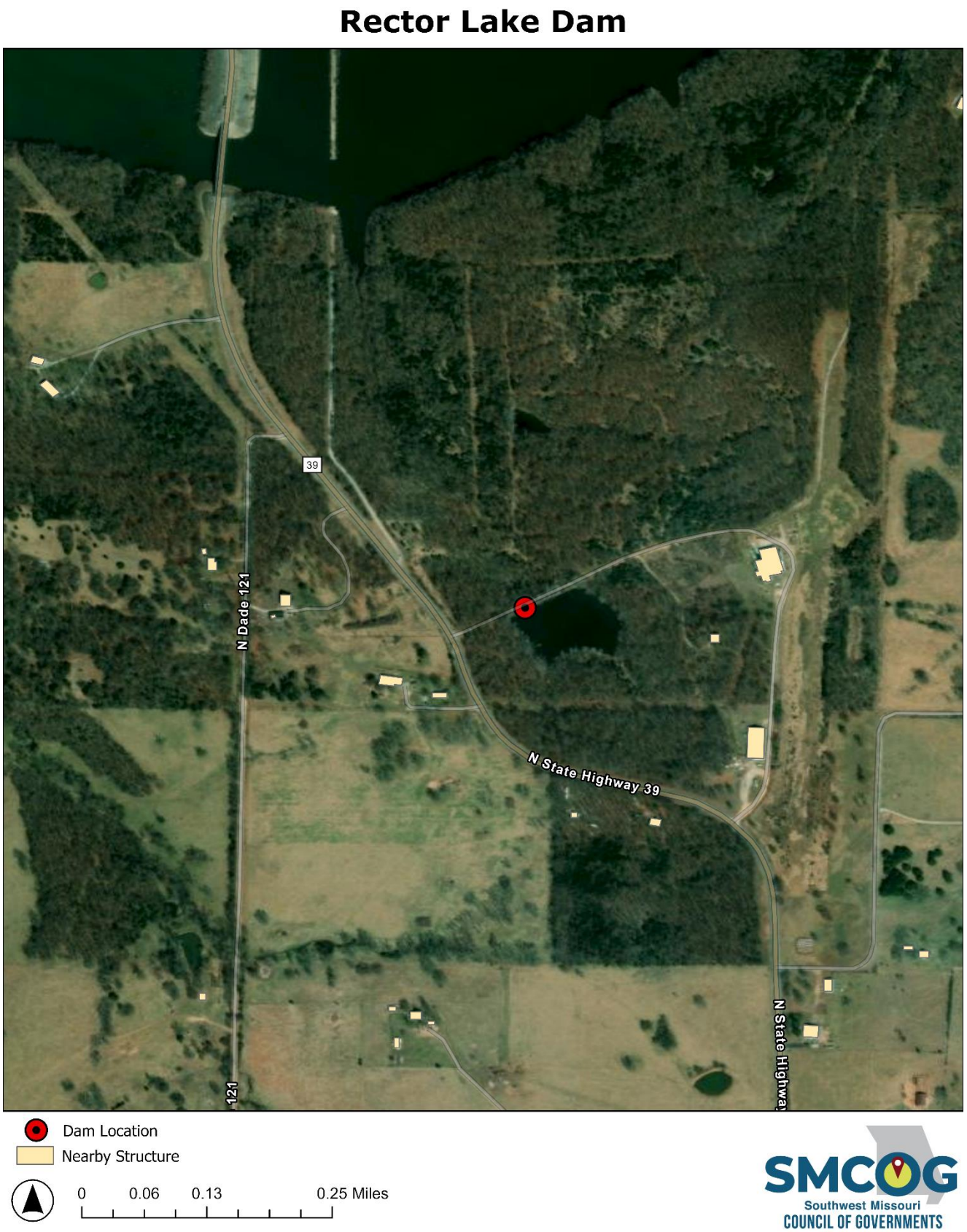


Figure 3.16. Giddings Lake Dam

Figure 3.17. Campbell Lake Dam

Figure 3.18. Winningham Lake Dam

Figure 3.19. Davis Lake Dam

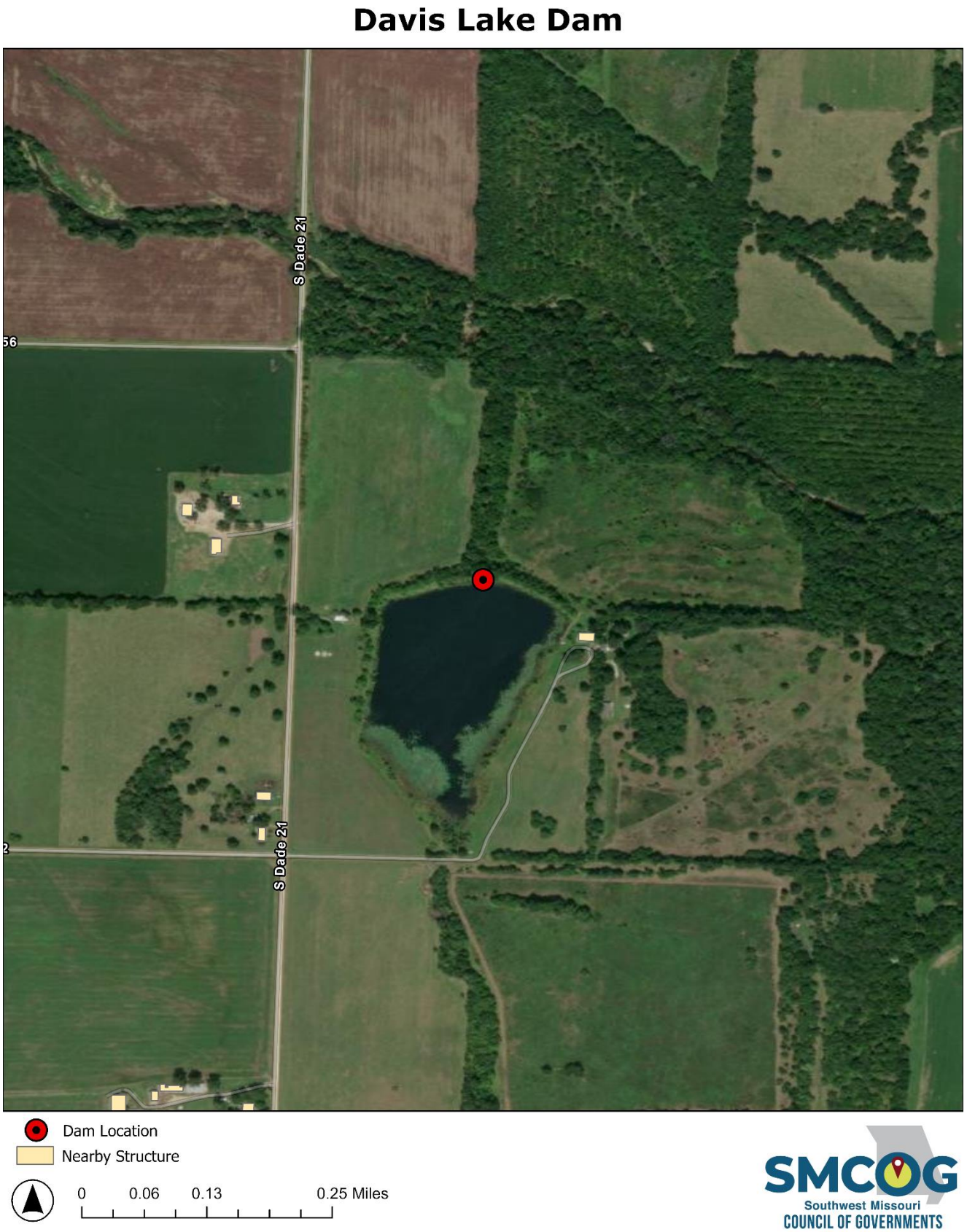


Figure 3.20. Habeyle Dam

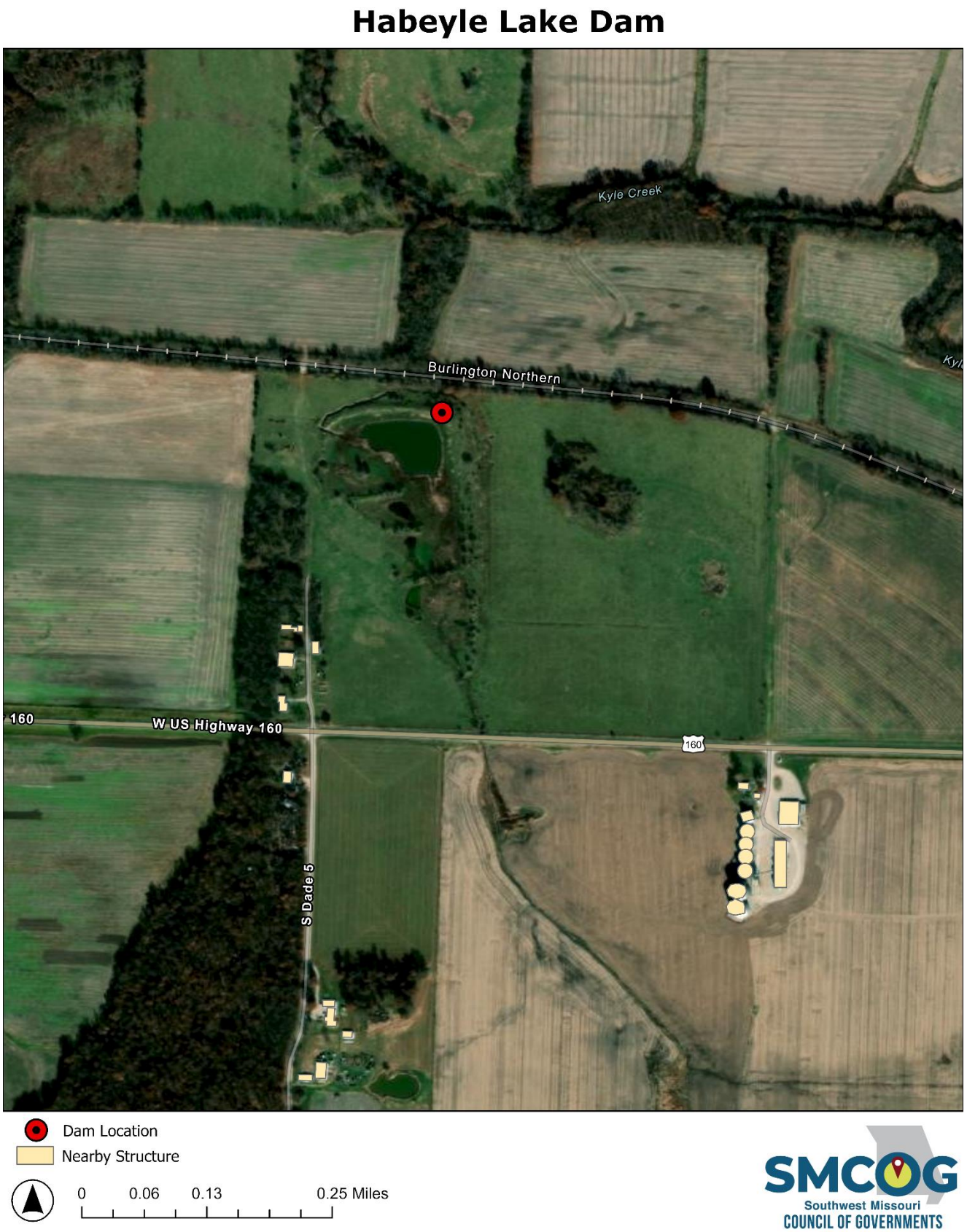


Figure 3.21. Schilling Lake Dam

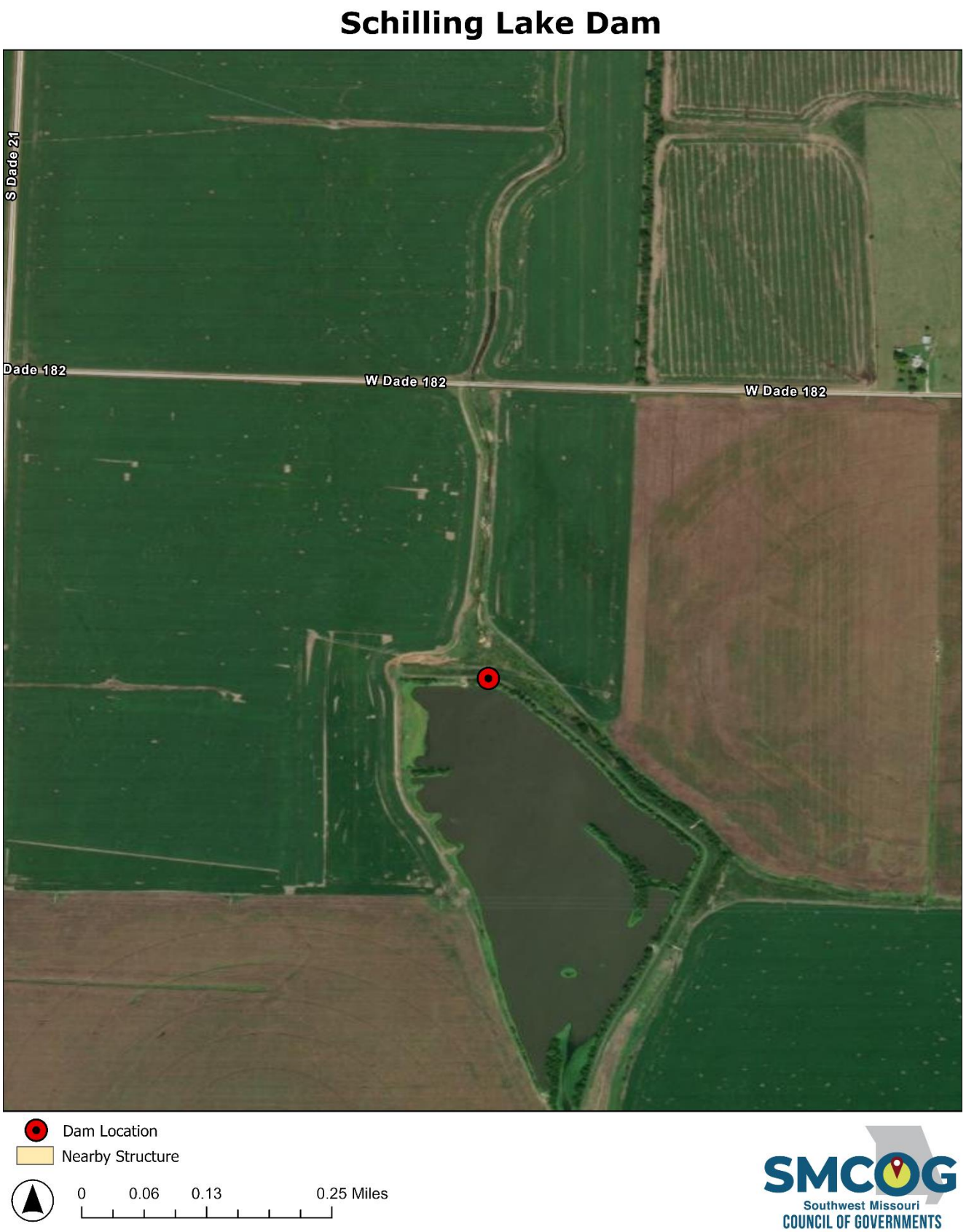


Figure 3.22. Townley Lake Dam

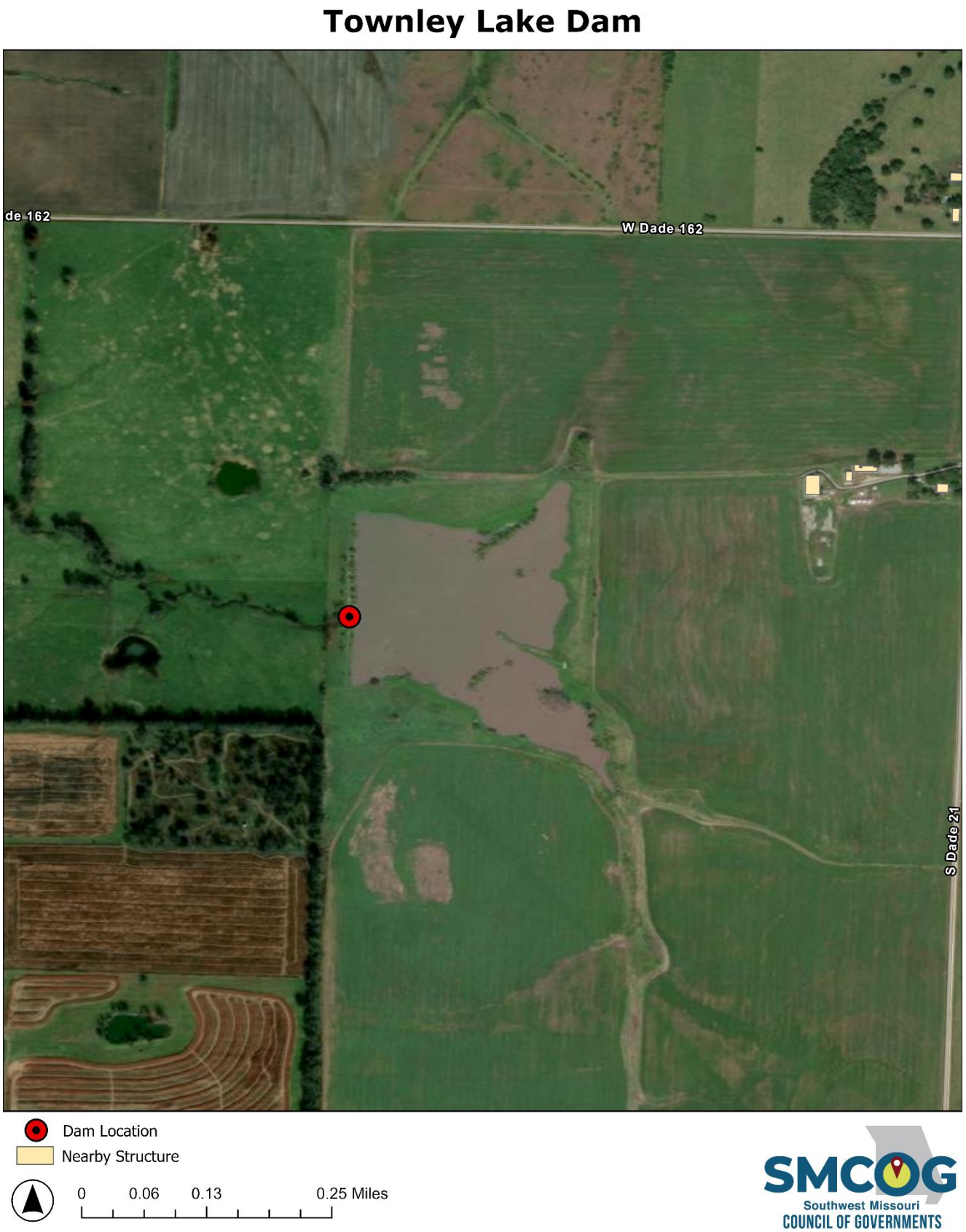
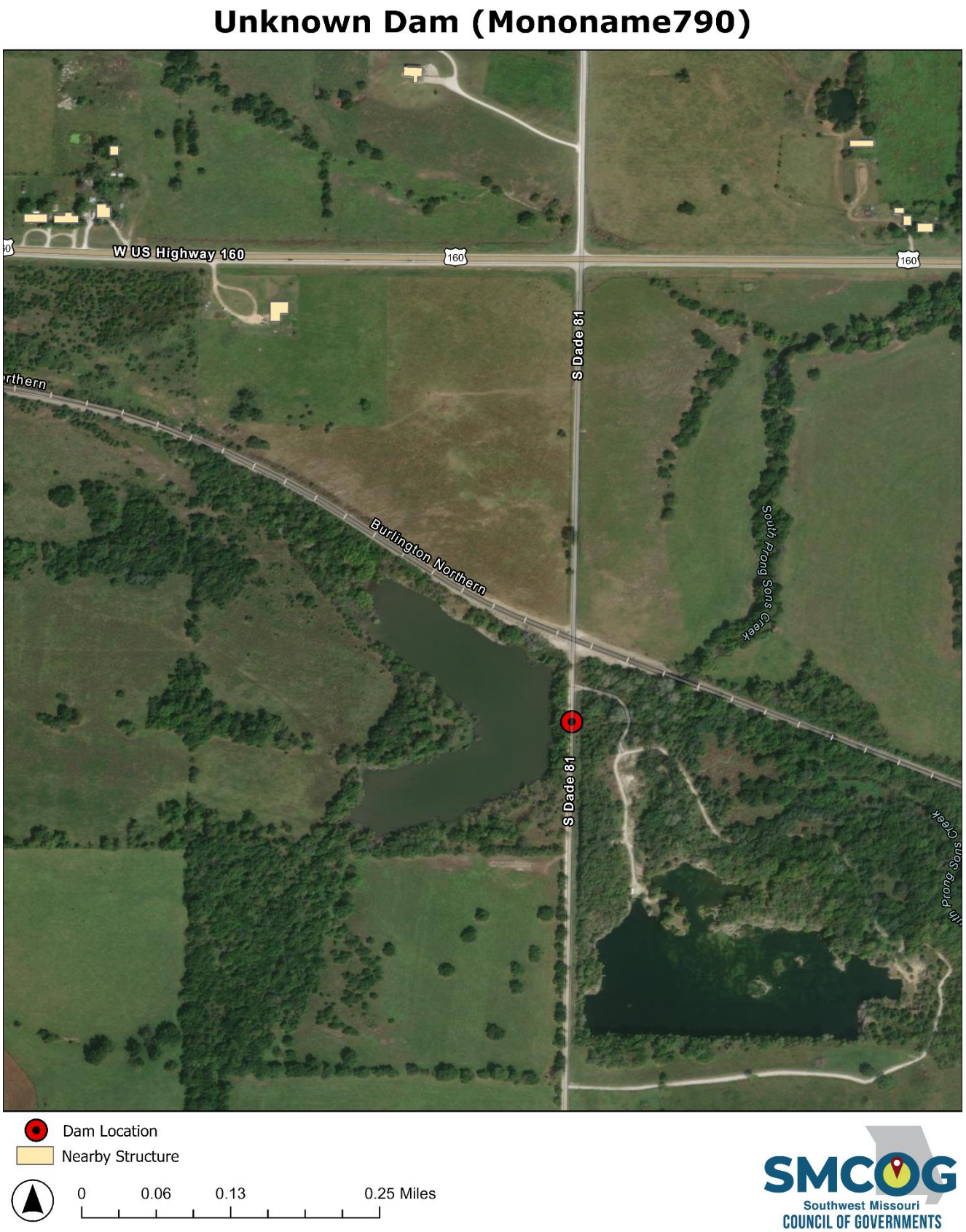


Figure 3.23. Hedeman Farms Lake Dam

Figure 3.24. Unknown Dam (Mononame790)



Upstream Dams Outside the Planning Area

There were no dams identified upstream that would impact Dade County jurisdictions. Stockton Lake Dam is north of Dade County, but Dade County communities would not be substantially impacted if that dam were to fail as water would flow into Cedar County, not Dade County

Strength/Magnitude/Extent

It can be stated that the severity of dam failure would be similar in some cases to the impacts associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the High Hazard/Class I dams could result in a serious threat of loss of human life, serious damage to residential, industrial, or commercial areas, public utilities, public buildings, or major transportation facilities. Catastrophic failure of any high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. However, there are no dams classified as high hazard within the planning area.

Previous Occurrences

According to the 2023 State Hazard Mitigation Plan, there are no recorded instances of dam failure within Dade County. From 1975 to 2016, there were 91 instances of dam failure statewide, with the vast majority occurring during the 1990s.

Probability of Future Occurrence

Since there were no recorded dam failures in Dade County in the past 20 years, a calculation of a probability percent would give a 0 percent annual probability of a dam failure.

Changing Future Conditions Considerations

According to the 2023 State Plan, dam failure is tied to flooding and the increased pressure that flooding has on dams. Future condition projections imply an increase in precipitation and more extreme events, which may increase flood risk and put additional stress on dams.

Vulnerability

Vulnerability Overview

The vulnerability to dam failure in Dade County is very small due to the lack of high hazard dams and limited significant hazard dams. Additionally, the dams located in Dade County have small associated water bodies and minimal downstream structures. There are no significant structures within the floodplain that may be affected in the event of a dam failure or within potential flow areas surrounding dams.

Potential Losses to Existing Development:

In the event of a dam failure in Dade County, losses would be minimal to none, because there are few structures downstream of the dams and there are no high hazard dams. With no inundation maps available, it can be assumed that the water in the event of a dam failure would follow the downstream topography and most affect the 100-year floodplain.

Impact of Previous and Future Development

Any future development in Dade County that occurs in low-lying areas downstream of dams would be impacted in the event of a dam failure. However, due to the rural nature of Dade County, substantial future development in potentially affected areas is not anticipated.

Hazard Summary by Jurisdiction

No jurisdictions or school districts would suffer damages in the event of a dam failure. All potential damage would occur in unincorporated parts of the county where population density is the lowest.

Community Comments on Hazard

Overall, survey responders were not concerned with the possibility of dam failure impacting their communities. No one indicated they had been impacted by this hazard in the past, nor did they mention it in any comments. This is consistent with the county's overall vulnerability rating and the lack of any high hazard potential dams.

The survey included questions gauging the public's perception of each hazard. **Table 3.26** below provides a summary of these responses.

Table 3.26. Dam Failure Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	91.7%	Not at all Concerned	68.8%	No Impact	43.8%
Occasionally	8.3%	Not so Concerned	25.0%	Limited Impact	37.5%
Likely	0.0%	Somewhat Concerned	6.3%	Critical Impact	10.4%
Highly Likely	0.0%	Very Concerned	0.0%	Catastrophic Impact	8.3%
-	-	Extremely Concerned	0.0%	-	-

Problem Statement

There are 11 total dams within Dade County, but none are classified as high hazard and only one is classified as significant hazard (Spain Lake Dam). No jurisdictions within the county were found to be at risk of damage due to dam failure, though several areas in unincorporated Dade County would see some slight losses in such an event.

No inspection records were reported, and it is unlikely that inspections will occur in the near future since every dam is privately owned. Educating the public on the location of dams and potential impacts could help reduce any potential negative effects. Additionally, identifying emergency access or evacuation routes that might be necessary in the event of a failure would minimize potential loss of life or injury if a dam were to fail.

3.4.3 Earthquakes

Hazard Profile

Hazard Description

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

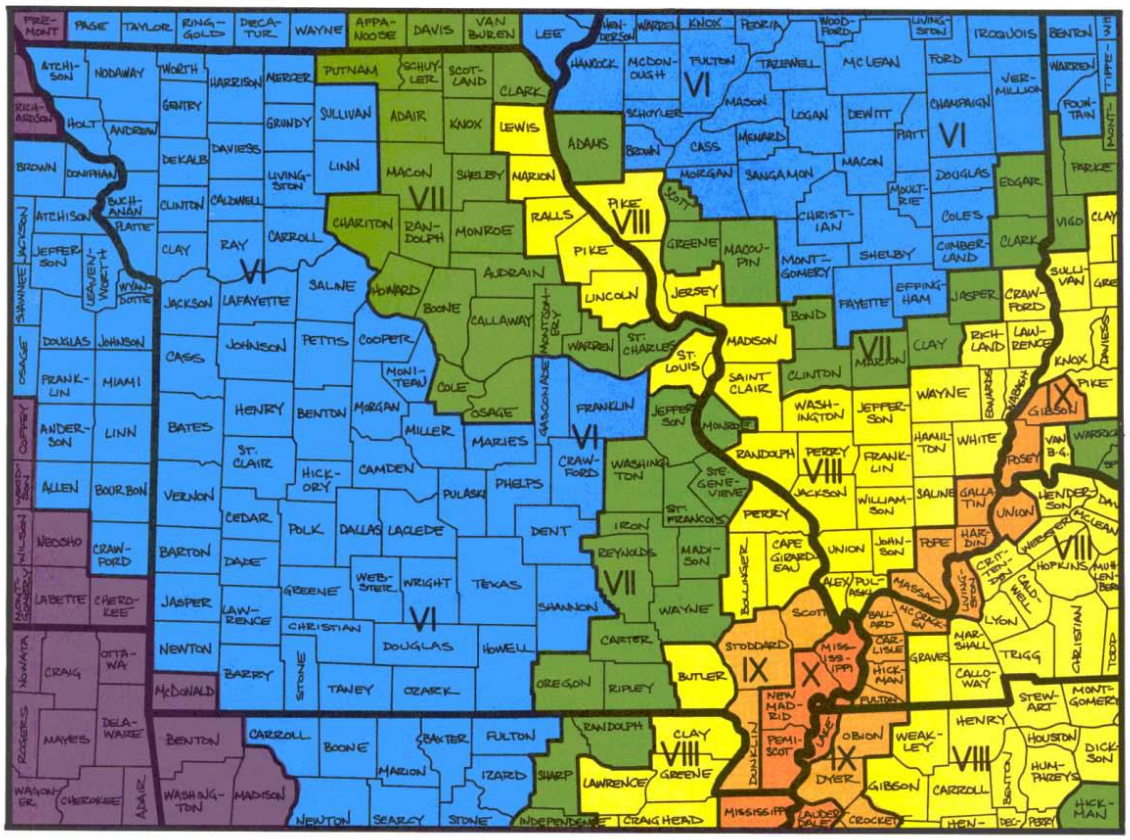
The subterranean faults were formed many millions of years ago on or near the surface of the earth. Subsequent to that time, these ancient faults subsided, while the areas adjacent were pushed up. As this fault zone (also known as a rift) lowered, sediments filled in the lower areas. Under pressure,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

Geographic Location

The greatest hazard from earthquakes in Dade County comes from the New Madrid Seismic Zone situated in the boot heel area of southeast Missouri. The potential of high magnitude earthquakes occurring along the New Madrid fault presents risk that does not vary across the county. The Nemaha uplift in central Kansas is also prone to seismic activity; however, the center of the Humbolt fault zone near the Nemaha Uplift is approximately 200 to 220 miles west of the county and produces lower magnitude seismic events.

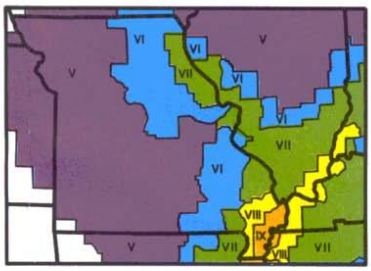
Figure 3.25 shows the highest projected Modified Mercalli intensities by county from a potential magnitude 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid Seismic Zone. The secondary maps in **Figure 3.25** show the same regional intensities for 6.7 and 9.6 earthquakes, respectively. Dade County is located in zone VI from a potential magnitude 7.6 earthquake along the New Madrid fault. Residents would feel movement, there could be minimal damage to structures, and dishes and glassware would likely be broken.

Figure 3.25. Impact Zones for Earthquake Along the New Madrid Fault



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

6.7

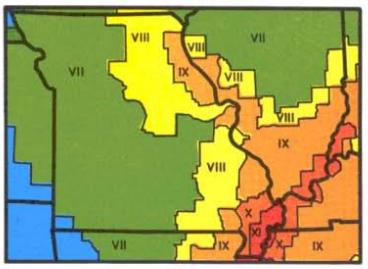


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 6.7 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

7.6

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

8.6

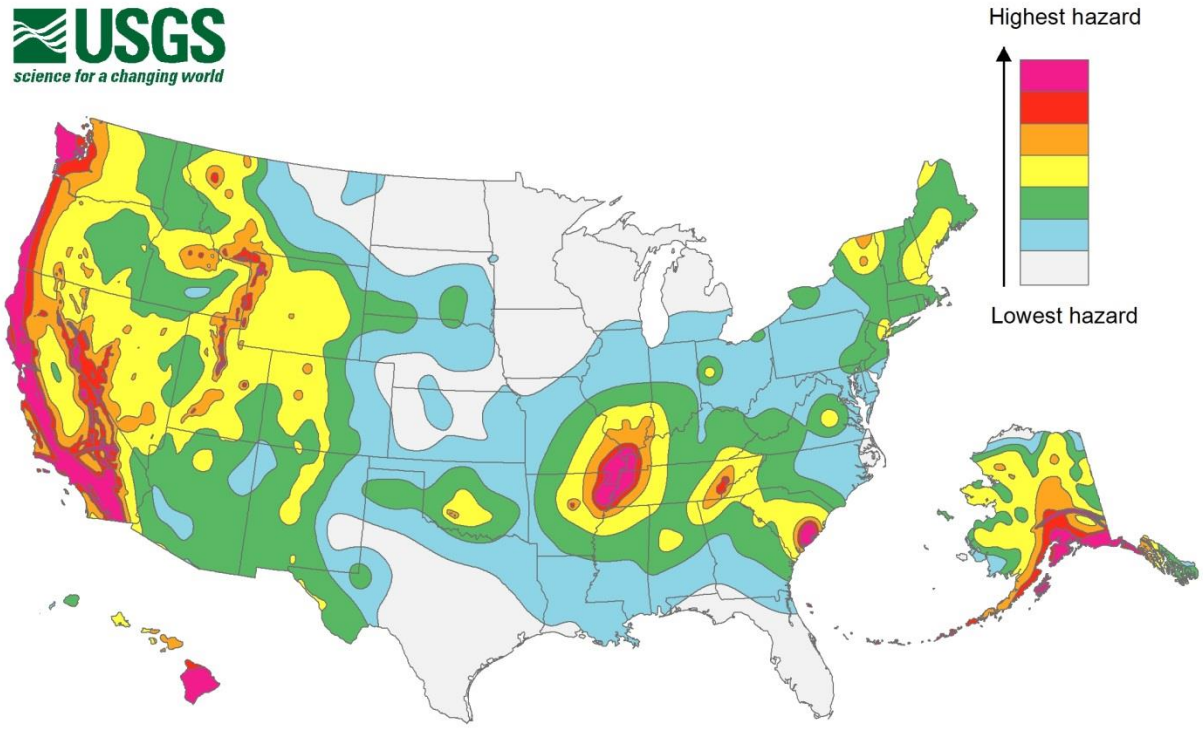


Source: https://sema.dps.mo.gov/docs/EQ_Map.pdf

The 2014 USGS National Seismic Hazard Maps display earthquake ground motions for various probability levels across the United States and are applied in seismic provisions of building codes, insurance rate structures, risk assessments, and other public policy. The update maps represent an assessment of the best available science in earthquake hazards and incorporates new findings on earthquake ground shaking, faults, seismicity, and geodesy. The USGS National Seismic Hazard Mapping Project developed these maps by incorporating information on potential earthquakes and associated ground shaking obtained from interaction in science and engineering workshops involving hundreds of participants, review by several science organizations and state surveys, and advice from expert panels and Steering Committee.

Figure 3.26 illustrates seismicity in the United States.

Figure 3.26. United States Seismic Hazard Map



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

Strength/Magnitude/Extent

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

Richter Magnitude Scale

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

Modified Mercalli Intensity Scale

The intensity of an earthquake is measured by the effect of the earthquake on the earth's surface. The intensity scale is based on the responses to the quake, such as people awakening, movement of

furniture, damage to chimneys, etc. The intensity scale currently used in the United States is the Modified Mercalli (MM) Intensity Scale, shown below in **Table 3.27** It was developed in 1931 and is composed of 12 increasing levels of intensity. They range from imperceptible shaking to catastrophic destruction, and each of the twelve levels is denoted by a Roman numeral. The scale does not have a mathematical basis but is based on observed effects. Its use gives the laymen a more meaningful idea of the severity.

Table 3.27. Modified Mercalli Intensity Scale

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

Previous Occurrences

There are no historical records of earthquake occurrences within Dade County. The southeastern portion of Missouri is most susceptible to earthquakes because it overlies the New Madrid Seismic Zone. Earthquake hazards in the western part of the State also exist because of the historical earthquakes in eastern Kansas and Nebraska. No area of Missouri is immune from the danger of earthquakes. Minor, but potentially damaging, earthquakes can occur anywhere in the state.

Probability of Future Occurrence

Without a historical record for earthquakes in Dade County it is not possible to calculate a precise probability of earthquake occurrence. The Center for Earthquake Research and Information (CERI) at the University of Memphis has computed conditional probabilities of a magnitude 6.0 earthquake in the New Madrid seismic zone. According to a fact sheet prepared by SEMA in 2003, the probability for a magnitude 6.0 to 7.5 or greater earthquake along the New Madrid Fault is 25 to 40 percent over the next 50 years. At the 25% level, the likelihood of an earthquake happening in a given year is 1.0%. At the 40% level, the likelihood of an earthquake happening in a given year is 1.6%.

Changing Future Conditions Considerations

Scientists are beginning to believe there may be a connection between changing climate conditions and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggests that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by changing future conditions.

Vulnerability

Vulnerability Overview

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

Potential Losses to Existing Development

The potential losses to existing development would be based on the total exposure for all communities in the planning area. The total exposure for each jurisdiction was used to estimate losses due to a 7.6 earthquake along the New Madrid Fault. A damage factor of 0.5% was applied to each jurisdiction's total building and contents based on the expected impact for Zone VI on the Modified Mercalli Scale. **Table 3.28** summarizes the estimated losses for each jurisdiction.

Table 3.28. Estimated Potential Earthquake Losses

Jurisdiction	Total Exposure	Potential Earthquake Losses
Unincorporated Dade County	$448,111,844	$2,240,559
Arcola	$10,264,091	$51,320
Greenfield	$120,469,745	$602,348
Lockwood	$84,340,541	$421,702
South Greenfield	$7,761,059	$38,805
Total	**$670,947,280**	**$3,354,736**

Source: University of Missouri GIS Department (MSDIS)

Impact of Previous and Future Development

Previous development constructed without adherence to building codes may be at a greater risk of damage during an event. If future development follows building codes, it is not expected to increase the risk other than contributing to the overall exposure of what could become damaged as a result of an earthquake event. Currently, the Cities of Greenfield and Lockwood are the only municipalities that enforce building codes.

Hazard Summary by Jurisdiction

Earthquake intensity is not likely to vary greatly throughout the county as the risk of occurrence is the same throughout. However, potential damages will be more significant in communities with a higher number of structures built in or prior to 1939. **Table 3.29** provides a summary.

Table 3.29. Housing Units Built in 1939 or Earlier

Jurisdiction	Built 1939 or earlier (#)	Built 1939 or earlier (%)
Dade County	769	20.2%
Arcola	2	4.1%
Greenfield	160	21.9%
Lockwood	141	29.4%
South Greenfield	10	41.7%

Source: US Census Bureau American Community Survey 5-Year Estimates

Community Comments on Hazard

Two out of the 48 total responders to the community survey indicated they had been impacted by earthquakes in the past. It's unclear if these events took place in Dade County.

The survey included questions gauging the public's perception of each hazard. **Table 3.30** below provides a summary of these responses.

Table 3.30. Earthquake Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	75%	Not at all Concerned	41.7%	No Impact	20.8%
Occasionally	18.8%	Not so Concerned	43.8%	Limited Impact	45.8%
Likely	6.3%	Somewhat Concerned	12.5%	Critical Impact	22.9%
Highly Likely	0.0%	Very Concerned	2.1%	Catastrophic Impact	10.4%
-	-	Extremely Concerned	0.0%	-	-

Problem Statement

Based on likely damage from a 7.6 magnitude earthquake along the New Madrid fault line, older, poorly built structures will suffer slight damage. Greenfield and Lockwood both have at least 20% of their housing units built before 1939, while South Greenfield has more than 40%. The county as a whole is just over 20% as well.

Adopting, updating, and enforcing building codes would assist in mitigating damages associated with earthquake events. Introducing public awareness programs that teach residents of the risks to older structures in earthquake events may motivate the public to support such legislation, as well as cooperate with its enforcement.

3.4.4 Land Subsidence/Sinkholes

Hazard Profile

Hazard Description

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

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

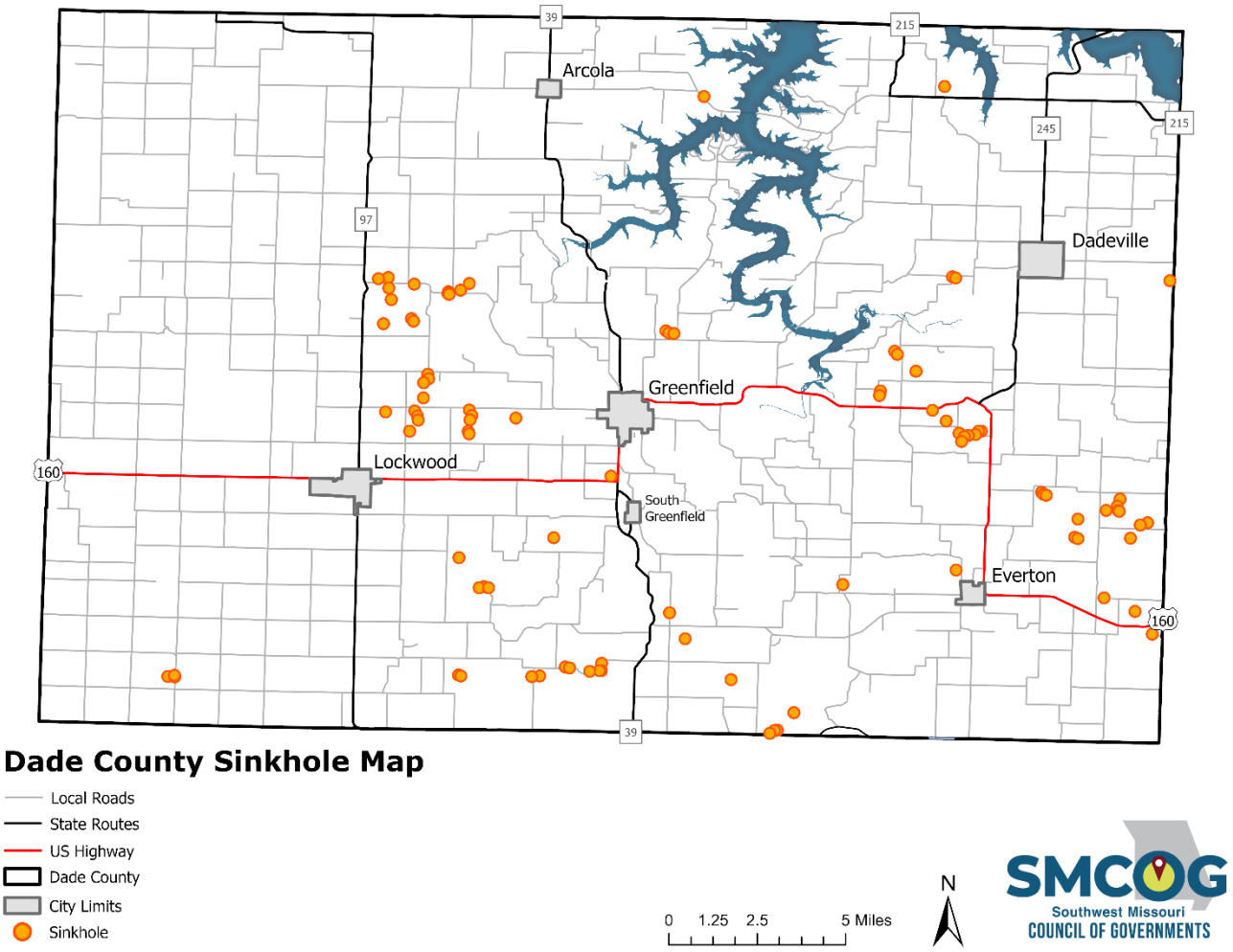
In the case of sinkholes, the rock below the surface is rock that has been dissolving by circulating groundwater. As the rock dissolves, spaces and caverns form, and ultimately the land above the spaces collapse. In Missouri, sinkhole problems are usually a result of surface materials above openings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

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

Geographic Location

According to the 2023 Missouri State HMP, there are 96 identified sinkholes in Dade County. **Figure 3.27** provides a map of these locations.

Figure 3.27. Dade County Identified Sinkholes



It's important to note that, while **Figure 3.27** provides the location of identified sinkholes, the vast majority of the county is located within a karst region. Karst is a type of landscape characterized by the presence of springs, caves, and sinkholes, created as groundwater dissolves soluble rock such a limestone. This means that the risk of land subsidence, notably sinkholes, is relatively uniform across the entire county.

There are also 152 identified mines located within the county, according to the 2023 Missouri Hazard Mitigation Plan. While land subsidence and sinkholes have been generally linked to mining operations in the past, especially mines that are located closer to the surface, there were no reports directly linking any of the identified sinkholes within Dade County to mining operations. However, it is still important to be aware of the correlation between the two and plan accordingly.

Strength/Magnitude/Extent

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

studies difficult to model.

Previous Occurrences

According to the 2019 Dade County HMP, there were two sinkholes reported to DGLS-MDNR by the public. No structural damage was recorded in either of the reports. One collapse occurred in the middle of an open field near Lockwood, and the other occurred at the base of a railroad support pier near Everton, where the base of the support had broken the underlying bedrock. Both events required filling of the sinkholes with foreign materials. The railroad sinkhole was filled with approximately eight yards of concrete, while the open field sinkhole was filled with large rock and debris, and then graded fully after stabilization of the sinkhole walls. The exact dates of these events are unknown.

Additionally, the 2018 Missouri HMP identified 85 sinkholes within the county, while the 2023 Missouri HMP identified 96. Which means 11 new sinkholes appeared within a five-year period.

Probability of Future Occurrence

An exact probability of future occurrence is difficult to identify for sinkholes as there is no centralized source for sinkholes by location. If we go by the data provided in the Missouri HMP, 11 new sinkholes were identified over a five-year time period from 2018 to 2023. Based on this data, we can calculate that the probability of future occurrence is 100% with 2.2 new sinkholes per year.

Changing Future Conditions Considerations

Changes in climate conditions could increase the number of sinkhole occurrences throughout Dade County. Drought periods can reduce groundwater levels, making the sediments within a sinkhole-prone hazard area dry and unstable. Severe storms triggered by drought could bring torrential rainfall that washes out the supporting sediments, undercutting the ground and creating conditions conducive to sinkhole formation.

Vulnerability

Vulnerability Overview

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

According to the 2023 Missouri State Hazard Mitigation Plan, Dade County rated Low Medium on the sinkholes per county rating values.

Potential Losses to Existing Development

Sinkhole losses can be estimated by assessing the building type and value of any structures located within a 50 ft. radius of an identified sinkhole. Dade County Assessor data was used for this analysis. **Table 3.31** provides the details.

Table 3.31. Sinkhole Exposure

Jurisdiction	Total Structures	Structure Value	Contents Value	Total Value
Unincorporated Dade County	1 (Residential)	$153,163.51	$76,581.76	$229,745.27
Arcola	0	$0	$0	$0
Greenfield	0	$0	$0	$0
Lockwood	0	$0	$0	$0
South Greenfield	0	$0	$	$0
Total	**1**	**$153,163.51**	**$76,581.76**	**$229,745.27**

Source: University of Missouri GIS Department (MSDIS)

Impact of Previous and Future Development

Future development over abandoned mines and in areas of known risk to sinkhole formation in the planning area will increase the vulnerability to this hazard. Population increases and new development in these areas, including certain portions of the unincorporated county, will increase exposure to sinkhole occurrence. Future development may also change storm runoff patterns and cause expansion of existing or formation of new sinkholes.

Hazard Summary by Jurisdiction

Though Dade County has a moderate number of existing identified sinkholes, most lie outside city limits and fall under the jurisdiction of the county. As demonstrated above by the sinkhole map in **Figure 3.27**, sinkholes will oftentimes appear in clusters. The unincorporated portions of the county north of Lockwood, north of Everton, and south of South Greenfield have the most risk.

Community Comments on Hazard

No responders to the community survey indicated they had been impacted by a sinkhole in the past, nor was it mentioned in any additional comments.

The survey included questions gauging the public's perception of each hazard. **Table 3.32** below provides a summary of these responses.

Table 3.32. Land Subsidence/Sinkhole Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	43.8%	Not at all Concerned	41.7%	No Impact	29.2%
Occasionally	39.6%	Not so Concerned	39.6%	Limited Impact	56.3%
Likely	16.7%	Somewhat Concerned	16.7%	Critical Impact	10.4%
Highly Likely	0.0%	Very Concerned	2.1%	Catastrophic Impact	4.2%
-	-	Extremely Concerned	0.0%	-	-

Problem Statement

It is likely that more sinkholes will occur as development increases within the county. Sinkholes can be remediated with fill material. Once a sinkhole has been remediated, building should be prohibited at the site. Existing sinkholes can expand if surface runoff erodes the edges of the sinkhole. Storm water runoff should be diverted away from known sinkholes. Jurisdictions may adopt regulations prohibiting construction at least 30 feet from known sinkholes. Undeveloped land that is in a sinkhole risk area can

be used for park space or other recreational purposes. Additionally, jurisdictions can utilize public awareness campaigns about sinkholes and risks associated with developing in prone areas. Maps of sinkholes and prone areas should be available to members of the public.

3.4.5 Drought

Hazard Profile

Hazard Description

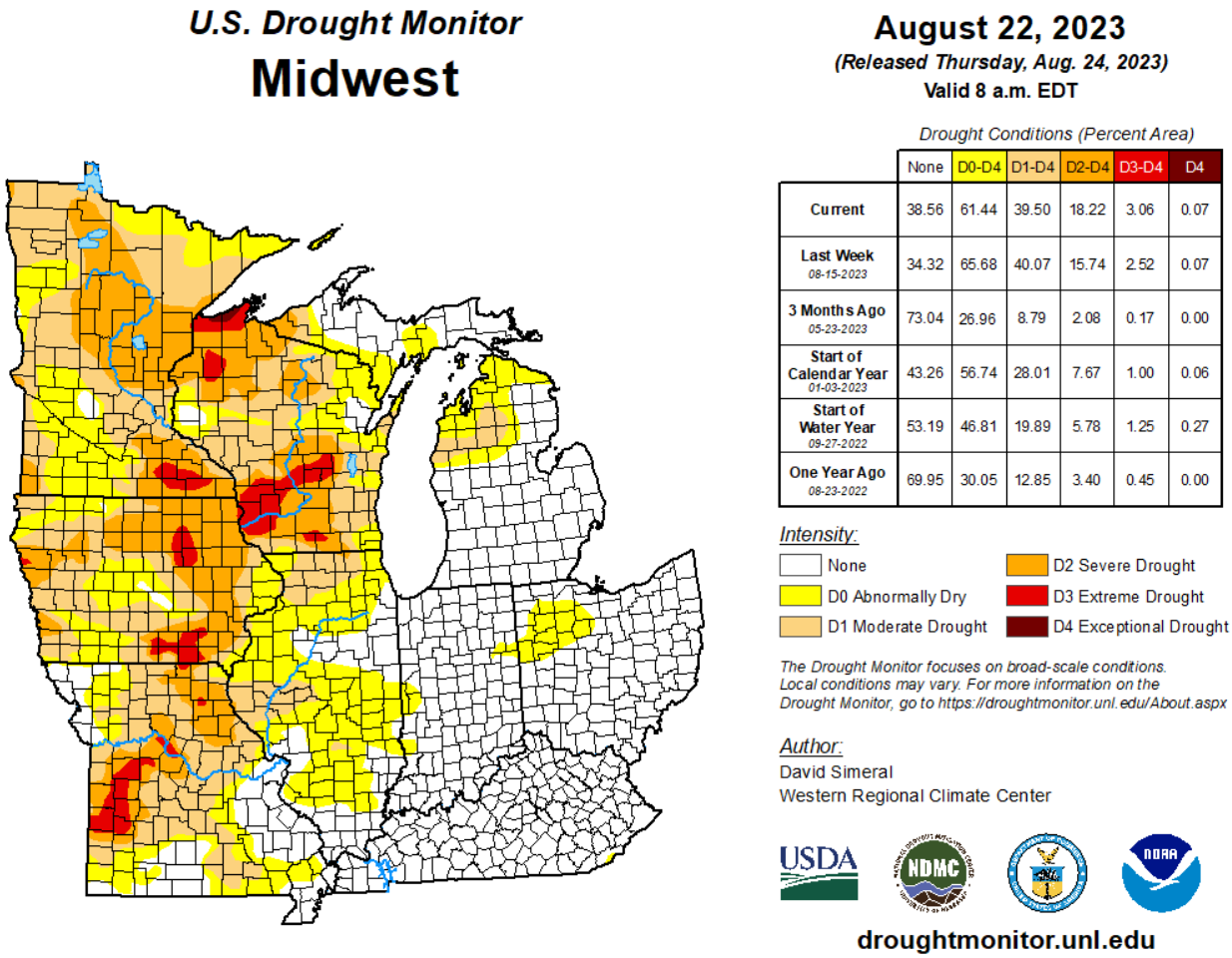
Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. A drought period can last for months, years, or even decades. There are four types of drought conditions relevant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

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

Geographic Location

Droughts are regional climatic events that can impact large areas and multiple counties. The entire county is at risk to the impacts of drought. However, drought most directly impacts the agricultural sector, so areas within the county where there is extensive agricultural land use can experience significant impacts. **Figure 3.28** is a recent map from the U.S. Drought Monitor. At this time, the entirety of Dade County is experiencing a drought ranging from D0 (Abnormally Dry) to D1 (Moderate Drought) to D2 (Severe Drought).

Figure 3.28. U.S. Drought Monitor Map as of August 22, 2023



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

Strength/Magnitude/Extent

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

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

Palmer also developed a formula for standardizing drought calculations for each individual location

based on the variability of precipitation and temperature at that location. The Palmer index can therefore be applied to any site for which sufficient precipitation and temperature data is available.

Previous Occurrences

According to the NECI storm events database, there were a total of five drought events in Dade County from 2003 to 2022. Most of these were multiple reports from persistent drought events that lasted several months. **Table 3.33** provides a summary of these events.

Table 3.33. Previous Drought Occurrences, 2003-2022

Drought Year	Months	Property Damage	Crop Damage
2006	January – April	-	-
2011	October – November	-	-
2012	July – October	$100,000	$1,710,000
2020	October	-	-
2022	July – December	-	$3,500,000

Source: NCEI Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

According to the USDA Cause of Loss historical data files, there were 479 policies with reported loss from 2013 - 2022. **Table 3.34** provides details.

Table 3.34. Insurance Payments by Year Because of Drought, 2013 to 2022

Year	Number of Policies with Reported Loss	Total Insurance Payments
2022	173	$4,591,464
2021	3	$3,677
2020	85	$761,219
2019	0	$0
2018	86	$704,360
2017	11	$30,023
2016	5	$15,571
2015	0	$
2014	66	$404,886
2013	50	$497,856
Total	**479**	**$7,009,056**

Source: USDA Cause of Loss Historical Data Files: https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss

Probability of Future Occurrence

Over the 20-year record period from 2003 to 2022, Dade County was in a drought for 17 months. There is a total of 240 months in the record period. Based on the number of months of drought and the total number of months in the record period, there is a 7% probability of drought occurrence in the county at any given month. Although drought is not predictable, long-range outlooks and predicated impacts of climate change could indicate an increased chance of occurrence and severity.

Changing Future Conditions Considerations

Drought frequently affects Missouri, including Dade County. Increasing temperatures due to a changing climate will inevitably accelerate evaporation rates and increase the frequency of droughts. It can be expected that rivers and groundwater reserves will experience significant reductions in available water with the increasing severity and frequency of droughts. It may be necessary in the future to restrict water usage in the county during drought periods, which would mainly affect the county's agriculture industry and would diminish residents' quality of life.

Vulnerability

Vulnerability Overview

Southwest Missouri has moderate drought susceptibility. Groundwater resources are adequate to meet domestic and municipal water needs, but due to required well depths, irrigation wells are very expensive. The topography is generally unsuitable for row-crop irrigation. During extended time periods without precipitation, municipal water sources may be at risk for contamination as the concentration of natural minerals, such as lead, will increase with low water levels.

Potential Losses to Existing Development

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

According to data from the USDA Risk Management Agency, there was $7,009,056 in insured crop loss payments in Dade County in the years of 2013 to 2022. Therefore, it is probable that future droughts will result in crop losses. There are no anticipated structural losses.

Impact of Previous and Future Development

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

Hazard Summary by Jurisdiction

Although the probability of drought is the same for the entire county, farming and livestock enterprises in the unincorporated parts of the county would feel the greatest impact. Although communities with wells are susceptible to water shortages due to groundwater reduction, other communities with no source are more at risk to extreme water shortages in the event of a drought. School districts would be the least impacted by drought; however, those districts in communities with single source wells or none at all may experience water shortages prior to those in larger communities. Special districts, such as the Dadeville Rural Fire Protection District, would feel impacts in the form of increased risk for wildfire and reduced fire-fighting water sources.

Community Comments on Hazard

12 of the 48 total responders indicated they had been impacted by drought, which is the most of any hazard. It consistently scored high on the questions regarding the public's perception of this hazard.

One of the comments specifically referenced drought impacting their beef cattle farm, which reflects the rural and agricultural nature of the county.

The survey included questions gauging the public's perception of each hazard. **Table 3.35** below provides a summary of these responses.

Table 3.35. Drought Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	2.1%	Not at all Concerned	0.0%	No Impact	0.0%
Occasionally	22.9%	Not so Concerned	10.4%	Limited Impact	10.4%
Likely	50.0%	Somewhat Concerned	58.3%	Critical Impact	72.9%
Highly Likely	25.0%	Very Concerned	18.8%	Catastrophic Impact	16.7%
-	-	Extremely Concerned	12.5%	-	-

Problem Statement

Although drought most likely will not cause structural damage, the impact is greatest on the agriculture sector and, if persistent enough, could cause reductions in groundwater and water shortages in communities that provide potable water services. Potential actions to mitigate the impact of drought would be for communities to develop public information campaigns regarding water conservation techniques and measures and provide notification mechanisms for community members to know when drought conditions may occur. Some methods may include restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc. during extreme drought periods. School and special districts can also implement water conservation measures at all district facilities as well. Additionally, Dade County should encourage the use of drought-resistant farming practices to help reduce the negative impacts on crops and municipal drinking water supplies.

3.4.6 Extreme Temperatures

Hazard Profile

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture, and other economic sectors. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index chart shown in **Figure 3.29** uses both factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

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

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

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

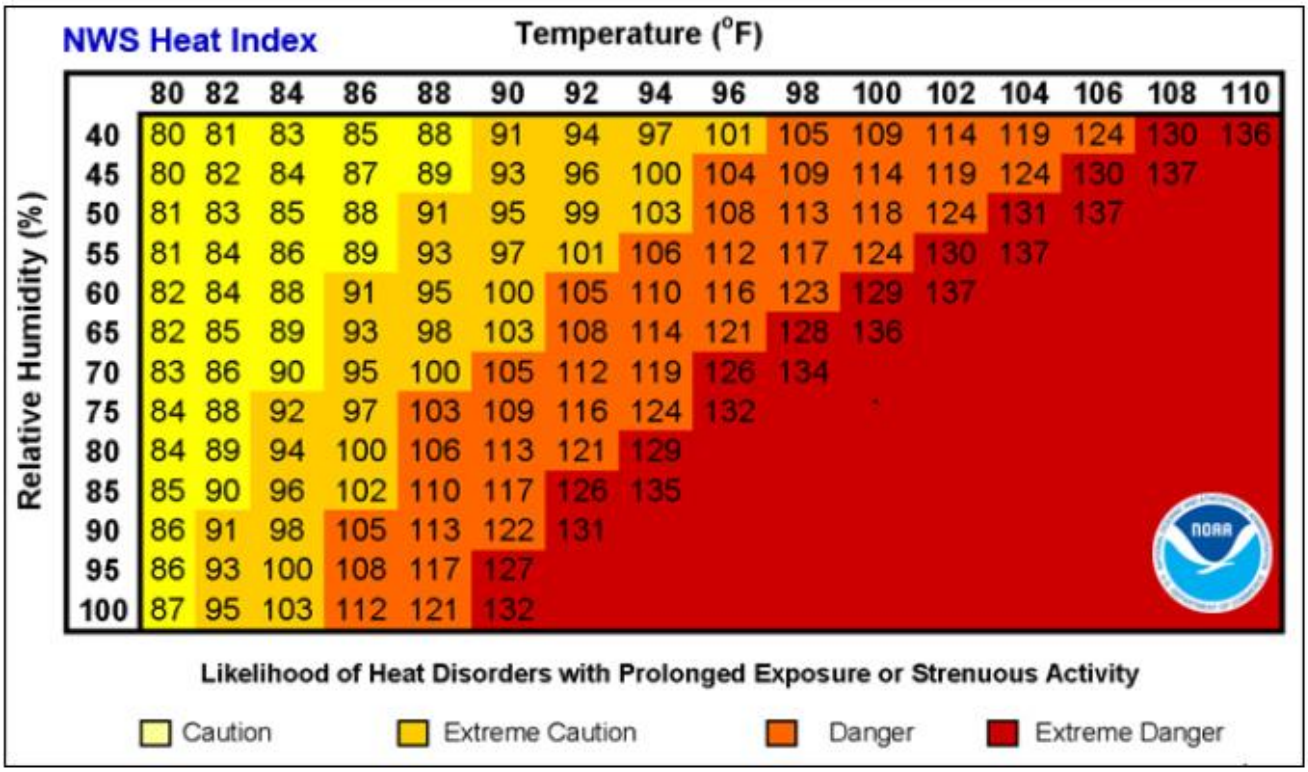
Geographic Location

Extreme temperature is an area-wide hazard event; the risk of does not vary across Dade County.

Strength/Magnitude/Extent

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

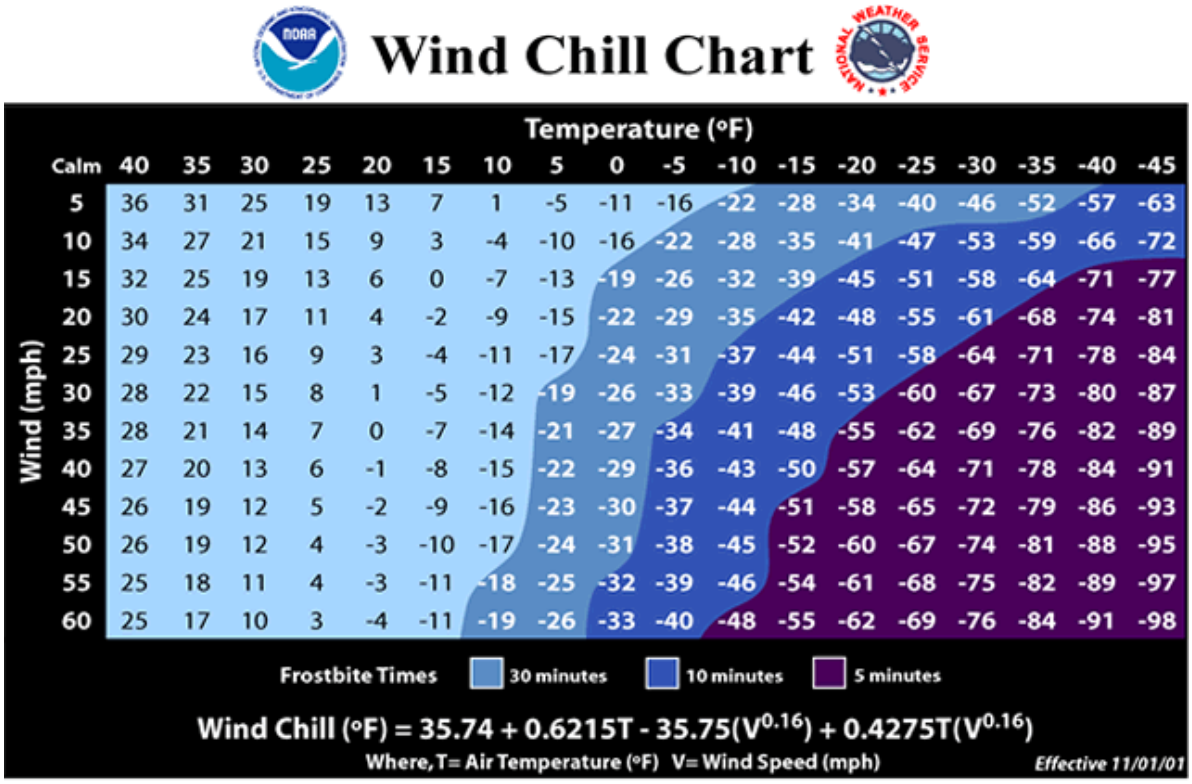
Figure 3.29. Heat Index (HI) Chart



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

The NWS Wind Chill Temperature (WCT) index uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. **Figure 3.30** below presents wind chill temperatures which are based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 3.30. Wind Chill Chart



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

Previous Occurrences

According to the National Centers for Environmental Information (NCEI) database, there were zero recorded excessive heat and three recorded heat events in Dade County from 2003-2022. The heat event occurred in June, July, and August of 2012. There were no deaths, injuries, or property/crop damages associated with these events.

According to the USDA Cause of Loss historical data files, there were 128 insurance payments for crop loss over the past ten years as a result of heat-related events. **Table 3.36** provides details of these payments.

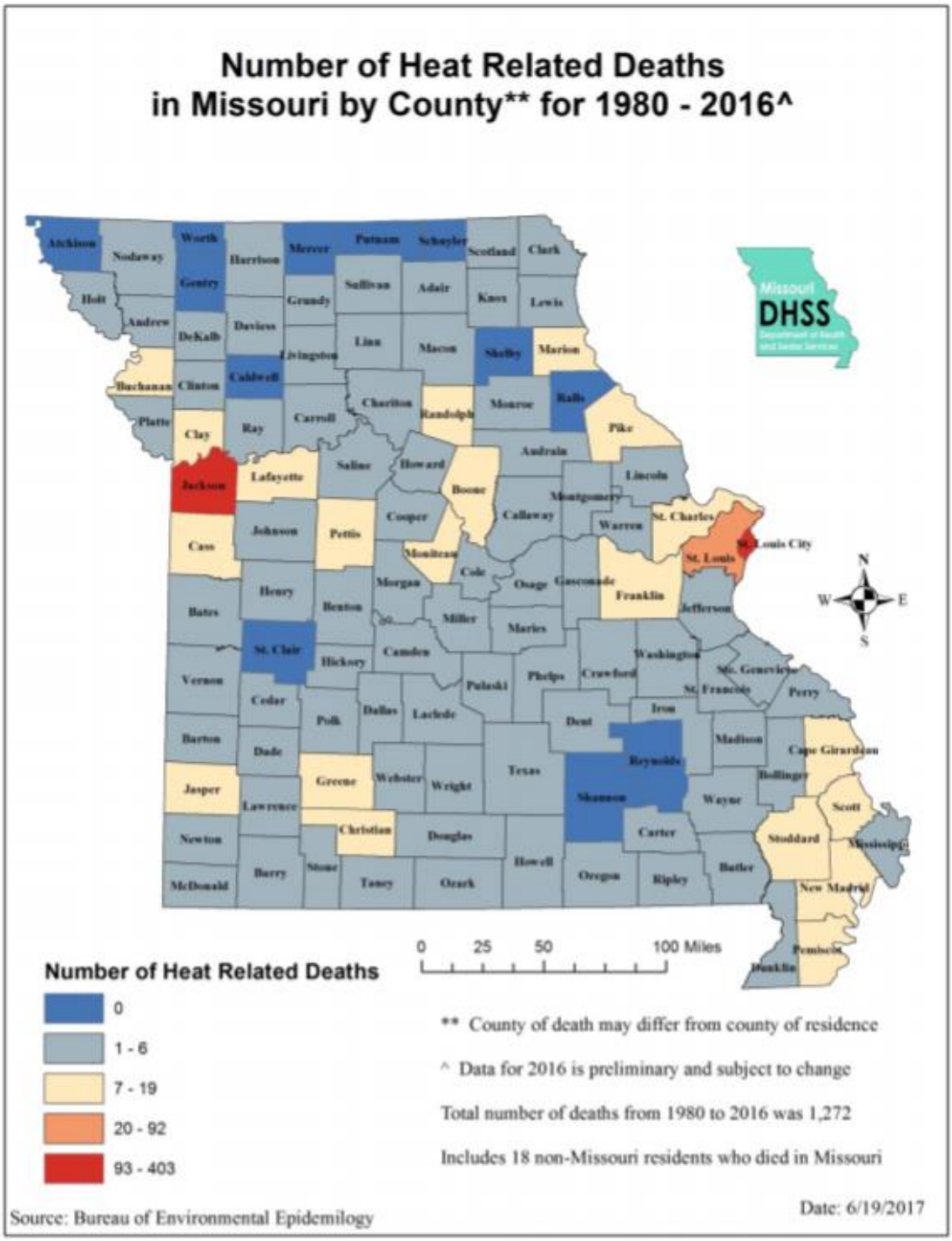
Table 3.36. Insurance Payments by Year Because of Extreme Heat, 2013 to 2022

Year	Number of Policies with Reported Loss	Total Insurance Payments
2022	94	$2,937,535.50
2021	0	$0.00
2020	13	$307,682.00
2019	0	$0.00
2018	4	$56,368.94
2017	5	$20,565.00
2016	0	$0.00
2015	0	$0.00
2014	6	$60,339.00
2013	6	$170,431.18
Total	**128**	**$3,552,921.62**

Source: USDA Cause of Loss Historical Data Files: https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss

Figure 3.31 is a map created by The Missouri Department of Health and Senior Services (DHSS) for heat related fatalities by county. The map indicates that there have been between 1 to 6 heat related fatalities in Dade County from 1980 to 2016.

Figure 3.31. Heat Related Deaths in Missouri 1980- 2016



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

According to the NCEI database, there were zero recorded extreme cold/wind chill and one cold/wind chill event in Dade County from 2003-2022. This event occurred in December 2022 and there were no

deaths, injuries, or property/crop damages.

According to the USDA Cause of Loss historical data files, there were 20 insurance payments for crop loss over the past ten years as a result of cold-related events. **Table 3.37** provides details of these payments.

Table 3.37. Insurance Payments by Year Because of Extreme Cold, 2013 to 2022

Year	Number of Policies with Reported Loss	Total Insurance Payments
2022	2	$3,254.00
2021	2	$4,188.00
2020	2	$63,049.00
2019	2	$23,885.00
2018	0	$0.00
2017	0	$0.00
2016	1	$16,921.00
2015	0	$0.00
2014	10	$86,139.00
2013	1	$1,754.00
Total	**20**	**$199,190.00**

Source: USDA Cause of Loss Historical Data Files: https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss

Probability of Future Occurrence

From 2003 to 2022, there were three total months with a heat-related event and one month with a cold-related event in Dade County. As a result, there is a 1.25% chance for a heat event and a 0.4% chance for a cold event in any given month.

It should be noted that there are limitations to the accuracy of these projections. The events recorded in the NCEI database describe extreme heat as prolonged periods where temperatures rose at least 10° above normal for at least 12 consecutive days, and extreme cold as prolonged periods where the temperature was at least 10° below normal for at least 12 consecutive days. Heat and cold advisories and warnings are issued for shorter periods of extreme heat and cold nearly every year and may not meet the threshold for consecutive days in the NCEI database. This data limitation indicates that extreme temperature events may be underreported in the NCEI.

Changing Future Conditions Considerations

Under a higher emissions pathway, historically unprecedented warming is projected by the end of the century. Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21st century. For example, in southern Missouri, the annual maximum number of consecutive days with temperatures exceeding 95 degrees F is projected to increase by up to 20 days. Temperature increases will cause future heat waves to be more intense, a concern for this region which already experiences hot and humid conditions. If the warming trend continues, future heat waves are likely to be more intense, and cold wave intensity is projected to decrease.

The impacts of extreme heat events are experienced most acutely by the elderly and other vulnerable populations. Higher demand for electricity as people try to keep cool amplifies stress on power systems and may lead to an increase in the number of power outages. Atmospheric concentrations of ozone occur at higher air temperatures, resulting in poorer air quality, while harmful algal blooms flourish in warmer water temperatures, resulting in poorer water quality.

Mitigation against the impacts of future temperature increase may include increasing education on heat stress prevention, organizing cooling centers, allocating additional funding to repair and maintain roads

damaged by buckling and potholes, and reducing nutrient runoff that contributes to algal blooms. Local governments should also prepare for increased demand on public recreational facilities, utility systems, and healthcare centers. Improving energy efficiency in public buildings will also present an increasingly valuable savings potential.

Vulnerability

Vulnerability Overview

High humidity, which often accompanies heat in Missouri, can make the effects of heat even more harmful. While heat-related illness and death can occur from exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. Consequently, the persistence of a heat wave increases the threat to public health. Those at greatest risk for heat-related illness include infants and children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. In agricultural areas, the exposure of farm workers, as well as livestock, to extreme temperatures is a major concern.

Dade County received an overall vulnerability rating of Medium for extreme heat and Medium High for extreme cold in the 2023 State HMP.

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

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

Potential Losses to Existing Development

In the event of an extreme temperature occurrence, most of the damage would be felt in the agricultural sector. According to USDA, from 2013 to 2022, there were 128 policies with a reported loss totaling $3,552,921.62 in insurance payments as a result of heat-related events and 20 policies with a reported loss totaling $199,190.00 in insurance payments as a result of cold-related events. This means the county can expect 12.8 policies with a reported loss per year totaling $355,292.16 in insurance payments as a result of heat events and two policies with a reported loss per year totaling $19,919.00 in insurance payments as a result of cold-related events.

Impact of Previous and Future Development

Population growth can result in increases in the age groups that are most vulnerable to extreme temperatures. Population growth also increases the strain on electricity infrastructure, as more electricity is needed to accommodate the growing population.

Hazard Summary by Jurisdiction

Those at greatest risk for heat-related illnesses and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the US Census American Community Survey on

population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat. **Table 3.39** below summarizes vulnerable populations in the participating jurisdictions. Note that school and special districts are not included in the table because students and those working for the special districts are not customarily in these age groups.

Table 3.39. Dade County Population Under 5 and Over 65

Jurisdiction	Population Under 5	Population 65 Years and Over	Percent of Total Population
Dade County	384	1,798	28.8%
Arcola	0	17	53.1%
Greenfield	99	332	32.7%
Lockwood	28	242	25.9%
South Greenfield	4	14	29.0%

Source: US Census Bureau

Community Comments on Hazard

Four of the 48 total responders indicated they had been impacted by extreme temperatures in the past. However, they did not clarify if it was extreme heat or extreme cold.

The survey included questions gauging the public's perception of each hazard. **Table 3.40** below provides a summary of these responses.

Table 3.40. Extreme Temperatures Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	2.1%	Not at all Concerned	6.3%	No Impact	0.0%
Occasionally	33.3%	Not so Concerned	18.8%	Limited Impact	33.3%
Likely	39.6%	Somewhat Concerned	52.1%	Critical Impact	56.3%
Highly Likely	25.0%	Very Concerned	18.8%	Catastrophic Impact	10.4%
-	-	Extremely Concerned	4.2%	-	-

Problem Statement

Older and younger segments of the population are more vulnerable to the impact of extreme heat. In addition, people living below the poverty level may be more vulnerable during periods of extreme temperatures due to a lack of air conditioning or heating in their homes. Institutionalized populations, such as those living in nursing homes, become more vulnerable to extreme temperatures due to power outages.

To help reduce the risk of death, heating and cooling centers should be promoted and known to the public, especially to those who have young children or are over the age of 65. Partnering with local community organizations to continue to donate fans and offer weatherization programs would mitigate the impact on vulnerable populations in the county. Additionally, backup generators should be installed in critical facilities, especially those housing vulnerable populations, to ensure property heating and cooling during extreme temperature events.

3.4.7 Severe Thunderstorms Including High Winds, Hail, and Lightning

Hazard Profile

Hazard Description

Thunderstorms

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When cold upper air sinks and warm moist air rises, storm clouds or 'thunderheads' develop resulting in thunderstorms. This can occur singularly as well as in clusters or lines. The National Weather Service defines a thunderstorm as "severe" if it includes hail that is one inch or more, or wind gusts that are at 58 miles per hour or higher. At any given moment across the world, there are about 1,800 thunderstorms occurring. Severe thunderstorms most often occur in Missouri in the spring and summer during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (discussed separately in Section 3.4.1) and tornadoes (discussed separately in Section 3.4.9).

High Winds

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

Lightning

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

Hail

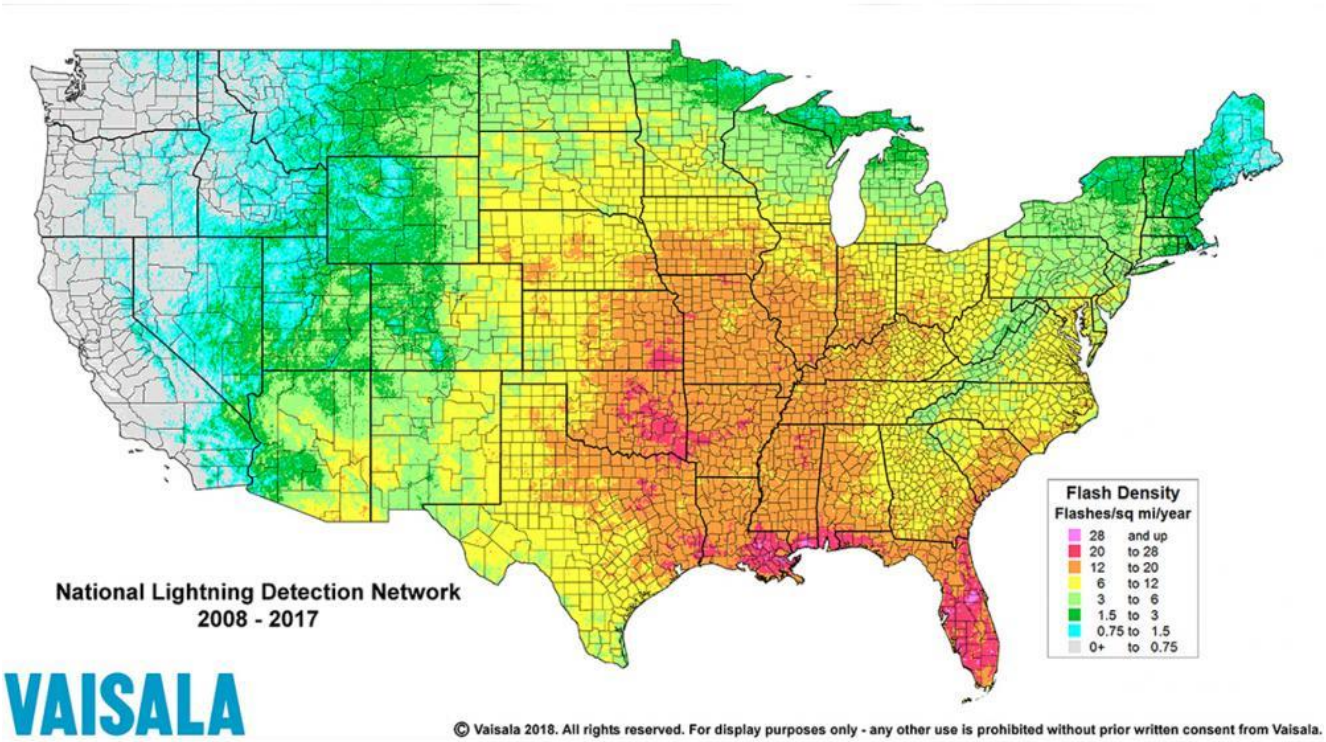
According to the National Oceanic and Atmospheric Administration (NOAA), hail is precipitation that is formed when thunderstorm updrafts carry raindrops upward into extremely cold atmosphere causing them to freeze. The raindrops form into small frozen droplets. They continue to grow as they come into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

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

Geographic Location

Thunderstorms, high winds, hail, and lightning events are an area-wide hazard that can happen anywhere in Dade County. Although these events occur similarly throughout the County, they are more frequently reported in the urbanized areas. In addition, damages are more likely to occur in more densely developed areas. **Figure 3.32** shows lightning frequency in the United States. Dade County is located in an area with an average flash density of 12-20 flashes/square mile/year.

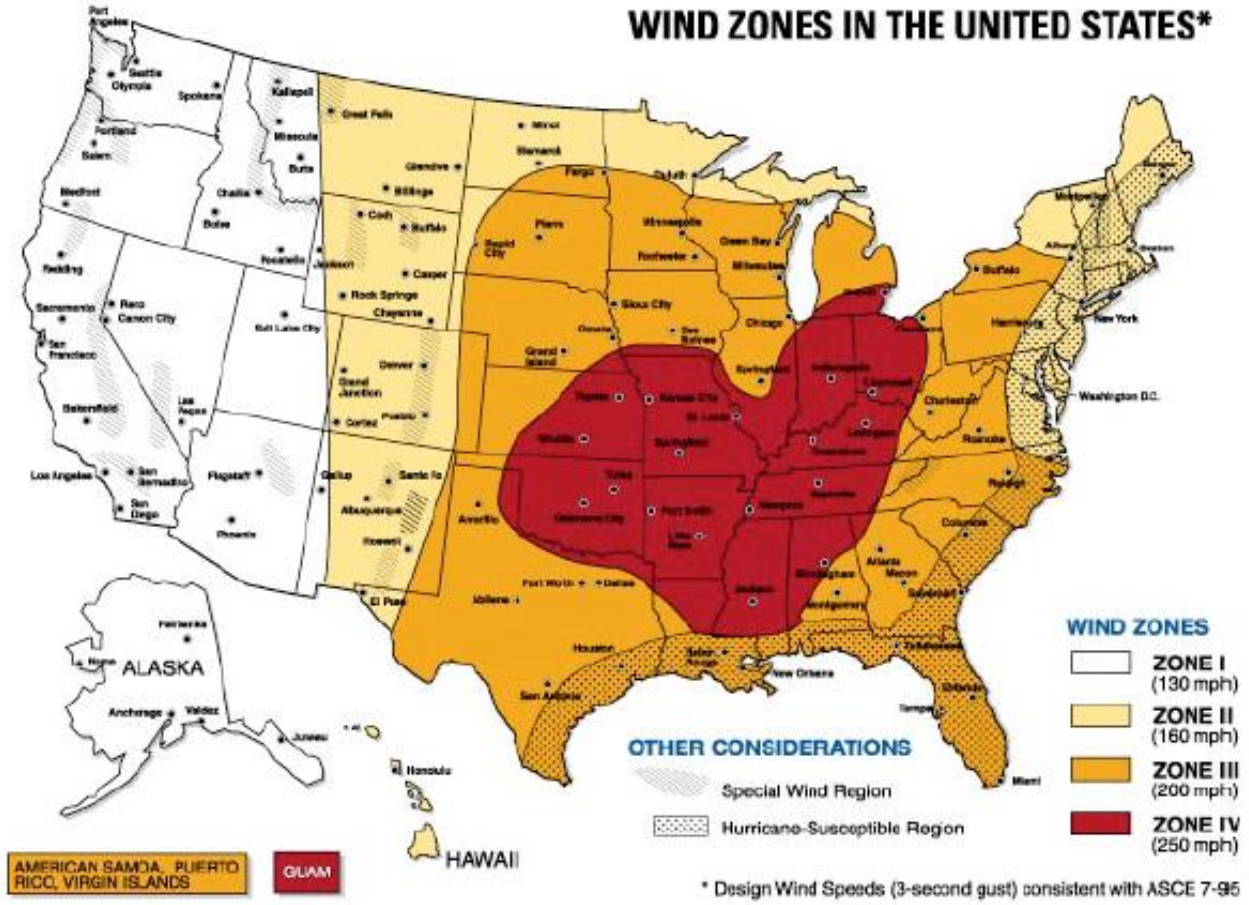
Figure 3.32. Location and Frequency of Lightning in Missouri



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

Figure 3.33 shows wind zones in the United States. Dade County lies in Zone IV, the zone with the highest possible wind speeds in the country.

Figure 3.33. Wind Zones in the United States



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

Strength/Magnitude/Extent

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.41** below describes typical damage impacts of the various sizes of hail.

Table 3.41. Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Destructive	76-90	3.0-3.5	Large orange > Soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

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

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

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

Previous Occurrences

Thunderstorm Winds

Table 3.42. NCEI Thunderstorm Wind Events in Dade County 2003-2022

Location	Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Dade County	23	0	0	$1,168,000.00	$0.00
Arcola	2	0	0	$2,000.00	$0.00
Greenfield	23	0	0	$55,000.00	$0.00
Lockwood	17	0	0	$28,000.00	$0.00
South Greenfield	3	0	0	$5,000.00	$0.00
Total	**68**	**0**	**0**	**$1,258,000.00**	**$0.00**

Source: NCEI Storm Events Database https://www.ncdc.noaa.gov/stormevents/

High Winds

Table 3.43. NCEI High Wind Events in Dade County 2003-2022

Location	Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Dade County	3	0	0	$2,000.00	$0.00
Arcola	0	0	0	$0.00	$0.00
Greenfield	0	0	0	$0.00	$0.00
Lockwood	0	0	0	$0.00	$0.00
South Greenfield	0	0	0	$0.00	$0.00
Total	**3**	**0**	**0**	**$2,000.00**	**$0.00**

Source: NCEI Storm Events Database https://www.ncdc.noaa.gov/stormevents/

Lightning

Table 3.44. NCEI Lightning Events in Dade County 2003-2022

Location	Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Dade County	1	0	0	$0.00	$0.00
Arcola	0	0	0	$0.00	$0.00
Greenfield	0	0	0	$0.00	$0.00
Lockwood	0	0	0	$0.00	$0.00
South Greenfield	0	0	0	$0.00	$0.00
Total	**1**	**0**	**0**	**$0.00**	**$0.00**

Source: NCEI Storm Events Database https://www.ncdc.noaa.gov/stormevents/

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

Hail

Table 3.45. NCEI Hail Events in Dade County 2003-2022

Location	Events	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Dade County	30	0	0	$10,000.00	$0.00
Arcola	4	0	0	$0.00	$0.00
Greenfield	22	0	0	$25,000.00	$0.00
Lockwood	18	0	0	$0.00	$0.00
South Greenfield	2	0	0	$0.00	$0.00
Total	**76**	**0**	**0**	**$35,000.00**	**$0.00**

Source: NCEI Storm Events Database https://www.ncdc.noaa.gov/stormevents/

Table 3.46 summarizes past crop damages as indicated by crop insurance claims.

Table 3.46. Crop Insurance Claims Paid in Dade County for Severe Thunderstorm Events, 2013 - 2022

Year	Cause of Loss Description	Number of Policies with Reported Loss	Total Insurance Payments
2022	Wind/excess wind	3	$3,382.00
2021	-	0	$0.00
2020	-	0	$0.00
2019	-	0	$0.00
2018	Hail	1	$235.81
2017	Wind/excess wind	1	$1,270.00
2016	-	0	$0.00
2015	-	0	$0.00
2014	Hail	1	$985.05
2013	-	0	$0.00
Total		**6**	**$5,872.86**

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

Probability of Future Occurrence

Thunderstorm Winds

Based on NCEI data from 2003 to 2022, there is a 100% probability of a thunderstorm wind event occurring in Dade County, with an average of 3.4 events and $62,900.00 in property damage per year.

High Winds

Based on NCEI data from 2003 to 2022, there is a 15% probability of a high wind event occurring in Dade County in any given year. Property damage per year is estimated at $100.

Lightning

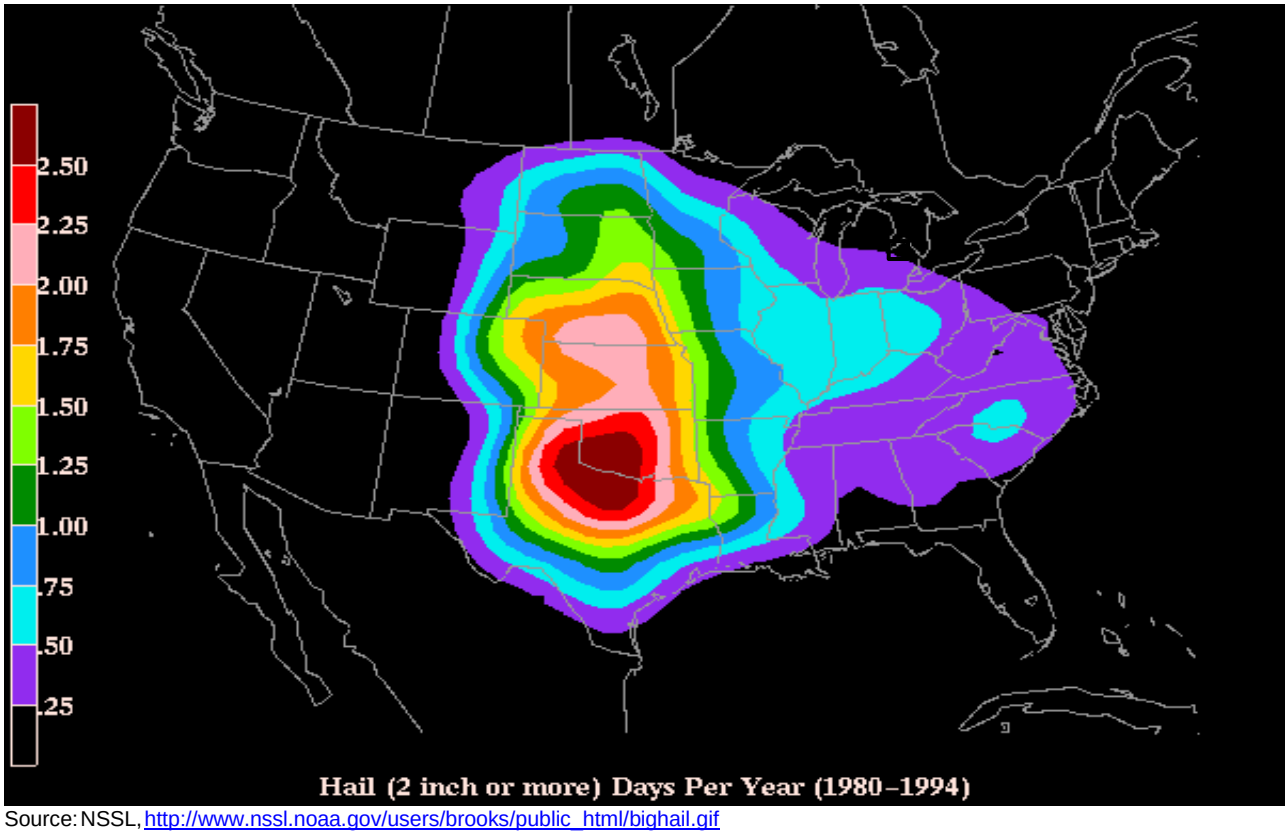
Based on NCEI data from 2003 to 2022, there is a 5% probability of a lightning event occurring in Dade County in any given year.

Hail

Based on NCEI data from 2003 to 2022, there is a 100% probability of a hail event occurring in Dade County, with an average of 3.8 events and $1,750.00 in property damage per year.

Figure 3.34 is a map based on hailstorm data from 1980-1994. It shows the probability of hailstorm occurrence (2" diameter or larger based on number of days per year). Dade County is located in a zone that should experience hail with a diameter of 2" or more up to 1.25 times per year.

Figure 3.34. Annual Hailstorm Probability (2'' diameter or larger), U 1980- 1994



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

Changing Future Conditions Considerations

Increases in temperature and more frequent droughts will accelerate the evaporation of water into the atmosphere, which will produce higher water concentrations. Elevated levels of moisture raise the likelihood of severe thunderstorms and tornadoes. Lives and property are endangered when the risk of these events increases, especially in jurisdictions that do not have a community safe room or the funds to construct one. This kind of event also possesses the threat of increasing the magnitude and frequency of other hazard events like riverine flooding, sinkhole occurrence, and flash flooding, putting residents in even greater danger.

Vulnerability

Vulnerability Overview

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

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

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

Potential Losses to Existing Development

The average annual losses determined from historical losses for severe thunderstorm events are indicators of the potential losses to existing development. These events can damage critical facilities, schools, government buildings, and private property. Based on NCEI data, Dade County can expect the following in potential property damage per year:

Thunderstorm Wind- $62,900.00
High Winds - $100.00
Lightning - $0.00
Hail - $1,750.00

It’s also important to consider losses to crops and the agricultural sector. According to USDA crop loss data, we can estimate $465.20 in wind damage and $122.09 in hail damage to crops per year.

Impact of Previous and Future Development

Development and population growth within the unincorporated parts of Dade County, as well as in

specific jurisdictions, including school and special districts, results in an increase of population and buildings. Development occurring in these areas will result in more exposure that is vulnerable to damage from thunderstorms, high winds, lightning, and precipitation. However, from 2010 to 2020, the county (as well as most municipalities) saw a decrease in population. This, coupled with the fact that new development occurs very slow, will limit the overall exposure of the county and decrease vulnerability.

Hazard Summary by Jurisdiction

Thunderstorms, heavy winds, lightning, hail, and heavy precipitation affect areas with more structures built prior to 1939. All participating jurisdictions have a significant amount of these homes with the exception of Arcola. Additionally, jurisdictions which have building plans or enforce building codes (Greenfield and Lockwood) will be more effective in mitigating the effects of these hazards.

Community Comments on Hazard

Eight of the 48 total responders mentioned they had been impacted by severe thunderstorms in the past. Multiple comments mentioned the need for safe rooms, while one specifically stated they had suffered hail damage and another mentioned they had suffered lighting damage.

The survey included questions gauging the public's perception of each hazard. **Table 3.47** below provides a summary of these responses.

Table 3.47. Severe Thunderstorms Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	2.1%	Not at all Concerned	2.1%	No Impact	2.1%
Occasionally	14.6%	Not so Concerned	14.6%	Limited Impact	43.8%
Likely	50.0%	Somewhat Concerned	52.1%	Critical Impact	43.8%
Highly Likely	33.3%	Very Concerned	22.9%	Catastrophic Impact	10.4%
-	-	Extremely Concerned	8.3%	-	-

Problem Statement

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

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

3.4.8 Severe Winter Weather

Hazard Profile

Hazard Description

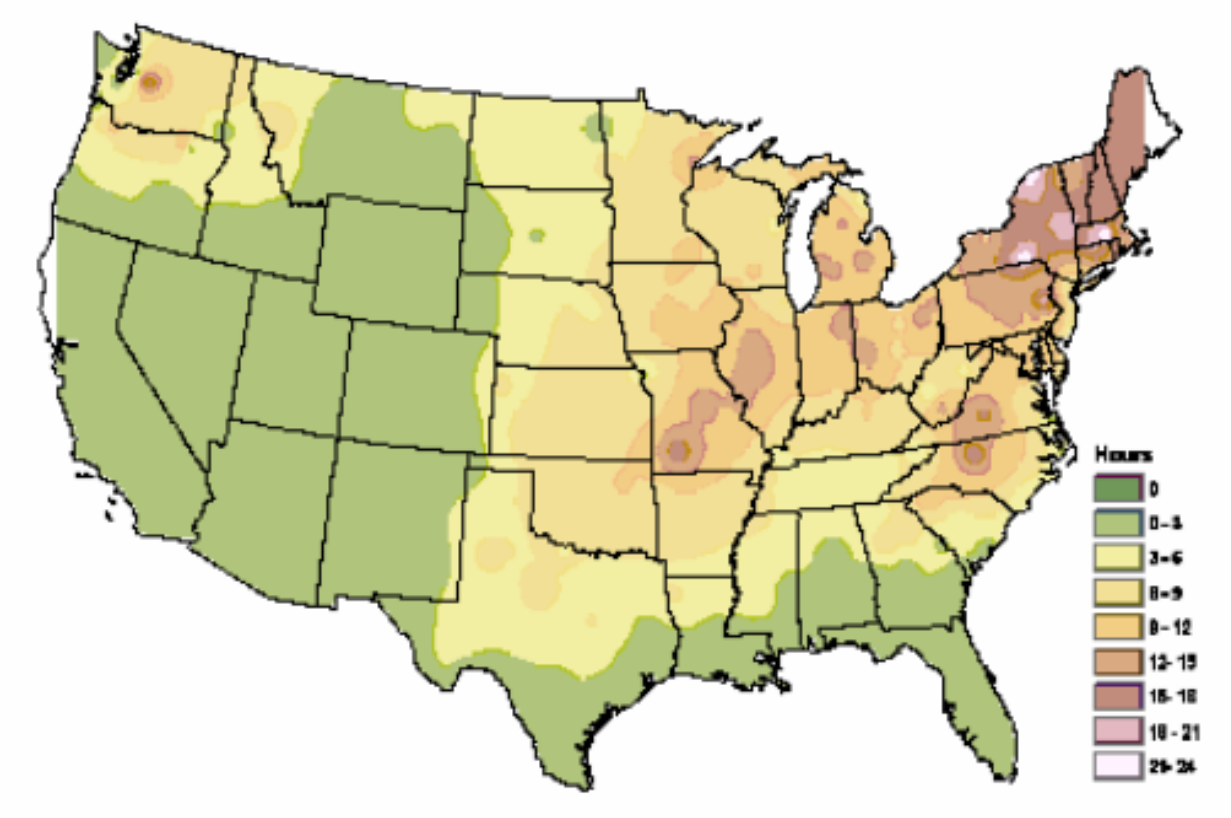
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows:

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

Geographic Location

The entire county is vulnerable to heavy snow, ice, extreme cold temperatures, and freezing rain. **Figure 3.35** depicts the average number of hours per year with freezing rain. Dade County is located in a zone that can expect 12-18 hours of freezing rain per year.

Figure 3.35. NWS Statewide Average Number of Hours per Year with Freezing Rain



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

Strength/Magnitude/Extent

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

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

- **Winter Weather Advisory** – Winter weather conditions are expected to cause significant inconveniences and may be hazardous. If caution is exercised, these situations should not become life threatening. Often the greatest hazard is to motorists.
- **Winter Storm Watch** – Severe winter conditions, such as heavy snow and/or ice are possible within the next day or two.
- **Winter Storm Warning** – Severe winter conditions have begun or are about to begin.
- **Blizzard Warning** – Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill.
- **Ice Storm Warning** – Dangerous accumulations of ice are expected with generally over one quarter inch of ice on exposed surfaces. Travel is impacted, and widespread downed trees and power lines often result.
- **Wind Chill Advisory** – Combination of low temperatures and strong winds will result in wind chill readings of -20 degrees F or lower.
- **Wind Chill Warning** – Wind chill temperatures of -35 degrees F or lower are expected. This is a life-threatening situation.

Previous Occurrences

Table 3.48 provides a summary of the NCEI reported winter events and damages from 2003-2022.

Table 3.48. Dade County Winter Weather Events Summary, 2003 – 2022

Type of Event	Date of Occurrence	Injuries	Property Damages	Crop Damages
Blizzard	02/01/2011	0	$0	$0
Extreme Cold/Wind Chill	-	0	$0	$0
Heavy Snow	12/10/2003, 02/05/2020	0	$0	$0
Ice Storm	01/12/2007, 12/09/2007, 02/11/2008, 02/21/2008, 01/13/2017, 02/06/2019	0	$600,000	
Sleet	-	0	$0	$0
Winter Storm	01/02/2003, 02/23/2003, 11/30/2006, 01/20/2007, 01/26/2009, 12/24/2009, 01/28/2010, 03/20/2010, 02/21/2013, 02/26/2013, 12/20/2013, 01/05/2014, 03/02/2017, 01/01/2021, 02/14/2021, 02/02/2022, 02/23/2022	0	$35,000	$0
Winter Weather	12/31/2020, 02/17/2021, 01/06/2022, 01/15/2022, 02/17/2022, 03/11/2022, 12/22/2022	0	$0	$0

Source: NCEI

$500,000 of the $600,000 in property damage from ice storms occurred during an event in 2007. Ice accumulation caused eight barns to collapse while two restaurants and one nursing home experienced roof damage. 80% of the county experienced power outages and three communities lost water systems and were under a boil order. This specific event caused over $350,000,000 in damages in Missouri alone.

Winter storms, cold, frost and freeze take a toll on crop production in the planning area. **Table 3.49** shows the USDA's Risk Management Agency payments for insured crop losses in the county as a result of cold conditions and snow from 2013-2022.

Table 3.49. Crop Insurance Claims Paid in Dade County as a Result of Cold Conditions and Snow 2013 to 2022

Year	Cause of Loss Description	Number of Policies with Reported Loss	Total Insurance Payments
2022	Cold Wet Weather, Frost	3	$13,430
2021	Cold Wet Weather	2	$4,188
2020	Cold Wet Weather	2	$63,049
2019	Cold Wet Weather	2	$23,885
2018	-	0	$0
2017	Freeze, Frost	6	$23,965
2016	Cold Wet Weather	1	$16,921
2015	-	0	$0
2014	Cold Wet Weather, Cold Winter	10	$86,139
2013	Cold Wet Weather	1	$1,754
Total	**-**	**27**	**$233,331**

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

Probability of Future Occurrence

The probability for all of the different types of winter weather events is included as one probability, since one storm generally includes multiple types of events. There were 29 severe winter storm events in Dade County from 2003 to 2022. This equates to a 100% probability of occurrence, with an average of 2.9 events occurring every year.

Changing Future Conditions Considerations

A shorter overall winter season and fewer days of extreme cold may have both positive and negative indirect impacts. Warmer winter temperatures may result in changing distributions of native plant and animal species and/or an increase in pests and non-native species. Warmer winter temperatures will result in a reduction of lake ice cover. Reduced lake ice cover impacts aquatic ecosystems by raising water temperatures. Water temperature is linked to dissolved oxygen levels and many other environmental parameters that affect fish, plant, and other animal populations. A lack of ice cover also leaves lakes exposed to wind and evaporation during a time of year when they are normally protected.

As both temperature and precipitation increase during the winter months, freezing rain will be more likely. Additional wintertime precipitation in any form will contribute to saturation and increase the risk and/or severity of spring flooding. A greater proportion of wintertime precipitation may fall as rain rather than snow.

Vulnerability

Vulnerability Overview

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

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

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

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

In the 2023 State Plan, the five factors considered in determining overall severe winter storm vulnerability were housing density, building exposure, social vulnerability, likelihood of occurrence, and

average annual property loss. Dade County received the following vulnerability rating for each criterion:

- Housing density: Low
- Building exposure: Low
- Social vulnerability: Medium
- Likelihood of occurrence: Low
- Average annual property loss: Low

This equates to an overall vulnerability rating of Low.

Potential Losses to Existing Development

We can use historical losses to estimate future potential losses. During the 20-year period from 2003 to 2022, Dade County suffered a total of $635,000 in property damages due to severe winter weather, for an average of $33,250 per year. The majority of this damage was caused by an ice storm in 2007. Additionally, $233,331 in crop damages occurred from 2013 to 2022, for an average of $23,331.10 per year.

Impact of Previous and Future Development

Increased development and any resulting increases in population will increase exposure to damage from severe winter weather. Future commercial development can expect functional downtime and decreased revenues during periods of severe winter weather. Future construction of facilities that will serve vulnerable populations will need to be prepared for extreme weather conditions. Road construction in the county will increase the need for snow removal and salt to keep transportation lifelines open during periods of severe winter weather. Any increase in agriculture crop production will also increase the risk of exposure.

Hazard Summary by Jurisdiction

Severe winter weather can cause power outages and put structures at risk to fires when individuals in homes resort to fuel heaters. The risk of extreme cold deaths and frostbite varies among segments of the populations. People over 65 and those living below the poverty level have an increased vulnerability to severe winter weather. **Table 3.43** includes information on populations over 65 and the percent living below the poverty level by participating jurisdiction.

Jurisdiction	Percent of Families Living Below the Poverty Line	Population Over 65	Population Over 65 (Percentage)
Dade County	11.9%	1,798	23.7
Arcola	0.0%	10	31.3
Greenfield	17.9%	332	25.2
Lockwood	11.5%	242	23.1
South Greenfield	29.4%	14	22.6

Source: US Census Bureau

Community Comments on Hazard

Six of the 48 total responders indicated they had been impacted by severe winter weather events in the past, the majority of which referenced ice storms in particular. “All of SWMO was impacted in the last 2 decades by the 2 ice storms. Electricity and heat sources were out for hours to weeks. I went without electricity for 2 days,” said one comment.

The survey included questions gauging the public’s perception of each hazard. **Table 3.50** below provides a summary of these responses.

Table 3.50. Severe Winter Weather Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	2.1%	Not at all Concerned	4.2%	No Impact	2.1%
Occasionally	31.3%	Not so Concerned	16.7%	Limited Impact	31.3%
Likely	41.7%	Somewhat Concerned	52.1%	Critical Impact	56.6%
Highly Likely	25.0%	Very Concerned	18.8%	Catastrophic Impact	10.4%
-	-	Extremely Concerned	8.3%	-	-

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

Organizing outreach to at-risk populations, including establishing and promoting accessible heating and cooling centers can help reduce the potential exposure to harsh winter weather. Additionally, identifying debris disposal and burning locations can assist in facilitating recovery efforts after a significant winter storm or ice incident. An automated alert system could also be utilized to notify residents of the coming winter weather and warming locations in the community.

3.4.9 Tornado

Hazard Profile

Hazard Description

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

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

Tornadoes spawn from the largest thunderstorms. The associated cumulonimbus clouds can reach heights of up to 55,000 feet above ground level and are commonly formed when Gulf air is warmed by solar heating. The moist, warm air is overridden by the dry cool air provided by the jet stream. This cold air presses down on the warm air, preventing it from rising, but only temporarily. Soon, the warm air forces its way through the cool air and the cool air moves downward past the rising warm air. This air movement, along with the deflection of the earth's surface, can cause the air masses to start rotating. This rotational movement around the location of the breakthrough forms a vortex, or funnel. If the newly created funnel stays in the sky, it is referred to as a funnel cloud. However, if it touches the ground, the funnel officially becomes a tornado.

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

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

Geographic Location

There are no specific geographic locations as the threat from this hazard is countywide.

Strength/Magnitude/Extent

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour and damage paths can be more than one mile wide and 50 miles long. Tornadoes have been known to lift and move objects weighing more than 300 tons a

distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. Tornadoes also can generate a tremendous amount of flying debris or "missiles," which often become airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls. However, the less spectacular damage is much more common.

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF-Scale (see **Table 3.51**) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F Scale was implemented in the U.S. on February 1, 2007.

Table 3.51. Enhanced F Scale for Tornado Damage

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

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.52**. The damage descriptions are summaries. For the actual EF scale it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator. Information on the Enhanced Fujita Scale's damage indicators and degrees or damage is located online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 3.52. Enhanced Fujita Scale with Potential Damage

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

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

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

Previous Occurrences

There are limitations to the use of NCEI tornado data that must be noted. For example, one tornado may contain multiple segments as it moves geographically. A tornado that crosses a county line or state line is considered a separate segment for the purpose of reporting to the NCEI. Also, a tornado that lifts off the ground for less than 5 minutes or 2.5 miles is considered a separate segment. If the tornado lifts off the ground for greater than 5 minutes or 2.5 miles, it is considered a separate tornado. Tornadoes reported in Storm Data and the Storm Events Database are in segments. **Table 3.53** below provides details on tornadoes in Dade County from 2003-2022.

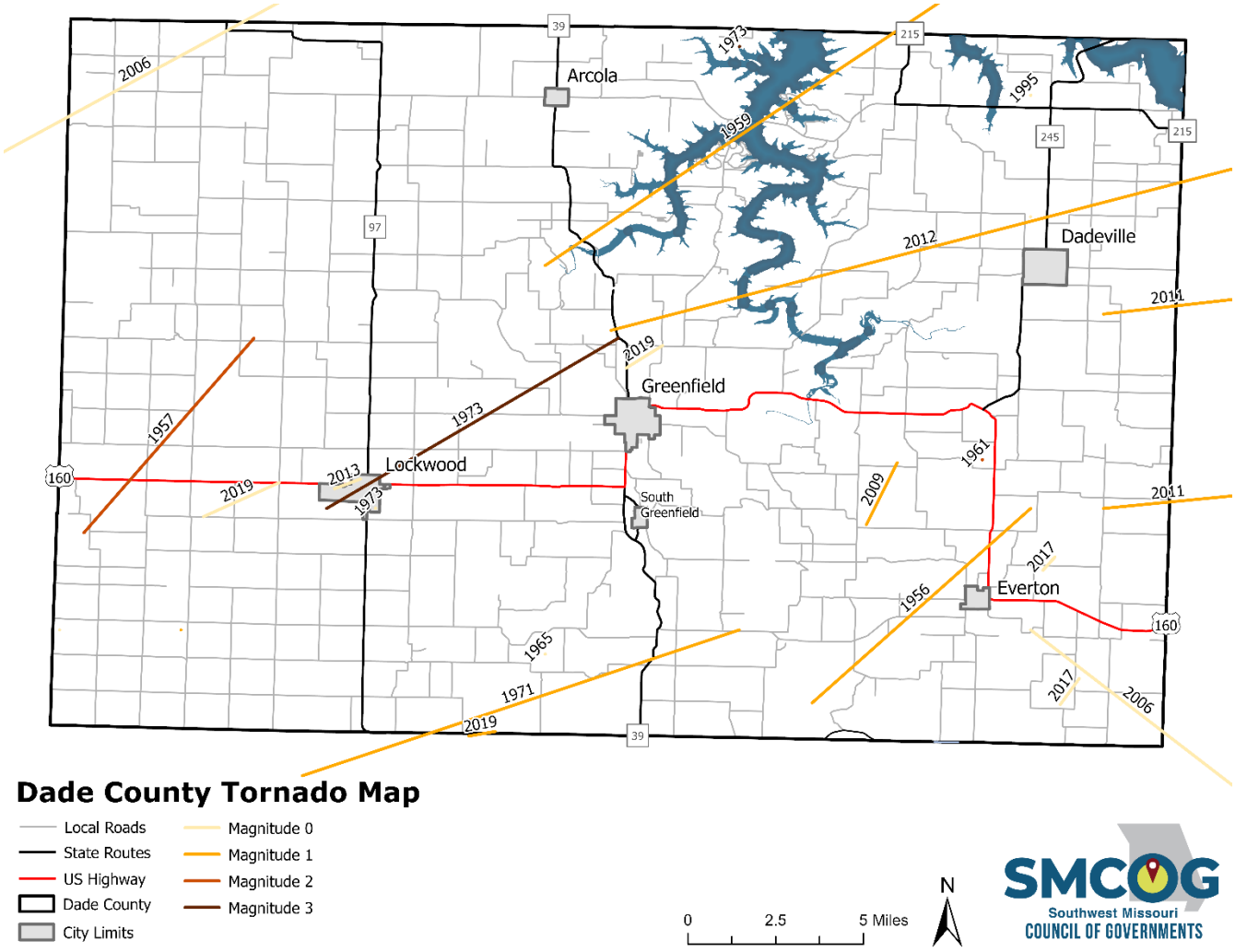
Table 3.53. Recorded Tornado Events in Dade County 2003-2022

Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damage
05/04/2003	Meinert	Meinert	0.20	25	F1	0	0	$10,000	$0
05/06/2003	Dadeville	Dadeville	0.20	20	F0	0	0	$0	$0
03/12/2006	Lockwood	Lockwood	14.0	35	F0	0	0	$0	$0
05/03/2006	Everton	Everton	3.00	25	F0	0	0	$0	$0
05/08/2009	Pilgrim	Pilgrim	1.90	100	EF1	0	0	$35,000	$0
06/18/2011	Everton	Emmet	1.72	100	EF1	0	0	$0	$0
06/18/2011	Dadeville	Dadeville	1.31	100	EF1	0	0	$0	$0
02/28/2012	Greenfield	Dadeville	13.0	100	EF1	0	0	$20,000	$0
05/19/2013	Lockwood	Lockwood	0.65	100	EF0	0	0	$25,000	$0
05/19/2017	Emmet	Emmet	0.86	100	EF0	0	0	$0	$0
05/19/2017	Emmet	Emmet	0.47	75	EF0	0	0	$0	$0
04/17/2019	Lockwood	Lockwood	1.97	50	EF0	0	0	$10,000	$0
04/18/2019	Greenfield	Greenfield	1.04	200	EF0	0	0	$15,000	$0
04/30/2019	Round Grove	Round Grove	0.25	50	EF1	0	0	$50,000	$0
Total	**-**	**-**	**-**	**-**	**-**	**0**	**0**	**$665,000**	**$0**

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

Figure 3.36 below shows historic tornado paths in Dade County.

Figure 3.36. Dade County Map of Tornado Events



Probability of Future Occurrence

Over a 20-year period from 2003 to 2022, there were a total of 14 tornadoes recorded in Dade County, seven of which were damaging events. This means there is a 70% chance there will be a tornado event and a 35% chance for a damaging tornado event in any given year.

Changing Future Conditions Considerations

Scientists do not know how the frequency and severity of tornadoes will change. Research published in 2015 suggests that changes in heat and moisture content in the atmosphere, brought on by a warming world, could be playing a role in making tornado outbreaks more common and severe in the U.S. The research concluded that the number of days with large outbreaks have been increasing since the 1950s and that densely concentrated tornado outbreaks are on the rise. It is notable that the research shows that the area of tornado activity is not expanding, but rather the areas already subject to tornado activity are seeing the more densely packed tornadoes. Because Missouri experiences on average around 39.6 tornadoes a year, such research is closely followed by meteorologists in the state.

Vulnerability

Vulnerability Overview

According to the 2023 State Plan, the following six factors were considered in determining overall tornado vulnerability: building exposure, population density, social vulnerability, percentage of mobile homes, likelihood of occurrence, and annual property loss.

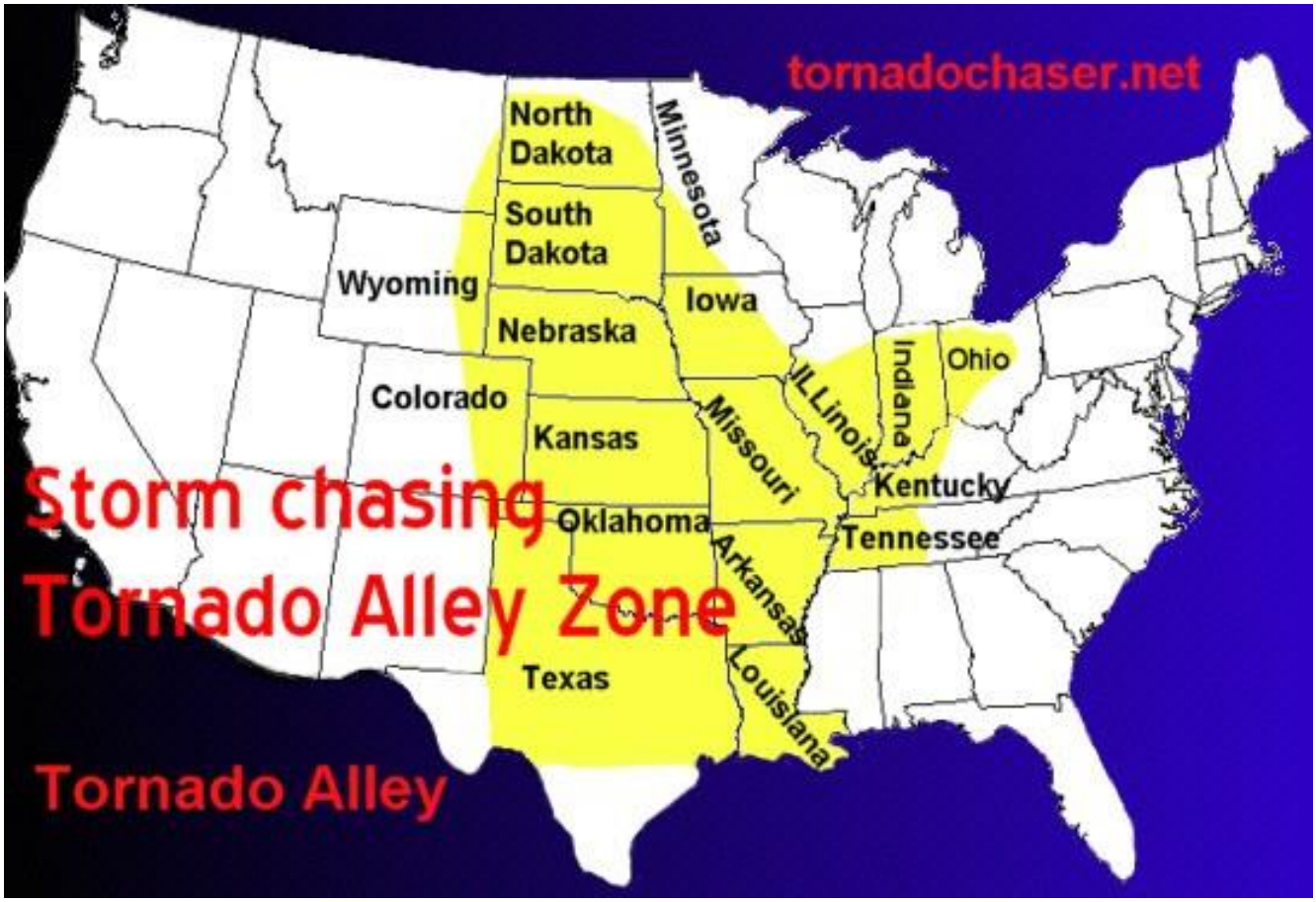
Dade County received the following vulnerability rating for each factor:

- Building exposure – Low
- Population density – Low
- Social vulnerability – Medium
- Percentage of mobile homes – Medium
- Likelihood of occurrence – Medium
- Annual property loss – Low

This equates to an overall vulnerability rating of Medium Low.

Figure 3.37 illustrates areas where dangerous tornadoes historically have occurred.

Figure 3.37. Tornado Alley in the U.S.



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

Potential Losses to Existing Development

During the 20-year period from 2003 to 2022, 14 tornadoes caused $665,000.00 in property damage in Dade County. Six tornados were classified as F/EF0 and eight were classified at F/EF1. Based on this information, Dade County can expect to see an estimated $33,250 in property damage per year caused by tornados.

We can also estimate potential losses based on the total exposure with an applied damage factor of 1% - an estimate of the average damage a tornado could cause in a community. **Table 3.54** provides a summary of the estimated total losses for each participating jurisdiction.

Table 3.54. Estimated Potential Tornado Losses by Jurisdiction

Jurisdiction	Total Exposure	Estimated Losses
Unincorporated Dade County	$448,111,844	$4,481,118.44
Arcola	$10,264,091	$102,640.91
Greenfield	$120,469,745	$1,204,697.45
Lockwood	$84,340,541	$843,405.41
South Greenfield	$7,761,059	$77,610.59
Total	**$670,947,280**	**$6,709,472.80**

Impact of Previous and Future Development

Development across the county and within incorporated jurisdictions increases the potential for losses. From 2003 to 2022, the average annual losses countywide were $33,250. This indicates potential future losses if the current development were to remain with no additional development. Future development and population increases will increase exposure to damage. It is anticipated that some communities may experience new development, but those communities that enforce building codes, including Greenfield and Lockwood, may help reduce the risk of building damage.

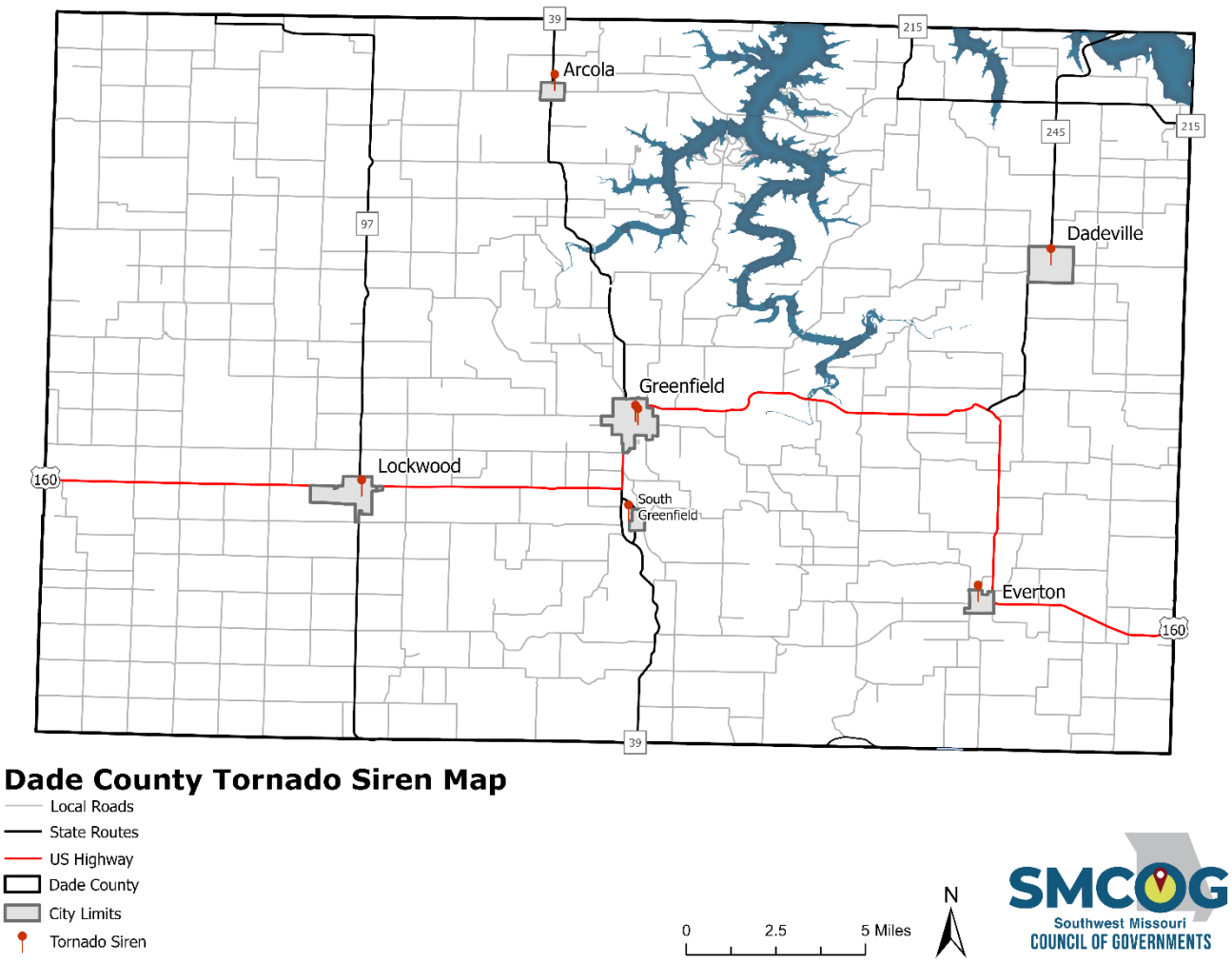
Hazard Summary by Jurisdiction

Although tornado events are area-wide hazard, communities with a greater percentage of structures built prior to 1939 are considered to be more vulnerable to this type of event. According to ACS data, at least 20% of Dade County (the entirety of Dade County, not just the unincorporated portions) and Greenfield housing units are of this type. Lockwood sits at 29% and South Greenfield is 41.7%. Arcola only has 2 of this type, or 4% of their total housing units.

School districts can be especially at risk of this hazard. However, all three participating districts (Dadeville R-II, Greenfield R-IV, and Lockwood R-I) have a designated campus tornado shelter ready to be used in the event of a tornado.

Figure 3.38 below is a map of all tornado sirens located within the county. There is one present in all cities/villages.

Figure 3.38. Tornado Siren Map



Community Comments on Hazard

Seven of the 48 total responders indicated they had been impacted by a tornado in the past. Multiple comments referenced the Joplin tornado of 2011. While this tornado didn't impact Dade County, it's important to note the event's significance because of the widespread damage.

Many comments also mentioned the need for more safe rooms located throughout the county and in school facilities. Additionally, when presented with a list of ten sample projects that could be funded with FEMA hazard mitigation grants, "new tornado safe room construction" scored the highest while "structural retrofitting of existing buildings to add tornado safe rooms" scored the second highest.

The survey included questions gauging the public's perception of each hazard. **Table 3.55** below provides a summary of these responses.

Table 3.55. Tornado Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	2.1%	Not at all Concerned	2.1%	No Impact	0.0%
Occasionally	39.6%	Not so Concerned	20.8%	Limited Impact	14.6%
Likely	41.7%	Somewhat Concerned	39.6%	Critical Impact	52.1%
Highly Likely	16.7%	Very Concerned	22.9%	Catastrophic Impact	33.3%
-	-	Extremely Concerned	14.6%	-	-

Problem Statement

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour and damage paths can be more than one mile wide and 50 miles long. From 2003 to 2022, tornado events in Dade County resulted in zero deaths, zero injuries, and $665,000.00 in property damage. Information in the 2023 State Plan indicates that Dade County has a Medim Low overall vulnerability to tornados.

The risk of property damage, injury, and death in the county can be mitigated by constructing FEMA saferooms in facilities that house vulnerable populations such as nursing homes, government buildings, and schools. Additionally, identifying safe refuge areas in public buildings, nursing homes and other facilities that house vulnerable populations that do not have a safe room can mitigate injury and loss of life. Retrofitting school district facilities with protective filming of windows and installation of storm proof doors will provide more protection for students and staff at school facilities. Promoting the installation of NOAA weather radios, and additional warnings and alerts systems such as Swift 911 or Nixle, will also provide the public and schools with more time to find shelter during tornado events.

3.4.10 Wildfire

Hazard Profile

Hazard Description

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

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

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

Geographic Location

Damages due to wildfires are higher in communities with more Wildland-Urban Interface (WUI) areas. The term refers to the zone of transition between unoccupied land and human development. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the intermix areas are those areas that intermingle with wildland areas. **Figure 3.39** shows the WUI and **Figure 3.40** shows the wildfire hazard potential for Dade County.

Figure 3.39. Wildland Urban Interface

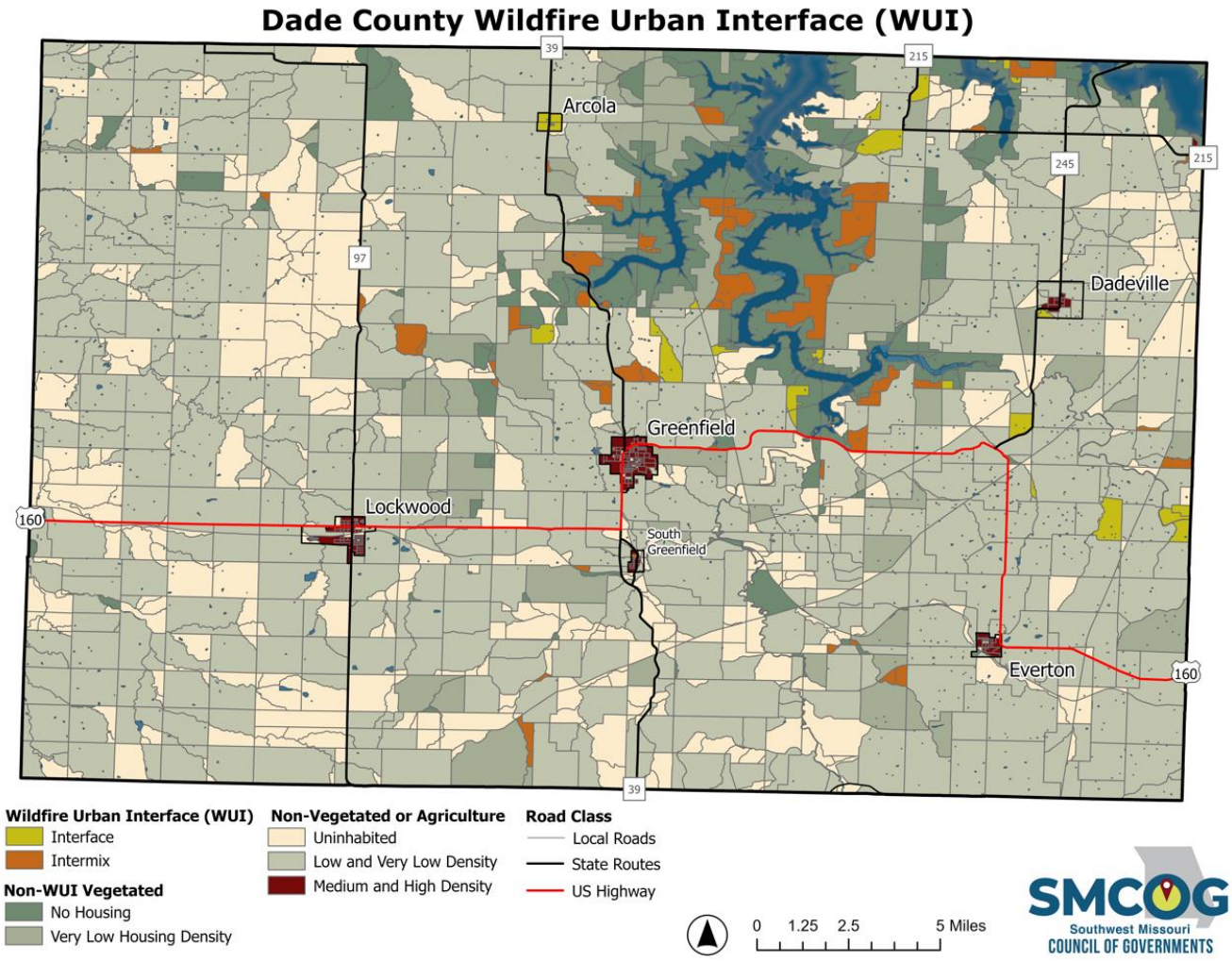
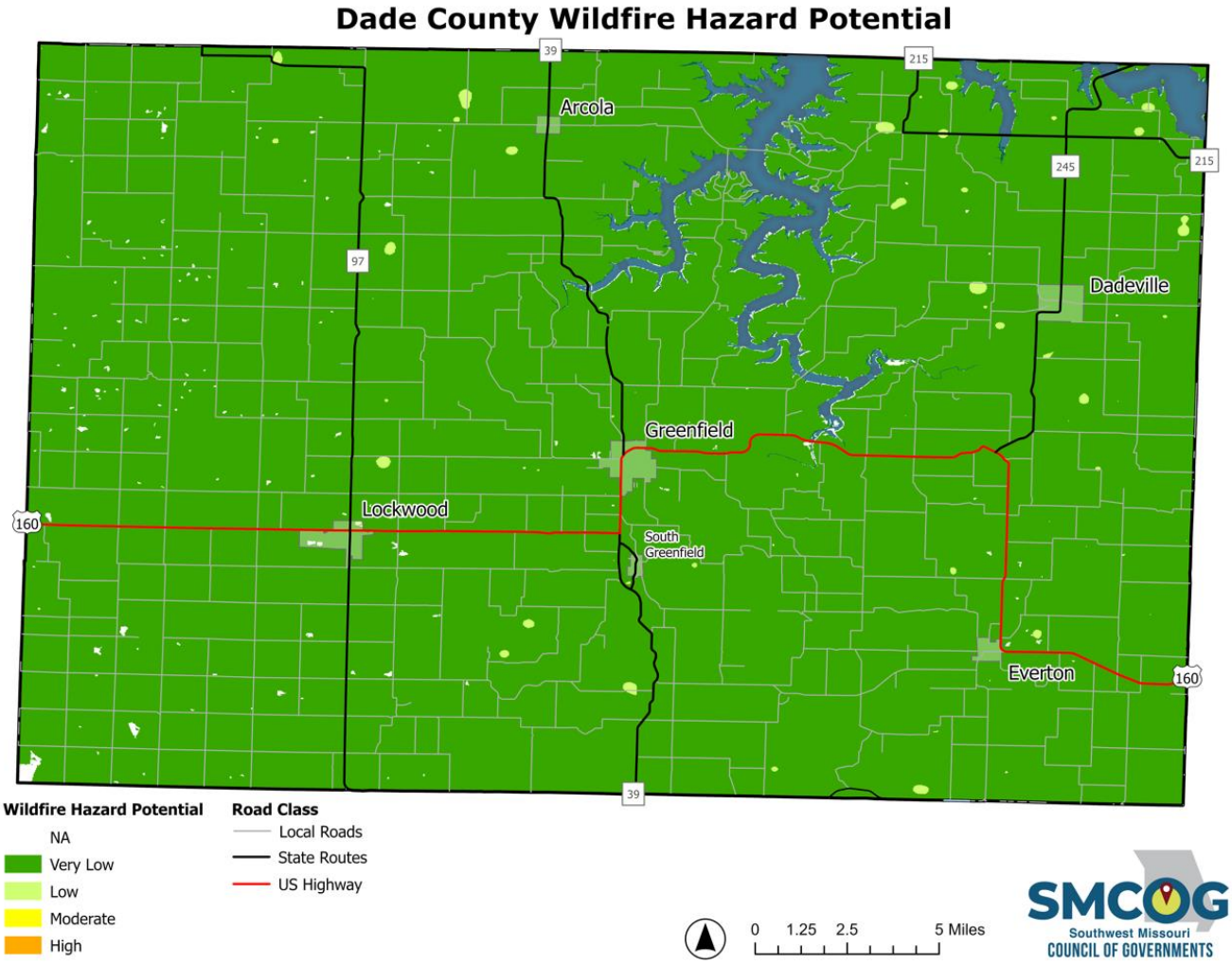


Figure 3.40. Wildfire Hazard Potential



Strength/Magnitude/Extent

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

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

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

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

Previous Occurrences

According to the Missouri Department of Conservation (MDC) Wildfire Data, there were a total of 357 wildfires in Dade County from 2013-2022. 4,075 acres were burned, 145 buildings were threatened, 55 buildings were damaged, and 48 buildings were destroyed. **Table 3.56** shows MDC wildfire statistics by year.

Table 3.56. Dade County Wildfires 2013-2022

Year	Number of Wildfires	Buildings Threatened	Buildings Damaged	Buildings Destroyed	Acres Burned
2013	25	3	2	1	128
2014	47	35	12	7	278
2015	30	19	10	8	70
2016	44	18	8	4	248
2017	47	9	10	3	687
2018	31	13	5	5	173
2019	18	8	1	1	1,808
2020	20	9	1	6	132
2021	42	15	6	12	154
2022	53	16	0	1	397
Total	**357**	**145**	**55**	**48**	**4,075**

Source: Missouri Department of Conservation MDC Wildfire Reporting (mo.gov)

Probability of Future Occurrence

There were 357 reported wildfires from 2013-2022, with several events taking place each year. This equates to a 100% probability of wildfire events in Dade County in any given year, with an average of 35.7 events per year.

Changing Future Conditions Considerations

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

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

Vulnerability

Vulnerability Overview

Wildfires occur throughout wooded and open vegetation areas of Missouri. They can occur any time of the year, but mostly occur during long, dry hot spells. Any small fire, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness or negligence. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Structures and people in WUI areas in the county and cities are more vulnerable to the impact of wildfires due to the level of fuel mixed with structures.

Potential Losses to Existing Development

Based on historical data from the Missouri Department of Conservation, we can estimate that, on average, 14.5 buildings are threatened, 5.5 buildings are damaged, 4.8 buildings are destroyed, and 407.5 acres of land are burned per year in Dade County as a result of wildfires.

Impact of Previous and Future Development

It is anticipated that there will be limited future development in WUI areas throughout the unincorporated parts of the county. Future growth in WUI areas of the county will increase the risk and exposure to wildfires. It is expected that WUI development in cities can be mitigated by development regulations reducing the risk of potential wildfires.

Hazard Summary by Jurisdiction

There are few areas of moderate risk that fall within jurisdictional boundaries; many areas at risk are under the jurisdiction of Dade County. Much of the county consists of grasslands, however, and lower-risk areas could quickly become dangerous in the event of a wildfire. School facilities in Greenfield are located near, but not within, an identified medium risk area, and are more likely to be affected in the event of a wildfire.

This hazard is the primary focus of participating fire protection districts in the county like the Dadeville Rural Fire Protection District. As many local jurisdictions do not have municipal fire departments, these special districts are important to all communities for protection against wildfire and assist in reducing exposure to wildfire risk.

Community Comments on Hazard

Overall, the Dade County community does not regard wildfires as a significant threat. There were no responders to the community survey that indicated they had been impacted by wildfires. “Wildfire mitigation” scored the lowest out of the ten potential projects that could be funded with FEMA hazard mitigation grants. No additional comments referred to this hazard.

The survey included questions gauging the public’s perception of each hazard. **Table 3.57** below provides a summary of these responses.

Table 3.57. Wildfire Community Survey Responses

Likelihood of Occurrence		Level of Concern		Magnitude of Impact	
Unlikely	33.3%	Not at all Concerned	25.0%	No Impact	16.7%
Occasionally	43.8%	Not so Concerned	41.7%	Limited Impact	33.3%
Likely	20.8%	Somewhat Concerned	22.9%	Critical Impact	31.3%
Highly Likely	2.1%	Very Concerned	6.3%	Catastrophic Impact	18.8%
-	-	Extremely Concerned	4.2%	-	-

Problem Statement

Wildfire occurrences are relatively frequent within Dade County. These events can threaten, damage, and destroy structures in hazard prone areas. Populations and structures in WUI areas of the county have an increased risk to wildfires due to the level of fuel mixed with structures. Cities may adopt landscape ordinances that include fire safe landscape design requirements in these areas. They may also adopt building codes or design requirements that encourage non-combustible materials for new construction.

The unincorporated portions of the county have the highest risk and exposure to wildfires. County officials and fire departments can implement burn restrictions during weather conditions conducive to the spread of wildfire. Additionally, understanding the highest risk locations and developing safe evacuation routes that members of the public are aware of can reduce the risk of loss of life or injury.

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

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

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

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

4.1 Goals

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

This planning effort is an update to Dade County's existing hazard mitigation plan approved by FEMA on May 1, 2019. Therefore, the goals from that plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their second meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2023 State Hazard Mitigation Plan goals were reviewed. The MPC also reviewed the goals from current surrounding county plans. During this update process, the MPC opted to adopt the same goals that were developed during the previous plan update. The plan goals are as follows:

- **Goal 1**: Protect the lives and livelihoods of all citizens.
- **Goal 2:** Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
- **Goal 3:** Ensure continued operation of government, emergency functions and critical infrastructure in a disaster.

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.

The plan includes a mitigation strategy that 1) analyzes actions and/or projects that the jurisdiction considered to reduce the impacts of hazards identified in the risk assessment, and 2) identifies the actions and/or projects that the jurisdiction intends to implement. Each jurisdiction has considered actions that reduce risk to existing buildings and infrastructure, as well as limiting risk to future development and redevelopment. These actions fall under several categories: prevention, structure and infrastructure projects, natural systems protection, emergency services, and education and outreach. The mitigation plan may include non-mitigation actions, such as actions that are emergency response or operational preparedness in nature.

During the second MPC meeting, the results of the risk assessment update were provided to the MPC members for review and the key issues were identified for specific hazards. Changes in risk since adoption of the previously approved plan were discussed.

The MPC included problem statements in the plan update at the end of each hazard profile. The problem statements summarize the risk to the planning area presented by each hazard and include possible methods to reduce that risk. Use of the problem statements allowed the MPC to recognize new and innovative strategies for mitigate risks in the planning area.

Jurisdiction representatives on the MPC were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction and the previously identified mitigation actions prior to Meeting #3. Representatives were provided a link to two FEMA publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)* and *Hazard Mitigation Assistance Guidance: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program (February 2015)*. These documents

were developed by FEMA as a resource for identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters.

The focus of meetings #3 and #4 was to update the mitigation strategy. For a comprehensive range of mitigation actions to consider, the MPC reviewed the following information during meeting #3:

- A list of actions proposed in the previous mitigation plan
- Input during meetings
- Key issues from the risk assessments
- Responses to data collection questionnaires where jurisdictions had reported progress made on previous actions

The MPC reviewed the actions from the previously approved plan for progress made since the plan had been adopted. The list of previous actions was included in the data collection questionnaire for each jurisdiction. The questionnaires were sent via email prior to meeting #1 and reviewed at meetings #1 and #2 before discussion at meeting #3. Each jurisdiction was instructed to provide information regarding the "Action Status" with one of the following status choices:

- Completed, with a description of the progress
- Ongoing, with a description of the progress made to date
- Not Yet Started, with a discussion of the reasons for lack of progress

During meeting #3, discussion of action modification occurred in order to make actions SMART: specific, measurable, achievable, relevant, and time-bound. SMCOG staff provided recommended altered language for some items and general discussion. MPC members were also encouraged to identify repetitive loss locations or infrastructure where the potential cost of a project may be high, but over time would cost less than frequent repairs and public assistance claims.

Additionally, the future inclusion of each mitigation action in the plan update was identified as either keep, delete, or modify. Based on the status updates, there were **three** completed actions, **64** continuing actions (either ongoing or modified), and **14** deleted actions. **Table 4.1** provides a full summary.

Table 4.1. Action Status Summary

Jurisdiction	Completed Actions	Continuing Actions (ongoing or modified)	Deleted Actions
Dade County	0	22	1
Arcola	0	2	0
Greenfield	0	12	0
Lockwood	1	3	13
South Greenfield	0	2	0
Dadeville R-II	0	6	0
Greenfield R-IV	0	10	0
Lockwood R-I	2	5	0
Dade County Emergency Services 911*	-	-	-
Dadeville Rural Fire Protection District	0	2	0
Total	**3**	**64**	**14**

*Dade County Emergency Services 911 participated in the previous plan as a stakeholder only.

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

Table 4.2. Summary of Deleted Actions from the Previous Plan

Deleted Action Number	Action Name	Reason for Deletion
Dade County 2.3	Drainage debris removal	Not provided
Lockwood 1.1	Low Water Crossing Markers	No longer relevant
Lockwood 1.2	NOAA Weather Radios	No longer relevant
Lockwood 1.4	Alert Systems	No longer relevant
Lockwood 1.5	Public Awareness	No longer relevant
Lockwood 1.6	Information Website	No longer relevant
Lockwood 1.7	Retrofit Existing Facilities	No longer relevant
Lockwood 2.1	Storm Water Improvements	No longer relevant
Lockwood 2.2	Goals Integration	No longer relevant
Lockwood 2.3	Drainage Debris Removal	No longer relevant
Lockwood 2.4	Information Sharing	No longer relevant
Lockwood 2.6	Annual Review	No longer relevant
Lockwood 2.7	Evacuation and Emergency Access	No longer relevant
Completed Action Number	**Action Name**	**Completion Details**
Lockwood 1.8	Saferoom Construction	Saferoom was constructed in 2022
Lockwood R-I 1.2	NOAA Weather Radios	All buildings are equipped with radios
Lockwood R-I 1.11	New Storm Shelter	Saferoom was constructed in 2022

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 others in their community or within their organization to finalize the 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 MPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the 2023 Missouri State Hazard Mitigation Plan. The benefit/cost review at the planning stage primarily consisted of a qualitative analysis and was not the detailed process required for grant funding applications. For each action, the plan sets forth a narrative describing the types of benefits that could be realized from action implementation. The cost was estimated as closely as possible, with further refinement to be supplied as project development occurs.

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

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

The following questions were asked for each proposed action.

S: Is the action socially acceptable?

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

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

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

Figure 4.1. Sample STAPLEE Worksheet

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

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

Completed by
(Name, Title, Phone Number) _____

In addition to the STAPLEE cost benefit review prioritization, an implementation plan for each action was discussed. An action worksheet was used to develop the implementation plan. The action worksheet format is shown in **Figure 4.2.**

Figure 4.2. Sample Action Worksheet

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

4.3.1 Dade County Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorms
Problem being Mitigated:	Damage caused during flood events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.1
Name of Action or Project:	Low water crossing markers
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Maintain and replace low water markers, as needed
Estimated Cost:	$10,00
Benefits:	Ensure proper marking in low water crossing will assist citizens and Emergency Responders in crossing in these location Lives will be saved as well as property
Plan for Implementation	
Responsible Organization/Department:	Dade County Roads
Supporting Organization/Department:	
Action/Project Priority:	37
Timeline for Completion:	24 Months
Potential Fund Sources:	General funds, grants.
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Many projects are being completed. Work continues to be done

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Notification for server weather
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.2
Name of Action or Project:	NOAA weather radios
Mitigation Category:	Prevention
Action or Project Description:	Use NOAA all-hazard radios with S.A.M.E technology in all critical/vulnerable facilities, residences, businesses, and places of population concentration.
Estimated Cost:	$5,000
Benefits:	By providing these radios citizens and organizations will be better informed on the continually changing weather situations
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	Local Fire Departments, Red Cross
Action/Project Priority:	32
Timeline for Completion:	2
Potential Fund Sources:	Grants, Donation
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Lack of funding, Change in personnel

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm
Problem being Mitigated:	Notification system for severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.3
Name of Action or Project:	Outdoor storm sirens
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install additional radio-controlled storm warning sirens in areas of population concentration
Estimated Cost:	$150,000
Benefits:	Place a Storm Siren in every community within the county. Early notification will save lives.
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	County 911
Action/Project Priority:	24
Timeline for Completion:	2
Potential Fund Sources:	Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	New
Report of Progress:	Limited by available funding

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Notification for severe weather
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.4
Name of Action or Project:	Alert systems
Mitigation Category:	Prevention
Action or Project Description:	Use available alert and automated messaging systems to provide storm warning.
Estimated Cost:	$2000
Benefits:	Early warning is key to saving lives in the event of a severe storm. This program would partner with the National Weather Service to warn citizens of coming weather events.
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	911, National Weather Service
Action/Project Priority:	29
Timeline for Completion:	1 year
Potential Fund Sources:	Grant funding
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	New
Report of Progress:	Limited by available funding

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Limited public knowledge/resources on how to reduce risk
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.5
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	$1,000
Benefits:	This program would interact with the schools as well as other public entities to make the general public more “weather aware”. Highlighting the risks of storms and prevention methods.
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	National Weather Service
Action/Project Priority:	29
Timeline for Completion:	1
Potential Fund Sources:	General fund
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	New personnel added to team

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Limited public knowledge/resources on how to reduce risk
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.6
Name of Action or Project:	Information website
Mitigation Category:	Education and Outreach
Action or Project Description:	Establish an emergency management website for the county that includes hazard mitigation educational information.
Estimated Cost:	$2,000
Benefits:	Establish an Emergency Management Webb Site to post information.
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	
Action/Project Priority:	35
Timeline for Completion:	1
Potential Fund Sources:	General Funds, Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	New Personnel added to team

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Unsafe environment during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.7
Name of Action or Project:	Retrofit existing facilities
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Where feasible, retrofit doors and windows in existing critical/vulnerable facilities serving concentrated populations.
Estimated Cost:	$25,000
Benefits:	Currently most facilities are dated in their construction, by updating doors and windows to be more storm tolerant, it will protect against storm debris
Plan for Implementation	
Responsible Organization/Department:	Maintenance
Supporting Organization/Department:	Emergency Management
Action/Project Priority:	25
Timeline for Completion:	2
Potential Fund Sources:	General Funds, Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	This has proved to be a large project for the number of staff and funding.

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm
Problem being Mitigated:	No safe place to shelter during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.8
Name of Action or Project:	Safe room construction
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Construct tornado/severe wind safe rooms in areas of population concentration.
Estimated Cost:	$4 Million
Benefits:	Having a Safe place for the community to go during a storm is paramount. Greenfield and Dadeville are small communities within Dade County that do not have a safe place
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	City of Greenfield, City of Dadeville, Greenfield Schools, Dadeville Schools
Action/Project Priority:	33
Timeline for Completion:	5
Potential Fund Sources:	Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	One complete in Lockwood. Other communities are seeking to implement

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Extreme temperatures, severe thunderstorm, tornado, severe winter weather
Problem being Mitigated:	Safe conditions for vulnerable populations during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dade County 1.9
Name of Action or Project:	Community programs
Mitigation Category:	Education and Outreach
Action or Project Description:	Continue community programs to provide fans, winter weatherization, and other donations for vulnerable populations during weather extremes.
Estimated Cost:	$1,000 to administer
Benefits:	This program would work low income housing and other facilities throughout the county to educate the public about weatherization of homes and protection against extreme heat and cold as well as severe weather
Plan for Implementation	
Responsible Organization/Department:	Emergency Management,
Supporting Organization/Department:	
Action/Project Priority:	28
Timeline for Completion:	4
Potential Fund Sources:	Grants, donations
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Social Media is being used in this area. Work continues to be done.

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado
Problem being Mitigated:	Loss of power during hazard events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.1
Name of Action or Project:	Backup generators
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install emergency backup generators where needed for critical and vulnerable facilities and infrastructure.
Estimated Cost:	$20,000
Benefits:	Generators are needed for critical facilties throughout the county in the event of power outages.
Plan for Implementation	
Responsible Organization/Department:	Maintenance, Emergency Management
Supporting Organization/Department:	
Action/Project Priority:	32
Timeline for Completion:	2 years
Potential Fund Sources:	Grants, general funds
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	A backup generator was added to the Annex Building. Work contuses to be done to identify other critical structures

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm
Problem being Mitigated:	Repeated damage caused during flood events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.2
Name of Action or Project:	Low water crossing upgrades
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Improve low water crossings that frequently flood
Estimated Cost:	$150,000
Benefits:	Improve low water crossing so they do not flood easily to prevent cars and people from being swept away during high water events
Plan for Implementation	
Responsible Organization/Department:	Roads
Supporting Organization/Department:	
Action/Project Priority:	27
Timeline for Completion:	5
Potential Fund Sources:	General revenue, Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Many projects have been completed. Work continues to be done.

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm
Problem being Mitigated:	Water not draining properly
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.3
Name of Action or Project:	Storm water improvements
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Where feasible, install and/or improve culverts to eliminate water flow restrictions.
Estimated Cost:	$100,000
Benefits:	Improving roads to ensure access to all residents throughout the county
Plan for Implementation	
Responsible Organization/Department:	Roads
Supporting Organization/Department:	
Action/Project Priority:	28
Timeline for Completion:	5
Potential Fund Sources:	General Revenue, Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Work Continues to be done

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Drought, wildfire
Problem being Mitigated:	Damage caused during drought events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.4
Name of Action or Project:	Drought-resistant practices
Mitigation Category:	Education and Outreach
Action or Project Description:	Encourage best practices for drought-resistant farming.
Estimated Cost:	$500
Benefits:	Work with Conservation and DNR to educate local farmers on best practices to prevent spreading of wild fires.
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	911
Action/Project Priority:	31
Timeline for Completion:	1
Potential Fund Sources:	General Revenue, Donations,
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	This in an ongoing project with MU extension office as well as DNR

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Disconnect between hazard mitigation and other plans, programs, and regulations
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.5
Name of Action or Project:	Goals integration
Mitigation Category:	Education and Outreach
Action or Project Description:	Incorporate the goals, objectives, and mitigation actions from the Dade County Natural Hazard Mitigation Plan into existing and new plans, programs, and regulations where appropriate.
Estimated Cost:	Can be completed with current budget
Benefits:	Ensure continuity in local mitigation plans
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	Elected Officials
Action/Project Priority:	28
Timeline for Completion:	1
Potential Fund Sources:	General revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing not started
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding
Problem being Mitigated:	Damage caused by flooding
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.6
Name of Action or Project:	NFIP Enforcement
Mitigation Category:	Prevention
Action or Project Description:	Enforce NFIP floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SFHAs).
Estimated Cost:	Can be completed with current budget
Benefits:	Enforcing the Flood Plain management requirements will ensure that all new structures will be safe in the event of flooding
Plan for Implementation	
Responsible Organization/Department:	Flood Plain Manager
Supporting Organization/Department:	
Action/Project Priority:	31
Timeline for Completion:	5
Potential Fund Sources:	General revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Training of new Flood Plain Manager in progress

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Wildfires
Problem being Mitigated:	Damage caused by wildfires
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.7
Name of Action or Project:	Burn restrictions
Mitigation Category:	Prevention
Action or Project Description:	enforce burn restrictions during time of weather conditions conducive to the spread of wildfire.
Estimated Cost:	$1,000
Benefits:	Educate and enforce burn restrictions throughout the county to prevent spreading of wild fires.
Plan for Implementation	
Responsible Organization/Department:	Law Enforcement, Elected Officials
Supporting Organization/Department:	Emergency Management
Action/Project Priority:	30
Timeline for Completion:	1
Potential Fund Sources:	General Revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	A burn restriction is Implemented. Work continues on public service messaging

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm
Problem being Mitigated:	Damage to roadways caused by repeated flooding events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.8
Name of Action or Project:	Ditches
Mitigation Category:	Prevention
Action or Project Description:	Cut ditches in areas of hills and curves on gravel roads to keep water from washing out roadways.
Estimated Cost:	$5,000
Benefits:	Controlling the water on the roadways will ensure the roadways are passible during a highwater event
Plan for Implementation	
Responsible Organization/Department:	Roads
Supporting Organization/Department:	
Action/Project Priority:	28
Timeline for Completion:	3
Potential Fund Sources:	General Revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	This work continues to be done throughout the county

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm
Problem being Mitigated:	Damage to Hulston Bridge caused by flooding
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dade County 2.9
Name of Action or Project:	Hulston Bridge
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Replace Hulston Bridge and approaches at the end of EE Hwy in order to eliminate frequent flooding.
Estimated Cost:	$250,000
Benefits:	Replacing the bridge will ensure safe travel
Plan for Implementation	
Responsible Organization/Department:	Roads
Supporting Organization/Department:	
Action/Project Priority:	32
Timeline for Completion:	1
Potential Fund Sources:	General Revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Should be completed this year

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of communication between jurisdictions regarding hazard mitigation
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County 3.1
Name of Action or Project:	Information sharing
Mitigation Category:	Education and Outreach
Action or Project Description:	Share information with all jurisdictions and entities responsible for critical/vulnerable facilities and services.
Estimated Cost:	$1000
Benefits:	Continuing to share information on social medial to educate the public of weather and other hazards
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	
Action/Project Priority:	28
Timeline for Completion:	
Potential Fund Sources:	General revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Work has been don't to establish social medial accounts and they are active

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Need for emergency response access for all jurisdictions
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County 3.2
Name of Action or Project:	Emergency response access
Mitigation Category:	Emergency Services
Action or Project Description:	Require all communities to have emergency response access to all portions of their jurisdictions
Estimated Cost:	Can be completed with current budget
Benefits:	Work with all jurisdictions within the county to ensure all of their communities are accessible to emergency vehicles
Plan for Implementation	
Responsible Organization/Department:	Roads
Supporting Organization/Department:	
Action/Project Priority:	28
Timeline for Completion:	1
Potential Fund Sources:	General revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	This is an ongoing process with each jurisdiction and emergency response agencies as projects and personnel change

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Outdated equipment
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County 3.3
Name of Action or Project:	Equipment upgrades
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Review and upgrade equipment as identified and budget for additional emergency equipment to enhance protection and response during disaster events.
Estimated Cost:	$5,000-$50,000
Benefits:	Work with all agencies throughout the county to ensure their equipment needs are met to respond to disasters
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	
Action/Project Priority:	34
Timeline for Completion:	Ongoing
Potential Fund Sources:	Grants
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	Have replaced some equipment for local fire departments and work continues

Action Worksheet	
Name of Jurisdiction:	Dade County
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Evacuation routes during and after hazard events
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County 3.4
Name of Action or Project:	Evacuation and emergency access
Mitigation Category:	Emergency Services
Action or Project Description:	Review emergency access routes and evacuation routes and work with the responsible entities to minimize or reduce identified problems.
Estimated Cost:	Can be completed with current budget
Benefits:	Ensure there is a safe and efficient evacuation route for every community within the county
Plan for Implementation	
Responsible Organization/Department:	Emergency Management
Supporting Organization/Department:	Law Enforcement, Roads
Action/Project Priority:	28
Timeline for Completion:	2
Potential Fund Sources:	General revenue
Local Planning Mechanisms to be Used in Implementation, if any:	HMP, Emergency Plan, Debris Management Plan, Watershed Plan, Floodplain Ordinance
Progress Report	
Action Status:	Continuing
Report of Progress:	Work Continues to be done.

4.3.2 Arcola Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Village of Arcola
Risk / Vulnerability	
Hazard(s) Addressed:	Dam failure, sinkhole, drought, extreme temperatures, wildfire
Problem being Mitigated:	Lack of public awareness regarding lesser known hazards
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Village of Arcola 1.1
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	$1,000-$1,500
Benefits:	Residents are more aware of hazards and what they can do to prevent damage
Plan for Implementation	
Responsible Organization/Department:	Village administration
Supporting Organization/Department:	
Action/Project Priority:	35
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	grant writing, budgeting
Progress Report	
Action Status:	New
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Village of Arcola
Risk / Vulnerability	
Hazard(s) Addressed:	flooding, earthquake, severe thunderstorm, severe winter weather, tornado
Problem being Mitigated:	Loss of power during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Village of Arcola 2.1
Name of Action or Project:	Backup generators
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	install emergency backup generators where needed for critical and vulnerable facilities and infrastructure
Estimated Cost:	$50,000-$100,000
Benefits:	Prevent complete loss of power during severe weather events
Plan for Implementation	
Responsible Organization/Department:	Village administration
Supporting Organization/Department:	
Action/Project Priority:	43
Timeline for Completion:	2-3 years
Potential Fund Sources:	BRIC, HMGP, DNR
Local Planning Mechanisms to be Used in Implementation, if any:	grant writing, budgeting
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	The village was awarded a $30,000 Drinking Water Engineering Reporting Grant from DNR. This grant will pay for a complete audit of the water system and will identify necessary improvements. The village is working with Allgeier Martin and Associates out of Springfield

Action Worksheet	
Name of Jurisdiction:	Village of Arcola
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm
Problem being Mitigated:	Damage caused by flooding
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Village of Arcola 2.2
Name of Action or Project:	NFIP Enforcement
Mitigation Category:	Prevention
Action or Project Description:	enforce NFIP floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SFHAs)
Estimated Cost:	Can be completed with current budget
Benefits:	Prevent damage from flooding and keep the community safe
Plan for Implementation	
Responsible Organization/Department:	Floodplain manager
Supporting Organization/Department:	Village administration
Action/Project Priority:	35
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Floodplain ordinance
Progress Report	
Action Status:	Continuing in progress
Report of Progress:	

4.3.3 Greenfield Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Notification for server weather
Action or Project	
Applicable Goal Statement:	Goal 1: Protect lives and livelihood of all citizens.
Action/Project Number:	City of Greenfield 1.1
Name of Action or Project:	NOAA weather radios
Mitigation Category:	Prevention
Action or Project Description:	Use NOAA all-hazard radios with S.A.M.E technology in all critical/vulnerable facilities, residences, businesses, and places of population concentration.
Estimated Cost:	$500
Benefits:	Avoid loss to property from winter, water, hail
Plan for Implementation	
Responsible Organization/Department:	Police department
Supporting Organization/Department:	911
Action/Project Priority:	18
Timeline for Completion:	3 months
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, emergency plan, hmp
Progress Report	
Action Status:	Continuing not started
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Notification for severe weather
Action or Project	
Applicable Goal Statement:	Goal 1: Protect lives and livelihood of all citizens.
Action/Project Number:	City of Greenfield 1.2
Name of Action or Project:	Alert systems
Mitigation Category:	Prevention
Action or Project Description:	Use available alert and automated messaging systems to provide storm warning.
Estimated Cost:	$55,000
Benefits:	Prevent loss of lives and property
Plan for Implementation	
Responsible Organization/Department:	Police
Supporting Organization/Department:	911
Action/Project Priority:	34
Timeline for Completion:	
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, emergency plan, hmp
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Two new storm sirens have been installed

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Limited public knowledge/resources on how to reduce risk
Action or Project	
Applicable Goal Statement:	Goal 1: Protect lives and livelihood of all citizens.
Action/Project Number:	City of Greenfield 1.3
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	$1,000
Benefits:	Prevent loss to life and property
Plan for Implementation	
Responsible Organization/Department:	Police
Supporting Organization/Department:	City administration
Action/Project Priority:	34
Timeline for Completion:	2 years
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, emergency plan, hmp
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	This is done through social media and flyers at city hall

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	No safe place to shelter during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1: Protect lives and livelihood of all citizens.
Action/Project Number:	City of Greenfield 1.4
Name of Action or Project:	Safe room construction
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Construct tornado/severe wind safe rooms in areas of population concentration.
Estimated Cost:	$5,000,000
Benefits:	Provide a safe shelter for citizens during severe weather
Plan for Implementation	
Responsible Organization/Department:	City council
Supporting Organization/Department:	Police
Action/Project Priority:	27
Timeline for Completion:	5 years
Potential Fund Sources:	HMGP, BRIC
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, emergency plan, hmp
Progress Report	
Action Status:	Continuing not started
Report of Progress:	Lack of funds

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, tornado, severe thunderstorms, severe winter weather
Problem being Mitigated:	Construction standards are not high enough to prevent damage caused by severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1: Protect lives and livelihood of all citizens.
Action/Project Number:	City of Greenfield 1.5
Name of Action or Project:	Construction standards
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Incorporate hazard mitigation construction standards into design and construction of new facilities.
Estimated Cost:	Can be implemented with current staff/budget
Benefits:	Better quality buildings that are more resilient
Plan for Implementation	
Responsible Organization/Department:	Building superintendent
Supporting Organization/Department:	Police
Action/Project Priority:	42
Timeline for Completion:	1 year
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, emergency plan, hmp
Progress Report	
Action Status:	Continuing not started
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Extreme temperatures, severe thunderstorm, tornado, severe winter weather
Problem being Mitigated:	Safe conditions for vulnerable populations during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1: Protect lives and livelihood of all citizens.
Action/Project Number:	City of Greenfield 1.6
Name of Action or Project:	Community programs
Mitigation Category:	Education and Outreach
Action or Project Description:	Continue community programs to provide fans, winter weatherization, and other donations for vulnerable populations during weather extremes.
Estimated Cost:	$10,000
Benefits:	Prevent loss of lives and property
Plan for Implementation	
Responsible Organization/Department:	Police
Supporting Organization/Department:	911
Action/Project Priority:	8
Timeline for Completion:	1 year
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, emergency plan, hmp
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorms
Problem being Mitigated:	Flooding due to insufficient infrastructure
Action or Project	
Applicable Goal Statement:	Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	City of Greenfield 2.1
Name of Action or Project:	Storm water improvements
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Where feasible, install and/or improve culverts to eliminate water flow restrictions.
Estimated Cost:	$500,000
Benefits:	Less sewage infiltration/flooding
Plan for Implementation	
Responsible Organization/Department:	Maintenance department
Supporting Organization/Department:	
Action/Project Priority:	13
Timeline for Completion:	4 years
Potential Fund Sources:	BRIC, HMGP, USDA grants
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, capital improvement plan, emergency plan, hmp, critical facilities plan, zoning ordinance, building code, floodplain ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Some ditches were improved in 2022. More will be done in 2023

Action Worksheet	
Name of Jurisdiction:	City of Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding
Problem being Mitigated:	Damage caused by flooding
Action or Project	
Applicable Goal Statement:	Goal 2: Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	City of Greenfield 2.2
Name of Action or Project:	NFIP Enforcement
Mitigation Category:	Prevention
Action or Project Description:	Enforce NFIP floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SFHAs).
Estimated Cost:	$500,000
Benefits:	Less sewage infiltration and prevent damage to streets, property, and buildings in low lying areas
Plan for Implementation	
Responsible Organization/Department:	Floodplain administrator
Supporting Organization/Department:	Maintenance department
Action/Project Priority:	42
Timeline for Completion:	Ongoing
Potential Fund Sources:	Local funds, FEMA grants
Local Planning Mechanisms to be Used in Implementation, if any:	Comp plan, capital improvement plan, emergency plan, hmp, critical facilities plan, zoning ordinance, building code, floodplain ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	

4.3.4 Lockwood Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	City of Lockwood
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado
Problem being Mitigated:	Loss of power during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	City of Lockwood 1.1
Name of Action or Project:	Backup generators
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install emergency backup generators where needed for critical and vulnerable facilities and infrastructure.
Estimated Cost:	$150,000
Benefits:	Provides power for wells whenever power is out
Plan for Implementation	
Responsible Organization/Department:	City administration
Supporting Organization/Department:	
Action/Project Priority:	30
Timeline for Completion:	2 years
Potential Fund Sources:	HMGP, BRIC
Local Planning Mechanisms to be Used in Implementation, if any:	Emergency operations plan
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	Lack of funding

Action Worksheet	
Name of Jurisdiction:	City of Lockwood
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of public awareness regarding lesser known hazards
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	City of Lockwood 1.2
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	$1,000-$1,500
Benefits:	Residents are more aware of hazards and what they can do to prevent damage
Plan for Implementation	
Responsible Organization/Department:	City administration
Supporting Organization/Department:	
Action/Project Priority:	30
Timeline for Completion:	ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Emergency operations plan
Progress Report	
Action Status:	New
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	City of Lockwood
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado
Problem being Mitigated:	Lack of proper equipment needed to respond to hazard events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	City of Lockwood 2.1
Name of Action or Project:	Equipment upgrades
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Review and upgrade equipment as identified and budget for additional emergency equipment to enhance protection and response during disaster events.
Estimated Cost:	$100,000
Benefits:	Cleaning debris will be safer and faster
Plan for Implementation	
Responsible Organization/Department:	City administration
Supporting Organization/Department:	
Action/Project Priority:	25
Timeline for Completion:	2 years
Potential Fund Sources:	HMGP, BRIC, CDBG
Local Planning Mechanisms to be Used in Implementation, if any:	Emergency operations plan
Progress Report	
Action Status:	Continuing not started
Report of Progress:	Lack of funding prevented any progress

Action Worksheet	
Name of Jurisdiction:	City of Lockwood
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding
Problem being Mitigated:	Damage caused by flooding
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	City of Lockwood 2.2
Name of Action or Project:	NFIP Enforcement
Mitigation Category:	Prevention
Action or Project Description:	Enforce NFIP floodplain management requirements, including regulating all new and substantially improved construction in the Special Flood Hazard Areas (SFHAs).
Estimated Cost:	Can be accomplished with current staff and budget
Benefits:	Safer community that is more resilient to flood damage
Plan for Implementation	
Responsible Organization/Department:	City administration
Supporting Organization/Department:	
Action/Project Priority:	30
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Emergency operations plan, floodplain ordinance
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	

4.3.5 South Greenfield Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Village of South Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm, earthquake
Problem being Mitigated:	No safe place to shelter during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Village of South Greenfield 1.1
Name of Action or Project:	Safe room construction
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Construct a safe room
Estimated Cost:	$1,000,000
Benefits:	Provide a safe location for city staff and residents to shelter in during severe weather
Plan for Implementation	
Responsible Organization/Department:	Village Board of Trustees.
Supporting Organization/Department:	
Action/Project Priority:	30
Timeline for Completion:	2-5 years
Potential Fund Sources:	HGMP, BRIC
Local Planning Mechanisms to be Used in Implementation, if any:	Budgeting process
Progress Report	
Action Status:	New
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Village of South Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Dam failure, sinkhole, drought, extreme temperatures, wildfire
Problem being Mitigated:	Lack of public awareness regarding lesser known hazards
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Village of South Greenfield 1.2
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	$1,000-$1,500
Benefits:	Residents are more aware of hazards and what they can do to prevent damage
Plan for Implementation	
Responsible Organization/Department:	Village Board of Trustees
Supporting Organization/Department:	
Action/Project Priority:	30
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	Budgeting process, comp plan
Progress Report	
Action Status:	New
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Village of South Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm, severe winter weather
Problem being Mitigated:	Damage done to Highway 39 bridge due to age of bridge and flood damage
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Village of South Greenfield 2.1
Name of Action or Project:	Highway 39 Bridge
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	replace South Highway 39 bridge in order to reduce damage from frequent flooding and snow storms
Estimated Cost:	1.3-2 million
Benefits:	The losses that will be avoided involve public safety. It will eliminate the hazardous driving conditions created by rain or snow storms, as well as the surface erosion that occurs each time.
Plan for Implementation	
Responsible Organization/Department:	Village Board of Trustees.
Supporting Organization/Department:	Dade County Commission and the State Highway Dept.
Action/Project Priority:	41
Timeline for Completion:	5-10 years to complete
Potential Fund Sources:	State and county funds, along with grants.
Local Planning Mechanisms to be Used in Implementation, if any:	Comprehensive planning will be required to involve the aforementioned agencies and the Village
Progress Report	
Action Status:	Continuing not started
Report of Progress:	Impediments to this project will be funding sources, labor availability, and inconvenience to the citizens as to access to travel.

Action Worksheet	
Name of Jurisdiction:	Village of South Greenfield
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm, severe winter weather
Problem being Mitigated:	Damage done to roads during flash flood events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Village of South Greenfield 2.2
Name of Action or Project:	City road improvements
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	elevate city roads to mitigate the effects of flash flooding
Estimated Cost:	25-35K includes replacing worn culverts
Benefits:	Recurring cost of grating the roads will be recouped. This is about 8-10 K per year.
Plan for Implementation	
Responsible Organization/Department:	Board of Trustees of the Village of South Greenfield
Supporting Organization/Department:	City Clerk
Action/Project Priority:	43
Timeline for Completion:	Completion should take 6 months once started
Potential Fund Sources:	Cart Taxes, grants
Local Planning Mechanisms to be Used in Implementation, if any:	The plan will be developed in the budgeting and comprehensive planning process
Progress Report	
Action Status:	Continuing not started
Report of Progress:	Barriers anticipated include funding and the availability of labor sources. There is only 2 companies in the county that perform this work, and both stay very busy.

4.3.6 Dadeville R-II School District Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Dadeville R-II School District
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm
Problem being Mitigated:	No safe place to shelter during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dadeville R-II School District 1.1
Name of Action or Project:	Safe room construction
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Construct tornado/severe wind safe rooms in areas of population concentration
Estimated Cost:	$750,000-$1,000,000
Benefits:	Lessen risks and injury to citizens during severe weather events.
Plan for Implementation	
Responsible Organization/Department:	Dadeville School Board and administration
Supporting Organization/Department:	
Action/Project Priority:	37
Timeline for Completion:	1 year
Potential Fund Sources:	HMGP Grant and Local Funds.
Local Planning Mechanisms to be Used in Implementation, if any:	Master plan, emergency plan, capital improvement plan, budgeting
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	Lack of funding

Action Worksheet	
Name of Jurisdiction:	Dadeville R-II School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, tornado, severe thunderstorms, severe winter weather, wildfire
Problem being Mitigated:	Construction standards are not high enough to prevent damage caused by severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dadeville R-II School District 1.2
Name of Action or Project:	Construction standards
Mitigation Category:	Prevention
Action or Project Description:	Incorporate hazard mitigation construction standards into design and construction of new facilities
Estimated Cost:	Can be completed with current budget
Benefits:	Improve public safety during hazard events.
Plan for Implementation	
Responsible Organization/Department:	Dadeville School Board and Superintendent
Supporting Organization/Department:	
Action/Project Priority:	35
Timeline for Completion:	Ongoing
Potential Fund Sources:	Local Funds
Local Planning Mechanisms to be Used in Implementation, if any:	Master plan, emergency plan, budgeting
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	Lack of Funds

Action Worksheet	
Name of Jurisdiction:	Dadeville R-II School District
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm, wildfire
Problem being Mitigated:	Loss of power during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dadeville R-II School District 2.1
Name of Action or Project:	Backup generators
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install emergency backup generators where needed for critical and vulnerable facilities and infrastructure
Estimated Cost:	$5,000-$10,000
Benefits:	Improve public safety and preservation of critical infrastructure during hazard events.
Plan for Implementation	
Responsible Organization/Department:	Board of Education and Superintendent
Supporting Organization/Department:	
Action/Project Priority:	36
Timeline for Completion:	1 year
Potential Fund Sources:	HMGP Grant
Local Planning Mechanisms to be Used in Implementation, if any:	Master plan, emergency plan, capital improvement plan, budgeting
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	Lack of funding

Action Worksheet	
Name of Jurisdiction:	Dadeville R-II School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Disconnect between hazard mitigation and other plans, programs, and regulations
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Dadeville R-II School District 2.2
Name of Action or Project:	Goals integration
Mitigation Category:	Prevention
Action or Project Description:	Incorporate the goals, objectives, and mitigation actions from the Dade County Natural Hazard Mitigation Plan into existing and new plans, programs, and regulations where appropriate
Estimated Cost:	$0
Benefits:	Enable streamlined implementation of identified actions to preserve property, infrastructure, and reduce loss of life and injury.
Plan for Implementation	
Responsible Organization/Department:	Superintendent
Supporting Organization/Department:	Dade County Emergency Management
Action/Project Priority:	34
Timeline for Completion:	Ongoing
Potential Fund Sources:	Local funds
Local Planning Mechanisms to be Used in Implementation, if any:	Master plan, emergency plan, budgeting
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	New administration

Action Worksheet	
Name of Jurisdiction:	Dadeville R-II School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of communication between jurisdictions regarding hazard mitigation
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dadeville R-II School District 3.1
Name of Action or Project:	Information sharing
Mitigation Category:	Education and Outreach
Action or Project Description:	Share information with all jurisdictions and entities responsible for critical/vulnerable facilities and services.
Estimated Cost:	$0
Benefits:	Cohesive response by all jurisdictions during hazard events.
Plan for Implementation	
Responsible Organization/Department:	Superintendent
Supporting Organization/Department:	Dade County Emergency Management
Action/Project Priority:	37
Timeline for Completion:	Ongoing
Potential Fund Sources:	Local funds
Local Planning Mechanisms to be Used in Implementation, if any:	Master plan, emergency plan, budgeting
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	New administration.

Action Worksheet	
Name of Jurisdiction:	Dadeville R-II School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Mitigation plan is only updated once every five years, while changes in the community can occur yearly which can impact resiliency
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dadeville R-II School District 3.2
Name of Action or Project:	Annual review
Mitigation Category:	Education and Outreach
Action or Project Description:	Annually review the Dade County Emergency Operations Plan and Hazard Mitigation Plan
Estimated Cost:	$0
Benefits:	Awareness of identified actions and ability to update plan as changes occur.
Plan for Implementation	
Responsible Organization/Department:	School Board and Superintendent.
Supporting Organization/Department:	Dade County Emergency Team
Action/Project Priority:	36
Timeline for Completion:	1 month
Potential Fund Sources:	Local funds
Local Planning Mechanisms to be Used in Implementation, if any:	Master plan, emergency plan, budgeting
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Will be annually reviewed at Dadeville School Board meetings.

4.3.7 Greenfield R-IV School District Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Notification for server weather
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Greenfield R-IV School District 1.1
Name of Action or Project:	NOAA weather radios
Mitigation Category:	Prevention
Action or Project Description:	Use NOAA all-hazard radios with S.A.M.E technology in all critical/vulnerable facilities, residences, businesses, and places of population concentration.
Estimated Cost:	$300
Benefits:	Weather radios will better warn building administrators from incoming storms
Plan for Implementation	
Responsible Organization/Department:	Maintenance dept
Supporting Organization/Department:	Central office
Action/Project Priority:	39
Timeline for Completion:	2 months
Potential Fund Sources:	Operating funds
Local Planning Mechanisms to be Used in Implementation, if any:	Emergency operations plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	All buildings are equipped with weather radios

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Limited public knowledge/resources on how to reduce risk
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Greenfield R-IV School District 1.2
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	$500-1000 annually
Benefits:	Better prepare the community for natural hazards
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	
Action/Project Priority:	32
Timeline for Completion:	1 year
Potential Fund Sources:	Operating funds
Local Planning Mechanisms to be Used in Implementation, if any:	Emergency operations plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Material is made available for faculty, students, community

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Severe thunderstorm, tornado
Problem being Mitigated:	Unsafe environment during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Greenfield R-IV School District 1.3
Name of Action or Project:	Retrofit existing facilities
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Where feasible, retrofit doors and windows in existing critical/vulnerable facilities serving concentrated populations.
Estimated Cost:	$100,000
Benefits:	Replace older windows and doors with new doors and windows that are capable of withstanding higher winds
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance department
Action/Project Priority:	31
Timeline for Completion:	2 years
Potential Fund Sources:	Capital fund and deb service
Local Planning Mechanisms to be Used in Implementation, if any:	Budgeting process, capital improvement plan, safety planning
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Lack of funding to complete

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm
Problem being Mitigated:	No safe place to shelter during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Greenfield R-IV School District 1.4
Name of Action or Project:	Safe room construction
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Construct tornado/severe wind safe rooms in areas of population concentration.
Estimated Cost:	$3,000,000-5,000,000
Benefits:	Provide a safe location for students and community members to go during a severe storm
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance dept
Action/Project Priority:	30
Timeline for Completion:	2-5 years
Potential Fund Sources:	Debt service
Local Planning Mechanisms to be Used in Implementation, if any:	Capital improvement plan, budgeting process, safety planning
Progress Report	
Action Status:	Continuing no progress
Report of Progress:	Lack of funding to complete

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, tornado, severe thunderstorms, severe winter weather
Problem being Mitigated:	Construction standards are not high enough to prevent damage caused by severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Greenfield R-IV School District 1.5
Name of Action or Project:	Construction standards
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	incorporate hazard mitigation construction standards into design and construction of new facilities
Estimated Cost:	$1,000
Benefits:	Will better prepare the district for severe weather
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance dept
Action/Project Priority:	27
Timeline for Completion:	1 year
Potential Fund Sources:	Operating
Local Planning Mechanisms to be Used in Implementation, if any:	Comprehensive plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Hazard mitigation is considered for any long-range planning

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado
Problem being Mitigated:	Loss of power during hazard events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Greenfield R-IV School District 2.1
Name of Action or Project:	Backup generators
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install emergency backup generators where needed for critical and vulnerable facilities and infrastructure.
Estimated Cost:	$5,000-10,000
Benefits:	Allows the district to continue to operate during loss of power
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance dept
Action/Project Priority:	29
Timeline for Completion:	1 year
Potential Fund Sources:	Capital
Local Planning Mechanisms to be Used in Implementation, if any:	Capital improvement plan, budgeting process, safety planning
Progress Report	
Action Status:	Continuing no progress
Report of Progress:	Lack of funding

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Disconnect between hazard mitigation and other plans, programs, and regulations
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Greenfield R-IV School District 2.2
Name of Action or Project:	Goals integration
Mitigation Category:	Education and Outreach
Action or Project Description:	Incorporate the goals, objectives, and mitigation actions from the Greenfield R-IV School District Natural Hazard Mitigation Plan into existing and new plans, programs, and regulations where appropriate.
Estimated Cost:	$1,000
Benefits:	Better protect our students and employees from severe weather
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance dept
Action/Project Priority:	31
Timeline for Completion:	6 months
Potential Fund Sources:	Operating
Local Planning Mechanisms to be Used in Implementation, if any:	Comprehensive plan, safety planning
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Hazard mitigation is used for long range planning

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of communication between jurisdictions regarding hazard mitigation
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Greenfield R-IV School District 3.1
Name of Action or Project:	Information sharing
Mitigation Category:	Education and Outreach
Action or Project Description:	Share information with all jurisdictions and entities responsible for critical/vulnerable facilities and services.
Estimated Cost:	$1,000
Benefits:	To better prepare the community and all jurisdiction for severe weather
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	
Action/Project Priority:	40
Timeline for Completion:	6 months
Potential Fund Sources:	Operating
Local Planning Mechanisms to be Used in Implementation, if any:	Comprehensive plan, safety planning
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	This is ongoing and done annually

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Mitigation plan is only updated once every five years, while changes in the community can occur yearly which can impact resiliency
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Greenfield R-IV School District 3.2
Name of Action or Project:	Annual review
Mitigation Category:	Education and Outreach
Action or Project Description:	annually review the Greenfield R-IV School District Emergency Operations Plan and Hazard Mitigation Plan
Estimated Cost:	No cost
Benefits:	Keep faculty and staff informed on safety measures
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance dept
Action/Project Priority:	40
Timeline for Completion:	Annually throughout the year
Potential Fund Sources:	Operating
Local Planning Mechanisms to be Used in Implementation, if any:	Comprehensive plan, safety plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Ongoing and done annually

Action Worksheet	
Name of Jurisdiction:	Greenfield R-IV School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Evacuation routes during and after hazard events
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Greenfield R-IV School District 3.3
Name of Action or Project:	Evacuation and emergency access
Mitigation Category:	Emergency Services
Action or Project Description:	Review emergency access routes and evacuation routes and work with the responsible entities to minimize or reduce identified problems.
Estimated Cost:	$3,000
Benefits:	Better prepare students and faculty for evacuation or safe location during severe weather events
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance dept
Action/Project Priority:	45
Timeline for Completion:	6 months
Potential Fund Sources:	Operating
Local Planning Mechanisms to be Used in Implementation, if any:	Comprehensive plan, safety plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Ongoing and reviewed annually

4.3.8 Lockwood R-I School District Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Lockwood R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	Earthquake, severe thunderstorm, tornado
Problem being Mitigated:	Limited real time knowledge of severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Lockwood R-I School District 1.1
Name of Action or Project:	Alert systems
Mitigation Category:	Prevention
Action or Project Description:	Use available alert and automated messaging systems to provide storm warning.
Estimated Cost:	500.00
Benefits:	The sooner we can get warnings the greater the chance of saving lives. We have a new storm shelter and the sooner that we get people notified the sooner they can access our shelter.
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Building principals
Action/Project Priority:	32
Timeline for Completion:	1 year
Potential Fund Sources:	Local tax effort
Local Planning Mechanisms to be Used in Implementation, if any:	Capital improvement plan, emergency plan
Progress Report	
Action Status:	Continuing no progress
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Lockwood R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of awareness of natural hazards and ways to reduce risk
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Lockwood R-I School District 1.2
Name of Action or Project:	Public Awareness
Mitigation Category:	Education and Outreach
Action or Project Description:	Provide educational materials on natural hazards and ways to reduce risk
Estimated Cost:	500.00
Benefits:	Through educating our community we would hope to reduce the amount of damage done in the event of a natural hazard or disaster.
Plan for Implementation	
Responsible Organization/Department:	Building level principals
Supporting Organization/Department:	Central office
Action/Project Priority:	26
Timeline for Completion:	2 years
Potential Fund Sources:	Local tax effort
Local Planning Mechanisms to be Used in Implementation, if any:	Curriculum committee
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Lockwood R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm
Problem being Mitigated:	Damage caused to property and people during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Lockwood R-I School District 1.3
Name of Action or Project:	Retrofit existing facilities
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Where feasible, retrofit doors and windows in existing critical/vulnerable facilities serving concentrated populations.
Estimated Cost:	100,000.00
Benefits:	This would make our building much safer in the event of a high wind event. If we have more secure windows students in classrooms would be much safer.
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	Maintenance
Action/Project Priority:	35
Timeline for Completion:	3
Potential Fund Sources:	Possible bond issue, HMGP/BRIC
Local Planning Mechanisms to be Used in Implementation, if any:	Capital improvement plan, emergency plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	Some doors have been replaced, but no windows due to lack of funding

Action Worksheet	
Name of Jurisdiction:	Lockwood R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, severe thunderstorm, severe winter weather, tornado, earthquake
Problem being Mitigated:	Loss of power during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 2 - Reduce the potential impact of natural disasters to property, infrastructure, and the local economy.
Action/Project Number:	Lockwood R-I School District 2.1
Name of Action or Project:	Backup generators
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install emergency backup generators where needed for critical and vulnerable facilities and infrastructure.
Estimated Cost:	20,000.00
Benefits:	Would allow our buildings to be as a resource for our community in the event of power outages. This would be in a short term or potentially longer outage event.
Plan for Implementation	
Responsible Organization/Department:	Central office
Supporting Organization/Department:	School board
Action/Project Priority:	29
Timeline for Completion:	3 years
Potential Fund Sources:	Possible bond issue HMGP/BRIC
Local Planning Mechanisms to be Used in Implementation, if any:	Capital improvement plan, emergency plan
Progress Report	
Action Status:	Continuing no progress
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Lockwood R-I School District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Mitigation plan is only updated once every five years, while changes in the community can occur yearly which can impact resiliency
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Lockwood R-I School District 3.1
Name of Action or Project:	Annual review
Mitigation Category:	Education and Outreach
Action or Project Description:	Annually review the Dade County Emergency Operations Plan and Hazard Mitigation Plan.
Estimated Cost:	200.00
Benefits:	This will help our district stay involved in continued growth in reducing the effects on our community when natural hazard events take place.
Plan for Implementation	
Responsible Organization/Department:	Superintendent
Supporting Organization/Department:	Building principals
Action/Project Priority:	34
Timeline for Completion:	1 year
Potential Fund Sources:	In kind donation of time
Local Planning Mechanisms to be Used in Implementation, if any:	Capital improvement plan, emergency plan
Progress Report	
Action Status:	Continuing in Progress
Report of Progress:	

4.3.9 Dade County Emergency Services 911 Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Dade County Emergency Services 911
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Loss of power during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 3 – ensure continue operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County Emergency Services 911 3.1
Name of Action or Project:	Backup generator
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	ensure emergency 911 communications and dispatch can continue in the vent of severe weather damage
Estimated Cost:	$90,000-$105,000
Benefits:	Generator power ensures that emergency 911 phone systems, radio equipment and CAD programs remain running in the event that commercial electrical power is lost. This helps keep the public connected to emergency response systems.
Plan for Implementation	
Responsible Organization/Department:	Dade County Emergency Services/911.
Supporting Organization/Department:	Dade County Emergency Management
Action/Project Priority:	40
Timeline for Completion:	10 Months after funding obtained
Potential Fund Sources:	HMGP, BRIC, USDA, CDBG
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	New
Report of Progress:	Obtaining funding will be the largest hurdle to overcome in this plan.

Action Worksheet	
Name of Jurisdiction:	Dade County Emergency Services 911
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, earthquake, drought, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Loss of power during severe weather events
Action or Project	
Applicable Goal Statement:	Goal 3 – ensure continue operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County Emergency Services 911 3.2
Name of Action or Project:	Backup mobile communications system
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	ensure emergency 911 communications and dispatch can continue in the vent of severe weather damage
Estimated Cost:	$35,000-45,000
Benefits:	Provide an alternative method of communicating to emergency service personnel in the vent that the primary radio system is rendered inoperable
Plan for Implementation	
Responsible Organization/Department:	Dade County Emergency Services 911
Supporting Organization/Department:	Dade County Emergency Management
Action/Project Priority:	39
Timeline for Completion:	10 months after funding obtained
Potential Fund Sources:	HMGP, BRIC, USDA, CDBG
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	New
Report of Progress:	Obtaining funding will be the largest hurdle to overcome in this plan

Action Worksheet	
Name of Jurisdiction:	Dade County Emergency Services 911
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of communication between jurisdictions regarding hazard mitigation
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dade County Emergency Services 911 3.3
Name of Action or Project:	Information sharing
Mitigation Category:	Education and Outreach
Action or Project Description:	Share information with all jurisdictions and entities responsible for critical/vulnerable facilities and services.
Estimated Cost:	$1,000
Benefits:	To better prepare the community and all jurisdiction for severe weather
Plan for Implementation	
Responsible Organization/Department:	Dade County Emergency Services 911
Supporting Organization/Department:	Dade County Emergency Management
Action/Project Priority:	30
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	New
Report of Progress:	

4.3.10 Dadeville Rural Fire Protection District Mitigation Actions

Action Worksheet	
Name of Jurisdiction:	Dadeville Rural Fire Protection District
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado, severe thunderstorm, severe winter weather
Problem being Mitigated:	Lack of outdoor storm warning sirens in the community of Bona
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dadeville Rural Fire Protection District 1.1
Name of Action or Project:	Outdoor storm sirens
Mitigation Category:	Structure and Infrastructure Projects
Action or Project Description:	Install a storm siren in the Bona area and enter into an agreement with Dade County 911 to activate in accordance to the county severe weather plan
Estimated Cost:	$100,000
Benefits:	An outdoor warning siren would provide valuable advance notice to the area in the event of a severe storm, potentially saving lives.
Plan for Implementation	
Responsible Organization/Department:	Dadeville Rural Fire Protection District
Supporting Organization/Department:	Dade County Emergency Management and Dade County Emergency Services
Action/Project Priority:	33
Timeline for Completion:	18 months
Potential Fund Sources:	HMGP, BRIC, USDA
Local Planning Mechanisms to be Used in Implementation, if any:	Mutual aid agreement
Progress Report	
Action Status:	Continuing Not Started
Report of Progress:	Lack of funding

Action Worksheet	
Name of Jurisdiction:	Dadeville Rural Fire Protection District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, drought, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Funding for mitigation practices
Action or Project	
Applicable Goal Statement:	Goal 1 - Protect lives and livelihood of all citizens.
Action/Project Number:	Dadeville Rural Fire Protection District 1.2
Name of Action or Project:	Funding identification
Mitigation Category:	education and outreach
Action or Project Description:	Monitor and identify funding from state and federal programs for hazard mitigation activities
Estimated Cost:	Can be completed with current budget
Benefits:	Expand fire fighting capabilities with additional funding
Plan for Implementation	
Responsible Organization/Department:	Dadeville Rural Fire Protection District
Supporting Organization/Department:	Dade County Emergency Management and Dade County Emergency Services
Action/Project Priority:	33
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	budgeting
Progress Report	
Action Status:	New
Report of Progress:	

Action Worksheet	
Name of Jurisdiction:	Dadeville Rural Fire Protection District
Risk / Vulnerability	
Hazard(s) Addressed:	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire
Problem being Mitigated:	Lack of communication between jurisdictions regarding hazard mitigation
Action or Project	
Applicable Goal Statement:	Goal 3 - Ensure continued operation of government, emergency functions, and critical infrastructure in a disaster
Action/Project Number:	Dadeville Rural Fire Protection District 3.1
Name of Action or Project:	Information sharing
Mitigation Category:	Education and Outreach
Action or Project Description:	Share information with all jurisdictions and entities responsible for critical/vulnerable facilities and services.
Estimated Cost:	$1,000
Benefits:	To better prepare the community and all jurisdiction for severe weather
Plan for Implementation	
Responsible Organization/Department:	Dadeville Rural Fire Protection District
Supporting Organization/Department:	Dade County Emergency Management and Dade County Emergency Services
Action/Project Priority:	30
Timeline for Completion:	Ongoing
Potential Fund Sources:	General funds
Local Planning Mechanisms to be Used in Implementation, if any:	budgeting
Progress Report	
Action Status:	New
Report of Progress:	

4.4 Mitigation Action Matrix

Table 4.3. Mitigation Action Matrix

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
Prevention								
1.2	NOAA weather radios	Dade County	32	1	Severe thunderstorm, tornado	X		
1.4	Alert systems	Dade County	29	1	Severe thunderstorm, tornado			
2.6	NFIP enforcement	Dade County	31	2	flooding	X	X	X
2.7	Burn restrictions	Dade County	30	2	Wildfire			
2.8	Ditches	Dade County	28	2	Flooding, severe thunderstorm	X		
2.2	NFIP Enforcement	Arcola	35	2	Flooding, severe thunderstorm	X	X	X
1.1	NOAA weather radios	Greenfield	18	1	Severe thunderstorm, tornado	X		
1.2	Alert systems	Greenfield	34	1	Severe thunderstorm. tornado			
2.2	NFIP enforcement	Greenfield	42	2	Flooding	X	X	X
2.2	NFIP enforcement	Lockwood	30	2	Flooding	X	X	X
1.2	Construction standards	Dadeville R-II School District	35	1	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather, wildfire		X	
2.2	Goals integration	Dadeville R-II School District	34	2	Flooding, earthquake, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
1.1	NOAA weather radios	Greenfield R-IV School District	39	1	Severe thunderstorm, tornado	X		
1.1	Alert system	Lockwood R-I School District	32	1	Earthquake, severe thunderstorm, tornado			
Structure and Infrastructure Projects								

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.1	Low water crossing markers	Dade County	37	1	Flooding, severe thunderstorm	X		X
1.3	Outdoor storm sirens	Dade County	24	1	Tornado, severe thunderstorm		X	
1.7	Retrofit existing facilities	Dade County	25	1	Severe thunderstorm, tornado,	X		
1.8	Safe room construction	Dade County	33	1	Tornado, severe thunderstorm	X	X	
2.1	Backup generators	Dade County	32	2	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X	X	
2.2	Low water crossing upgrades	Dade County	27	2	Flooding, severe thunderstorm	X		X
2.3	Storm water improvements	Dade County	28	2	Flooding, severe thunderstorm	X		X
2.9	Hulston bridge	Dade County	32	2	Flooding, severe thunderstorm	X		X
3.3	Equipment upgrades	Dade County	34	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire	X		
2.1	Backup generator	Arcola	43	2	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X		
1.4	Safe room construction	Greenfield	27	1	Severe thunderstorm, tornado	X	X	
1.5	Construction standards	Greenfield	42	1	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather			
2.1	Storm water management	Greenfield	13	2	Flooding, severe thunderstorm	X		X
1.1	Backup generator	Lockwood	30	1	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X		

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
2.1	Equipment upgrades	Lockwood	25	2	Flooding, earthquake, drought, extreme temp, severe thunderstorm, severe winter weather, tornado			
1.1	Safe room construction	South Greenfield	30	1	Tornado, severe thunderstorm, earthquake	X		
2.1	Highway 39 bridge	South Greenfield	41	2	Flooding, severe thunderstorm, severe winter weather	X		
2.2	City road improvements	South Greenfield	43	2	Flooding, severe thunderstorm, severe winter weather	X		
1.1	Safe room construction	Dadeville R-II School District	37	1	Tornado, severe thunderstorm	X		
2.1	Backup generator	Dadeville R-II School District	36	2	Tornado, severe thunderstorm, wildfire	X		
1.3	Retrofit existing facilities	Greenfield R-IV School District	31	1	Severe thunderstorm, tornado	X		
1.4	Safe room construction	Greenfield R-IV School District	30	1	Severe thunderstorm, tornado	X		
1.5	Construction standards	Greenfield R-IV School District	27	1	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather			
2.1	Backup generator	Greenfield R-IV School District	29	2	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado	X		
1.3	Retrofit existing facilities	Lockwood R-I School District	35	1	Tornado, severe thunderstorm	X		
2.1	Backup generator	Lockwood R-I School District	29	2	Flooding, severe thunderstorm, severe winter weather, tornado, earthquake	X		

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.1	Backup generator	Dade County Emergency Services 911	40	3	Flooding, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire	X		
3.2	Backup mobile communications system	Dade County Emergency Services 911	39	3	Flooding, earthquake, drought, severe thunderstorm, severe winter weather, tornado, wildfire	X		
1.1	Outdoor storm siren	Dadeville Rural Fire Protection District	33	1	Tornado, severe thunderstorm, severe winter weather		X	
Natural Systems Protection								
-	-	-	-	-	-	-	-	-
Emergency Services								
3.2	Emergency response access	Dade County	28	3	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire	X	X	X
3.4	Evacuation and emergency access	Dade County	28	3	Flooding, dam failure, earthquake, severe thunderstorm, severe winter weather, tornado, wildfire	X	X	X
3.3	Evacuation and emergency access	Greenfield R-IV School District	45	3	Flooding, earthquake, tornado, severe thunderstorm, severe winter weather, tornado, wildfire	X	X	X
Education and Outreach								
1.5	Public awareness	Dade County	29	1	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.6	Information website	Dade County	35	1	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
1.9	Community programs	Dade County	28	1	Extreme temps, severe thunderstorm, tornado, severe winter weather			
2.4	Drought-resistant practices	Dade County	31	2	Drought, wildfire			
2.5	Goal integration	Dade County	28	2	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
3.1	Information sharing	Dade County	28	3	Flooding, earthquake, drought, extreme temps, severe thunderstorm, severe winter weather, tornado, wildfire			
1.1	Public awareness	Arcola	35	1	Dam failure, sinkhole, drought, extreme temperatures, wildfire			
1.3	Public awareness	Greenfield	34	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.6	Community programs	Greenfield	8	1	Extreme temp, severe thunderstorm, tornado, severe winter weather			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.2	Public Awareness	Lockwood	30	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Public Awareness	South Greenfield	30	1	Dam failure, sinkhole, drought, extreme temps, wildfire			
3.1	Information sharing	Dadeville R-II School District	37	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.2	Annual review	Dadeville R-II School District	36	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Public awareness	Greenfield R-IV School District	32	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
2.2	Goal integration	Greenfield R-IV School District	31	2	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.1	Information sharing	Greenfield R-IV School District	40	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.2	Annual review	Greenfield R-IV School District	40	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Public awareness	Lockwood R-I School District	26	1	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.1	Annual review	Lockwood R-I School District	34	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
3.3	Information Sharing	Dade County Emergency Services 911	30	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			
1.2	Funding identification	Dadeville Rural Fire Protection District	33	1	Flooding, drought, severe thunderstorm, severe winter weather, tornado, wildfire			

#	Action	Jurisdiction	Priority	Goal Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.3	Information Sharing	Dadeville Rural Fire Protection District	30	3	Flooding, dam failure, earthquake, sinkhole, drought, extreme temperatures, severe thunderstorm, severe winter weather, tornado, wildfire			

5 PLAN MAINTENANCE PROCESS

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

5.1 Monitoring, Evaluating, and Updating the Plan

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

5.1.1 Responsibility for Plan Maintenance

The Mitigation Planning Committee (MPC) has served as an advisory body during the plan update process, but it is not a standing committee. Many MPC representatives and stakeholders are also represented on the Local Emergency Planning Committee (LEPC), as well as several other committees and groups in Dade County. The County Emergency Management Director oversees the LEPC and will be charged with reconvening the MPC, either as part of the already established LEPC or as a separate group, if necessary. However, it will be up to the County Commission, Office of Emergency Management, and local jurisdictions to carry out the goals and actions outlined. Maintenance will involve agreement of the participating jurisdictions, including schools and special districts, to:

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

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

5.1.2 Plan Maintenance Schedule

The MPC should meet annually and after any state or federally declared hazard events as appropriate to monitor progress and update the mitigation strategy. The Dade 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, a five-year written update of the plan will be submitted to the Missouri State Emergency Management Agency (SEMA) and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. During future meetings, the MPC (or other designated responsible entity) will review changes in vulnerability identified as follows:

- Decreased vulnerability as a result of implementing mitigation actions
- Increased vulnerability as a result of failed or ineffective mitigation actions
- Increased vulnerability due to hazard events,
- 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
- 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 are advised to adopt the following process:

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC (or designated responsible entity) member on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdictional MPC (or designated

responsible entity) member will determine necessary remedial action, making any required modifications to the plan.

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

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 Dade County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

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

Jurisdictional representatives involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The EMD and MPC are also responsible for monitoring this integration and incorporation of the appropriate information into the next five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual review of the Hazard Mitigation Plan, the County Emergency Management Director will provide the updated Mitigation Strategy with the 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 Management 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
Dade County	Emergency plan Recovery plan Debris management plan Watershed plan Mitigation plan Floodplain ordinance Floodplain administrator Critical facilities plan Vulnerable population inventory Land use map	Emergency operations plan Annual budget Mitigation plan Floodplain ordinance	Hazard mitigation plan Emergency plan Debris management plan Watershed plan Floodplain ordinance
Arcola	Mitigation plan Floodplain ordinance Floodplain administrator Tree trimming ordinance	Annual budget Floodplain ordinance	Grant writing Budgeting Floodplain ordinance
Greenfield	Comprehensive plan Capital improvement plan Emergency plan Recovery plan Mitigation plan Firewise Critical facilities plan Zoning ordinance Building code Floodplain ordinance Floodplain administrator Nuisance ordinance Landscape ordinance Planning and Zoning Stream maintenance program Tree trimming program Mutual aid agreements Evacuation route map Land use map	Emergency operations plan Annual budget Building code Floodplain ordinance Council meeting	Comprehensive plan Emergency plan Hazard mitigation plan Capital improvement plan Critical facilities plan Zoning ordinance Building code Floodplain ordinance
Lockwood	Comprehensive plan Emergency plan Mitigation plan Building codes Floodplain ordinance Floodplain administrator Tree trimming ordinance Nuisance ordinance Drainage ordinance NWS ready Planning and zoning Tree trimming program Mutual aid agreements	Annual budget Emergency operations plan Building code Drainage ordinance	Emergency operations plan Floodplain ordinance
South Greenfield	Nuisance ordinance Mitigation plan	Annual budget	Budgeting Comprehensive plan
Dadeville R-II	Master plan School emergency plan Capital improvement planning	Annual budget Master plan CSIP School emergency plan	Master plan Emergency plan Capital improvement plan Budgeting

	Full time emergency manager		
Greenfield R-IV	School emergency plan Full time grant writer Full time emergency manager	Annual budget Master plan Capital improvement plan School emergency plan	Emergency operations plan Budgeting Capital improvement plan Safety planning
Lockwood R-I	Capital improvement plan School emergency plan Full time emergency manager	Annual budget Emergency plan	Capital improvement plan Curriculum committee Emergency plan
Dade County Emergency Services 911	Emergency operations plan Continuity of operations plan	Did not participate in the previous plan	None identified
Dadeville Rural Fire Protection District	Mutual aid agreements	Annual budget	Mutual aid agreement budgeting

It should be noted, however, that throughout the course of plan update process, it was determined that incorporating the previous hazard mitigation plan into other plans and projects was generally not a focus over the last five years. Hazard mitigation principles were broadly considered when developing yearly budgets, and some of the larger communities with more staff and departments dedicated to emergency management were able to focus more on this topic, but those communities generally focused on their own planning independent of the county hazard mitigation plan. Moving forward, all participants should work to incorporate this plan update into any other relevant plans they might have, including emergency management plans, capital improvement plans, master plans, floodplain management plans, etc.

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.

Maintaining a hazard mitigation plan is crucial for the safety and resiliency of a community. Continued public participation is an important step in that process, as it is key to ensuring that the plan reflects the needs and concerns of the community. Participating jurisdictions (including municipalities, school districts, and special districts) will actively solicit public participation through a combination of the following methods:

- **Public Meetings and Workshops**: Host public meetings and workshops organized by local government or emergency management agencies. These events provide opportunities to learn about the hazard mitigation plan, ask questions, and provide input.
- **Community Surveys**: Craft community surveys designed to gather opinions and feedback on hazard mitigation priorities. These surveys may be conducted online, by mail, or in-person at community events.
- **Open Houses**: Host open houses dedicated to hazard mitigation planning. These events often include displays, presentations, and interactive activities to inform the public about the plan and gather input on future changes.
- **Advisory Committees**: Create hazard mitigation planning advisory committees. These committees often include representatives from various community sectors, and they play a role in decision-making and plan development.
- **Online Platforms**: Post information and updates about the hazard mitigation plan,

mitigation actions, and ongoing efforts to increase resiliency on official websites and social media platforms.

- **Educational Programs**: Host educational programs and outreach initiatives. These programs can provide information on hazards, risk reduction strategies, and the importance of community involvement.
- **Collaborative Initiatives**: Engage in collaborative initiatives with local organizations, non-profits, and businesses that focus on hazard mitigation.
- **Emergency Preparedness Events**: Host events related to emergency preparedness, where hazard mitigation planning may be discussed. These events often provide opportunities for dialogue between the public and emergency management professionals.
- **Media Engagement**: News articles, radio broadcasts, and other media may highlight updates and opportunities for public involvement in hazard mitigation planning.

By actively participating in these activities, community members can contribute valuable insights, share local knowledge, and play a role in shaping hazard mitigation strategies that enhance the overall resilience of their community.