

# **2019 Perry County Multi-Jurisdictional Hazard Mitigation Plan**

5 Year Update



Southeast Missouri  
Regional Planning Commission

## CONTRIBUTORS

### Perry County Hazard Mitigation Planning Committee

#### Jurisdictional Representatives

Name	Title	Department	Jurisdiction/Agency/Organization
Hank Voelker	Emergency Management Director/911	Emergency Management	Perry County
Jay Wengert	County Commissioner	County Commission	Perry County
Jared Kurtz	County Clerk	County Commission	Perry County
Brent Buerck	City Administrator	Administration	Perryville
Jim Cadwell	Parks & Rec Director	Parks & Rec	Perryville
Tracy Prost	City Clerk	Administration	Perryville
Angela Brown	Building Inspector/Zoning Admin	Administration	Perryville
Bill Jones	Assistant Police Chief	Police	Perryville
Andy Comstock	Superintendent	Administration	Perry Co School Dist 32

#### Stakeholder Representatives

Name	Title	Department	Agency/Organization
Valerie Klein	Director	Administration	Perry County Health Dept.
Patrick Carron	President/CEO	Administration	Perry County Memorial Hospital
Jeremy Triller	Chief	Fire Department	Perryville
Mark Brown	Director	Public Works	Perryville
Gary Schaaf	Sheriff	Sheriff's	Sheriff's Department

Capt. Jeffrey Vitale	Commanding Officer	Administration	MSHP Region E
Van Robinson	CEO	Administration	Citizens Electric Cooperative
Steve Besemer	Mitigation Planner	Mitigation	Missouri State Emergency Management Agency
Jackson Bostic	Director	Southeast Regional Office	Missouri Department of Natural Resources
Leslie Sebaugh	Coordinator	Regional Homeland Security Oversight Committee	SEMO Regional Planning Commission
David Grimes	Coordinator	Solid Waste Management District	SEMO Regional Planning Commission
Chris Harmon	Regional Disaster and Program Officer	Administration	American Red Cross - Eastern Missouri Chapter
Brian Okenfuss	Area Engineer	SE District	Missouri Department of Transportation

Stakeholders are individuals or groups that are affected by a mitigation action or policy and include businesses, private organizations, and citizens. Unlike planning team members, stakeholders may not be involved in all stages of the planning process, but they inform the planning team on a specific topic or provide input from different points of view in the community. Many of the Stakeholders and Jurisdictional Representatives listed above provided feedback, input, and information through discussions over the phone, emails, or in-person, but were not in attendance at Hazard Mitigation Planning Team meetings.

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## EXECUTIVE SUMMARY

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The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Perry County and participating jurisdictions and school/special districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to the County and its communities and school/special districts. The plan is an update of a plan that was approved on October 10, 2013. The plan and the update were prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to result in eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

The County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following three (3) jurisdictions that participated in the planning process:

- Perry County
- Perryville
- Perry County School District No. 32

The cities of Altenburg and Frohna, the school district of Altenburg 48, and the Bois Brule Levee District were invited to participate in the planning process but did not meet all of the established requirements for official participation. When the future five-year update is developed for this plan, these jurisdictions will be invited again to participate.

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

The plan update process followed a methodology prescribed by FEMA, which began with the formation of a Hazard Mitigation Planning Committee (HMPC) comprised of representatives from the County and participating jurisdictions. The HMPC updated the risk assessment that identified and profiled hazards that pose a risk to Perry County and analyzed jurisdictional vulnerability to these hazards. The HMPC 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 HMPC determined that the planning area is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightning/high winds, and tornadoes are among the hazards that historically have had a significant impact.

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

1. Protect the health, safety, and welfare of residents and students.
2. Ensure the operation of critical facilities and services.
3. Protect public and private property.
4. Enhance informed decision making of mitigation actions.

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

## **PREREQUISITES**

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

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

- Perry County
- Perryville
- Perry County School District No. 32

**Model Resolution**

Resolution # \_\_\_\_\_

Adopting the Madison County Multi-Jurisdictional Local Hazard Mitigation Plan

**Whereas**, the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

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

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

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

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

**Whereas**, the (Name of Government/District/Organization) fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

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

**Whereas**, the (Name of Government/District/Organization) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Madison County Multi-Jurisdictional Local Hazard Mitigation Plan; and

**Whereas**, adoption by the governing body for the (Name of Government/District/Organization) demonstrates the jurisdictions’ commitment to fulfilling the mitigation goals outlined in this Multi-Jurisdictional Local Hazard Mitigation Plan; and

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

**Now, therefore, be it resolved**, that the (Name of Government/District/Organization) has adopted the “Madison County Multi-Jurisdictional Local Hazard Mitigation Plan” as an official plan.

Date: \_\_\_\_\_

Certifying Official: \_\_\_\_\_

# 1 INTRODUCTION AND PLANNING PROCESS

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## 1.1 Purpose

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The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Hazard mitigation is generally considered to be the actions taken well in advance of a disaster event. Actions taken immediately prior to or during an event or immediately following an event are typically considered response and recovery actions, respectively. This plan has been developed to assist participating jurisdictions in identifying potential hazard exposures and defining actions that can limit such.

For jurisdictions to be eligible for federal Hazard Mitigation Grants, they must participate in this planning process and adopt the plan by resolution. Any jurisdictions that do not participate will be ineligible for such grants until the next plan update is undertaken. This plan is viable for five (5) years from the date of FEMA approval.

For additional information about the Hazard Mitigation Planning Process, please refer to: the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007 (hereafter referred to collectively as the Disaster Mitigation Act or DMA) and the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

## 1.2 Background and Scope

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This hazard mitigation plan (HMP) is an update to the 2013 Perry County HMP which was approved by FEMA on October 10, 2013. This plan is valid for a period of five years and will undergo a full update cycle in 2024.

The following table provides a list of participants during this plan update process as well as the previous one.

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**Table 1.1. Plan Participants**

Jurisdiction	NFIP Participant	Participating Jurisdiction (2013)	Participating Jurisdiction Criteria (2019)				Participating Jurisdiction (2019)
			Meetings Attended	Actions Developed	Draft Reviewed	Formal Adoption	
Perry County	Y	X	X	X	X	X	X
Altenburg	Y	X					
Frohna	Y	X					
Perryville	Y	X	X	X	X	X	X
Altenburg School Dist No. 48		X					
Perry County School Dist No. 32		X	X	X	X	X	X
Bois Brule Levee District		X					

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use and development policy in the future. Actions from this plan will also be incorporated into local jurisdiction's other planning efforts as appropriate.

### 1.3 Plan Organization

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This HMP is organized into 5 main chapters, along with an executive summary and appendices, as follows:

- 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 1.2 shows a comparison between this plan's structure and that of the previous plan, along with a summary of changes in each section from the previous plan.

**Table 1.2. Changes Made in Plan Update**

Changes and Revisions	Current Plan Sections	Previous Plan Sections
Participants, stakeholders, resolution of adoption	Executive Summary & Prerequisites	Introduction
		Prerequisites
Information on the current planning process, including dates, locations, participants, and meetings	Introduction and Planning Process	The Planning Process
Information on the planning area including demographics, economics, and assets as well as the capabilities of each jurisdiction	Planning Area Profile and Capabilities	Risk Assessment
Information on jurisdictions' exposure to hazards	Risk Assessment	
Jurisdictions' previous, continuing, and new actions as well as the goals and objectives for the plan	Mitigation Strategy	Hazard Mitigation Program
Information on implementation with other plans and the maintenance schedule and responsibilities	Plan Implementation and Maintenance	Plan Maintenance Process
Additional relevant data	Appendices	Appendices

## 1.4 Planning Process

The Southeast Missouri Regional Planning Commission (SEMO RPC) was contracted by SEMA to facilitate the update of the HMP. RPC staff assisted local jurisdictions in the establishment of an HMPC as defined by the DMA and updated the committee on current requirements for the HMP process. Planning staff determined the plan had been maintained in accordance with the methodology set forth in the previous plan through communications with all participating jurisdictions on a yearly basis to assess the need for revisions to the plan, of which there were none. SEMO RPC staff also ensured the updated plan met the DMA requirements as established by federal regulations and that it followed the most current planning guidance of FEMA.

The RPC also facilitated the entire plan development process by identifying the data which HMPC participants should provide and conducting research and documentation necessary to augment such data and by soliciting public input in the planning process. Commission staff also produced the draft and final plan update in a FEMA-approvable document and coordinated plan reviews with both SEMA and FEMA.

**Table 1.3. Jurisdictional Representatives Perry County Mitigation Planning Committee**

<b>Name</b>	<b>Title</b>	<b>Department</b>	<b>Jurisdiction/Agency/Organization</b>
Hank Voelker	Emergency Management Director/911	Emergency Management	Perry County
Jay Wengert	County Commissioner	County Commission	Perry County
Jared Kurtz	County Clerk	County Commission	Perry County
Brent Buerck	City Administrator	Administration	Perryville
Jim Cadwell	Parks & Rec Director	Parks & Rec	Perryville
Tracy Prost	City Clerk	Administration	Perryville
Angela Brown	Building Inspector/Zoning Admin	Administration	Perryville
Bill Jones	Assistant Police Chief	Police	Perryville
Andy Comstock	Superintendent	Administration	Perry Co School Dist 32

Some of the Representatives listed above were not able to attend the Committee meetings but did participate by providing valuable input and information during the planning process and are therefore considered a part of the committee.

**1.4.1 Multi-Jurisdictional Participation**

Active participation in the hazard mitigation planning process is important to ensure each jurisdiction is adequately represented, that their needs and exposures are properly evaluated, and that their actions are appropriate and effective at addressing those needs and exposures. Representatives from the County, incorporated communities, public schools, and stakeholders were invited to participate in the planning process through certified mail and electronic communications. The DMA requires each jurisdiction to participate in the planning process and officially adopt the plan to be considered an eligible participant.

During its first meeting, the HMPC determined the criteria for being considered an eligible participant in this planning process, as follows:

- Representation (direct or through appointee) at a majority of the public HMPC meetings,
- Actively solicit public input and participation in planning process,
- Review prior plan,

- Complete HMP questionnaire,
- Update jurisdiction’s hazard mitigation actions from previous plan,
- Review and comment on new draft, and
- Adoption of new plan.

Three jurisdictions met all the participation requirements: Perry County, Perryville, and Perry County School Dist No. 32. The remaining jurisdictions chose not to participate in this planning process. These jurisdictions will be invited to participate again in the next plan update process in five (5) years.

For small, rural jurisdictions, participation in planning processes such as these can be difficult. Many rural communities have no full-time staff, and in some cases have only a volunteer clerk. Making committee meetings, completing questionnaires, review previous plans, validating actions, and commenting on drafts are entirely different undertakings for officials who have a full-time day job and a full-time elected position. Additionally, acquiring public input in rural areas can be challenging as well. Many residents lack adequate access to the internet, do not visit their local library or courthouse on a regular basis, and do not subscribe to other media. Limited resources, less population density, and longer commute times mean word of mouth spreads much more slowly in these areas. These issues make it more difficult for small communities and the rural public to participate in planning processes. RPC staff continues to work with jurisdictions to improve public outreach and engagement practices.

Table 1.4 shows the manner of participation for each participating jurisdiction. Meeting sign-in sheets can be found in the appendix. The non-participating jurisdictions stated that they did not see the value in participating in the planning process given they had no ability to match any FEMA mitigation grants and would therefore not be applying for any. Planning staff stressed the value of hazard mitigation planning goes far beyond the opportunity to apply for grants, but these jurisdictions did not feel there was enough value. Planning staff will continue to work with the jurisdictions in question over the next five years to develop a greater understanding and appreciation for the comprehensive benefits of hazard mitigation planning.

**Table 1.4. Jurisdictional Participation in Planning Process**

Jurisdiction	Kick-off Meeting	Meeting #2	Data Collection Questionnaire Response	Update/Develop Mitigation Actions
Perry County	X	X	X	X
Perryville	X	X	X	X
Perry County School Dist. No. 32	X	X	X	X

### 1.4.2 The Planning Steps

SEMO RPC and Perry County worked together to establish the framework and process for this planning effort using FEMA’s *Local Mitigation Planning Handbook* (March 2013). The plan update was completed utilizing the 9-task approach within a broader four-phase process:

1. Organize resources,

- 
2. Assess risks,
  3. Develop the mitigation plan, and
  4. Implement the plan and monitor progress.

Into this process, SEMO RPC integrated a detailed 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program. Table 1.5 shows how this process fits into FEMA's original four-phase DMA process as well as the revised Nine Task Process outlined in the 2013 *Local Mitigation Planning Handbook* and the 10-step CRS process.

**Table 1.5. County Mitigation Plan Update Process**

Phase	Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
I	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)
II	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	
III	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
	Step 7. Review possible activities	201.6(c)(3)(iii)
	Step 8. Draft an action plan	
IV	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)

**Phase I**

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

The planning process resulting in the preparation of this plan document officially began with Meeting #1 in Perryville, MO on November 2, 2017. Participants of the meeting included representatives from all three participating jurisdictions and RPC staff. The purpose of this meeting was to set planning meeting dates, determine hazards to be included in the plan update, discuss options for the flood risk assessment methodology, develop an initial public participation strategy, and discuss the plan update format. Meeting materials are included in the appendix. An HMPC was created that includes representatives from each participating jurisdiction.

After the initial meeting a second planning meeting was held on December 6, 2017. A complete list of all representatives of the agencies and organizations that participated on the HMPC is provided in the appendix.

The HMPC communicated during the planning process with a combination of face-to-face meetings, phone interviews, and email correspondence. The meeting schedule and topics are listed in Table 1.6.

**Table 1.6. Schedule of HMPC Meetings**

Meeting	Topic	Date
Planning Meeting #1	General overview of planning process, requirements, and schedule. Introduction to DMA, hazard identification, and public input strategy. Distribution of data collection guide to jurisdictions. Preliminary hazard rankings. Determine process to monitor, evaluate, and update plan.	November 2, 2017
Planning Meeting #2	Review of draft Risk Assessment, distribution of critical facility inventories for jurisdictions to validate/correct, development of plan goals. Mitigation action update, development, and prioritization.	December 6, 2017

During the meetings, SEMO RPC presented information on the scope and purpose of the plan, participation requirements of HMPC members, and the proposed project work plan and schedule. Plans for public involvement (Step 2) and coordination with other agencies and departments (Step 3) were discussed. SEMO RPC also introduced hazard identification requirements and data needs. The HMPC discussed potential hazards as well as past events and impacts and refined the identified hazards relevant to the County. The HMPC made preliminary determinations of probability and magnitude for each hazard identified.

Participants were given the Data Collection Guide to facilitate the collection of information needed to support the plan, such as data on historic hazard events, values at risk, and current capabilities. Each participating jurisdiction completed and returned the worksheets in the Data Collection Guide to the RPC. SEMO RPC integrated this information into the plan, supporting the development of Chapters 2 and 3.

### ***Step 2: Plan for Public Involvement (Handbook Task 3)***

At the kickoff meeting, the HMPC discussed options for soliciting public input on the mitigation plan. To provide an opportunity for the public to comment during the drafting stage, the committee determined the most effective method would be to invite the public to the HMPC meetings to gather direct input.

The public was also given an opportunity to provide input on a draft of the complete plan prior to its submittal to the State and FEMA. The entire plan draft was made available on the RPC's website as a PDF document. In addition, two hard copies were made available; one at the Emergency Management Office and the other at the County Courthouse. The County and RPC announced the availability of the entire final draft plan and the two-week final public comment period on their websites. A copy of the announcement is provided in the appendix. The final public comment period was from February 26-March 12, 2018.

The HMPC invited other targeted stakeholders to comment on the draft plan via e-mail, and phone conversations, which are described in greater detail in Step 3: Coordinate with Other Departments and Agencies.

Much of the public's input was focused on specific actions they wanted jurisdictions to pursue. These suggestions were forwarded to the HMPC and were discussed with the pertinent jurisdiction and with the HMPC. The specific jurisdictions conducted internal assessments of the suggestions and incorporated the actions when feasible.

**Step 3: Coordinate with Other Departments and Agencies and Incorporate Existing Information (Handbook Task 3)**

There are numerous organizations whose goals and interests interface with hazard mitigation in Perry County. Coordination with these organizations and other community planning efforts is vital to the success of this plan. The County invited neighboring counties, other local, state, and federal departments and agencies to the planning meetings to learn about the hazard mitigation planning initiative. In addition, the HMPC developed a list of additional stakeholders involved in hazard mitigation activities, to invite to review and comment on the draft of the Perry County Multi-jurisdictional Hazard Mitigation Plan prior to submittal to the State and FEMA. Those agencies invited to meetings and/or comment on the plan draft included emergency management officials of adjacent counties, economic development agencies, and various state agencies such as the Department of Natural Resources and MoDOT. The following table shows the other departments and agencies which were coordinated with. All positions were notified via written notice.

Title	Department	Agency/Organization
Director	Administration	Perry County Health Dept.
President/CEO	Administration	Perry County Memorial Hospital
Commanding Officer	Administration	MSHP Region E
CEO	Administration	Citizens Electric Cooperative
Mitigation Planner	Mitigation	Missouri State Emergency Management Agency
Director	Southeast Regional Office	Missouri Department of Natural Resources
Coordinator	Regional Security Oversight Committee	SEMO Regional Planning Commission
Coordinator	Solid Waste Management District	SEMO Regional Planning Commission
Regional Disaster and Program Officer	Administration	American Red Cross - Eastern Missouri Chapter
Area Engineer	SE District	Missouri Department of Transportation
Emergency Management Director	Emergency Management	Cape Girardeau County
Emergency Management Director	Emergency Management	Bollinger County

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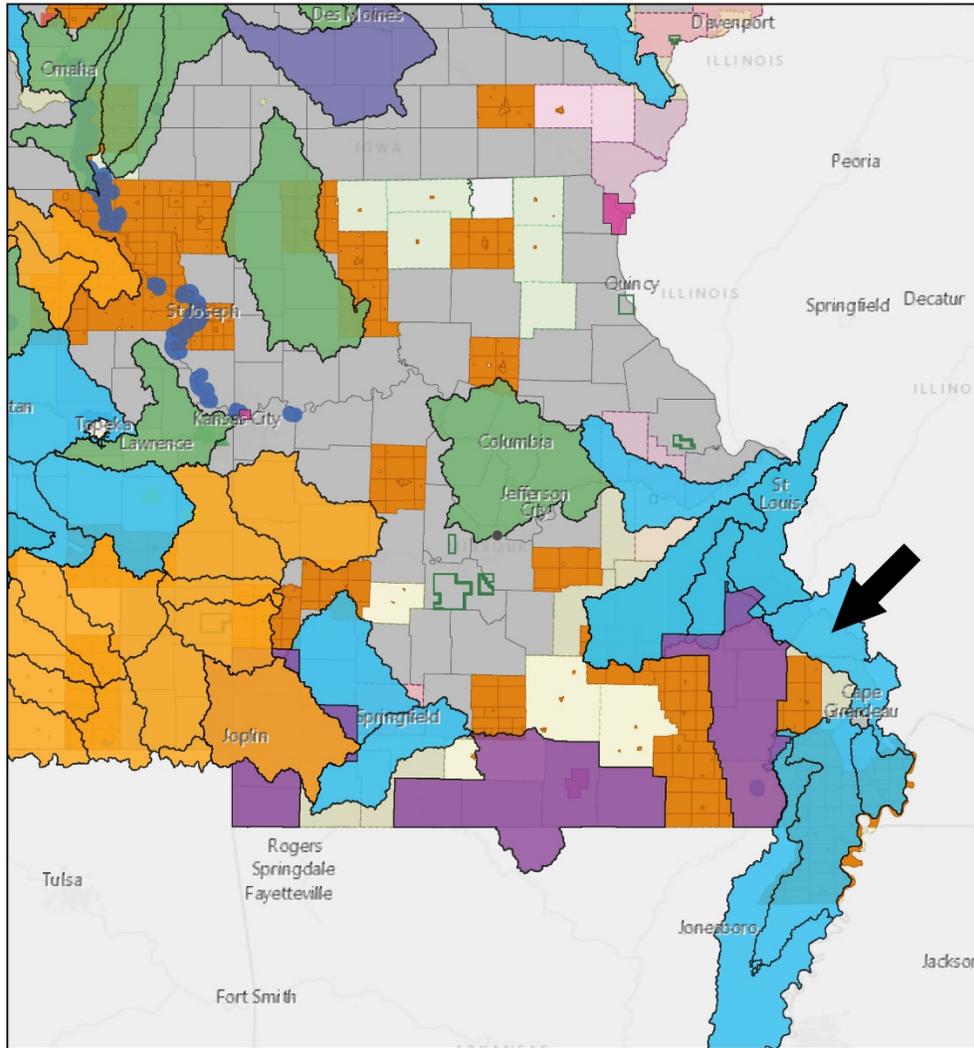
Emergency Director	Management	Emergency Management	Ste. Genevieve County
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### **Coordination with FEMA Risk MAP Project**

Perry County is designated as “Effective FIS/FIRM” for the Risk MAP project. Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens.

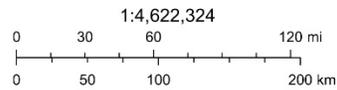
Through collaboration with State, Tribal, and local entities, Risk MAP delivers quality data that increases public awareness and leads to action that reduces risk to life and property. This data is not yet available for the County, though work is underway as the county falls into the Data Development Category. Figure 1.1 Risk MAP Status Map shows the status of regional counties.

**Figure 1.1. RiskMAP Status Map (August 16, 2017)**



9/30/2019, 9:24:33 AM

- Watershed Projects - Automated Engineering
- Watershed Projects - Ongoing: Discovery
- Watershed Projects - Ongoing: Data Development
- Watershed Projects - Flood Risk Products Available
- Watershed Projects - On-Hold



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

### Integration of Other Data, Reports, Studies, and Plans

In addition, input was solicited from many other agencies and organizations that provided information but were not able to attend planning meetings. As part of the coordination with other agencies, the HMPC collected and reviewed existing technical data, reports, and plans. These included:

- Missouri Hazard Mitigation Plan,

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- Perry County Hazard Mitigation Plan (2013),
  - National Flood Insurance Program's Community Information System Reports,
  - Digital Flood Insurance Rate Maps,
  - DNR Dam and Reservoir Safety Program,
  - DNR Sinkhole Location Data,
  - MO Land Use Land Cover Data,
  - National Fire Incident Reporting System Fire Incident Data,
  - Various local plans such as Comprehensive Plans, Economic Development Plans, Emergency Operations Plans, Capital Improvement Plans, etc.

This information was used in the development of the hazard identification, vulnerability assessment, and capability assessment and in the formation of goals, objectives, and mitigation actions. These sources, as well as additional sources of information are documented throughout the plan and in the appendix.

## ***Phase 2: Assess Risk (Handbook Task 5)***

### ***Step 4: Assess the Hazard: Identify and Profile Hazards***

SEMO RPC assisted the HMPC in a process to identify the hazards that have impacted or could impact communities in the County. At the first meeting, the HMPC examined the history of disaster declarations in Perry County, the list of hazards considered in the 2013 Missouri State Hazard Mitigation Plan, and the hazards identified in the previous hazard mitigation plan. The committee then worked through this list of all potential hazards that could affect the planning area. They discussed past hazard events, types of damage, and where additional information might be found. The committee identified 11 natural hazards that have the potential to impact the planning area. Additional information on the hazard identification process and which hazards were identified for each jurisdiction is provided in Chapter 3.

During the kick-off meeting, the HMPC refined the list of hazards to make the analysis relevant to Perry County, discussed past events and impacts and came to consensus on the preliminary probability and magnitude on a county-wide basis. In addition, each jurisdiction completed a Data Collection Guide, including information on previous hazard events in their community. Utilizing the information from the Data Collection Guides as well as existing plans, studies, reports, and technical information as well as information available through internet research and GIS analysis, a profile was developed for each hazard identified. More information on the methodology and resources used to identify and profile the hazards can be found in Chapter 3.

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

Assets for each jurisdiction were identified through a combination of several resources. A listing of critical facilities in each jurisdiction from the previous HMP was presented at Meeting #2 for correction and validation. Once the critical/essential facility lists were validated, they were geo-located to create a consolidated GIS layer of these facilities to be used in additional risk analysis. Methodologies and results of the analyses are provided in Chapter 3.

Additional assets such as historic, cultural, and economic assets as well as specific vulnerable populations and structures were obtained from a variety of sources as described in Chapter 3.

The HMPC also analyzed development trends from data available from the U.S. Census Bureau

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as well as information obtained from each jurisdiction such as Comprehensive Plans and Future Development Plans. For each hazard, there is a discussion regarding future development and how it may impact vulnerability to that specific hazard.

After profiling the hazards that could affect the County and identifying assets, the HMPC collected information to describe the likely impacts of future hazard events on the participating jurisdictions.

Existing mitigation capabilities were also considered in developing loss estimates. This assessment consisted of identifying the existing mitigation capabilities of participating jurisdictions. This involved collecting information about existing government programs, policies, regulations, ordinances, and plans that mitigate or could be used to mitigate risk from hazards. Participating jurisdictions collected information on their regulatory, personnel, fiscal, and technical capabilities, as well as previous and ongoing mitigation initiatives. This information is included in Chapter 2 Planning Area Profile and Capabilities.

Specific capabilities such as participation in the National Flood Insurance Program as well as placement of storm sirens are incorporated in the vulnerability analysis discussions, where applicable.

Taking into consideration the vulnerability and capability assessments, and where sufficient information was available, a variety of methods were used to estimate losses for each profiled hazard. For geographic hazards such as river flooding and wild fire, specific assets at risk and loss estimates were determined through GIS analysis. For other hazards such as weather-related hazards, loss estimates were developed based on statistical analysis of historic events and HMPC input. For dam and levee failure, GIS data was not available to identify specific geographic boundaries at risk. Therefore, the risk assessment is based on aerial photography analysis of development within an estimated hazard area. The methodologies for each loss estimate are described in detail in Chapter 3. Within each hazard section, the text provides details on how the hazard varies by jurisdiction, where applicable. In addition, at the conclusion of each hazard section, a summary table indicates the specific probability and magnitude of the hazard for each jurisdiction to show how the hazard varies. Where applicable, introductory text preceding the table highlights noted variables.

Results of the preliminary risk assessment were presented at Meeting #2 and the Draft Risk Assessment (Chapter 3) was provided to the HMPC for review and comment. Several comments, corrections, and suggestions were provided to SEMO RPC and incorporated into the risk assessment as appropriate.

### ***Phase 3: Develop the Mitigation Plan (Handbook Task 6)***

#### ***Step 6: Set Goals***

SEMO RPC facilitated a discussion session with the HMPC during Meeting #2 to review and update goals. Common categories of mitigation goals were presented as well as the 2013 State Hazard Mitigation Plan goals.

This planning effort is an update to an existing hazard mitigation plan. As a result, the goals from the previous plan were reviewed. The planning committee decided that the 2012 goals are still valid. The goals for the plan update are provided below.

- 
1. Protect the health, safety, and welfare of residents and students.
  2. Ensure the operation of critical facilities and services.
  3. Protect public and private property.
  4. Enhance informed decision making of mitigation actions.

### ***Step 7: Review Possible Mitigation Actions and Activities***

One of the focuses of Meeting #2 was to update the mitigation strategy by reviewing existing actions submitted in the previous mitigation plans as well as discuss relevant new actions considered necessary as a result of the updated risk assessment. The development of mitigation actions was facilitated through group discussion of the capabilities and risks of each jurisdiction. Consideration was given to the analysis results provided in the risk assessment and the anticipated success for each project type. Committee members discussed issues such as: availability of funds, prioritization of actions, and feasibility of implementation utilizing the STAPLEE methodology as a guide. Projects relating to emergency response were discussed, but participants were encouraged to focus on long-term mitigation solutions since response-related mitigation actions occur on a routine basis as requirements of other plans. Complex projects that would necessitate use of large numbers of county resources were also discussed. This opportunity to discuss a broad range of mitigation alternatives allowed the jurisdictions to understand the overall priorities of the committee and to allow for discussion of the types of project most beneficial to each jurisdiction. As part of this discussion, consideration was given to the potential cost of each project in relation to the anticipated future cost savings.

Since this plan is an update to the *2013 Perry County Hazard Mitigation Plan*, the update of the mitigation strategy included review and update of the status of all actions included in the previous hazard mitigation plan. Jurisdictions were encouraged to maintain a focused approach and continue forward only those actions that are aimed at implementing long-term solutions to prevent losses from hazards. To facilitate the update of previous actions, a spreadsheet was provided to each jurisdiction prior to Meeting #2 with the actions they submitted in the previous mitigation plan. The jurisdictions were also provided instructions for completing the status of each of the previous actions as well as the details to provide for continuing and newly developed actions. A modified form of the STAPLEE prioritization tool was provided to assist jurisdictions in determining the prioritization that should be assigned to each action. Each participating jurisdiction prioritized the projects they submitted by indicating high, moderate, or low local priority. The completed spreadsheets with action details were returned to SEMO RPC. Chapter 4 provides additional details regarding the process undertaken to refine the mitigation strategy to make the County and its jurisdictions more disaster resistant.

### ***Step 8: Draft an Action Plan***

A complete draft of the plan was made available online and in hard copy for review and comment by the public, other agencies and interested stakeholders. This review period was from February 26-March 12, 2018. Methods for inviting interested parties and the public to review and comment on the plan were discussed in Steps 2 and 3, and materials are provided in the appendix. Comments were integrated into a final draft for submittal to SEMA and FEMA.

### ***Step 9: Adopt the Plan (Handbook Task 8)***

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To secure buy-in and officially implement the plan, the governing bodies of each participating jurisdiction adopted the plan. Scanned copies of resolutions of adoption are included in the appendix of this plan.

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

The HMPC developed and agreed upon an overall strategy for plan implementation and for monitoring and maintaining the plan over time during Meeting #1. This strategy is described in Chapter 5, Plan Maintenance Process.

## 2 PLANNING AREA PROFILE AND CAPABILITIES

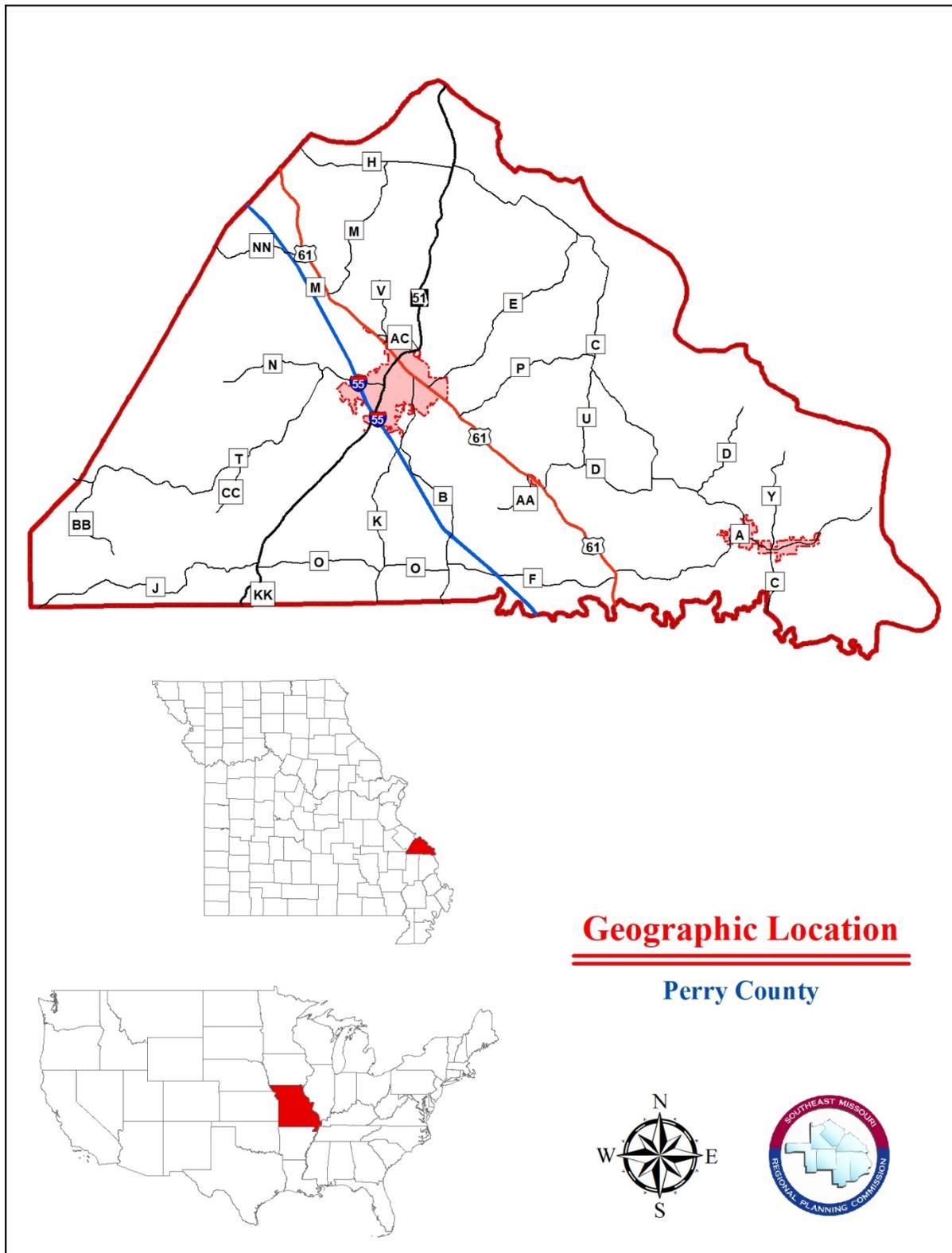
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This chapter provides a general profile of Perry County followed by individual sections for each participating jurisdiction. The section for each jurisdiction provide an overview profile as well as details on existing capabilities, plans, and programs that enhance their ability to implement mitigation strategies.

### 2.1 Perry County Planning Area Profile

Figure 2.1 provides a map of the Perry County planning area. As of 2016, the total Perry County population was 19,152, a growth of 6% since 2000. The population growth rate was below both the nation's (13%) and the State's (8%). Perry County median household income was \$53,014 in 2016 an increase of 14% over 2010, which is double that of the national rate of 6% and the state rate of 7%. The county's 2016 MHI is slightly below that of the nation (\$55,322) and slightly above the state's (\$49,593). Perry County median home value in 2016 was \$126,000, up 3% from 2010 census estimates. While median home value is well below state and national amounts (\$141,200 and \$184,700) the rate of growth outpaced both the state's rate of 2% and the nation's of -2%.

Figure 2.1. Map of Perry County



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## 2.1.1 Geography, Geology and Topography

Perry County lies in the foothills of the Ozarks in Southeast Missouri. Terrain varies from flat alluvial bottom land along the Mississippi River to steeper forested areas in the western part of the County. In between the extremes, the land is mostly gently rolling in nature. The land is either timbered or used for agricultural or urban uses.

The County can be broadly divided into four physiographic subregions: the Mississippi Bottoms, which consist of the Missouri portion of the Mississippi River floodplain and are generally characterized by nearly level ground with relief generally ranging from 5 to 10 feet; the Perryville Sinkhole Plain, which is a belt 3 to 15 miles wide extending from the vicinity of Ste. Genevieve to Cape Girardeau and is generally dominated by gentle to moderate slopes; the Ste. Genevieve ("Becket") Hills, a 7 to 16 mile wide belt extending northwestward from western Perry County through Ste. Genevieve County and northeastern St. Francois County, an area of moderate to steep slopes; and finally, the Castor River Hills which extend into the southwestern part of the County and exhibit moderate to steep slopes.

Soils in Perry County can be classified into eight broad general types. The Menfro Association consists of gently sloping to very steep, deep, well drained, silty soils on uplands adjoining the floodplains along the Mississippi River. The association extends west into the central part of the County. These soils are on ridgetops and side slopes. Menfro soils typically have a surface layer of brown, friable silt loam. The color of the subsoil is brown and dark yellowish brown silty clay loam and silt loam.

The second association occurs on broad floodplains and terraces along the Mississippi River. The Leta-Darwin-Parkville Association consists of nearly level, deep, somewhat poorly drained and poorly drained, clayey soils. Poorly drained Leta soils generally are on low terraces and have a surface layer of very dark gray silty clay. Darwin soils are poorly drained and located in floodplains. Normally they have a surface layer of very dark grayish brown silty clay. The Parkville soils are generally somewhat poorly drained and located on low terraces. The surface layer of this soil is generally very dark gray silty clay.

A third association, the Haymond-Wilbur-Auxvasse, is nearly level and very gently sloping, deep, well drained to somewhat poorly drained, silty soils located on flood plains and terraces. These soils are usually located along the tributaries of the Mississippi River. Haymond soils are well drained on narrow to wide floodplains.

They normally have a surface layer of dark brown silt loam. The Wilbur soils are moderately well drained soils on narrow to wide floodplains. The surface layer of this soil is typically dark brown silt loam. The Auxvasse soils are somewhat poorly drained and are located on terraces. Their surface layer is dark grayish brown silt loam.

The fourth association is the Goss-Hildebrecht Association which consists of gently sloping to very steep, deep, well drained and moderately well drained, cherty and silty soils, typically located on uplands. Goss soils are generally well drained, moderately steep to very steep soils generally located on the lower sides of slopes. The surface layer is typically dark grayish brown cherty silt loam. The Hildebrecht soils are generally moderately well drained soils on ridgetops, side slopes, and foot slopes. The typical surface layer is brown silt loam.

Elsah-Ashton-Auxvasse Association is the fifth soil type in the County. It consists of nearly level and very gently sloping, deep, somewhat excessively drained, well drained, and somewhat poorly drained, loamy and silty soils. The soils occur on narrow floodplains and low terraces along tributaries. Elsay soils are somewhat excessively drained with a typical surface layer of dark yellowish-brown loam. They are located on narrow to

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wide floodplains. Well drained Ashton soils have a typical surface layer of dark brown loam and are located on terraces. Auxvasse soils are somewhat poorly drained and are located on terraces. The surface layer of these soils is generally dark grayish brown silt loam.

The sixth soil type is the Goss-Weingarten-Gasconade Association. This is a gently sloping to very steep, deep and shallow, well drained and somewhat excessively drained, cherty, silty and stony soil, typically located on uplands. Goss soils are deep, well drained, moderately steep and cherty soils located on side slopes. The surface layer is typically a layer of dark grayish brown cherty silt loam. Weingarten soils are deep, well drained gently sloping to strongly sloping soils on ridges, foot slopes, and side slopes. The surface layer is usually brown silt loam. The Gasconade soils are shallow, somewhat excessively drained, strongly sloping to very steep on the lower side slopes. Their surface layer is typically black stony silty clay loam.

A seventh soil type is the Minnith-Lily Association. This is a gently sloping to steep, deep and moderately deep, moderately well drained and well drained silty and loamy soil on uplands. The Minnith soils are deep, moderately well drained, gently sloping to steep soils on ridgetops and shoulder slopes. They typically have a surface layer of brown silt loam. Lily soils are moderately deep, well drained, strongly sloping to steep soils on irregularly shaped side slopes. The surface layer is of very dark grayish brown loam.

Clarksville-Menfro Association is the eighth soil type in the County. It is a steep and very steep, deep, somewhat excessively drained and well drained, cherty and silty soil on uplands. Clarksville soils are cherty, somewhat excessively drained and are located on the mid and lower side slopes. They typically have a surface layer of very dark grayish brown very cherty silt loam. The Menfro soils are well drained on narrow ridgetop, shoulder slopes or foot slopes. Menfro soils usually have a surface layer of dark brown silt loam.

Several types of bedrock occur in Perry County. Dolomite and sandstone are the primary bedrock types in the western part of the county. An area of dolomite mixed with some limestone, sandstone and shale occurs in the area west of Interstate 55, while sandstone occurs in a narrow band that nearly coincides with the location of Interstate 55. Limestone and dolomite, along with some shale, underlay the remainder of the County, except for the bottom land along the Mississippi River which is underlain by alluvium (Exhibit No. 3).

## **2.1.2 Climate**

Because the County is located in the middle section of the United States, it is prone to several kinds of natural hazards. The county has a continental climate, meaning that the weather is changeable and has large variations in temperature and precipitation.

Perry County's climate parallels that of southeast Missouri. In general, the County has hot humid summers and mild to cold winters. Average temperatures fall in the 56° to 58° range. The warmest month is normally July, when average maximum temperatures are around 90° to 92°, and minimum temperatures range in the neighborhood of 62° to 68°. The coldest month is usually January, when maximum temperatures reach an average of only 45° to 46°, and minimum average temperatures run 25° to 28°. Below freezing temperatures usually occur on 80 to 100 days during the year.

Rainfall averages approximately 39 to 42 inches per year, while snowfall averages approximately 11 to 13 inches per year. Springtime and early summer are normally the seasons when much of the rainfall occurs during frequent thunderstorms. This is also the

time when flooding normally occurs along the creeks and rivers in the County. On average, 60% of the annual rainfall occurs during the months from April through September.

### 2.1.3 Population/Demographics

According to the 2016 U.S. Census, the population of Perry County was 66,230, up 19 percent from the 2000 population of 19,152. Table 2.1 provides the populations for each city and the unincorporated county for 2000 and 2016, with the number and percent change. The unincorporated area’s population was determined by subtracting the populations of the incorporated areas from the overall county population.

**Table 2.1. Perry County Population 2000-2016 by Community**

Population				
	2000	2016	Change	% Change
Perry County	18,132	19,152	1,020	6%
Perryville	7,667	8,374	707	9%
Unincorporated County	9,964	10,047	83	1%
Missouri	5,595,211	6,059,651	464,440	8%
United States	281,421,906	318,558,162	37,136,162	13%

Source: American FactFinder

According to the 2016 census, 6% of the county population is under the age of 5 and 17% is 65 and older. In 2016 there were 8,607 housing units with an average household size of 2.53 people.

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

Figure 2.2 shows that Perry County has a Medium Low Social Vulnerability Index when compared to counties nation-wide and state-wide.

**Figure 2.2. Perry County Social Vulnerability Index (SoVI)**

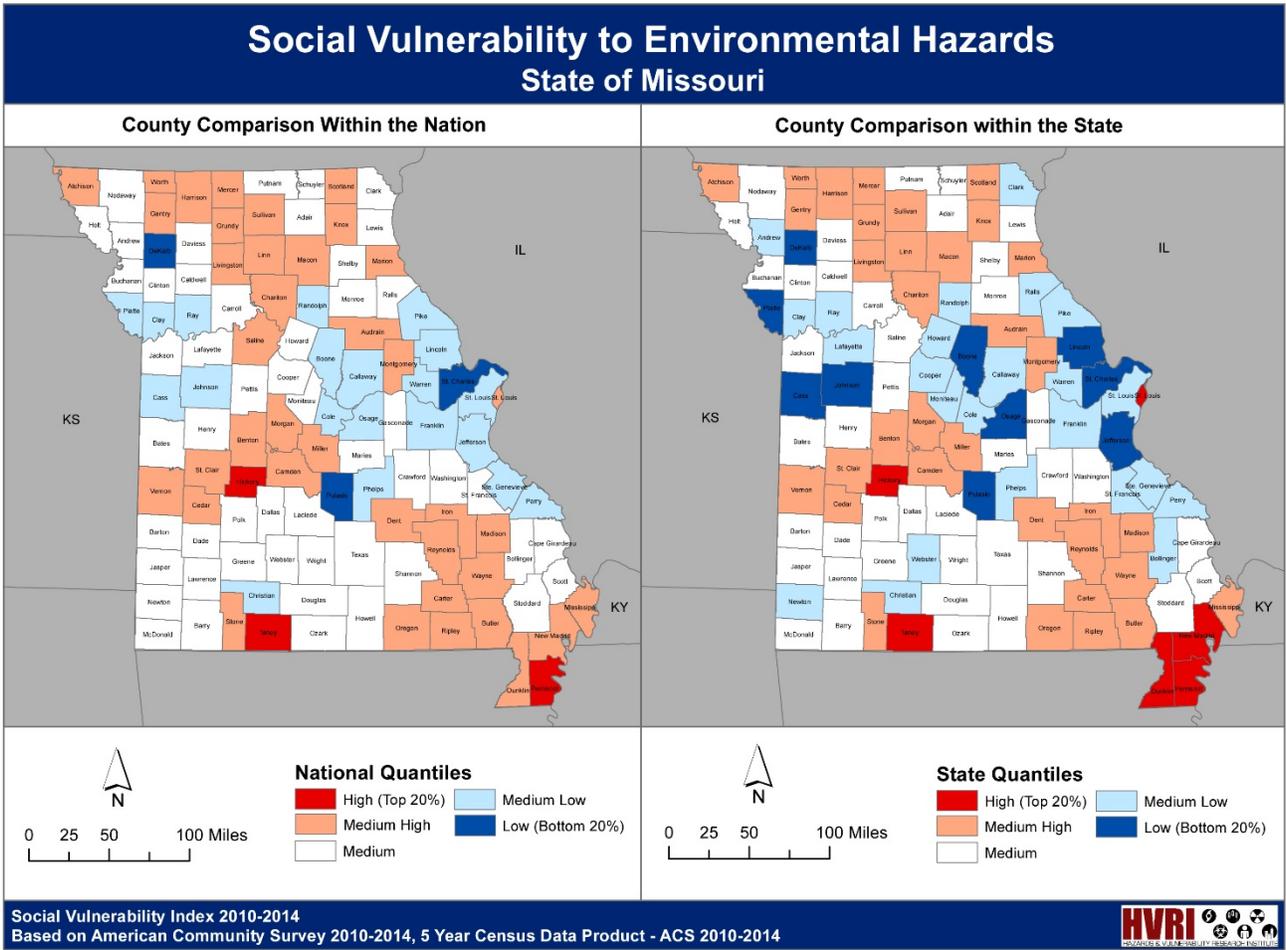


Table 2.2 provides additional demographic and economic indicators for participating jurisdictions in Perry County. The County values are for all of the county, including the incorporated cities.

**Table 2.2. 2016 Selected Demographics**

Jurisdiction	% Labor Force Participation	% Population Unemployed	% Families Below Poverty Level	% Population High School graduate	% of Population with Bachelor's Degree or higher	% Households Limited English Proficiency
Perry County	65.1%	4.3%	6.2%	87.5%	16.1%	0.6%
Perryville	63.0%	4.6%	6.5%	87.4%	17.7%	0.9%

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

## 2.1.4 History

Perry County is a county located in Southeast Missouri on the Mississippi River. Its county seat and largest city is Perryville. The county was officially organized on November 16, 1820 when it was split from Ste. Genevieve County and was named after Oliver Hazard Perry, a naval hero of the War of 1812.

## 2.1.5 Occupations

Table 2.3 provides occupation statistics for the participating cities and the county as a whole.

**Table 2.3. Occupation Statistics, St. Francois County, Missouri**

Jurisdiction	Management, business, science, and arts	Service	Sales and office	Natural resources, construction, and maintenance	Production, transportation, and material moving
Perry County	25%	22%	22%	12%	18%
Perryville	20%	21%	35%	9%	16%

Source: U.S. Census, 2016 American Community Survey, 5-year Estimates.

## 2.1.6 Agriculture

According to the USDA's 2012 Census of Agriculture, Perry County had 951 farms comprising of 226,441 acres, with an average size of 238 acres. Over 625 of the farms in the county fall into the range of 50-499 acres. The average market value of land and buildings per farm was \$636,469. Crops account for approximately \$31.7 million of agriculture sales in the county, while livestock and poultry account for \$31.6 million in sales.

## 2.1.7 FEMA Hazard Mitigation Assistance (HMA) Grants In Planning Area

Since 1993, there have been two HMA grants in Perry County totaling \$3,723,399 in total project costs.

**Table 2.4. FEMA HMA Grants In County, 1993-2019**

Disaster Declaration	Project Type	Sub-Grantee	Date Approved	Project Total
995	Property Acquisition	Perry County	1994-03-10	\$760,147
4317	Safe Room	Perry Co School Dist No. 32	2018-08-14	\$2,222,439
<b>Total</b>				<b>\$3,723,399</b>

Source: FEMA, 2019

## 2.1.8 FEMA Public Assistance (PA) Grants In Planning Area

Since 1993, there have been sixty-six PA grants in Perry County totaling \$4,693,444 in total project costs.

**Table 2.5. FEMA PA Grants In County, 1993-2019**

Disaster Declaration	Project Type	Project Size	Applicant	Project Total
1412	Roads and Bridges	Small	Perry County	\$ 27,343
1412	Roads and Bridges	Small	Perry County	\$ 21,031
1412	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 2,997
1412	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 94,213
1631	Protective Measures	Small	Perry County	\$ 4,244
1631	Roads and Bridges	Small	Perry County	\$ 34,889
1631	Protective Measures	Small	Perry Co. Rural Fire Protection Assn.	\$ 1,427
1749	Debris Removal	Small	Perry County	\$ 2,526
1749	Roads and Bridges	Small	Perry County	\$ 22,574
1749	Debris Removal	Small	Bois Brule Levee	\$ 22,550
1749	Roads and Bridges	Small	Perry County	\$ 9,804
1749	Roads and Bridges	Small	Perry County	\$ 9,297
1749	Public Utilities	Small	Public Water Supply Distric #1	\$ 20,867
1749	Protective Measures	Small	Public Water Supply Distric #1	\$ 6,242
1749	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 579,309
1749	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 2,108
1773	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 256,637
1773	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 44,927
1773	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 6,523
1847	Protective Measures	Small	Frohna/Altenburg Fire Dept.	\$ 7,678
1847	Protective Measures	Large	Perry County	\$ 75,509
1847	Debris Removal	Small	Bois Brule Levee & Drainage District	\$ 6,040
1847	Public Buildings	Small	Perry County	\$ 3,450
1847	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 131,872

1847	Public Buildings	Small	Perry County	\$ 5,000
1847	Recreational or Other	Small	Perry County	\$ 4,315
1847	Public Buildings	Small	Perryville	\$ 5,000
1847	Protective Measures	Small	Perryville	\$ 5,458
1847	Debris Removal	Large	Perryville	\$ 78,730
1847	Protective Measures	Small	Perryville	\$ 3,097
1847	Protective Measures	Small	Frohna/Altenburg Fire Dept.	\$ 597
1934	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 14,800
1934	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 155,152
1980	Recreational or Other	Small	Perryville	\$ 1,146
1980	Public Utilities	Small	Perryville	\$ 3,854
1980	Debris Removal	Small	Perryville	\$ 28,789
1980	Public Buildings	Small	Perryville	\$ 300
1980	Protective Measures	Small	Perryville	\$ 158
1980	Protective Measures	Small	Perryville	\$ 7,496
1980	Debris Removal	Small	Perry Co Road Dept	\$ 2,280
1980	Roads and Bridges	Small	Perry Co Road Dept	\$ 1,428
1980	Public Buildings	Small	Perry Co Road Dept	\$ 5,000
1980	Roads and Bridges	Small	Perry Co Road Dept	\$ 1,689
1980	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 749,074
1980	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 6,345
1980	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 1,525
1980	Roads and Bridges	Small	Perry Co Road Dept	\$ 6,699
1980	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 25,639
1980	Debris Removal	Small	Bois Brule Levee & Drainage District	\$ 48,482
1980	Roads and Bridges	Small	Perry Co Road Dept	\$ 11,082
1980	Roads and Bridges	Small	Perry Co Road Dept	\$ 26,616
1980	Roads and Bridges	Small	Perry Co Road Dept	\$ 13,448
4130	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 181,833
4130	Debris Removal	Small	Bois Brule Levee & Drainage District	\$ 4,230
4130	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 9,760
4238	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 425,976
4238	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 6,195
4238	Debris Removal	Small	Bois Brule Levee & Drainage District	\$ 4,204
4250	Roads and Bridges	Small	Perry County	\$ 69,405
4250	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 15,377
4250	Debris Removal	Small	Bois Brule Levee & Drainage District	\$ 8,198
4250	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 801,310
4317	Debris Removal	Small	Bois Brule Levee & Drainage District	\$ 10,911
4317	Protective Measures	Large	Bois Brule Levee & Drainage District	\$ 524,119
4317	Protective Measures	Small	Bois Brule Levee & Drainage District	\$ 24,671

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TOTAL				\$ 4,693,444
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## **2.2 Jurisdictional Profiles and Mitigation Capabilities**

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This section includes individual profiles for each participating jurisdiction as well as a discussion of previous mitigation initiatives and a summary table indicating specific capabilities of each jurisdiction that relate to their ability to implement mitigation opportunities. The unincorporated county is profiled first, followed by the incorporated cities, and the public school districts.

### **2.2.1 Unincorporated Perry County**

The jurisdiction of Perry County includes all unincorporated areas within the county boundaries. The Perry County government is a County Commission comprised of a Presiding Commissioner voted on by the entire county and two Associate Commissioners voted on by their respective districts. The County government includes the following departments and offices:

- County Commissioners
- County Assessor
- County Attorney
- County Auditor
- County Recorder
- County Sheriff
- County Treasurer
- Emergency Management
- Health Department

#### **Mitigation Initiatives/Capabilities**

Table 2.6 shows the County's planning and hazard mitigation capabilities.

**Table 2.6. Unincorporated Perry County Mitigation Capabilities**

<b>Element</b>	<b>Status Including Date of Document or Policy</b>
<b>Planning Capabilities</b>	
<b><u>Comprehensive Plan</u></b>	Date: No
Builder's Plan	Date: No
Capital Improvement Plan	Date:CIP
City Emergency Operations Plan	Date:N/A
County Emergency Operations Plan	Date:2018
Local Recovery Plan	Date:No
County Recovery Plan	Date:No
City Mitigation Plan	Date:N/A
County Mitigation Plan	Date:2013
Debris Management Plan	Date:No
<b><u>Economic Development Plan</u></b>	Date:No
Transportation Plan	Date:2018
Land-use Plan	Date:No
Flood Mitigation Assistance (FMA) Plan	Date:No
<b><u>Watershed Plan</u></b>	Date:No
Firewise or other fire mitigation plan	Date:No
Critical Facilities Plan (Mitigation/Response/Recovery)	Date:No
<b>Policies/Ordinance</b>	
Zoning Ordinance	No
Building Code	Version:2016
Floodplain Ordinance	Date:2012
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Seismic Construction Ordinance	No
<b>Program</b>	
Zoning/Land Use Restrictions	No
Codes Building Site/Design	No

Element	Status Including Date of Document or Policy
Hazard Awareness Program	No
National Flood Insurance Program	Yes
Community Rating System (CRS) program under the National Flood Insurance Program (NFIP)?	No
National Weather Service (NWS) Storm Ready Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	Rating:
Economic Development Program	Yes
Land Use Program	No
Public Education/Awareness	Yes
Property Acquisition	Yes
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
<b><u>Engineering Studies for Streams (Local/County/Regional)</u></b>	No
Mutual Aid Agreements	Yes
<b>Studies/Reports/Maps</b>	
<b><u>Hazard Analysis/Risk Assessment (City)</u></b>	N/A
<b><u>Hazard Analysis/Risk Assessment (County)</u></b>	None
Evacuation Route Map	None
<b><u>Critical Facilities Inventory</u></b>	None
<b><u>Vulnerable Population Inventory</u></b>	None
<b><u>Land Use Map</u></b>	None

Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	None
Engineer	None
Development Planner	None
Public Works Official	Yes
Emergency Management Coordinator	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	None
Emergency Response Team	None
Hazardous Materials Expert	None
Local Emergency Planning Committee	None

<b>Element</b>	<b>Status Including Date of Document or Policy</b>
County Emergency Management Commission	None
Sanitation Department	None
Transportation Department	Yes
Economic Development Department	Yes
Housing Department	None
Historic Preservation	None
<b>Non-Governmental Organizations (NGOs)</b>	<b>Is there a local chapter? Yes or No</b>
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Local Environmental Organization	None
Homeowner Associations	Yes
Neighborhood Associations	None
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Financial Resources</b>	<b>Is your jurisdiction able to? Yes or No</b>
Apply for Community Development Block Grants	Yes
Fund projects thru Capital Improvements funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	Yes

## 2.2.2 Perryville

The City of Perryville is located in central Perry County. It is governed by a Mayor and 6-member board of aldermen.

**Table 2.7. Perryville Mitigation Capabilities**

Element	Status Including Date of Document or Policy
<b>Planning Capabilities</b>	
<b>Comprehensive Plan</b>	Date: 2011
Builder's Plan	Date: No
Capital Improvement Plan	Date:2018
City Emergency Operations Plan	Date:2018
County Emergency Operations Plan	Date:yes
Local Recovery Plan	Date:No
County Recovery Plan	Date:N/A
City Mitigation Plan	Date:2013
County Mitigation Plan	Date:2013
Debris Management Plan	Date:No
<b>Economic Development Plan</b>	Date:2011
Transportation Plan	Date:2011
Land-use Plan	Date:2011
Flood Mitigation Assistance (FMA) Plan	Date:No
<b>Watershed Plan</b>	Date:Yes
Firewise or other fire mitigation plan	Date:No
Critical Facilities Plan (Mitigation/Response/Recovery)	Date:No
<b>Policies/Ordinance</b>	
Zoning Ordinance	Yes
Building Code	Version:2015, NEC: 2014
Floodplain Ordinance	Date:2011
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	Yes
Drainage Ordinance	Yes
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	No
Seismic Construction Ordinance	No

Element	Status Including Date of Document or Policy
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
Hazard Awareness Program	Yes
National Flood Insurance Program	Yes
Community Rating System (CRS) program under the National Flood Insurance Program (NFIP)?	No
National Weather Service (NWS) Storm Ready Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	Yes
ISO Fire Rating	Rating:4
Economic Development Program	Yes
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes
Tree Trimming Program	No
<b>Engineering Studies for Streams (Local/County/Regional)</b>	Yes
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
<b>Hazard Analysis/Risk Assessment (City)</b>	None
<b>Hazard Analysis/Risk Assessment (County)</b>	None
Evacuation Route Map	None
<b>Critical Facilities Inventory</b>	Yes
<b>Vulnerable Population Inventory</b>	None
<b>Land Use Map</b>	Yes

Staff/Department	
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	Yes
Engineer	Yes
Development Planner	None
Public Works Official	Yes
Emergency Management Coordinator	Yes
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	Yes
Emergency Response Team	Yes

<b>Element</b>	<b>Status Including Date of Document or Policy</b>
Hazardous Materials Expert	None
Local Emergency Planning Committee	Yes
County Emergency Management Commission	N/A
Sanitation Department	Yes
Transportation Department	No
Economic Development Department	Yes
Housing Department	None
Historic Preservation	None
<b>Non-Governmental Organizations (NGOs)</b>	<b>Is there a local chapter? Yes or No</b>
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Local Environmental Organization	None
Homeowner Associations	Yes
Neighborhood Associations	None
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes
<b>Financial Resources</b>	<b>Is your jurisdiction able to? Yes or No</b>
Apply for Community Development Block Grants	Yes
Fund projects thru Capital Improvements funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	Yes

## Additional Questions

1. How is your government structure organized? (Commission, Mayor/City Council, how many members)

Mayor/City Council - 1 Mayor, 6 City Council Members

2. List any past or ongoing public education or information programs, such as for responsible water use, fire safety, household preparedness, or environmental education.

The Fire Dept. has constant ongoing Fire Safety Education available on request.  
Police - Fire - Office of Emergency Management has ongoing Public Education on preparedness + Safety

3. List any other past or ongoing projects or programs designed to reduce disaster losses, these may include projects to protect critical facilities. Be sure to include pending or approved projects submitted for FEMA mitigation grants.

Implemented a Maintenance + professional testing program for the early warning sirens. Implemented a replacement/addition program for the early warning sirens.

4. Describe any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, low-income, or migrant farm workers.

Transportation of Special Needs persons and Emergency Sheltering for these individuals.

5. How many outdoor warning sirens are in your community? 4

How are they activated (indicate responsible department/personnel)?

Police + Fire Communications Division

6. Does your community utilize any other warning systems such as Cable Override, Reverse 911, etc? If so, please describe. Social Media + Nexel System

7. Does your community have designated public tornado shelters/saferooms? If so, are they constructed in accordance with FEMA standards?

Not at the present time.

Please provide address locations:

8. List residential, commercial and industrial development in your jurisdiction since last plan update.

All three of these has grown significantly

9. Describe development trends and expected  Yes Is any new development expected to occur in the 100-year floodplain? Is any new development expected to occur in any other known hazard areas? If possible, please provide a map indicating potential/planned growth areas.

None that is planned at present time.

10. Are any new facilities or infrastructure planned for construction during the next five years? If so, please provide facility name and purpose along with proposed locations, if known.

New Waste Water Treatment Plant  
New Fire Station on MO 51 @ RAND Ave.

11. Please list major employers in your jurisdiction with an estimated number of employees.

Gilster Mary-Lee  
TG. Missouri  
Perry Co. Memorial Hospital

## 2.2.3 Summary of Jurisdictional Capabilities

**Table 2.8. Mitigation Capabilities Summary Table**

Element	Perry County	Perryville
Planning Capabilities		
<b><u>Comprehensive Plan</u></b>	Date: No	Date: 2011
Builder's Plan	Date: No	Date: No
Capital Improvement Plan	Date:2018	Date:2018
City Emergency Operations Plan	Date:N/A	Date:2018
County Emergency Operations Plan	Date:2018	Date:N/A
Local Recovery Plan	Date:No	Date:No
County Recovery Plan	Date:No	Date:N/A
City Mitigation Plan	Date:N/A	Date:2013
County Mitigation Plan	Date:2013	Date:2013
Debris Management Plan	Date:No	Date:No
<b><u>Economic Development Plan</u></b>	Date:No	Date:2011
Transportation Plan	Date:2018	Date:2011
Land-use Plan	Date:No	Date:2011
Flood Mitigation Assistance (FMA) Plan	Date:No	Date:No
<b><u>Watershed Plan</u></b>	Date:No	Date:Yes
Firewise or other fire mitigation plan	Date:No	Date:No
Critical Facilities Plan (Mitigation/Response/Recovery)	Date:No	Date:No
Policies/Ordinance		
Zoning Ordinance	No	Yes
Building Code	Version:2016	Version:2015, NEC: 2014
Floodplain Ordinance	Date:2012	Date:2011
Subdivision Ordinance	No	Yes
Tree Trimming Ordinance	No	No
Nuisance Ordinance	No	Yes
Storm Water Ordinance	No	Yes
Drainage Ordinance	No	Yes
Site Plan Review Requirements	No	Yes
Historic Preservation Ordinance	No	Yes
Landscape Ordinance	No	No
Seismic Construction Ordinance	No	No
Program		
Zoning/Land Use Restrictions	No	Yes
Codes Building Site/Design	No	Yes

Element	Perry County	Perryville
Hazard Awareness Program	No	Yes
National Flood Insurance Program	Yes	Yes
Community Rating System (CRS) program under the National Flood Insurance Program (NFIP)?	No	No
National Weather Service (NWS) Storm Ready Certification	No	No
Firewise Community Certification	No	No
Building Code Effectiveness Grading (BCEGs)	No	Yes
ISO Fire Rating	Rating:	Rating:4
Economic Development Program	Yes	Yes
Land Use Program	No	Yes
Public Education/Awareness	Yes	Yes
Property Acquisition	Yes	No
Planning/Zoning Boards	No	Yes
Stream Maintenance Program	No	Yes
Tree Trimming Program	No	No
<b><u>Engineering Studies for Streams (Local/County/Regional)</u></b>	No	Yes
Mutual Aid Agreements	Yes	Yes
<b>Studies/Reports/Maps</b>		
<b><u>Hazard Analysis/Risk Assessment (City)</u></b>	N/A	None
<b><u>Hazard Analysis/Risk Assessment (County)</u></b>	None	None
Evacuation Route Map	None	None
<b><u>Critical Facilities Inventory</u></b>	None	Yes
<b><u>Vulnerable Population Inventory</u></b>	None	None
<b><u>Land Use Map</u></b>	None	Yes

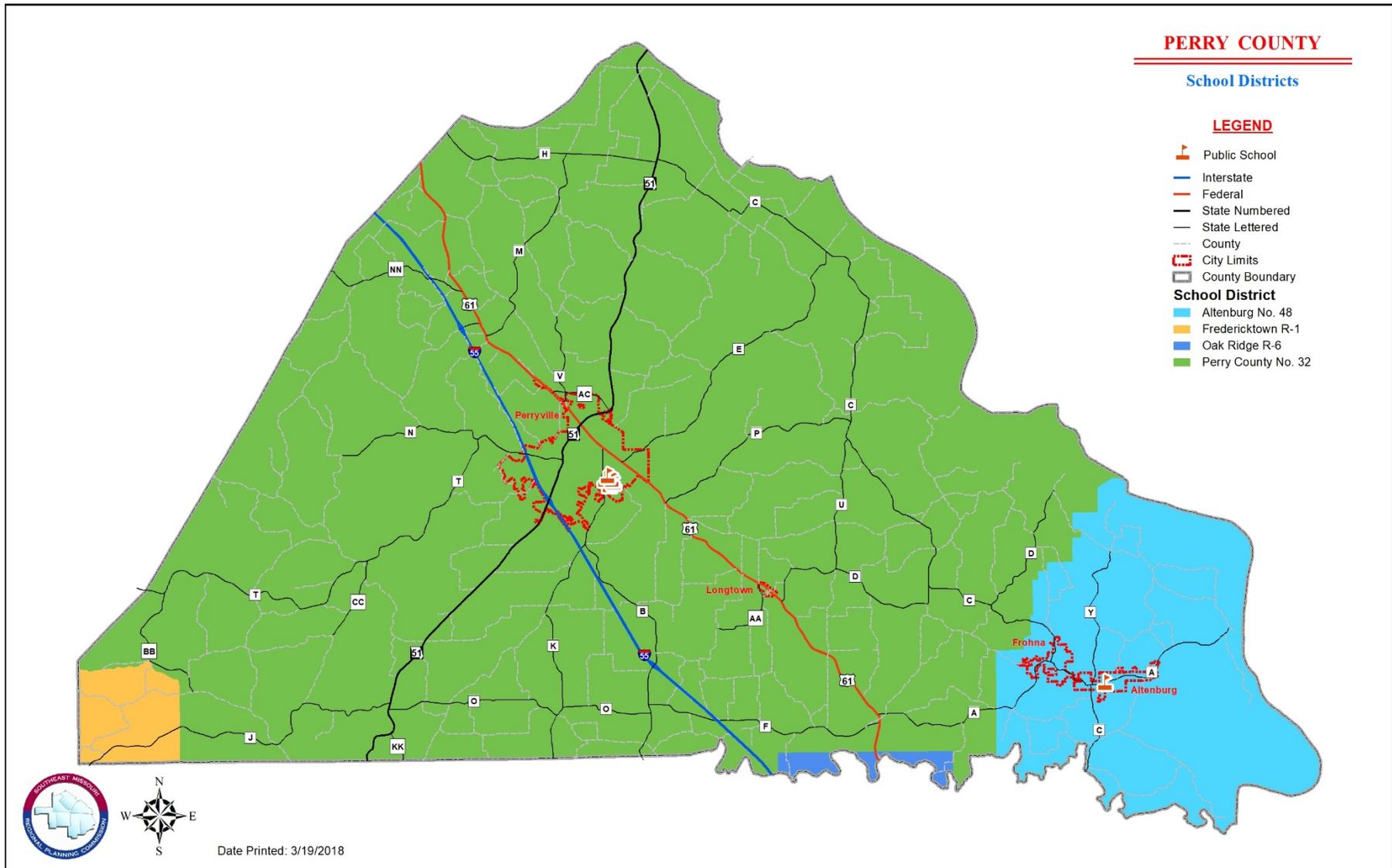
Staff/Department		
Building Code Official	Yes	Yes
Building Inspector	Yes	Yes
Mapping Specialist (GIS)	None	Yes
Engineer	None	Yes
Development Planner	None	None
Public Works Official	Yes	Yes
Emergency Management Coordinator	Yes	Yes
NFIP Floodplain Administrator	Yes	Yes
Bomb and/or Arson Squad	None	Yes
Emergency Response Team	None	Yes
Hazardous Materials Expert	None	None

Element	Perry County	Perryville
Local Emergency Planning Committee	None	Yes
County Emergency Management Commission	None	N/A
Sanitation Department	None	Yes
Transportation Department	Yes	No
Economic Development Department	Yes	Yes
Housing Department	None	None
Historic Preservation	None	None
Non-Governmental Organizations (NGOs)	Is there a local chapter? Yes or No	Is there a local chapter? Yes or No
American Red Cross	Yes	Yes
Salvation Army	Yes	Yes
Veterans Groups	Yes	Yes
Local Environmental Organization	None	None
Homeowner Associations	Yes	Yes
Neighborhood Associations	None	None
Chamber of Commerce	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes
Financial Resources	Is your jurisdiction able to? Yes or No	Is your jurisdiction able to? Yes or No
Apply for Community Development Block Grants	Yes	Yes
Fund projects thru Capital Improvements funding	Yes	Yes
Authority to levy taxes for specific purposes	Yes	Yes
Fees for water, sewer, gas, or electric services	Yes	Yes
Impact fees for new development	No	No
Incur debt through general obligation bonds	Yes	Yes
Incur debt through special tax bonds	Yes	Yes
Incur debt through private activities	No	No
Withhold spending in hazard prone areas	Yes	Yes

## 2.2.4 Public School District Profiles and Mitigation Capabilities

This section includes general profile information for Perry County School Dist. No. 32. The school district fully participated in the development process of this plan. Multiple other school districts cover small portions of the county; however, none of these districts have any structures or assets located in Perry County, and are therefore not included in this mitigation plan. For information on these school districts, see their respective county HMPs.

Figure 2.3. Perry County School Districts



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**Table 2.9. School District Buildings and Enrollment Data, 2017**

<b>District Name</b>	<b>Building Name</b>	<b>Building Enrolment</b>
Perry Co. School Dist. No 32	Perryville Senior High	774
Perry Co. School Dist. No 32	Perry Co. Middle	643
Perry Co. School Dist. No 32	Perry Elementary	827
Perry Co. School Dist. No 32	Early Childhood Special Education Center	48

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

**Table 2.10. Summary of Mitigation Capabilities-Perry Co. School Dist. No. 32**

Planning Elements	Yes/No	Date of Latest Version	Comments
Master Plan	Yes		
Capital Improvement Plan	Yes		
<b>School Emergency Plan</b> Shelter in place protocols Evacuation protocols	Yes		
Weapons Policy	Yes		

**Administrative/Technical**

Identify the technical and personnel resources responsible for activities related to hazard mitigation/loss prevention within your school district / institution.

Personnel Resources	Yes/No	Department/Position	Comments
Full-time building official (i.e. Principal)	Yes		
Emergency Manager	No		
Grant Writer	No		
Public Information Officer	No		

**Financial Resources**

Identify whether your school district /institution has access to or is eligible to use the following financial resources for hazard mitigation.

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Capital improvements project funding	Yes	
Local funds	Yes	
General obligation bonds	Yes	
Special tax bonds	Yes	
Private activities/donations	Yes	
State and federal funds	Yes	

### **Additional Capabilities Questions**

1. Are your buildings equipped with a public address system or other emergency alert system? Please describe.  
Yes
  
2. Does your school buildings' have NOAA Weather Radios?  
  
No
  
3. List any past or ongoing projects or programs designed to reduce disaster losses, these may include projects to protect facilities or provide education regarding hazards that could occur.
  
  
  
  
4. List any other past or ongoing projects or programs designed to reduce disaster losses, these may include projects to protect critical facilities.  
Saferoom grant application
  
  
  
  
5. Do any of your buildings have designated tornado shelters or "saferooms"? If so, are they constructed in accordance with FEMA standards?  
No
  
  
  
  
6. Did your school district / institution make any additions to buildings or construction new buildings since the last plan update (2010)? Please list the buildings and the improvement.  
No
  
  
  
  
7. Does your school district / institution plan to remodel or construct any buildings in the next 5 years? If so, please list the building or proposed building and planned improvements. Are any planned construction activities in known hazard areas?  
New saferoom facility, not in a known hazard area.
  
  
  
  
8. What percentage is your projected enrollment expected to increase or decrease in the next five years?  
Steady to 5% increase.

9. Do you have your own campus police? Please explain your police department or who you rely on for security needs. No. Police and sheriff.

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## 3 RISK ASSESSMENT

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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.

There have been little changes in the County over the past 5 years. Since 2013, the populations of the county and Perryville have grown less than 1%. Likewise, there has been only marginal commercial, office, and industrial development in the county and the communities. These small changes, while important to the residents, mean that much of the exposure and risk in the planning area has remained relatively unchanged since the 2013 plan.

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 Future Land Use and Development** discusses areas of planned future development
- **Section 3.4 Hazard Profiles and Vulnerability Analysis** provides more detailed information about the hazards impacting the planning area. For each hazard, there are three sections: 1) Hazard Profile provides a general description and discusses the threat to the planning area, the geographic location at risk, potential severity/magnitude/extent, previous occurrences of hazard events, probability of future occurrence, risk summary by jurisdiction, impact of future development on the risk; 2) Vulnerability Assessment further defines and quantifies populations, buildings, critical facilities, and other community/school or special district assets at risk to natural hazards; and 3) Problem Statement briefly summarizes the problem and develops possible solutions.

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## 3.1 Hazard Identification

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The 11 hazards identified for this plan update are listed below in alphabetical order:

- Dam & Levee Failure
- Drought
- Earthquake
- Extreme Cold
- Extreme Heat
- Flash & Riverine Flooding
- Severe Thunderstorms
- Severe Winter Weather
- Sinkholes
- Tornadoes
- Wild Fire

It should be noted that this mitigation plan, like most local HMP in the state, only includes natural hazards and does not address “man-made” hazards such as terrorism, structural fires, chemical spills, etc.

Sections 3.1.1 through 3.1.3 describe how these hazards were identified for this plan update.

### 3.1.1 Review of Existing Mitigation Plans

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To determine which hazards to include in this plan update cycle, the HMPC considered all hazards from the previous Perry County HMP, hazards from surrounding counties’ HMPs, and the State’s current HMP. The HMPC decided to carry forward the hazards from the 2013 plan into this plan unchanged, as they felt there had been no significant changes in the county to warrant revision.

### 3.1.2 Review Disaster Declaration History

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

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

**Table 3.1. FEMA Disaster Declarations that included Perry County, Missouri, 2007-Present**

Disaster Number	Description	Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-4317	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	4/28/2017 – 5/11/2017	PA
DR-4250	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	12/23/2015 – 1/09/2016	PA
DR-4238	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	5/15/2015 – 7/27/2015	PA
DR-4130	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	5/29/2013 – 6/10/2013	PA
DR-1980	Severe Storms, Tornadoes, and Flooding	4/10/2011 - 6/6/2011	PA
DR-1934	Severe Storms, Flooding, and Tornadoes	6/12/2010 – 7/31/2010	PA
DR-1847	Severe Storms, Tornadoes, and Flooding	5/8/2009 - 5/16/2009	PA
DR-1822	Severe Winter Storm	1/26/2009 - 1/28/2009	PA
DR-1809	Severe Storms, Flooding, and Tornado	9/11/2008 - 9/24/2008	PA
DR-1773	Severe Storms and Flooding	6/1/2008 – 8-13/2008	IA, PA
DR-1749	Severe Storms and Flooding	3/17/2008 - 5/9/2008	IA, PA
DR-1631	Severe Storms, Tornadoes, and Flooding	3/08/2006 – 3/13/2006	IA, PA
EM-3374	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	12/22/2015 – 1/09/2016	
EM-3317	Severe Winter Storm	1/31/2011 – 2/05/2011	
EM-3303	Severe Winter Storm	1/26/2009 – 1/28/2009	
EM-3281	Severe Winter Storms	12/08/2007 – 12/15/2007	
EM-3232	Hurricane Katrina Evacuation	8/29/2005 – 10/01/2005	

Source: Federal Emergency Management Agency <http://www.fema.gov/disasters>

### 3.1.3 Research Additional Sources

Additional data on locations and past impacts of hazards in the planning area was collected from the following sources:

- Missouri Hazard Mitigation Plans (2010 and 2013)
- 2013 Perry County Hazard Mitigation Plan
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture’s (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)

- 
- Data Collection Questionnaires completed by each jurisdiction
  - State of Missouri GIS data
  - Environmental Protection Agency (EPA)
  - Flood Insurance Administration
  - Missouri Department of Transportation (MoDOT)
  - Missouri Division of Fire Marshal Safety
  - National Fire Incident Reporting System (NFIRS)
  - National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI);
  - County and local Comprehensive Plans when available
  - County Emergency Management
  - County Flood Insurance Rate Map, 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)

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

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

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

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

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

### **3.1.4 Hazards Identified**

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Through the hazard identification review process, 11 natural hazards that have the potential to significantly affect the planning area were chosen for further analysis in the risk assessment. The hazards identified for this plan update are shown in Table 3.2. Although 11 hazards were identified, not all hazards impact every jurisdiction. In addition to listing the hazards selected for this plan, Table 3.2 also provides a summary of the jurisdictions impacted by each hazard. An “X” indicates the jurisdiction is impacted by the hazard, while a “-” indicates the hazard is not applicable to that jurisdiction.

**Table 3.2. Hazards Identified for Each Jurisdiction**

Hazard	Perry County	Perryville	Perry Co School Dist No 32
Dam/Levee Failure	X	-	-
Drought	X	X	-
Earthquake	X	X	X
Extreme Cold	X	X	X
Extreme Heat	X	X	X
Flash & Riverine Flooding	X	X	-
Severe Thunderstorm	X	X	X
Severe Winter Weather	X	X	X
Sinkhole	X	X	X
Tornado	X	X	X
Wild Fire	X	X	X

### 3.1.5 Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional plan, the risks are assessed for each jurisdiction where they deviate from the risks facing the entire planning area. The planning area is fairly uniform in terms of climate and topography as well as building construction characteristics. Accordingly, the geographic areas of occurrence for weather-related hazards do not vary greatly across the planning area for most hazards. The more urbanized areas within the planning area have more assets that are vulnerable to the weather-related hazards and varied development trends impact the future vulnerability. These differences are discussed in greater detail in the vulnerability sections of each hazard.

The hazards that have the potential to vary across the planning area in terms of geographic areas at risk include dam/levee failure, flash & riverine flooding, sinkhole, and wild fire.

## 3.2 Assets at Risk

This section assesses the population, structures, critical facilities, and other important assets in the planning area that may be at risk to hazards.

### 3.2.1 Total Exposure of Population and Structures

#### Unincorporated County and Incorporated Cities

In the following three tables, population data is based on 2016 Census Bureau data. Building counts are based on the University of Missouri Structures Count and building exposure values are HMPC and SEMO RPC estimates based on median home values in each jurisdiction. Contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type. The multipliers were derived from the HAZUS MH 2.1 and are defined below in Table 3.3. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). It should be noted that this valuation methodology is an estimate only and will not equal other estimates or calculations (e.g. Assessor data) due to variations in the methodologies.

Table 3.3 shows the total population, building count, estimated value of buildings, estimated value of contents and estimated total exposure for the unincorporated county and each participating incorporated city. Table 3.4 that follows provides the building value exposures for the county and each participating city in the planning area broken down by usage type. Finally, Table 3.5 provides the building count total for the county and each participating city in the planning area broken out by building usage types (residential, commercial, industrial, and agricultural).

**Table 3.3. Maximum Population and Building Exposure by Jurisdiction - Communities**

Jurisdiction	2016 Population	Building Count	Building Exposure	Contents Exposure	Total Exposure
Unincorporated County	10,047	5,394	\$ 686,947,504	\$ 458,250,602	\$ 1,145,198,106
Perryville	8,374	4,052	\$ 494,538,739	\$ 355,196,037	\$ 849,734,775
Total	18,421	9,446	\$ 1,181,486,242	\$ 813,446,639	\$ 1,994,932,881

Sources: Population, 2016 Census; Building Count, SEMO RPC data; Building Exposure, HMPC and SEMO RPC data; Contents Exposure derived by applying multiplier to Building Exposure based on HAZUS MH 2.1 standard contents multipliers per usage type as follows: Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%).

**Table 3.4. Building Values/Exposure by Usage Type**

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Total
Unincorporated County	\$ 486,068,300	\$ 10,455,766	\$ 28,674,498	\$ 161,748,939	\$ 686,947,504
Perryville	\$ 348,858,755	\$ 70,173,351	\$ 70,173,351	\$ 5,333,281	\$ 494,538,739
Total	\$ 834,927,056	\$ 80,629,117	\$ 98,847,849	\$ 167,082,220	\$ 1,181,486,242

**Table 3.5. Building Counts by Usage Type**

Jurisdiction	2016 Population	Residential	Commercial	Industrial	Agricultural	Total
Unincorporated County	10,047	3,971	43	59	1,321	5,394
Perryville	8,374	3,475	349	175	53	4,052
Total	18,421	7,446	392	233	1,375	9,446

Based on the data that is available from the districts' completion of the Data Collection Questionnaire and district maintained websites, the number of enrolled students at the participating public school districts is provided in Table 3.6 below. Additional information includes the number of buildings, building values (building exposure) and contents value (contents exposure).

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

Public School District	Enrolment	Building Count	Building Exposure (\$)	Contents Exposure (\$)	Total Exposure (\$)
Perry Co School Dist No 32	2,292	4	14,500,000	7,000,000	21,500,000

Source: Enrollment - <http://mcids.dese.mo.gov/quickfacts/Pages/District-and-School-Information.aspx>. Building Count, Building Exposure, Contents Exposure, and Total Exposure amounts - Public School Districts.

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### 3.2.2 Other Assets

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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 more 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.

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**Table 3.7. Threatened and Endangered Species in Perry County**

Gray Myotis <i>Myotis grisescens</i>	Endangered
Grotto Sculpin <i>Cottus specus</i>	Endangered
Indiana Myotis <i>Myotis sodalis</i>	Endangered
Interior Least Tern <i>Sterna antillarum athalassos</i>	Endangered
Northern Long-eared Myotis <i>Myotis septentrionalis</i>	Threatened
Pallid Sturgeon <i>Scaphirhynchus albus</i>	Endangered

Source: MO DNR

Although there are many structures in Perry County of significant historic importance, there are currently nine properties/sites in Perry County which are listed on the National Register of Historic Places. The County has one designated historic district.

- Christian A. Bergt Farm (listed January 10, 1980)
- Concordia Log Cabin College (listed November 21, 1978)
- Doerr-Brown House (listed November 14, 1980)
- Eggers and Company General Store (June 21, 2007)
- Mack's Chapel Cemetery (listed January 29, 2018)

- Perry County Courthouse (listed May 23, 2016)
- St. Mary's of the Barrens Historic District (listed August 25, 1995)
- Shelby-Nicholson-Schindler House (listed July 24, 1974)
- Tower Rock (listed February 26, 1970)

These National Register properties, and other historic structures found in Perry County, are most vulnerable to damage which could be caused by earthquakes, tornadoes or severe thunderstorms.

**Table 3.8. Major Employers in Perry County**

COMPANY	EMPLOYEES
Southeast Missouri Health Center	882
Eastern Reception Diagnostic	780
Farmington Correctional Center	700
Farmington School Dist R-VII	547
Piramal Glass-USA Inc	501
US Tool Group	400
Parkland Heath Center	386
US Tool Grinding	360
Walmart (Farmington)	350
Walmart (Desloge)	320
Centene Corp	300
Sexual Offender Treatment Center	300
Lee Mechanical Contractors	299
Central School Dist. R-III	250
Mineral Area College	180
St. Joe Manor	150

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### **3.3 Future Land Use and Development**

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As discussed in previous chapters, Perry County and participating jurisdictions have experienced only marginal population growth and new building starts. Given the area's rural nature, there is little impact expected on hazards and mitigation actions due to future growth.

#### **School District's Future Development**

The school district anticipates only minor changes in student population and does not expect any future building development in the next five years, other than the construction of a safe-room.

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## 3.4 Hazard Profiles, Vulnerability, and Problem Statements

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

### **Hazard Profiles**

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 location of the hazard in the planning area. Where available, use maps to indicate the specific locations of the planning area that are vulnerable to the subject hazard. For some hazards, the entire planning area is at risk.

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

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

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

### **Vulnerability Assessments**

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments will be based on the best available county-level data, which is in the Missouri Hazard Mitigation Plan (2013). The county-level assessments in the State Plan were based on the following sources:

- Statewide GIS data sets compiled by state and federal agencies; and
- FEMA's HAZUS-MH loss estimation software.

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

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

Detailed profiles for each of the identified hazards include information categorized as follows:

### **Vulnerability Overview**

This section consists of a general overview narrative of the planning area's vulnerability to the hazard. Within this section, the magnitude/severity of the hazard is discussed. The magnitude of the impact of a hazard event (past and perceived) is related directly to the vulnerability of the people, property, and the environment it affects. This is a function of when the event occurs, the location affected, the resilience of the community, and the effectiveness of the emergency response and disaster recovery efforts.

### **Potential Losses to Existing Development**

This section provides the potential losses to existing development. Where data is available, this section provides estimated financial losses as well as the methodology used. For hazards with an overall "Low" rating, potential losses may not be discussed.

### **Future Development**

This section provides information on how vulnerability to this hazard will be impacted by planned future development as well as information for jurisdictions to consider in planning future development.

### **Hazard Summary by Jurisdiction**

For hazards that vary by jurisdiction, this section will provide an overview of how the hazard varies, followed by a table indicating the probability, magnitude, warning time, and duration rankings for each jurisdiction with the resulting hazard score and level.

### 3.4.1 Dam Failure

#### Hazard Profile

##### *Hazard Description*

A dam is defined as a barrier constructed across a watercourse for 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.

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 3.10 does not indicate its condition. Dams assigned the high hazards potential classification are those where failure will potentially result in loss of human life. Significant hazard potential are those dams where failure results in no probable loss of human life but can cause economic loss. Dams assigned the low hazard potential classification are those where failure will result in no probable loss of human life and low economic or environmental losses. Losses are principally limited to the owner's property.

**Table 3.9. MDNR Dam Hazard Classification Definitions**

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

Source: Missouri Department of Natural Resources, [http://dnr.mo.gov/env/wrc/docs/rules\\_reg\\_94.pdf](http://dnr.mo.gov/env/wrc/docs/rules_reg_94.pdf)

**Table 3.10. NID Dam Hazard Classification Definitions**

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

Source: National Inventory of Dams

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

The following table shows the National Inventory of Dams listing for Perry County.

**Table 3.11. Perry County National Inventory of Dams Listing**

Dam Name	Other Dam Name	NIDID	Hazard Potential *	NID Height (Ft.)	River	Nearest City	Distance To City (Mi.)
EDDLEMAN LAKE DAM	-	MO31376	High	32	TR-SOUTH FORK SALINE CR	ST MARYS	0
KOOL BREEZE RIDGE DAM	-	MO31226	High	39	TR-GOOSE CR	ST MARYS	9
PERRY COUNTY COMM. LAKE DAM	-	MO30813	High	47	TR-SOUTH FORK SALINE CR	SAINT MARYS	20
LAKE KAH-TAN-DA NO.2	-	MO31099	High	32	TR-NATIONS CREEK	SILVER LAKE	3
MALLARD LAKE DAM	-	MO30807	High	24	TR-WHITEWATER RIVER	YOUNT	3
HICKORY HOLLOW LAKE DAM	-	MO31068	High	44	TR-GOOSE CREEK	ST MARYS	16
ELLIS LAKE DAM	-	MO31067	High	29	TR-BLUE SPRING BRANCH	LITHIUM	1
PORT PERRY DAM	-	MO30030	High	70	TR NATIONS CREEK	SILVER LAKE	5
PARKER LAKE NO 1 DAM	-	MO30037	High	34	TR JORDAN BR-SALINE CREEK	ST MARYS	28
LAKE KAH-TAN-DA NO.3	-	MO31071	High	34	TR-NATIONS CREEK	SILVER LAKE	3
PARKER LAKE DAM NO. 2	-	MO30809	High	34	JORDAN BRANCH SALINE CREEK	SILVER LAKE	0
PERRY CO SPORTSMANS CLUB LAKE DAM	-	MO31097	High	34	TR-WHITEWATER RIVER	YOUNT	5
PERCO LAKE DAM NORTH	-	MO30837	High	25	TR-SOUTH FORK SALINE CR	ST MARYS	23
PORT PERRY #2 LAKE DAM	-	MO31098	High	30	TR-NATIONS CREEK	ST MARYS	30
PERCO LAKE DAM SOUTH	-	MO31198	High	22	TR-SOUTH FORK SALINE CR	ST MARYS	23
COLONIAL ACRES LAKE DAM	-	MO30134	High	29	TYLER BRANCH-CINQUE HOMMES	MENFRO	0
WHITEWOOD LAKE DAM	-	MO30135	High	32	WHITEWATER CREEK	YOUNT	3
LAKENAN LAKE DAM	-	MO31066	High	30	TR-SPRING BRANCH	LITHIUM	1
LAKE KAH-TAN-DA DAM	-	MO30838	High	56	TR-NATIONS CREEK	SILVER LAKE	6
ZOELLNER DAM	-	MO40177	High	62	-	-	0
HUDSON LAKE DAM (SHALLOW)	-	MO31213	Low	25	TR CEDAR FORK	ST MARYS	10
TURKEY TOE CANYON LAKE DAM	-	MO30812	Low	25	TR CINQUE HOMMES CREEK	MENFRO	3
TWIN LAKES LOWER DAM	-	MO30810	Low	33	TR MCCLANAHAN CREEK	MENFRO	6
SLEEPY HOLLOW LAKE DAM	-	MO30092	Low	25	TR DRY FORK	ST MARYS	16
LACH DIFANI DAM	-	MO31028	Low	28	TR SALINE CREEK	ST MARYS	8
MARY'S LAKE DAM	-	MO30132	Low	30	TR SOUTH FORK SALINE CREEK	ST MARY'S	0
ABSHER LAKE DAM	-	MO31221	Low	30	TR-SOUTH SALINE CREEK	ST MARYS	9
OLLIE MOORE LOWER LAKE DAM	-	MO31069	Low	18	TR HIGHLAND CREEK	MENFRO	14
THE LOST SEVEN LAKE DAM	-	MO31369	Low	23	NATIONS CREEK	SILVER LAKE	8
MACH LAKE DAM	MACH LAKE	MO30133	Low	30	TR-GOOSE CREEK	SAINT MARYS	-
ROCK VALLEY LAKE DAM	-	MO30003	Low	25	TR SOUTH FORK SALINE CREEK	ST MARYS	0
CLIFFORD HOEHN DAM	-	MO51383	Low	35	APPLE CREEK	OLD APPLETON	15
LARRY BAER DAM	-	MO50847	Low	30	TR-APPLE CREEK	OLD APPLETON	-
LEGION LAKE DAM	LEGION LAKE	MO31721	Low	31	TR-CINQUE HOMMES CREEK	MENFRO	-
KEN BUCHHEIT DAM	-	MO51181	Low	26	TR-APPLE CREEK	OLD APPLETON	-

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RODNEY BARBER DAM	-	MO50845	Low	29	TR-BRAZEAU CREEK	NONE	-
BAUDENDISTEL DAM	-	MO50848	Low	30	TR-WHITEWATER	YOUNT	-
MARK STEINBECKER	-	MO51180	Low	28	TR-SALINE CREEK	ST. MARY	-
LONESS DAM	-	MO50846	Low	29	TR-HUNT BRANCH	ST. MARY	-

**Table 3.12. State Regulated Dams in Planning Area**

LOCATION	ID_NO	NAME	DRAINAGE							
			YEAR COMPLETE	LENGTH	DAMHT	RESAREA	AREA (acres)	STATE REGULATED	HAZARD CLASS	PERMIT NUMBER
S08, T34 N, R09E	MO30030	PORT PERRY DAM	1973	900	70	187	1993	Y	1	R-184
LG0856, T35 N, R10E	MO30813	PERRY COUNTY COMM. LAKE DAM	1971	900	47	87	2560	Y	2	R-203
S13, T34 N, R09E	MO30838	LAKE KAH-TAN-DA DAM	1966	850	56	50	365	Y	2	R-435
S07, T35 N, R10E	MO31226	KOOL BREEZE RIDGE DAM	1976	465	39	3	60	Y	2	R-263
S25, T35 N, R09E	MO31068	HICKORY HOLLOW LAKE DAM	1964	760	44	43	550	Y	2	R-099
S16, T34 N, R09E	MO40177	ZOELLNER DAM	0000	0	62	31	210		1	S-133

Source: Missouri DNR

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### ***Severity/Magnitude/Extent***

The severity/magnitude of dam failure would be similar in some cases to the impacts associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the High Hazard/Class I dams could result in a serious threat of loss of human life, serious damage to residential, industrial or commercial areas, public utilities, public buildings, or major transportation facilities. Catastrophic failure of any high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. Note that for this reason, dam failures could flood areas outside of mapped flood hazards. Also note that inundation areas have not been mapped for these dams; however, the expected inundation area is generally considered greater than the SFHA near the dam, decreasing down to equaling the SFHA further from the dam, and then eventually lying within the SFHA.

### ***Previous Occurrences***

There have been no previous occurrences of dam or levee failures in the past 25 years.

### ***Probability of Future Occurrence***

There are no documented dam failures in the county in the past 25 years. This makes a calculation of probability difficult. However, regulated dams are inspected regularly, which greatly reduces the chances of a failure.

### **Vulnerability**

#### ***Vulnerability Overview***

According to the 2013 State Hazard Mitigation Plan, there are approximately 40 buildings in the county vulnerable to a failure of a state-regulated dam. There are, of course, other non-regulated dams in the county, but estimates are difficult due to data limitations.

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

The 2013 State Hazard Mitigation Plan estimates potential losses due to the failure of state-regulated dams at \$3.7 million. As with the number of buildings exposed, it is difficult to make any estimates for non-regulated dams due to data limitations.

#### ***Impact of Future Development***

Future development will be most prominent around the urbanized area in the center of the county. Therefore, over the next five years, little development is anticipated in the estimated inundation areas of local dams.

#### ***Hazard Summary by Jurisdiction***

Development density (low) in the presumed inundation zones for all dams in the county are similar across the county.

### **Problem Statement**

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Dam failures primarily pose a problem for unincorporated areas of the county, which are generally less densely populated and have far less commercial or industrial development. While this limits the magnitude of potential loss of life due to a dam failure, damage to homes and agricultural assets still represent significant problems for county residents. Continued inspection of dams will help alleviate the chance of dam failure, and future mapping of inundation areas will help identify what structures are vulnerable.

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## 3.4.2 Drought

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### **Hazard Profile**

#### ***Hazard Description***

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period 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***

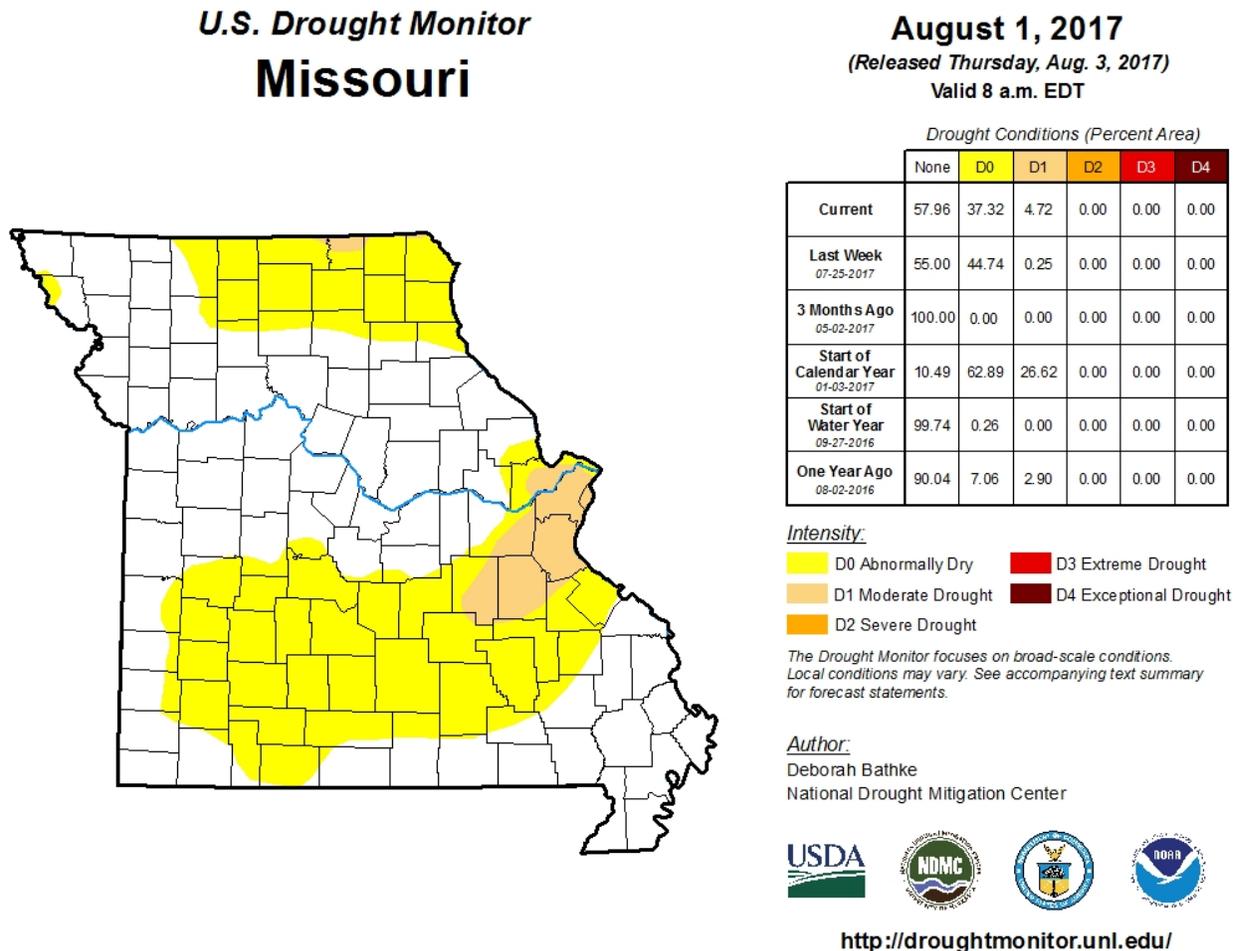
Given the nature of droughts, the entire county is equally exposed to this hazard. Droughts do tend to have greater impact on agricultural activities and would therefore have more impact in the unincorporated county than the more urbanized areas.

#### ***Severity/Magnitude/Extent***

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

affected. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can all contribute to increased mortality.

**Figure 3.1. U.S. Drought Monitor Map of Missouri on 8/1/2017**



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

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.

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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***

Since 1993, there have been 8 significant drought events to affect the county. The most severe were months-long events in the summers of 1999 and 2012.

### ***Probability of Future Occurrence***

Over the last 25 years there have been 8 major drought occurrences in the County. This equals a 32% annual chance of a drought.

## **Vulnerability**

### ***Vulnerability Overview***

Perry County has a moderate vulnerability to drought compared to other areas of the State. The 2013 Missouri State Hazard Mitigation Plan indicates the county has had \$531,517 in annualized crop insurance claims due to drought from 1998-2012 and is rated with a Medium-Low crop loss ratio.

### ***Potential Losses to Existing Development***

Much of the impact would be felt by agricultural activities, especially for crop related uses. Approximately half of Perry County's agricultural land use is in crops, which has greater vulnerability to drought than live stock. This explains the County's moderate annualized crop insurance claims and indicates that potential losses to existing development Medium-Low. Impacts on the city and the school district will be lesser still.

### ***Impact of Future Development***

Given the small amount of growth the County is expected to experience over the next 5 years, impacts to future development will be almost identical to those on existing development.

### ***Hazard Summary by Jurisdiction***

All jurisdictions are equally exposed to a drought but given the greater amount of agricultural activities in the County, it has a greater vulnerability to drought than any of the other jurisdictions.

## **Problem Statement**

While droughts have regional impacts, within the county the most vulnerable areas are the agricultural assets in the unincorporated county. Droughts have little to no impact on the school district, and the City of Perryville has had no issues with water source depletion in recent history.

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### **3.4.3 Earthquakes**

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#### **Hazard Profile**

##### ***Hazard Description***

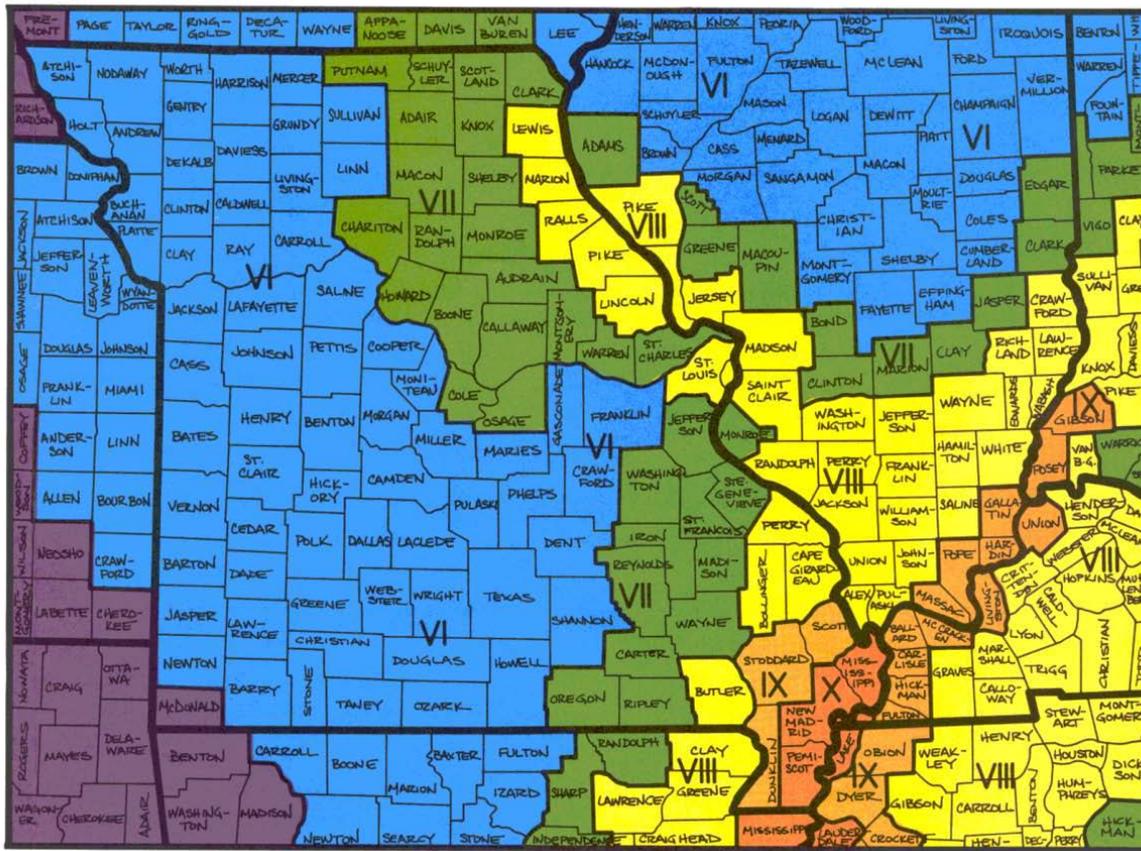
An earthquake is a sudden motion or trembling that is caused by a release of energy accumulated within or along the edge of the earth's tectonic plates. Earthquakes occur primarily along fault zones and tears in the earth's crust. Along these faults and tears in the crust, stresses can build until one 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.

##### ***Geographic Location***

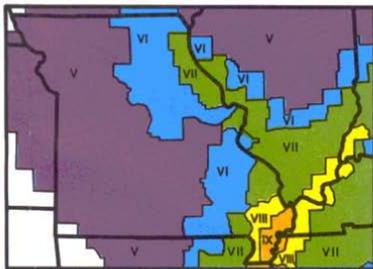
Perry County is located approximately 80 miles northwest of the New Madrid Fault. This fault was responsible for the famous 1811 earthquakes that registered up to 7.9 on the Richter Scale and rang church bells in Boston, MA.

The following Figures illustrate the potential impact the New Madrid Fault could have on Perry County.

**Figure 3.2. Impact Zones for Earthquake Along the New Madrid Fault**

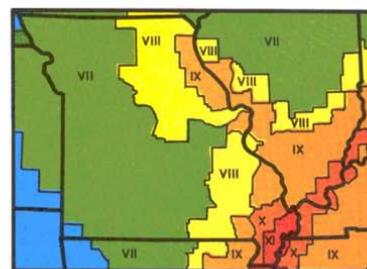


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



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

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



Source:

[http://sema.dps.mo.gov/docs/programs/Planning,%20Disaster%20&%20Recovery/State%20of%20Missouri%20Hazard%20Analysis/2012-State-Hazard-Analysis/Annex\\_F\\_Earthquakes.pdf](http://sema.dps.mo.gov/docs/programs/Planning,%20Disaster%20&%20Recovery/State%20of%20Missouri%20Hazard%20Analysis/2012-State-Hazard-Analysis/Annex_F_Earthquakes.pdf)

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## PROJECTED EARTHQUAKE INTENSITIES

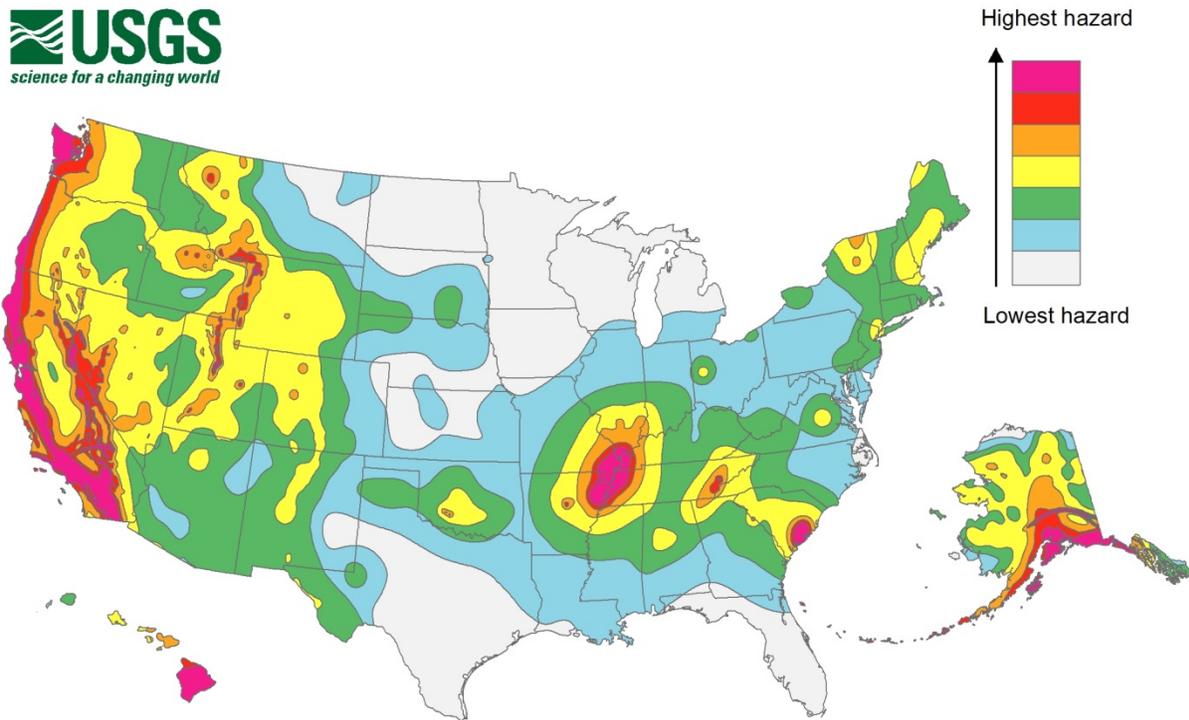
### MODIFIED MERCALLI INTENSITY SCALE

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

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

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

Figure 3.3. United States Seismic Hazard Map



Source: United States Geological Survey at [http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014\\_lg.jpg](http://earthquake.usgs.gov/hazards/products/conterminous/2014/HazardMap2014_lg.jpg)

### **Severity/Magnitude/Extent**

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

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

### ***Previous Occurrences***

In recent years there have been earthquakes recorded near the county ranging in magnitude from 1 to 3, but no known serious damage has resulted. The New Madrid Seismic Zone experiences more than 200 measurable earthquakes a year. Earthquakes of magnitude 2.5 to 3 on the Richter scale are felt annually, with a quake of 4 or more being released every 18 months. An earthquake of 5.0 or greater on the Richter scale occurs about once per decade.

### ***Probability of Future Occurrence***

As stated previously, the County typically experiences at least one earthquake per year, while an earthquake of 5.0 or greater on the Richter scale has an annual probability of approximately 10%.

## **Vulnerability**

### ***Vulnerability Overview***

Perry County has a higher than average loss ratio for earthquake damages compared to the rest of the State due to its proximity to the New Madrid Seismic Zone.

### ***Potential Losses to Existing Development***

Given a scenario of 2% probability of exceedance in 50 years, Perry County would be projected to suffer over \$756 million in total economic loss to buildings. Such an economic loss in a rural county could be catastrophic and devastate the population for decades.

### ***Impact of Future Development***

Future development is not expected to increase the risk of an earthquake other than by contributing to the overall exposure of what could become damaged because of an event. Given the small growth anticipated in the County, even this increase in exposure is small.

### ***Hazard Summary by Jurisdiction***

Earthquake intensity will not vary in any meaningful way across the county; therefore, all jurisdictions are equally exposed to an earthquake, and the impacts are expected to be similar for all jurisdictions, given similar development patterns and types.

## **Problem Statement**

Earthquakes pose a serious threat to all jurisdictions in the county. A sufficiently strong earthquake will likely damage numerous private and public structures and facilities, including utility distribution and supply infrastructure. The disruption to transportation, water, sewer, electricity, and natural gas will leave residents, businesses, and schools unable to function reliably for potentially weeks after the event. Seismic retrofitting can help, but is often cost prohibitive, and seismic requirements for new development can drive costs up and stymie the growth of the city. Emergency generators can help alleviate the potential loss of power presented

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by an event.

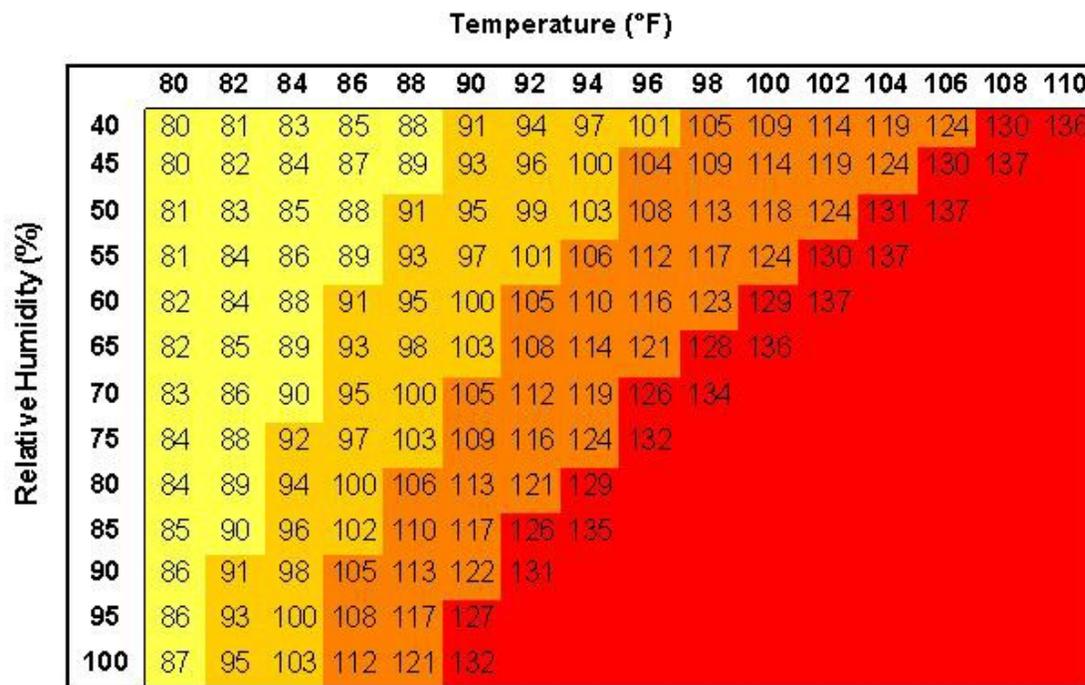
### 3.4.4 Extreme Heat

#### Hazard Profile

##### *Hazard Description*

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture and other economic sectors. The remainder of this section profiles extreme heat. Extreme cold events are profiled in combination with Winter Storm. 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 3.4** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

**Figure 3.4. Heat Index (HI) Chart**



#### Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

■ Caution   
 ■ Extreme Caution   
 ■ Danger   
 ■ Extreme Danger

Source: National Weather Service (NWS)

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

#### *Geographic Location*

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

#### *Severity/Magnitude/Extent*

Extreme heat can strain crops, livestock, and human health, as well as electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

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

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

**Table 3.13** lists typical symptoms and health impacts due to exposure to extreme heat.

**Table 3.13. 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

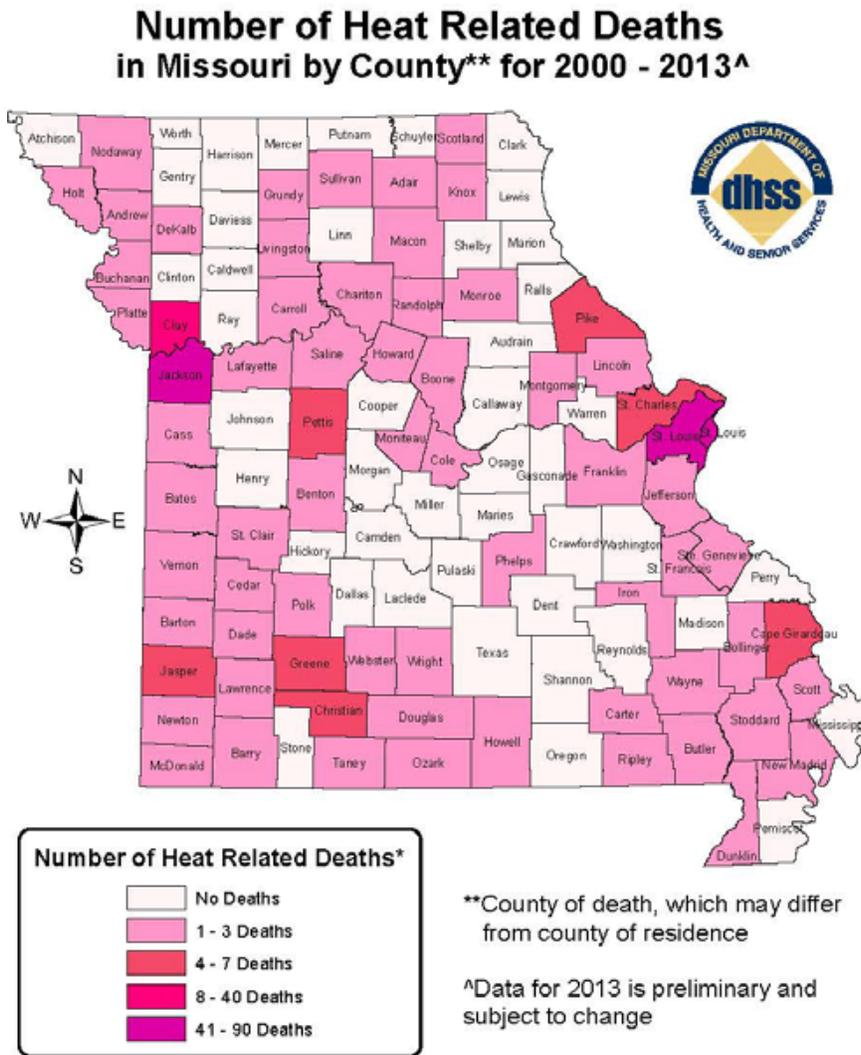
Source: National Weather Service Heat Index Program, [www.weather.gov/os/heat/index.shtml](http://www.weather.gov/os/heat/index.shtml)

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

***Previous Occurrences***

The NCEI lists 10 recorded events in the past 25 years, with no deaths reported. Additionally, Figure 3.5 shows there were no heat-related deaths in Perry County between 2000 and 2013.

**Figure 3.5. Heat Related Deaths in Missouri 2000 - 2013**



\*Source: Bureau of Environmental Epidemiology

Date: 6/5/2014

**Probability of Future Occurrence**

While Extreme Heat events can potentially be under-reported in the NCEI, a total of 10 reported events in 25 years calculates to an annual probability of an event of 40%.

**Vulnerability**

**Vulnerability Overview**

The State HMP lists concentrations of elderly populations as one of the best indicators of vulnerability to extreme Heat events. For Perry County, the adults age 65 and older make up 17% of the population. This puts the County near the median of all counties in the state. This moderate percentage of elderly in the county along with 0 reported deaths in the past 25 years due to extreme heat indicate the county is marginally vulnerable to extreme heat events.

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### ***Potential Losses to Existing Development***

Given the limited number of heat related deaths in the past quarter century and the median concentration of elderly in the County, the potential losses to existing development are marginal.

### ***Impact of Future Development***

Population growth can result in increases in the age-groups that are most vulnerable to extreme heat. Population growth also increases the strain on electricity infrastructure, as more electricity is needed to accommodate the growing population. While no jurisdictions are experiencing major growth, the aging of the Baby Boomers is likely to lead to a growth in the percentage of elderly in the County.

### ***Hazard Summary by Jurisdiction***

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2010 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat. Table 3.14 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.

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**Table 3.14. County Population Under Age 5 and Over Age 65, 2010 Census Data**

<b>Jurisdiction</b>	<b>Population Under 5 yrs</b>	<b>Population 65 yrs and over</b>
Perry County	6%	17%
Perryville	7%	17%

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

### **Problem Statement**

Extreme heat is most problematic for the elderly and youth in the entire county. While schools host much of the youth population for a period of time each day, the buildings are temperature controlled and offer a reprieve to students from the heat if they lack air conditioning at home. Likewise, the senior center offers an oasis for senior residents seeking a break from extreme heat.

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## 3.4.5 Wildfires

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### **Hazard Profile**

#### ***Hazard Description***

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

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

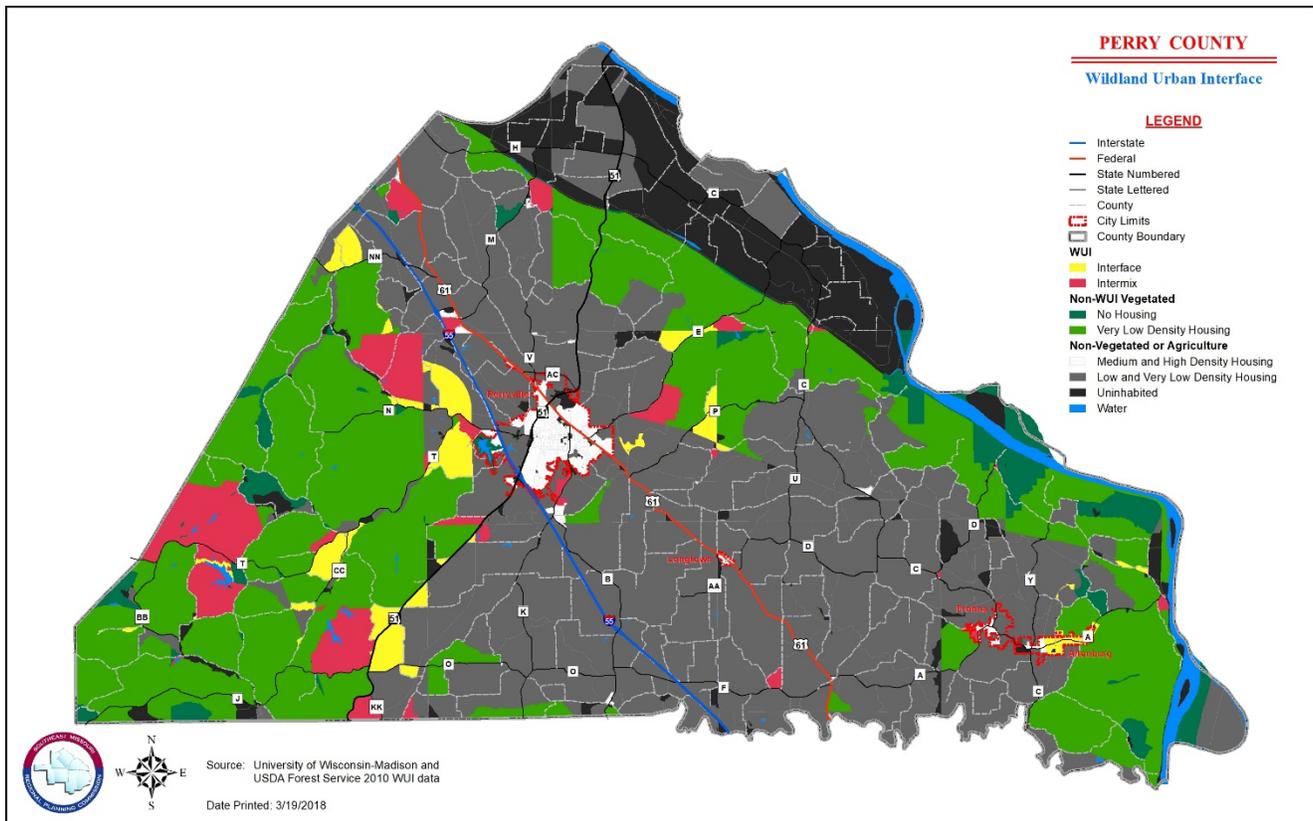
The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works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

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

#### ***Geographic Location***

The risk of structural fire does not vary widely across the planning area. However, damages due to wildfires are likely to be higher in communities with more wildland–urban interface (WUI) areas. WUI 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 3.6 illustrates the most vulnerable areas of the county based on Interface and Intermix.

Figure 3.6. Perry County Woodland-Urban Interface Map



### Severity/Magnitude/Extent

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

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

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

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

Information on severity of damages from wildfires is not currently available.

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### ***Previous Occurrences***

No records of wildfires are currently readily available for the County. SEMO RPC will continue to work with local and state agencies to develop reliable data sets for wildfires in the region.

### ***Probability of Future Occurrence***

No statistics are currently available on which to estimate the probability of future occurrence. The 2013 State HMP indicates there is an annual average of 3.8 wildfires in the county.

### **Vulnerability**

#### ***Vulnerability Overview***

The 2013 State HMP indicates Perry County has a “Low” vulnerability to wildfires. The woodland-urban interface map indicates this is likely true for the participating cities as well.

#### ***Potential Losses to Existing Development***

Data was sought from the National Fire Incident Reporting System, the Department of Conservation, and DNR. However, no data is readily available.

#### ***Impact of Future Development***

Future development is likely to occur in areas of Intermix on the WUI map. This will increase the number of structures in the area while also reducing the amount of vegetation to serve as fuel. These two factors are expected to balance one another, leading to no significant impact from future development.

#### ***Hazard Summary by Jurisdiction***

There is little “Intermix” area in the county, with much of it located away from Perryville. The County certainly has more forest cover than the cities, but the lower population density minimizes the impacts of a wildfire on human life and structures in the county.

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## 3.4.6 Flooding (Flash and River)

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### **Hazard Profile**

#### ***Hazard Description***

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

Flooding caused by dam and levee failure is discussed in the Dam and Levee Failure section. It will not be addressed in this section.

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

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

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

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

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

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

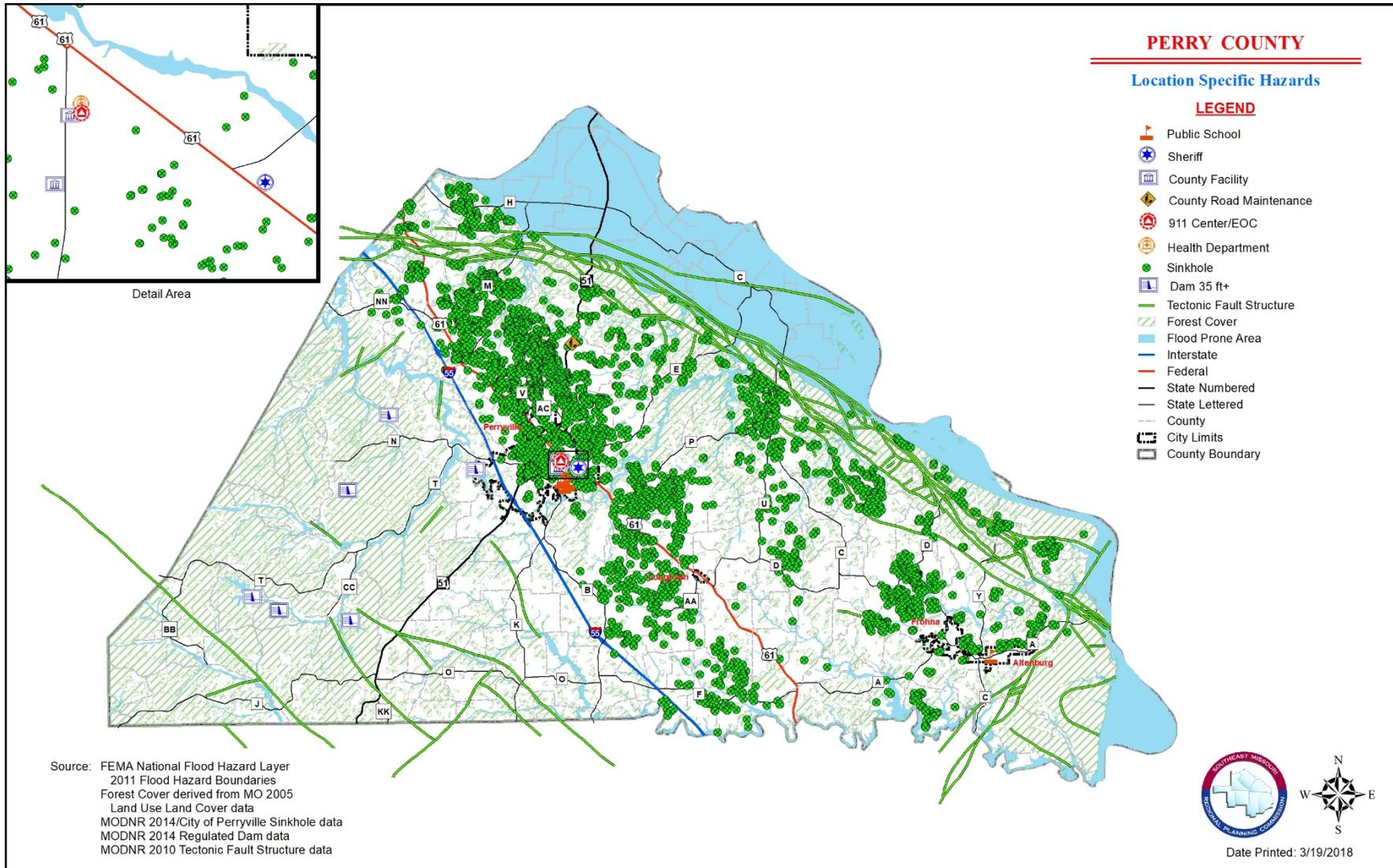
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advanced warning systems has increased the warning time for flash floods.

***Geographic Location***

River flooding is most likely to occur in SFHAs. The following maps illustrate the SFHAs for all participating jurisdictions.

Figure 3.7. Perry County SFHAs



**Figure 3.8. Perryville SFHAs**

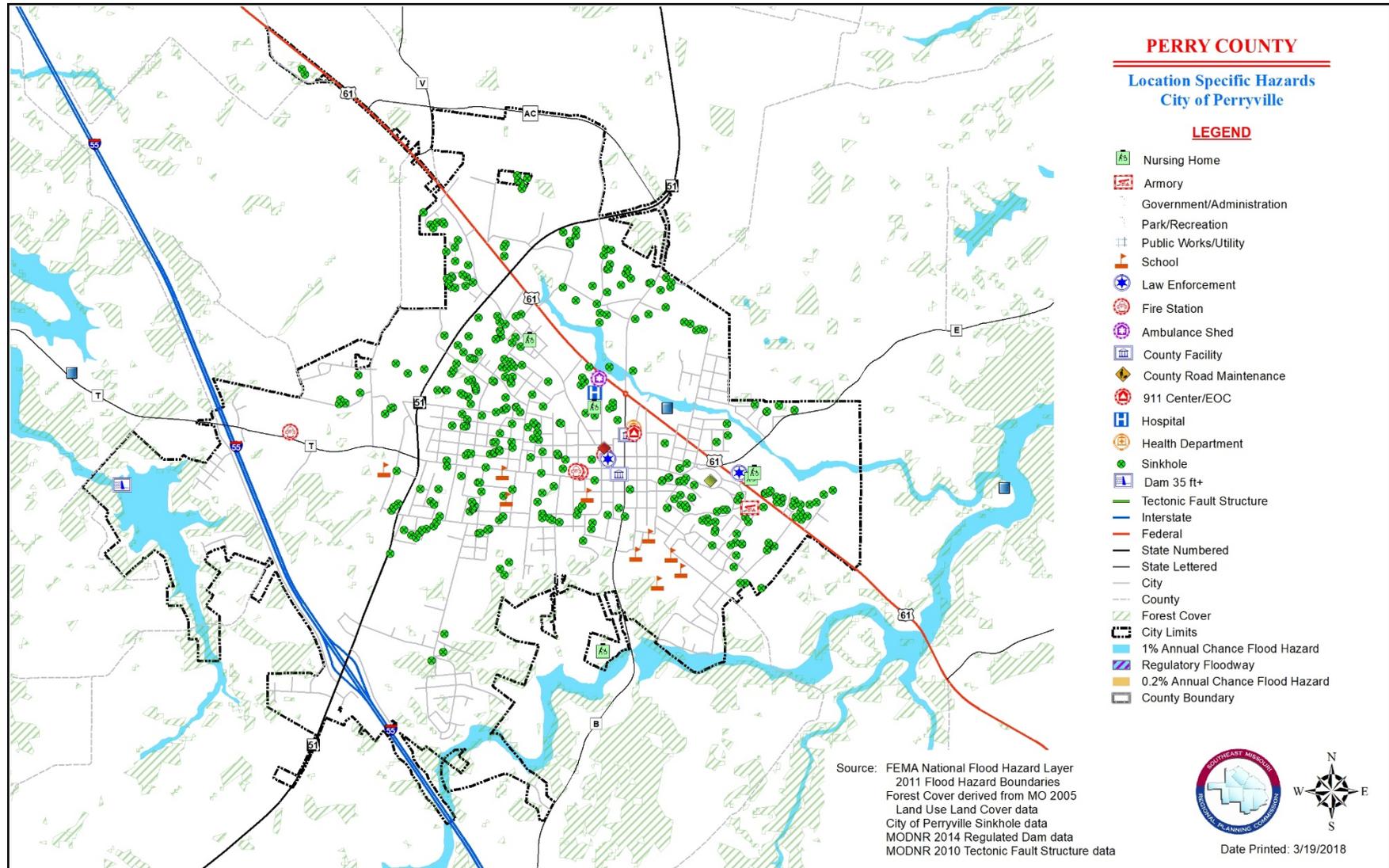
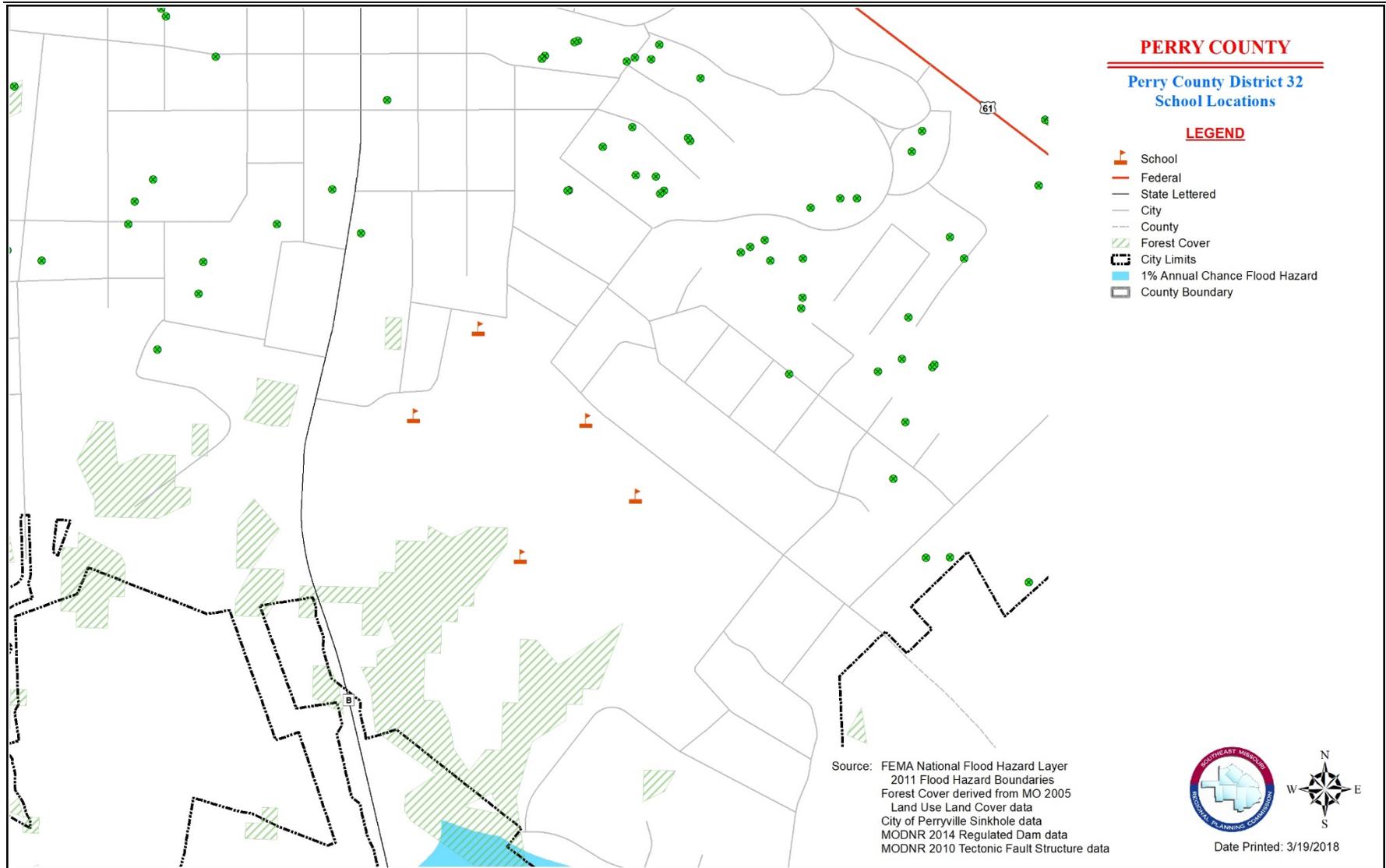


Figure 3.9. Perry Co School Dist. No 32 SFHA



## Severity/Magnitude/Extent

Missouri has a long and active history of flooding over the past century, according to the 2013 State Hazard Mitigation Plan. Flooding along Missouri's major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing communities downstream sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, floods exact a heavy toll in terms of human suffering and losses to public and private property. By contrast, flash flood events in recent years have caused a higher number of deaths and major property damage in many areas of Missouri.

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

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

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

### National Flood Insurance Program (NFIP) Participation

Table 3.15 shows the participation status of all jurisdictions in the planning area, regardless of participation status in this plan. Table 3.16 shows the NFIP policy and claim statistics of participating jurisdictions of this plan.

**Table 3.15. NFIP Participation**

Community ID #	Community Name	NFIP Participant (Y/N)	Current Effective Map Date	Regular-Emergency Program Entry Date
290280	Perry County	Y	8/2/11	1/6/88
295415	Altenburg	Y	NSFHA	10/22/13
	Frohna			
290282	Perryville	Y	8/2/11	8/4/83

Source: NFIP Community Status Book, 8/17/2017; BureauNet, <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>; M= No elevation determined – all Zone A, C, and X; NSFHA = No Special Flood Hazard Area; E=Emergency Program

**Table 3.16. NFIP Policy and Claim Statistics as of 8/17/2017**

Community Name	Total Losses	Closed Losses	Total Payments
Perry County	285	268	\$5,260,842
Perryville	4	3	\$28,950

Source: NFIP Community Status Book, 8/17/2017; BureauNet, <http://bsa.nfipstat.fema.gov/reports/reports.html>; \*Closed Losses are those flood insurance claims that resulted in payment.

### Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss Properties, according to the State Hazard Mitigation Officer, are those properties covered by a contract for flood insurance made available under the NFIP that:

- a) have incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and
- b) at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Severe Repetitive Loss Properties are defined, by the National Flood Insurance Reform Act of 2004, as: a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 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 amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

According to the Flood Insurance Administration, jurisdictions included in the planning area have a combined total of 2 non mitigated repetitive loss properties (1 residential, 1 commercial) and 1 mitigated property (residential). There are no Severe Repetitive Loss properties in the county.

**Table 3.17. Perry County Repetitive Loss Properties, Non-Mitigated**

County Name	Community Name	Building	Contents	Total	Average	Losses	Properties
		Payments	Payments	Payments	Payment		
<u>PERRY COUNTY</u>	<u>Perry County*</u>	139,619.57	107,126.75	246,746.32	49,349.26	5	2

Residential 1  
Commercial 1

Source: S E M A

**Table 3.18. Perry County Repetitive Loss Properties, Mitigated**

County Name	Community Name	Building	Contents	Total	Average	Losses	Properties
		Payments	Payments	Payments	Payment		
<u>PERRY COUNTY</u>	<u>Perry County*</u>	26,480.97	4,425.00	30,905.97	15,452.99	2	1

Residential 1  
Commercial 0

**Previous Occurrences**

Table 3.19 shows flash flood events in the county from the past 25 years. Table 3.20 shows riverine flood events in the County for the same time period.

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**Table 3.19. NCEI County Flash Flood Events Summary, 1993 to 2017**

LOCATION	DATE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
PERRYVILLE	4/22/1996	1	1	10000	0
MENFRO	5/5/1996	0	0	0	0
MENFRO	5/10/1996	0	0	100000	0
SERENO	5/14/1996	0	0	0	0
PERRYVILLE	3/1/1997	0	0	0	0
PERRYVILLE	4/15/1998	0	0	25000	0
COUNTYWIDE	4/15/1998	0	0	20000	0
COUNTYWIDE	1/21/1999	0	0	0	0
COUNTYWIDE	4/3/1999	0	0	0	0
COUNTYWIDE	4/3/1999	0	0	0	0
PERRYVILLE	4/3/1999	0	0	0	0
COUNTYWIDE	5/12/1999	0	0	5000	0
PERRYVILLE	1/31/2002	0	0	0	0
COUNTYWIDE	3/25/2002	0	0	0	0
COUNTYWIDE	5/8/2002	0	0	5000	0
COUNTYWIDE	5/12/2002	0	0	10000	0
SILVER LAKE	4/29/2003	0	0	0	0
COUNTYWIDE	5/6/2003	0	0	0	0
APPLECREEK	11/15/2005	0	0	0	0
SCHNERBUSCH	3/31/2008	0	0	0	0
HIGHLAND	5/26/2008	0	0	8000	0
BREWER	4/19/2009	0	0	0	0
PERRYVILLE	6/19/2015	0	0	10000	0
LITHIUM	5/11/2016	0	0	0	0
MC BRIDE	4/29/2017	0	0	10000	0
ALTENBURG	4/30/2017	0	0	0	0
LITHIUM	6/23/2017	0	0	0	0

Source: NCEI, data accessed 12/2/17

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**Table 3.20. NCEI County Riverine Flood Events Summary, 1993 to 2017**

LOCATION	DATE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
PERRY (ZONE)	2/5/1996	0	0	0	0
PERRY (ZONE)	5/1/1996	0	0	100000	0
PERRY (ZONE)	6/1/1996	0	0	0	0
PERRY (ZONE)	2/24/1997	0	0	0	0
PERRY (ZONE)	3/1/1997	1	0	150000	0
PERRY (ZONE)	5/1/1997	0	0	0	0
PERRYVILLE	5/26/1997	0	0	0	0

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PERRY (ZONE)	6/19/1998	0	0	0	0
PERRY (ZONE)	4/18/1999	0	0	0	0
PERRY (ZONE)	5/1/1999	0	0	0	0
COUNTYWIDE	5/5/1999	0	0	0	0
PERRY (ZONE)	2/28/2001	0	0	0	0
PERRY (ZONE)	3/1/2001	0	0	0	0
PERRY (ZONE)	5/11/2001	0	0	0	0
PERRY (ZONE)	6/6/2001	0	0	0	0
PERRY (ZONE)	12/16/2001	0	0	0	0
PERRY (ZONE)	5/8/2002	0	0	5000	0
PERRY (ZONE)	6/1/2002	0	0	0	0
PERRYVILLE	7/10/2002	0	0	0	0
COUNTYWIDE	12/18/2002	0	0	0	0
PERRY (ZONE)	5/11/2003	0	0	0	0
PERRY (ZONE)	5/29/2004	0	0	0	0
PERRY (ZONE)	6/1/2004	0	0	0	0
PERRY (ZONE)	1/6/2005	0	0	0	0
COUNTYWIDE	9/23/2006	0	0	0	0
PERRYVILLE	3/18/2008	0	0	150000	0
PERRYVILLE	4/10/2008	0	0	0	0
PERRYVILLE	10/30/2009	0	0	0	0
MENFRO	3/15/2010	0	0	0	0
WITTENBURG	5/15/2010	0	0	0	0
MENFRO	4/20/2011	0	0	0	0
ALTENBURG	4/24/2011	0	0	0	0
ALTENBURG	5/1/2011	0	0	50000	0
ALTENBURG	5/1/2011	0	0	30000	0
WITTENBURG	6/1/2011	0	0	0	0
PERRYVILLE MUNI ARPT	5/11/2015	0	0	0	0
WITTENBURG	6/9/2015	0	0	10000	0
WITTENBURG	7/1/2015	0	0	10000	0
ALTENBURG	12/18/2015	0	0	0	0
BREWERVILLE	12/28/2015	0	0	0	0
ALTENBURG	1/1/2016	0	0	250000	0
MC BRIDE	5/11/2016	0	0	0	0
MC BRIDE	4/29/2017	0	0	20000	0
ALTENBURG	5/1/2017	0	0	250000	50000

Source: NCEI, data accessed 12/2/17

### ***Probability of Future Occurrence***

For flash flood events, NCEI reports 24 events in the past 25 years, equaling an annual chance of 96%. Ten events resulted in damages or losses, equaling an 40% chance of occurrence in a year with annual damages of \$8,100. For river flooding, there are 43 reported event in the past 25 years, for an annual chance of 100%.

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There were 11 events with reported losses in that time due to river flooding, equaling a 44% annual rate.

## **Vulnerability**

### ***Vulnerability Overview***

The County has extensive amounts of areas designated as SFHAs, primarily in the bottoms area along the Mississippi river, which accounts for the majority of the riverine floods in the county. Perryville has little SFHA within its boundaries, with most streams occurring in the cave system.

### ***Potential Losses to Existing Development***

Table 3.21 shows the number of buildings in the floodplain in the participating jurisdictions. The table also shows the value of those buildings and their contents.

The school district has no structures in floodplains.

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**Table 3.21. Maximum Potential Flood Losses**

<b>Jurisdiction</b>	<b>Building Count</b>	<b>Building Exposure</b>	<b>Contents Exposure</b>	<b>Total Exposure</b>
Unincorporated County	551	\$ 70,223,026	\$ 46,844,546	\$ 117,067,572
Perryville	48	\$ 5,799,721	\$ 4,165,575	\$ 9,965,296
Total	599	\$ 76,022,747	\$ 51,010,120	\$ 127,032,868

Sources: Population, 2016 Census; Building Count, SEMO RPC data; Building Exposure, HMPC and SEMO RPC data; Contents Exposure derived by applying multiplier to Building Exposure based on HAZUS MH 2.1 standard contents multipliers per usage type as follows: Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%).

### ***Impact of Future Development***

Future development which occurs in floodplains, low-lying areas near rivers or streams or where drainage systems are not adequate to provide drainage during heavy rainfall events will face a much higher risk of flooding. Additionally, future development will also increase impervious surfaces, leading to additional run off, putting more strain on existing drainage systems.

### ***Hazard Summary by Jurisdiction***

GIS analysis of data from the University of Missouri of structures in the County indicates the County has approximately 190 residences, 21 commercial structures, 12 industrial structures, and 328 agricultural structures in SFHAs. Perryville has an estimated 41 residences and 7 commercial structures in SFHAs.

The school district has no structures in the floodplain.

## **Problem Statement**

Flood prone areas of the county are primarily relegated to the area along the Mississippi River. The majority of the structures in the area are agricultural in nature, with one industrial facility and Perryville airport being the

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two exceptions. Both facilities have structural and administrative mitigation measures in place to address potential flooding. Other than the airport, and roadways, there is no critical infrastructure in the SFHA.

One other impact of flood is the closure of Highway 51 leading to the Chester Bridge. This closure shuts off access between Perryville and Chester, IL, which significantly impacts businesses and industries on both sides of the river. However, a new bridge and approach are currently being studied, with replacement expected in the next 5-10 years.

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## 3.4.7 Sinkholes

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### **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).

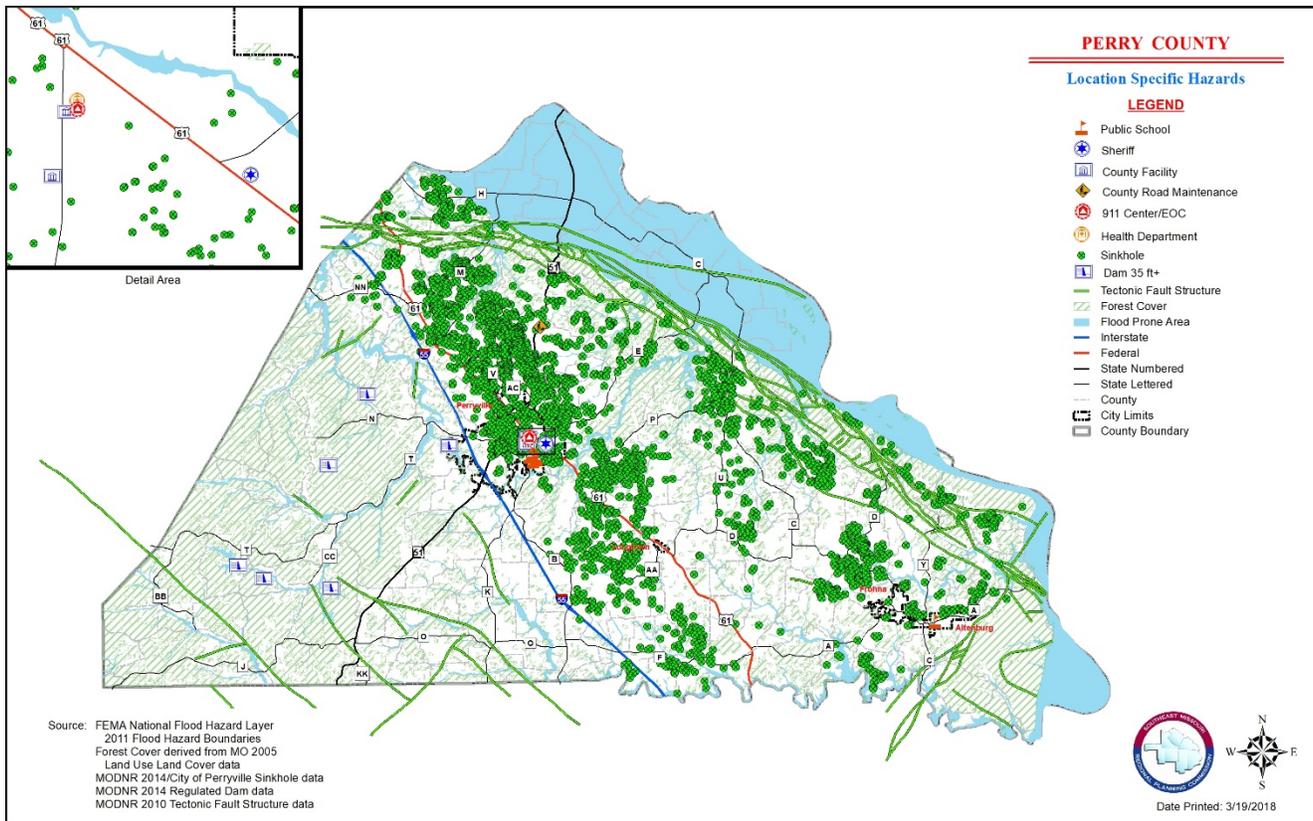
In the case of sinkholes, the rock below the surface is rock that has been dissolving by circulating groundwater. As the rock dissolves, spaces and caverns form, and ultimately the land above the spaces collapse. In Missouri, sinkhole problems are usually a result of surface materials above openings 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***

East of I-55, especially near the Interstate and the Mississippi River, the county is covered with sinkholes leading into the cave systems underground. The locations of all known sinkholes in the county are shown in Figure 3.10.

**Figure 3.10. Sinkhole Locations In Perry County**



**Severity/Magnitude/Extent**

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

The 2013 State Plan included only seven documented sinkhole “notable events”. The plan stated that sinkholes are common to Missouri and the probability is high that they will occur in the future. To date, Missouri sinkholes have historically not had major impacts on development nor have they caused serious damage. Thus, the severity of future events is likely to be low.

**Previous Occurrences**

While there are over 2,700 known sinkholes in the County, there have been no significant events related to them.

**Probability of Future Occurrence**

It is difficult to predict the probability of future occurrence of sinkholes given the complexities involved with bedrock conditions and the unknown “start” dates of the existing sinkholes. Given the karst topography of the county, additional sinkholes are likely to occur eventually.

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## **Vulnerability**

### ***Vulnerability Overview***

With 2,700 known sinkholes but no significant events associated with them, the County's vulnerability to such events is estimated as low.

### ***Potential Losses to Existing Development***

There are no county owned structures in the county within 100 ft. of a known sinkhole. The occurrence of new sinkholes is possible, but it is virtually impossible to predict the exact location currently, making potential losses impractical to estimate.

### ***Impact of Future Development***

Additional future development will statistically increase the risk of damage to development, though it is not currently possible to predict by what amount.

### ***Hazard Summary by Jurisdiction***

Sinkholes, while present and possible, are expected to pose little threat to any jurisdictions.

## **Problem Statement**

Sinkholes are common throughout the county between I-55 and the SFHA of the Mississippi River. Development of new sinkholes is likely to occur, but there is no way to predict where, or to what magnitude. Perryville has mapped and protected all known sinkholes within the city, and the county is working to map known sinkholes in the county.

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## 3.4.8 Levee Failure

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### **Hazard Profile**

#### ***Hazard Description***

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

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

#### **Overtopping: When a Flood Is Too Big**

Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee.

#### **Breaching: When a Levee Gives Way**

A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach. In seismically active areas, earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. Seismic activity can also cause levees to slide or slump, both of which can lead to failure.

### ***Geographic Location***

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

There are two concurrent nation-wide levee inventory development efforts, one led by the United State Army Corps of Engineers (USACE) and one led by Federal Emergency Management Agency (FEMA). The National Levee Database (NLD), developed by USACE, captures all USACE related levee projects, regardless of design levels of protection. The Midterm Levee Inventory (MLI), developed by FEMA, captures all levee data (USACE

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and non-USACE) but primarily focuses on levees that provide 1% annual-chance flood protection on FEMA Flood Insurance Rate Maps (FIRMs).

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

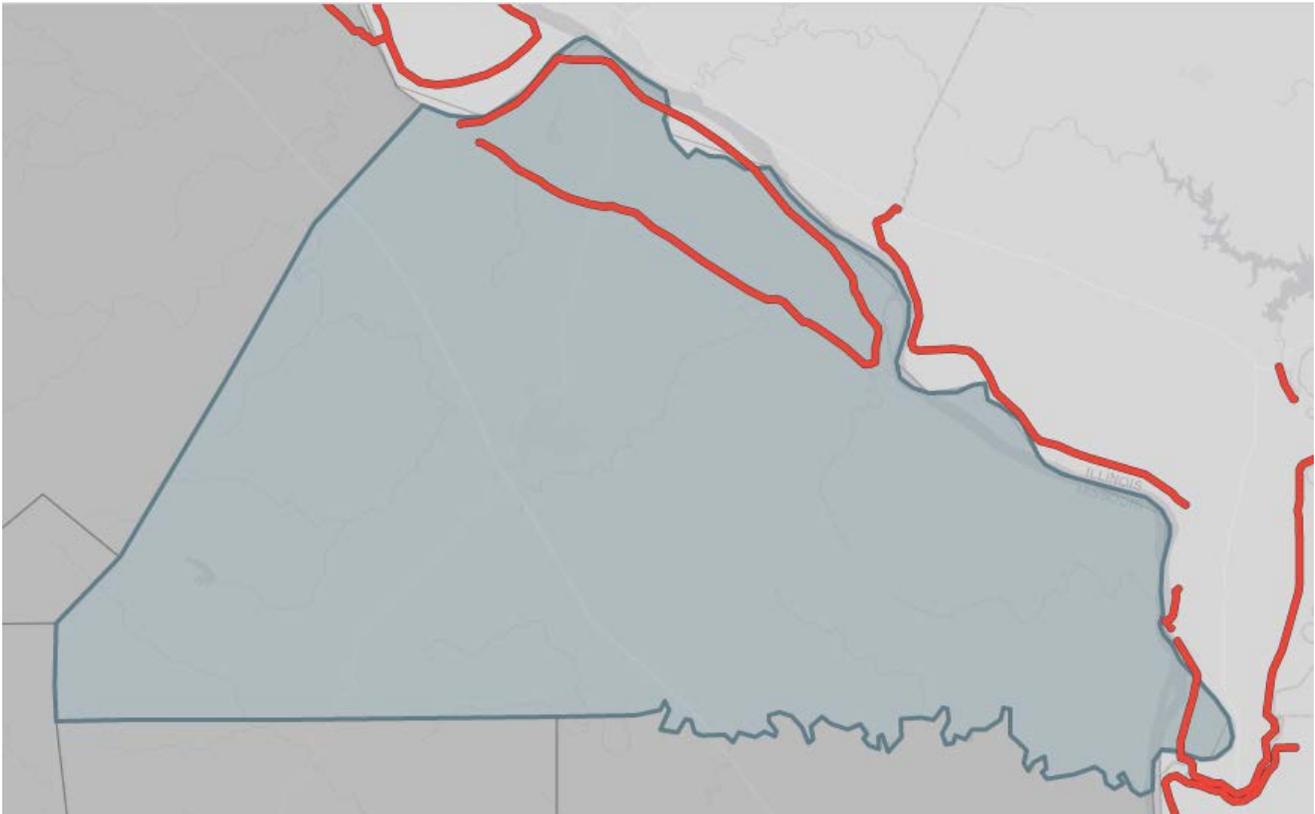
There are two levees listed in the USACE NLD in the County:

- The Bois Brule Levee and Drainage District, which protects the “Bottoms” area of the county, and
- The Grand Tower/Degognia Levee protects a small, uninhabited section of the county.

The Bois Brule Levee, according to the National Levee Database (NLD), “reduces the risk of flooding from the Mississippi River primarily to Perry County, Missouri including the communities of McBride, Belgique, and Menfro. A small portion of the agricultural lands fall within Randolph County, Illinois due to historic river migration. The system is federally authorized and constructed and locally operated and maintained by the non-federal Sponsor, Bois Brule Levee and Drainage District. The levee system was originally completed in 1968 and consists of 33 miles of earthen embankment in an oblong shape along the Mississippi River and several tributaries; construction of improvements to the system has been ongoing since 2014 to increase its resiliency. Within the over 26,000-acre leveed area are residences, several small businesses, two major industrial facilities, a municipal airport, a BNSF railroad line, MO HWY 51 and access to the Chester Bridge, a major Mississippi River crossing. The Chester Bridge crossing is of significant regional importance; flooding of the leveed area could interrupt transportation for nearly 6,500 vehicles per day. The majority of the leveed area is productive agricultural land. This system provides benefits to approximately 500 residents and employees and approximately \$55 million in property value.”

The Grand Tower Levee primarily protects portions of Illinois, as it is on the east side of the Mississippi River. However, due to river migration, a small, uninhabited portion of Perry County, which is east of the river, is also protected by the levee.

The following map shows the locations of the two levees, with the Boise Brule Levee being the Northern of the two levees.



### ***Severity/Magnitude/Extent***

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

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

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

The USACE now conducts two types of levee inspections. Routine Inspection is a visual inspection to verify and rate levee system operation and maintenance. It is typically conducted each year for all levees in the USACE Levee Safety Program. Periodic Inspection is a comprehensive inspection led by a professional engineer and conducted by a USACE multidisciplinary team that includes the levee sponsor. The USACE

typically conducts this inspection every five years on the federally authorized levees in the USACE Levee Safety Program.

Both Routine and Periodic Inspections result in a rating for operation and maintenance. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. Figure 3.11 below defines the three ratings.

**Figure 3.11. Definitions of the Three Levee System Ratings**

Levee System Inspection Ratings

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

***Previous Occurrences***

The Bois Brule Levee, which protects the bottoms area of the county from rising Mississippi waters, failed in 1993 due to underseepage, causing the entire district to be flooded with 20 feet of water.

***Probability of Future Occurrence***

The single levee failure in the past 25 years indicates a probability of 4%. However, levee failures are directly tied to flooding events, making their probability harder to determine.

**Vulnerability**

***Vulnerability Overview***

Due to data limitations, there is no reliable method to determine vulnerability for the County or other jurisdictions at this time. However, the 1993 event clearly showed the entire area protected by the Boise Brule Levee is vulnerable to a failure of the levee.

***Potential Losses to Existing Development***

The Perryville Airport and a Gilster-Mary Lee food manufacturing center are both located in the bottoms area protected by the Bois Brule levee. While both facilities have taken steps to protect from and mitigate the effects of another levee failure, there would still be significant impacts to both. The Grand Tower levee protects only an uninhabited portion of the county. Data limitations prevent further analysis at this time.

***Impact of Future Development***

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Little agricultural development has occurred in the area protected by the Bois Brule levee due to the possibility of another levee failure in the future, and no development has occurred in the area protected by the Grand Tower levee due to it being entirely cut off from the rest of the county by the Mississippi River. The bottoms area is almost entirely farmland, while the Grand Tower area is entirely farmland. Data limitations prevent further analysis at this time.

### ***Hazard Summary by Jurisdiction***

The county is the only jurisdiction exposed and vulnerable to a levee failure.

### **Problem Statement**

A levee failure in the county would result in the inundation of the entire “bottoms” area of the county, flooding hundreds of acres of agricultural lands, shutting down the city’s airport, closing one food processing plant, and closing access to the Chester Bridge. There is little residential development in the area, limiting the impacts of a levee failure to primarily economic in nature. However, these impacts would be significant. The levee has been repaired and strengthened throughout the years, but has also been threatened with failure in recent years. Improved mapping and real-time data collection has helped local jurisdictions and the CoE more quickly address areas of potential failure during recent flood events.

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## 3.4.9 Thunderstorm/High Winds/Lightning/Hail

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### **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 and tornadoes (discussed separately).

##### **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 strike more than 10 miles away from the rainfall area. Thunder is simply the sound that lightning makes. Lightning is a huge discharge of electricity that shoots through the air causing vibrations and creating the sound of thunder.

##### **Hail**

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

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

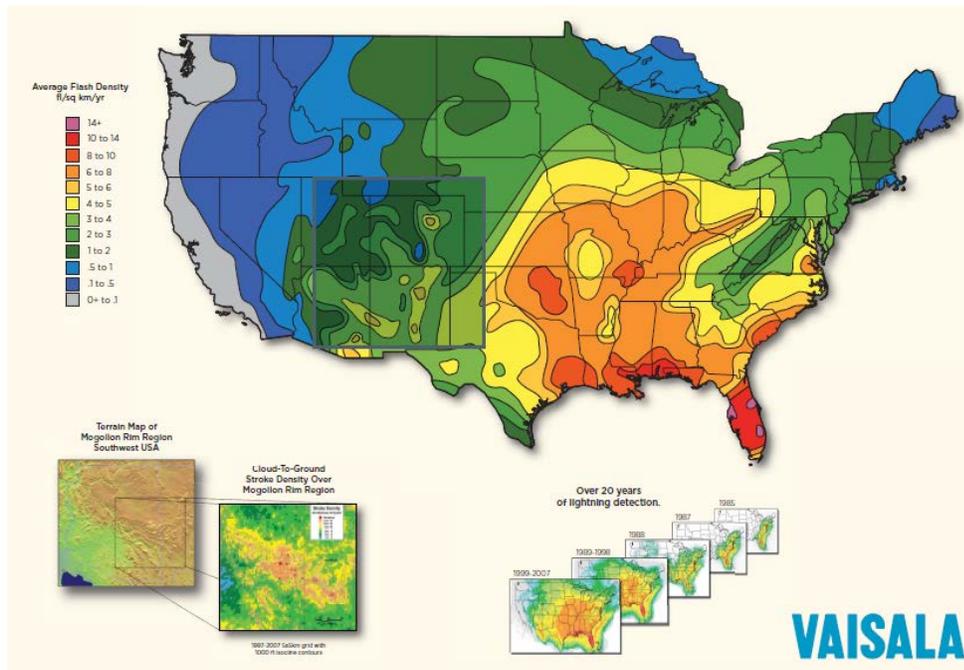
damage.

### Geographic Location

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

Figure 3.12 shows lightning frequency in the state, with the County located in the 6 to 8 category.

**Figure 3.12. Location and Frequency of Lightning in Missouri**



Source: National Weather Service, [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf). Note: indicate location of planning area with a colored square or arrow.

Figure 3.13 shows the wind zones in the nation, with the county located in Zone 4.

**Figure 3.13. Wind Zones in the United States**



Source: FEMA 320, Taking Shelter from the Storm, 3rd edition, [http://www.weather.gov/media/bis/FEMA\\_SafeRoom.pdf](http://www.weather.gov/media/bis/FEMA_SafeRoom.pdf)

**Severity/Magnitude/Extent**

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

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

Most lightning damages occur to electronic equipment located inside buildings. But structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops if fields or forested lands are set on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes. [http://www.lightningsafety.noaa.gov/stats/08\\_Vaisala\\_NLDN\\_Poster.pdf](http://www.lightningsafety.noaa.gov/stats/08_Vaisala_NLDN_Poster.pdf) and <http://www.lightningsafety.noaa.gov/>

Based on information provided by the Tornado and Storm Research Organization (TORRO), **Table 3.22** below describes typical damage impacts of the various sizes of hail.

**Table 3.22. Tornado and Storm Research Organization Hailstorm Intensity Scale**

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

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

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

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

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

### **Previous Occurrences**

Table 3.23, Table 3.24, and Table 3.25 show the previous occurrences of high wind events, lightning events, and hail events in the County. All data is from the NCEI.

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.

**Table 3.23. High & Strong Wind Events (50 knts and higher) 1993-2017**

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
PERRY (ZONE)	4/30/1997	52	0	0	0	0
PERRY (ZONE)	3/26/1998	50	0	0	5000	0
PERRY (ZONE)	11/10/1998	50	0	0	0	0
PERRY (ZONE)	9/14/2008	52	0	0	200000	0

**Table 3.24. Lighting Events 1993-2017**

LOCATION	DATE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
PERRYVILLE	7/30/2010	0	0	1000	0
SERENO	7/1/2012	0	0	0	14000

**Table 3.25. Hail Events 1993-2017**

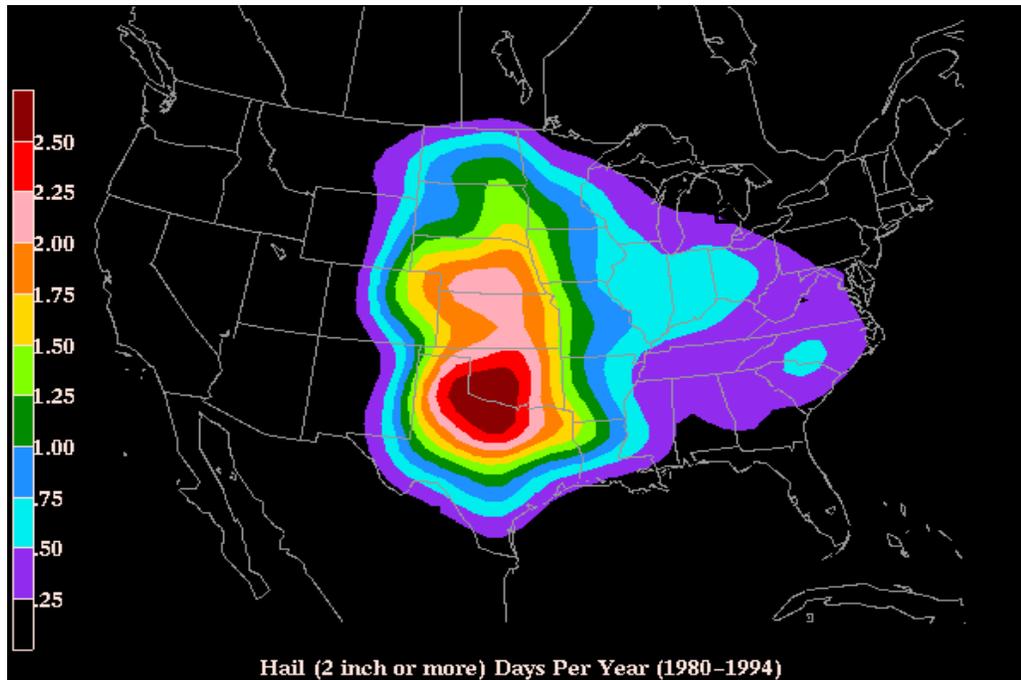
LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
Silver Lake	5/5/1993	1.75	0	0	0	0
Biehle	5/5/1993	1.75	0	0	500	0
PERRYVILLE	5/26/1997	1	0	0	0	0
BIEHLE	7/14/1997	1.75	0	0	10000	0
PERRYVILLE	4/15/1998	1	0	0	0	0
SILVER LAKE	2/27/1999	2	0	0	6000000	0
PERRYVILLE	5/17/1999	1	0	0	0	0
FROHNA	4/7/2000	1.75	0	0	0	0
ALTENBURG	10/24/2001	1	0	0	0	0
SILVER LAKE	4/29/2003	1.75	0	0	0	0
SILVER LAKE	5/6/2003	2	0	0	0	0
BIEHLE	5/6/2003	1.75	0	0	0	0
BREWER	4/23/2006	1.75	0	0	0	0
LONGTOWN	6/23/2007	1	0	0	0	0
FROHNA	8/16/2007	1	0	0	0	0
PERRYVILLE	2/28/2011	1	0	0	0	0
PERRYVILLE	7/1/2012	1	0	0	0	0
PERRYVILLE	7/1/2012	1	0	0	0	0
PERRYVILLE	6/26/2013	1.25	0	0	0	0
PERRYVILLE	7/1/2014	1.75	0	0	0	0
PERRYVILLE	6/25/2016	1	0	0	0	0
MC BRIDE	2/28/2017	1.75	0	0	0	0

**Probability of Future Occurrence**

Four events of high or strong winds of over 50 knots in past 25 years are listed in the NCEI, leading to a probability of 16%. While only 2 lighting events are listed in the NCEI, data limitations are the leading factor in this phenomenon, not the lack of actual events. The HMPC believes it is safe to assume that at least one lightning strike will occur each year in the County.

NCEI lists 22 events of hail over 1in. in diameter in the past 25 years, a probability of 88%. Additionally, NOAA’s NSSL indicates hail of 2” diameter or more is likely to occur 1 day every 16 months in the County (see Figure 3.14)

**Figure 3.14. Annual Hailstorm Probability (2” diameter or larger), U 1980- 1994**



Source: NSSL, [http://www.nssl.noaa.gov/users/brooks/public\\_html/bighail.gif](http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif) Note:

## **Vulnerability**

### ***Vulnerability Overview***

Based on the state’s 2013 HMP, Perry County has a summarized thunderstorm vulnerability rating of “Medium.”

### ***Potential Losses to Existing Development***

Available data indicates there has been significant damage due to an element of a severe thunderstorm, with an annualized loss of nearly \$250,000.

### ***Future Development***

Additional development will result in the exposure of more structures to damages from severe thunderstorms.

### ***Hazard Summary by Jurisdiction***

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Perryville is the most exposed jurisdiction simply due to the higher density of development, followed by the county. Other than the population density difference, all jurisdictions are equally at risk to such hazard events.

**Problem Statement**

Impacts from these events are typically property related, with debris, falling trees, and hail damage. Advanced warnings typically keep residents inside during such events which limits potential injuries and loss of life. While all jurisdictions can be impacted by these events, the city and county are most affected due to their size compared to the relatively small campus of the school district. Of the city and the county, the city is the most affected due to the density of development and concentration of higher property values.

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## 3.4.10 Tornado

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### **Hazard Profile**

#### ***Hazard Description***

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

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

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

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

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

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

#### ***Geographic Location***

Tornadoes can occur at any location in the planning area with equal probability.

#### ***Severity/Magnitude/Extent***

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour and damage paths can be more than one mile wide and 50 miles long. Tornadoes have been known to lift and move objects weighing more than 300 tons a distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. Tornadoes also can generate a tremendous amount of flying debris or “missiles,” which often become

airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls. However, the less spectacular damage is much more common.

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (see **Table 3.26**) 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 3.26. 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 Num	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](http://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 3.27**. 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](http://www.spc.noaa.gov/efscale/ef-scale.html).

**Table 3.27. Enhanced Fujita Scale with Potential Damage**

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

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

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

### ***Previous Occurrences***

Table 3.28 lists all tornado events from 1993 to 2016. Prior to 1993, only very destructive tornadoes were recorded. It is necessary to go back as far as possible due to the random and intermittent nature of tornado events, but data limitations hinder this.

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

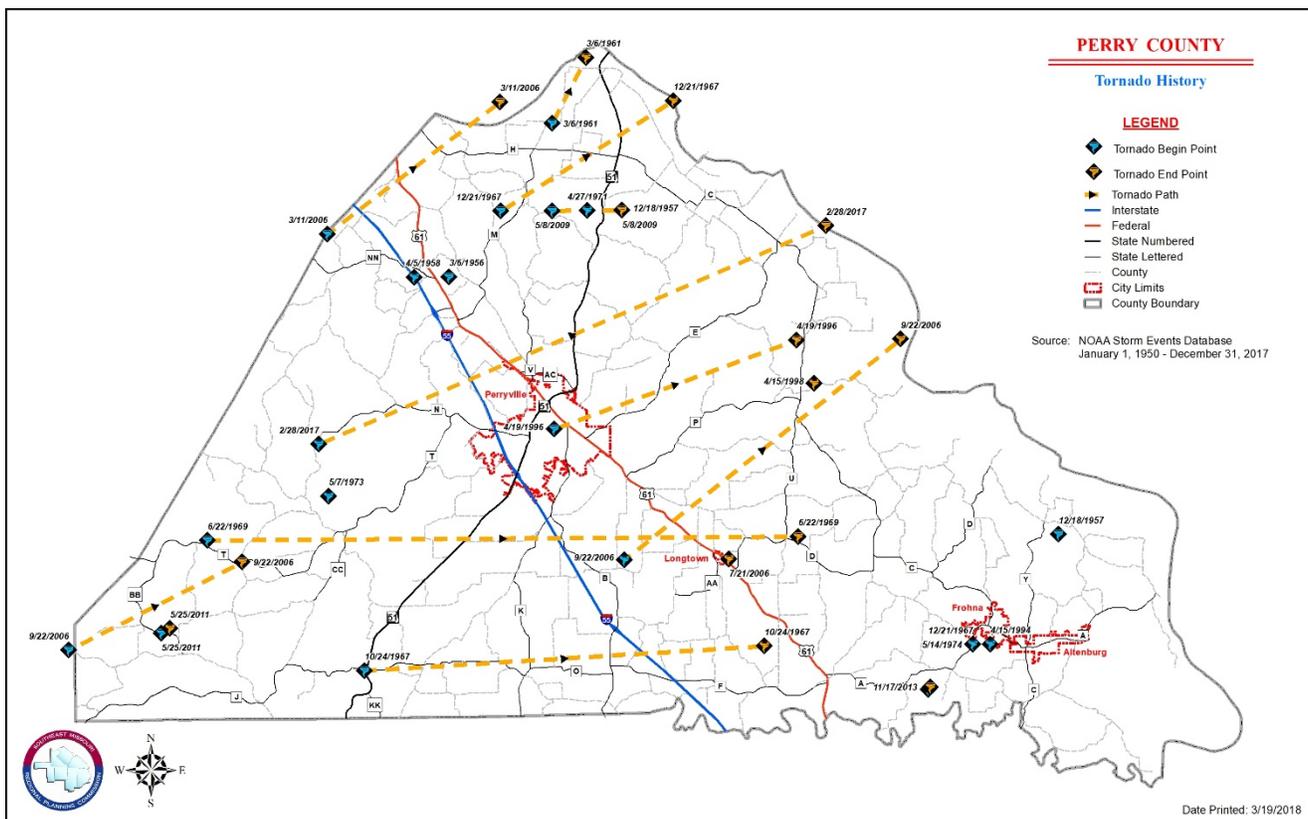
Figure 3.15 shows the approximate paths of all NCEI listed tornadoes in the County from 1950 to present.

**Table 3.28. Recorded Tornadoes in Perry County, 1993-2017**

LOCATION	DATE	F SCALE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
Frohna	4/15/1994	F0	0	0	50000	0
PERRYVILLE	4/19/1996	F3	0	0	500000	0
CROSTOWN	4/15/1998	F0	0	0	0	0
BREWER	3/11/2006	F3	2	10	100000	0
FRIEDENBURG	7/21/2006	F0	0	0	15000	0
SILVER LAKE	9/22/2006	F2	0	0	15000	0
PERRYVILLE	9/22/2006	F4	0	5	700000	0
MC BRIDE	5/8/2009	EF0	0	0	7000	0
YOUNT	5/25/2011	EF0	0	0	3000	0
FROHNA	11/17/2013	EF0	0	0	1000	0
SILVER LAKE	2/28/2017	EF4	1	12	800000	0

Source: National Climatic Data Center, <http://www.ncdc.noaa.gov/stormevents/>

**Figure 3.15. Perry County: Map of Historic Tornado Events**



Source: National Climatic Data Center, <http://www.ncdc.noaa.gov/stormevents/>

**Probability of Future Occurrence**

There have been 11 NCEI listed tornadoes in the County over the past 25 years. This equals an annual probability of 44% of a tornado event.

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## **Vulnerability**

### ***Vulnerability Overview***

Perry County is located in the region of the country known as “Tornado Alley,” a region of the nation with a high frequency of dangerous and destructive tornadoes (Figure 3.16). This high frequency leads to an elevated vulnerability to tornadoes for the County, but the rural nature of the County limits the amount of damage done by any single event. Because of this, the 2013 State HMP rates Perry County with a “Moderate” tornado vulnerability.

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**Figure 3.16. Tornado Alley in the U.S.**



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

### ***Potential Losses to Existing Development***

According to the 2013 State HMP, Perry County has annualized tornado damages of \$1.2 million. This places the county in the top half of the State for annualized losses and indicates a significant amount of potential loss.

### ***Future Development***

Additional development in any jurisdiction will lead to greater exposure of structures to a tornado event. Given the low growth history of the County recently though, increases are expected to be minimal.

### ***Hazard Summary by Jurisdiction***

A tornado event is equally likely to happen in any area of the County. With its higher density development though, Perryville is the most exposed jurisdiction.

### **Problem Statement**

Any participant can be affected by a tornado. While the city is the most exposed due to population and development density, the school district is also densely populated during session. The school district has

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constructed one safe room and is currently constructing another to address this issue, while the city and county have early warning sirens to alert residents to approaching tornadoes. Given the low population density in the county, saferooms are not typically cost effective, unless developed on a county property in the city.

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### 3.4.11 Winter Weather/Snow/Ice/Severe Cold

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#### **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.

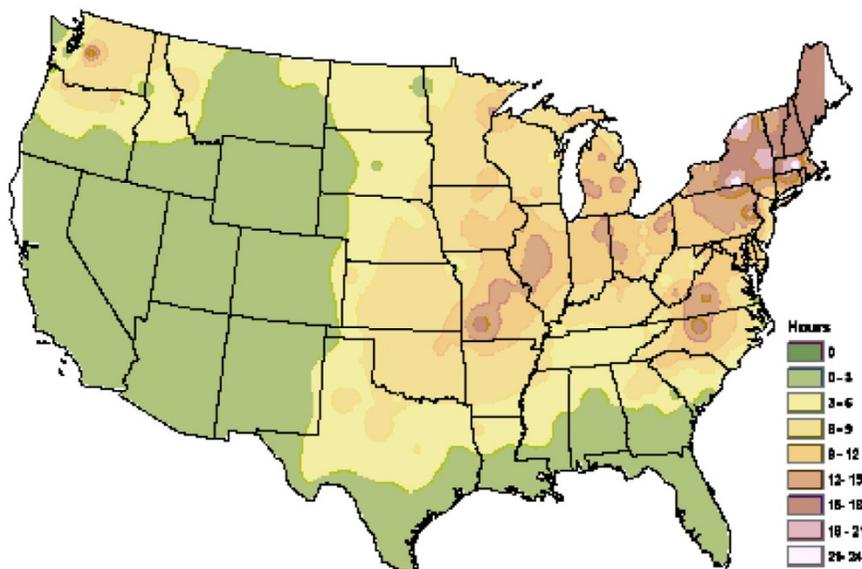
**Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

##### ***Geographic Location***

The entire county is vulnerable to heavy snow, ice, freezing rain, and extreme cold temperatures. Figure 3.17 shows the average number of hours per year with freezing rain, with the County sitting on the line between 9-12 hours and 12-15 hours.

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**Figure 3.17. 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>

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## Severity/Magnitude/Extent

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

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

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

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

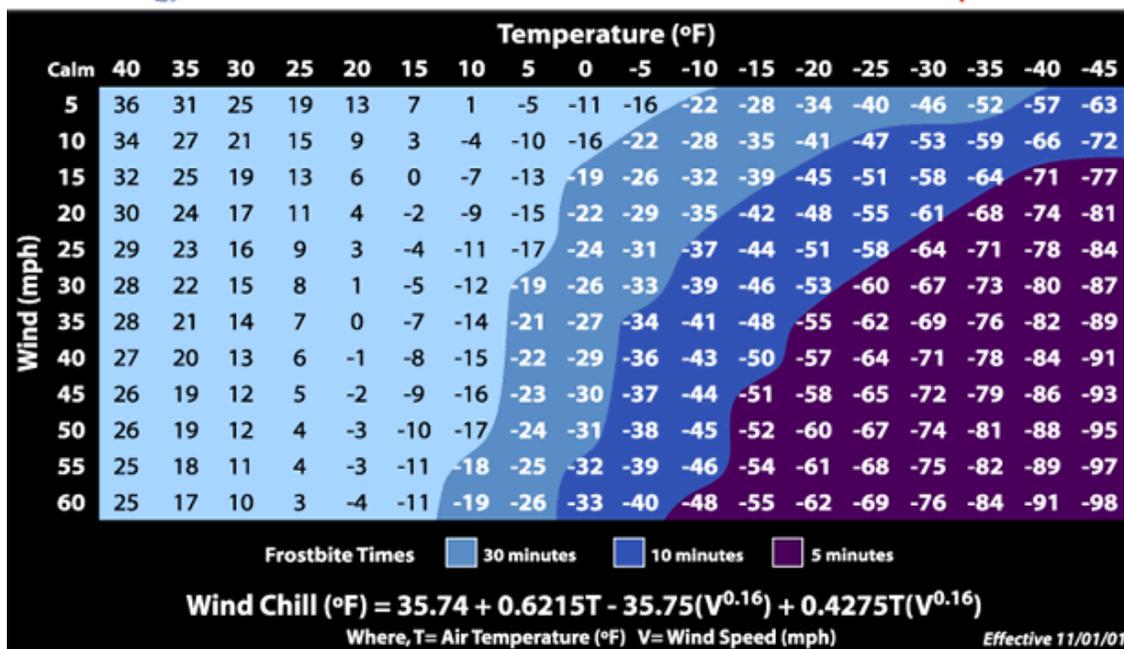
Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when limbs fall. Businesses experience loss of income as a result of closure during power outages. In general heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to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

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

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

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, Figure 3.18 below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

**Figure 3.18. Wind Chill Chart**



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

**Previous Occurrences**

The National Centers for Environmental Information lists 30 winter weather events in the past 25 years. Table 3.29 provides a list of the events.

**Table 3.29. NCEI Perry County Winter Weather Events Summary, 1993-2017**

LOCATION	DATE	DEATHS	INJURIES	DAMAGE PROPERTY	DAMAGE CROPS
PERRY (ZONE)	1/2/1996	0	0	0	0
PERRY (ZONE)	12/16/1996	0	0	0	0
PERRY (ZONE)	1/8/1997	0	0	0	0
PERRY (ZONE)	1/15/1997	0	0	0	0
PERRY (ZONE)	2/7/1997	0	0	0	0
PERRY (ZONE)	2/13/1997	0	0	0	0
PERRY (ZONE)	1/1/1999	0	0	50000	0
PERRY (ZONE)	12/13/2000	0	0	0	0
PERRY (ZONE)	2/21/2001	0	0	0	0
PERRY (ZONE)	12/4/2002	0	0	0	0
PERRY (ZONE)	1/16/2003	0	0	0	0
PERRY (ZONE)	2/16/2003	0	0	0	0
PERRY (ZONE)	1/25/2004	0	0	0	0
PERRY (ZONE)	12/22/2004	0	0	0	0
PERRY (ZONE)	1/31/2008	0	0	0	0
PERRY (ZONE)	2/1/2008	0	0	0	0
PERRY (ZONE)	2/11/2008	0	0	0	0
PERRY (ZONE)	2/21/2008	0	0	0	0
PERRY (ZONE)	3/3/2008	0	0	50000	0
PERRY (ZONE)	1/26/2009	0	0	400000	0

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PERRY (ZONE)	12/28/2012	0	0	0	0
PERRY (ZONE)	2/21/2013	0	0	50000	0
PERRY (ZONE)	12/5/2013	0	0	0	0
PERRY (ZONE)	1/5/2014	0	0	0	0
PERRY (ZONE)	2/4/2014	0	0	0	0
PERRY (ZONE)	3/2/2014	0	0	0	0
PERRY (ZONE)	2/20/2015	0	0	0	0
PERRY (ZONE)	3/4/2015	0	0	0	0
PERRY (ZONE)	2/24/2016	0	0	30000	0
PERRY (ZONE)	1/13/2017	0	0	50000	0

Source: NCEI

### ***Probability of Future Occurrence***

With 30 events in 25 years, the County is projected to experience 6 winter storm events every 5 years.

## **Vulnerability**

### ***Vulnerability Overview***

The 2013 State HMP lists Perry County with a “Medium” vulnerability to winter storm events. This determination is made based on multiple factors, including housing density, likelihood of the event, property and crop losses, and social vulnerability.

### ***Potential Losses to Existing Development***

According to the 2013 State HMP, the County has had property annualized losses of \$396,000 per year.

### ***Future Development***

Additional development will increase a jurisdictions exposure to the hazard by adding structure and people to the study area. The minor growth rate of the county and communities indicates little future impact due to development trends.

### ***Hazard Summary by Jurisdiction***

All jurisdictions are equally exposed to severe winter weather, though the event will have different impacts on different jurisdictions. Schools are typically closed during these events, making property damage their primary concern. While the County has far less population density compared to the communities, county residents can far more easily have transportation and communications severed by winter storms, leaving them isolated for days or even weeks in extreme cases. For the communities, the inverse is true; residents continue to have services and contacts in close proximity, but there are far more people affected by the event.

## **Problem Statement**

Winter weather can affect any of the three participants. While the school district typically closes during sever events, in some cases children are present when an event occurs soon or stronger than expected. Transportation of students during such an event can be dangerous, and power failures are also possible. The density of development in the city increases its exposure, but residents are also closer to emergency services when compared to county residents. Because of this, each jurisdiction is impacted by these events in a slightly

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different manner.

## 4 MITIGATION STRATEGY

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<b>4</b>	<b>MITIGATION STRATEGY</b>	<b>4.1</b>
4.1	Goals	4.1
4.2	Identification and Analysis of Mitigation Actions	4.1
4.3	Implementation of Mitigation Actions	4.3

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

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

### 4.1 Goals

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This planning effort is an update to Perry County's existing hazard mitigation plan approved by FEMA in 2013. Therefore, the goals from the previous HMP were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The HMPC 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 2013 State Hazard Mitigation Plan goals were also reviewed. SEMO RPC also presented common goals from other county HMPs.

After discussion, the HMPC decided the 2013 goals were still valid. The goals for this plan update are:

1. Protect the health, safety, and welfare of residents and students.
2. Ensure the operation of critical facilities and services.
3. Protect public and private property.
4. Enhance informed decision making of mitigation actions.

### 4.2 Identification and Analysis of Mitigation Actions

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During the second MPC meeting, the results of the risk assessment update were provided to the HMPC members for review and the key issues were identified for specific hazards. Changes in risk since adoption of the previously approved plan were discussed. The second meeting concluded with the distribution of a list of possible mitigation actions to prompt discussions within and among the jurisdictions. The discussions occurred during jurisdictional break-out meetings. The list included possible new mitigation actions, as well as actions from the previously approved plan. Actions from the previous plan included completed actions, on-

going actions, and actions upon which progress had not been made. The HMPC discussed SEMA’s identified funding priorities and the types of mitigation actions generally recognized by FEMA.

The HMPC then updated the mitigation strategy of each jurisdiction during Meeting 2 and through electronic correspondence afterward. For a comprehensive range of mitigation actions to consider, the HMPC reviewed the following information:

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

Individual jurisdictions, including school districts, then developed final mitigation strategies for inclusion in the plan. They were encouraged to review the details of the risk assessment vulnerability analysis specific to their jurisdiction. They were also provided a link to the FEMA’s publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)*. This document was developed by FEMA as a resource for identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters.

The MPC reviewed the actions from the previously approved plan for progress made since the plan had been adopted, using worksheets included in the appendix of this plan. Each jurisdiction was instructed to provide information regarding the “Action Status” with one of the following status choices:

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

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

**Table 4.1. Action Status Summary**

Jurisdiction	Completed Actions	Continuing Actions (ongoing or modify)	Deleted Actions
Perry County	0	5	19
Perryville	0	6	18
Perry Co. School Dist. No. 32	1	3	6

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

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

Completed Actions	Completion Details (date, amount, funding source)
Construct Safe Room at School Dist	08/14/2018; \$2,222,439; HMGP with local fund match

Deleted Actions	Reason for Deletion
Emphasize county planning and zoning and building codes	County has no planning or zoning
Enforce floodplain regulations and boundaries	Included in NFIP actions
Assist in updating of FIRMs	Included in NFIP actions
Require permits for development in a floodplain	Included in NFIP actions
Buyout repetitive loss properties	No potential properties identified at this time
Issue evacuation orders	Not a mitigation action
Regularly inspect, repair, and improve dams	No dams under jurisdictions' control
Encourage mobile home owners to anchor homes	Jurisdictions felt action was weak
Retrofit, where possible, buildings and bridges for seismic resistance	No structures identified at this time
Clear brush and debris from around buildings	On-going maintenance, weak action
Retain green space and reduce hard surface areas	Jurisdictions chose to focus on other actions
Encourage reinforcement of towers	Jurisdictions have no control over towers, weak action
Acquire equipment	Jurisdictions felt action was weak
Maintain mutual aid agreements	General practice of jurisdictions, weak action
Monitor weather	General practice of jurisdictions, weak action
Confirm equipment is in usable condition	General practice of jurisdictions, weak action
Provide emergency shelters	Included in Safe Room actions
Maintain GIS system	General practice of jurisdictions, weak action
Make pertinent data available	General practice of jurisdictions, weak action

### 4.3 Implementation of Mitigation Actions

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Jurisdictions were encouraged to meet with others in their community to finalize the actions to be submitted for the updated mitigation strategy. Throughout the HMPC consideration and discussion, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The HMPC decided to pursue implementation according to when and where damage occurs, available funding, political will, and jurisdictional priority. 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 project. During the prioritization process, the HMPC 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:

**Figure 4.1. Blank Mitigation Action Worksheet**

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	List the hazard or hazards that will be addressed by this action
<b>Problem being Mitigated:</b>	Provide a brief description of the problem that the action will address. Utilize the problem statement developed in the risk assessment.
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Choose the goal statement that applies to this action
<b>Action/Project Number:</b>	Insert a unique action number for this action for future tracking purposes. This can be a combination of the jurisdiction name, followed by the goal number and action number (i.e. Joplin1.1)
<b>Name of Action or Project:</b>	
<b>Mitigation Category:</b>	Prevention; Structure and Infrastructure Projects; Natural Systems Protection; Education and Outreach; Emergency Services
<b>Action or Project Description:</b>	Describe the action or project.
<b>Estimated Cost:</b>	Provide an estimate of the cost to implement this action. This can be accomplished with a range of estimated costs.
<b>Benefits:</b>	Provide a narrative describing the losses that will be avoided by implementing this action. If dollar amounts of avoided losses are known, include them as well.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Which organization will be responsible for tracking this action? Be specific to include the specific department or position within a department.
<b>Supporting Organization/Department:</b>	Which organization/department will assist in implementation of this action?
<b>Action/Project Priority:</b>	Include the STAPLEE score and Priority (H, M, L)
<b>Timeline for Completion:</b>	How many months/years to complete.
<b>Potential Fund Sources:</b>	List specific funding sources that may be used to pay for the implementation of the action.
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	
<b>Progress Report</b>	
<b>Action Status:</b>	Indicate status as New, Continuing Not Started, or Continuing in Progress)
<b>Report of Progress:</b>	For Continuing actions only, indicate the report on progress. If the action is not started, indicate any barriers encountered to initiate the action. If the action is in progress, indicate the activity that has occurred to date.

**Figure 4.2. Perry County New and Continuing Actions**

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry County
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado
<b>Problem being Mitigated:</b>	Lack of safe locations for some residents
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents.
<b>Action/Project Number:</b>	Perry-1.1
<b>Name of Action or Project:</b>	Construct Safe Room
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Construct a safe room in county
<b>Estimated Cost:</b>	\$5-\$10 million
<b>Benefits:</b>	Provide safe location for residents to take shelter during a tornado
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	County Commission
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	26/Medium
<b>Timeline for Completion:</b>	4 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry County
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado
<b>Problem being Mitigated:</b>	Lack of advanced warning
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents and students.
<b>Action/Project Number:</b>	Perry-1.2
<b>Name of Action or Project:</b>	Construct emergency warning sirens
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Construct emergency warning sirens throughout county
<b>Estimated Cost:</b>	\$500,000-\$2,000,000
<b>Benefits:</b>	Provide advanced warning to residents during a tornado event
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Public Works
<b>Supporting Organization/Department:</b>	County Commission
<b>Action/Project Priority:</b>	26/Medium
<b>Timeline for Completion:</b>	1-3 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry County
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Flooding
<b>Problem being Mitigated:</b>	Development in floodplain
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents.
<b>Action/Project Number:</b>	Perry-1.3
<b>Name of Action or Project:</b>	NFIP Participation
<b>Mitigation Category:</b>	Prevention
<b>Action or Project Description:</b>	Enforce floodplain management ordinances, regulate new construction in SFHA, work with residents to identify flood prone areas, assist residents with map amendment process.
<b>Estimated Cost:</b>	\$25,000-\$50,000
<b>Benefits:</b>	Reduce development in SFHA, protect floodplain.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Emergency Management
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	30/High
<b>Timeline for Completion:</b>	Ongoing
<b>Potential Fund Sources:</b>	General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Floodplain Ordinances
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing
<b>Report of Progress:</b>	Ongoing

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry County
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake, Winter Storm, Severe Thunderstorm
<b>Problem being Mitigated:</b>	Loss of power and response capabilities
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	Perry-2.1
<b>Name of Action or Project:</b>	Emergency Generators
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Purchase and install emergency generators at county facilities
<b>Estimated Cost:</b>	\$50,000-\$500,000
<b>Benefits:</b>	Keep facilities and services operational during and after an event.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Public Works
<b>Supporting Organization/Department:</b>	County Commission
<b>Action/Project Priority:</b>	27/Medium
<b>Timeline for Completion:</b>	2 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue, Homeland Security
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	EOP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry County
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Flooding
<b>Problem being Mitigated:</b>	Impediment to transportation and emergency services
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	Perry-2.2
<b>Name of Action or Project:</b>	Low water crossings
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Raise low water crossings in the county
<b>Estimated Cost:</b>	\$100,000-\$2,000,000
<b>Benefits:</b>	Keep transportation routes open to allow residents to travel as needed and allow emergency services to reach residents.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Road and Bridge
<b>Supporting Organization/Department:</b>	County Commission
<b>Action/Project Priority:</b>	26/Medium
<b>Timeline for Completion:</b>	3 years
<b>Potential Fund Sources:</b>	General Revenue, MoDOT BRO
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

**Figure 4.3. Perryville New and Continuing Actions**

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake, Winter Storm, Severe Thunderstorm, Flooding
<b>Problem being Mitigated:</b>	Inadequate equipment for emergency response
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	Perryville-2.1
<b>Name of Action or Project:</b>	Emergency Equipment
<b>Mitigation Category:</b>	Emergency Services
<b>Action or Project Description:</b>	Purchase equipment for hazard response
<b>Estimated Cost:</b>	\$10,000-\$100,000
<b>Benefits:</b>	Keep services operational and relevant during and after an event.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Police Dept.
<b>Supporting Organization/Department:</b>	Emergency Management
<b>Action/Project Priority:</b>	31/High
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue, Homeland Security
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	EOP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake, Winter Storm, Severe Thunderstorm, Flooding
<b>Problem being Mitigated:</b>	Inadequate communications capabilities for emergency services
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	Perryville-2.2
<b>Name of Action or Project:</b>	Radio Acquisition
<b>Mitigation Category:</b>	Emergency Services
<b>Action or Project Description:</b>	Purchase radios and other communications equipment for hazard response
<b>Estimated Cost:</b>	\$50,000-\$500,000
<b>Benefits:</b>	Improved and interoperable communications for emergency and first responders.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Police Dept.
<b>Supporting Organization/Department:</b>	Emergency Management
<b>Action/Project Priority:</b>	30/High
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue, Homeland Security
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	EOP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake, Winter Storm, Severe Thunderstorm
<b>Problem being Mitigated:</b>	Loss of power and response capabilities
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	Perryville-2.3
<b>Name of Action or Project:</b>	Emergency Generators
<b>Mitigation Category:</b>	Emergency Services
<b>Action or Project Description:</b>	Purchase and install emergency generators at county facilities
<b>Estimated Cost:</b>	\$50,000-\$500,000
<b>Benefits:</b>	Keep facilities and services operational during and after an event.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Police Dept.
<b>Supporting Organization/Department:</b>	Emergency Management
<b>Action/Project Priority:</b>	30/High
<b>Timeline for Completion:</b>	3 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue, Homeland Security
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	EOP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Flooding
<b>Problem being Mitigated:</b>	Stormwater flooding
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	Perryville-2.4
<b>Name of Action or Project:</b>	Stormwater system improvements
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Improve stormwater sewer system to better handle heavy-rain events, including improvements to and protection of sinkholes
<b>Estimated Cost:</b>	\$100,000-\$1,000,000
<b>Benefits:</b>	Reduce flooding and impacts of downpour events.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Public Works.
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	24/Medium
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Zoning Ordinance, Floodplain Management Ordinance
<b>Progress Report</b>	
<b>Action Status:</b>	New
<b>Report of Progress:</b>	New

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado
<b>Problem being Mitigated:</b>	Lack of advanced warning
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents.
<b>Action/Project Number:</b>	Perryville-1.1
<b>Name of Action or Project:</b>	Construct emergency warning sirens
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Construct emergency warning sirens throughout city
<b>Estimated Cost:</b>	\$500,000-\$2,000,000
<b>Benefits:</b>	Provide advanced warning to residents during a tornado event
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Public Works
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	27/Medium
<b>Timeline for Completion:</b>	3 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Flooding
<b>Problem being Mitigated:</b>	Development in floodplain
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents.
<b>Action/Project Number:</b>	Perryville-1.2
<b>Name of Action or Project:</b>	NFIP Participation
<b>Mitigation Category:</b>	Prevention
<b>Action or Project Description:</b>	Enforce floodplain management ordinances, regulate new construction in SFHA, work with residents to identify flood prone areas, assist residents with map amendment process.
<b>Estimated Cost:</b>	\$50,000-\$100,000
<b>Benefits:</b>	Reduce development in SFHA, protect floodplain.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Development Services
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	27/Medium
<b>Timeline for Completion:</b>	Ongoing
<b>Potential Fund Sources:</b>	General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	Zoning Ordinances, Land Use Plan
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing
<b>Report of Progress:</b>	Ongoing

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perryville
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado
<b>Problem being Mitigated:</b>	Lack of safe locations for some residents
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents.
<b>Action/Project Number:</b>	Perryville-1.3
<b>Name of Action or Project:</b>	Construct Safe Room
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Construct a safe room in the city
<b>Estimated Cost:</b>	\$5-\$20 million
<b>Benefits:</b>	Provide safe location for residents to take shelter during a tornado
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Public Works
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	27/Medium
<b>Timeline for Completion:</b>	5 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP, Comprehensive Plan
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

**Figure 4.4. Perry Co. School Dist. No 32 New and Continuing Actions**

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry Co. School Dist. No 32
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado
<b>Problem being Mitigated:</b>	Lack of safe locations for students
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Protect the health, safety, and welfare of residents.
<b>Action/Project Number:</b>	PCSD 32-1.1
<b>Name of Action or Project:</b>	Construct Safe Room
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Construct a safe room on school property
<b>Estimated Cost:</b>	\$5-\$10 million
<b>Benefits:</b>	Provide safe location for students to take shelter during a tornado
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Facilities Dept.
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	28/Medium
<b>Timeline for Completion:</b>	1 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP, Master Plan
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry Co. School Dist. No 32
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake, Winter Storm, Severe Thunderstorm
<b>Problem being Mitigated:</b>	Loss of power and response capabilities
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	PCSD 32-2.1
<b>Name of Action or Project:</b>	Emergency Generators
<b>Mitigation Category:</b>	Emergency Services
<b>Action or Project Description:</b>	Purchase and install emergency generators at school facilities
<b>Estimated Cost:</b>	\$50,000-\$500,000
<b>Benefits:</b>	Keep facilities and services operational during and after an event.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Facilities Dept..
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	26/Medium
<b>Timeline for Completion:</b>	3 years
<b>Potential Fund Sources:</b>	FEMA Grant, General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

<b>Action Worksheet</b>	
<b>Name of Jurisdiction:</b>	Perry Co. School Dist. No 32
<b>Risk / Vulnerability</b>	
<b>Hazard(s) Addressed:</b>	Tornado, Earthquake, Winter Storm, Severe Thunderstorm
<b>Problem being Mitigated:</b>	Loss of power and response capabilities
<b>Action or Project</b>	
<b>Applicable Goal Statement:</b>	Ensure the operation of critical facilities and services.
<b>Action/Project Number:</b>	PCSD 32-2.2
<b>Name of Action or Project:</b>	Bury Power Lines
<b>Mitigation Category:</b>	Structure and Infrastructure Projects
<b>Action or Project Description:</b>	Bury overhead powerlines throughout property
<b>Estimated Cost:</b>	\$50,000-\$100,000
<b>Benefits:</b>	Keep facilities and services operational during and after an event.
<b>Plan for Implementation</b>	
<b>Responsible Organization/Department:</b>	Facilities Dept.
<b>Supporting Organization/Department:</b>	
<b>Action/Project Priority:</b>	26/Medium
<b>Timeline for Completion:</b>	2 years
<b>Potential Fund Sources:</b>	General Revenue
<b>Local Planning Mechanisms to be Used in Implementation, if any:</b>	CIP
<b>Progress Report</b>	
<b>Action Status:</b>	Continuing-not started
<b>Report of Progress:</b>	None, funding constraints

# 5 PLAN MAINTENANCE PROCESS

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<b>5 PLAN MAINTENANCE PROCESS .....</b>	<b>5.1</b>
<i>5.1 Monitoring, Evaluating, and Updating the Plan.....</i>	<i>5.1</i>
5.1.1 Responsibility for Plan Maintenance .....	5.1
5.1.2 Plan Maintenance Schedule .....	5.1
5.1.3 Plan Maintenance Process.....	5.1
5.2 Incorporation into Existing Planning Mechanisms .....	5.2
5.3 Continued Public Involvement.....	5.4

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**

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### **5.1.1 Responsibility for Plan Maintenance**

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

### **5.1.2 Plan Maintenance Schedule**

The MPC agrees to meet annually and after a state or federally declared hazard event as appropriate to monitor progress and update the mitigation strategy. The Perry 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. The Southeast Missouri Regional Planning Commission and the County Emergency Management Director will initiate the five-year update.

### **5.1.3 Plan Maintenance Process**

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

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions,

- Increased vulnerability due to hazard events, and/or
- Increased vulnerability as a result of new development (and/or annexation).

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

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

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

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

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

## **5.2 Incorporation into Existing Planning Mechanisms**

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Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. Based on the capability assessments of the participating jurisdictions, communities in Perry 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;
- Perry 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 District Plans and budgets; and

- Other plans and policies outlined in the capability assessment sections for each jurisdiction in Chapter 2 of this plan.

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

Additionally, after the annual review of the Hazard Mitigation Plan, the Perry County Emergency Management Director will provide the updated Mitigation Strategy with current status of each mitigation action to the County Commission as well as all Mayors, City Clerks, and School District Superintendents. The Emergency Manager Director will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

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

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

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Perry County	Capital Improvement Program	County officials identified actions relating to infrastructure that were included in annual update to CIP	County officials identified new actions or ongoing actions relating to infrastructure that will be included in annual update to CIP
Perry County	County Emergency Operations Plan	County officials identified actions relating to emergency operations that were included in the update to the EOP	County officials identified new or ongoing actions relating to emergency operations that will be included in the next update to the EOP
Perryville	Capital Improvement Program	City officials identified actions relating to infrastructure that were included in annual update to CIP	City officials identified new actions or ongoing actions relating to infrastructure that will be included in annual update to CIP
Perryville	Emergency Operations Plan	City officials identified actions relating to emergency operations that were included in the update to the EOP	City officials identified new or ongoing actions relating to emergency operations that will be included in the next update to the EOP
Perryville	Watershed Plan	Plan was not developed during previous HMP process	City officials identified new or ongoing actions relating to flooding and

			sinkholes that will be included in the next update to the watershed plan.
Perry Co School Dist No. 32	Master Plan	Plan was not updated since previous HMP process	School representatives identified new or ongoing actions relating to future development that will be included in the next Master Plan update
Perry Co School Dist No. 32	Capital Improvement Program	School representatives identified actions relating to infrastructure that were included in annual update to CIP	School representatives identified new actions or ongoing actions relating to infrastructure that will be included in annual update to CIP
Perry Co School Dist No. 32	School Emergency Plan	School representatives identified actions relating to emergency procedures that were included in previous update to Emergency Plan	School representatives identified new actions or ongoing actions relating to emergency procedures that will be included in the next update to the Emergency Plan

### 5.3 Continued Public Involvement

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The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan's implementation and seek additional public comment. Information about the annual reviews will be posted in the local newspaper as well as on the Perry County website following each annual review of the mitigation plan. When the MPC reconvenes for the five-year update, it will coordinate with all stakeholders participating in the planning process. Included in this group will be those who joined the MPC after the initial effort, to update and revise the plan. Public notice will be posted and public participation will be actively solicited, at a minimum, through available website postings and press releases to local media outlets, primarily newspapers.

## APPENDIX A: ADOPTION RESOLUTIONS

APPENDIX A: ADOPTION RESOLUTIONS .....	1
1.1 <i>Adoption Resolutions</i> .....	1

### 1.1 Adoption Resolutions

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COUNTY OF PERRY, MISSOURI

RESOLUTION NO. 0328-2018

A RESOLUTION OF THE PERRY COUNTY COMMISSION  
ADOPTING THE COUNTY OF PERRY, MISSOURI COUNTY ALL-HAZARD  
MITIGATION PLAN (UPDATED 2018)

WHEREAS the County of Perry, Missouri recognizes the threat that natural hazards pose to people and property within the County of Perry, Missouri and

WHEREAS the Perry County Commission has participated in the preparation of a multi-hazard mitigation plan, hereby known as the *Perry County All-Hazard Mitigation Plan (Updated 2018)*, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the County of Perry, Missouri from the impacts of future hazards and disasters; and

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

WHEREAS adoption by the Perry County Commission demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

NOW THEREFORE, BE IT RESOLVED BY THE PERRY COUNTY COMMISSION, STATE OF MISSOURI, THAT:

Section 1. In accordance with Missouri Statute, the Perry County Commission adopts the final FEMA-approved plan.

ADOPTED by a vote of 3 in favor and 0 against, and 0 abstaining, this 2<sup>nd</sup> day of April, 2018.



By (Sig):

Print name:

Carl Leuckel Jr  
Carl Leuckel, Jr., Presiding Commissioner

ATTEST:

By (Sig):

Print name:

Jared W. Kutz, County Clerk

**A RESOLUTION OF THE CITY OF PERRYVILLE, MISSOURI,  
ADOPTING THE PERRY COUNTY ALL-HAZARD MITIGATION PLAN  
(UPDATED 2018)**

**WHEREAS**, the City of Perryville, Missouri, recognizes the threat that natural hazards pose to people and property within the City of Perryville; and

**WHEREAS**, the City of Perryville has participated in the preparation of a multi-hazard mitigation plan, hereby known as the *Perry County All-Hazard Mitigation Plan (Updated 2018)*, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

**WHEREAS**, the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Perryville from the impacts of future hazards and disasters; and

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

**WHEREAS**, adoption by the City of Perryville demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

**NOW THEREFORE, BE IT RESOLVED BY THE BY THE MAYOR AND BOARD OF ALDERMEN OF THE CITY OF PERRYVILLE, MISSOURI, THAT:**

Section 1. In accordance with Code of Ordinances of the City of Perryville, the Mayor and Board of Aldermen of the City of Perryville do hereby adopt the final FEMA-approved *plan*.

**PASSED AND APPROVED** this 20th day of March, 2018, by a vote of 5 ayes, 0 nays, 0 abstentions, and 1 absent.

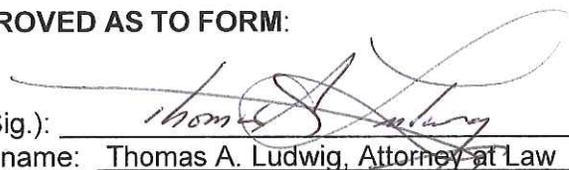
**CITY OF PERRYVILLE, MISSOURI**

By:   
Mayor

**ATTEST:**

  
City Clerk

**APPROVED AS TO FORM:**

By (Sig.):   
Print name: Thomas A. Ludwig, Attorney at Law

PERRY COUNTY SCHOOL DISTRICT #32, Missouri

RESOLUTION NO. \_\_\_\_\_

A RESOLUTION OF THE PERRY COUNTY SCHOOL DISTRICT #32 ADOPTING THE  
PERRY COUNTY ALL-HAZARD MITIGATION PLAN (UPDATED 2017)

WHEREAS the Perry County School District #32 recognizes the threat that natural hazards pose to people and property within the Perry County School District #32; and

WHEREAS the Perry County School District #32 has participated in the preparation of a multi-hazard mitigation plan, hereby known as the *Perry County All-Hazard Mitigation Plan (Updated 2017)*, 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 Perry County School District #32 from the impacts of future hazards and disasters; and

WHEREAS the Perry County School District #32 recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the Perry County School District #32 will endeavor to integrate the *Plan* into the comprehensive planning process and

WHEREAS adoption by the Perry County School District #32 demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*

NOW THEREFORE, BE IT RESOLVED BY THE PERRY COUNTY SCHOOL DISTRICT #32, in the State of Missouri, THAT:

Section 1. In accordance with (local rule for adopting resolutions), the Perry County School District #32 adopts the final FEMA-approved plan.

ADOPTED by a vote of \_\_\_\_\_ in favor and \_\_\_\_\_ against, and \_\_\_\_\_ abstaining, this 28th day of Feb., 2018.

By (Sig.): Kathy Carron  
Print name: Kathy Carron

ATTEST:  
By (Sig.): Barbara Hagan  
Print name: Barbara Hagan

APPROVED AS TO FORM:  
By (Sig.): ARBC  
Print name: Andrew B. Comstock

## APPENDIX B: MEETING AND NOTICE MATERIALS

<b>APPENDIX B: MEETING AND NOTICE MATERIALS</b> .....	<b>1</b>
1.1 <i>Meeting and Notice Materials</i> .....	<i>1</i>

### **1.1 Meeting and Notice Materials**

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# **PUBLIC NOTICE**

Perry County and Participating Jurisdictions, along with the Southeast Missouri Regional Planning Commission (SEMO RPC) are beginning the plan update process for the **2018 Perry County Hazard Mitigation Plan.**

**This process is open to the public.**

Meeting notices will be posted at this location, the County Courthouse, participating jurisdictions City Halls/offices, at the SEMO RPC office, and on the RPC's website: [www.semorpc.org](http://www.semorpc.org).

Public participation is encouraged to help develop the best plan possible. All meetings are open to the public and any comments, concerns, ideas, or suggestions are welcome at any time during this plan update, regardless of meeting attendance.

The draft plan can be found at:

[http://www.semorpc.org/hazard\\_mitigation\\_planning.html](http://www.semorpc.org/hazard_mitigation_planning.html)

For more information or to provide comments or feedback on the draft, please contact:

Drew Christian  
Director of Planning  
Southeast Missouri Regional Planning Commission  
1 W. St. Joseph Street  
P.O. Box 366 Perryville, MO 63775  
Phone: 573-547-8357 ext 315  
Fax: 573-547-7283  
[dchristian@semorpc.org](mailto:dchristian@semorpc.org)  
[www.semorpc.org](http://www.semorpc.org)

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# **PUBLIC NOTICE**

Perry County and Participating Jurisdictions, along with the Southeast Missouri Regional Planning Commission (SEMO RPC), are holding a **Hazard Mitigation Planning Committee meeting** for the **2018 Perry County Hazard Mitigation Plan** on

**Thursday, November 2nd, 2017 at 1:30 p.m. at the**

**SEMO RPC Office  
1 W. Saint Joseph St.  
Perryville, MO 63775.**

**This meeting is open to the public.**

Public participation is encouraged to help develop the best plan possible. The draft plan can be found at: [http://www.semorpc.org/hazard\\_mitigation\\_planning.html](http://www.semorpc.org/hazard_mitigation_planning.html)

For more information or to provide comments or feedback on the draft, please contact:

Drew Christian  
Director of Planning  
Southeast Missouri Regional Planning Commission  
1 W. St. Joseph Street  
P.O. Box 366 Perryville, MO 63775  
Phone: 573-547-8357 ext 315  
Fax: 573-547-7283  
[dchristian@semorpc.org](mailto:dchristian@semorpc.org)  
[www.semorpc.org](http://www.semorpc.org)

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# **PUBLIC NOTICE**

Perry County and Participating Jurisdictions, along with the Southeast Missouri Regional Planning Commission (SEMO RPC), are holding a **Hazard Mitigation Planning Committee meeting** for the **2018 Perry County Hazard Mitigation Plan** on

**Wednesday, December 6th, 2017 at 1:30 p.m. at the**

**SEMO RPC Office  
1 W. Saint Joseph St.  
Perryville, MO 63775.**

**This meeting is open to the public.**

Public participation is encouraged to help develop the best plan possible. The draft plan can be found at: [http://www.semorpc.org/hazard\\_mitigation\\_planning.html](http://www.semorpc.org/hazard_mitigation_planning.html)

For more information or to provide comments or feedback on the draft, please contact:

Drew Christian  
Director of Planning  
Southeast Missouri Regional Planning Commission  
1 W. St. Joseph Street  
P.O. Box 366 Perryville, MO 63775  
Phone: 573-547-8357 ext 315  
Fax: 573-547-7283  
[dchristian@semorpc.org](mailto:dchristian@semorpc.org)  
[www.semorpc.org](http://www.semorpc.org)





# APPENDIX C: STAPLEE SCORING MATERIALS

<b>APPENDIX C: STAPLEE SCORING MATERIALS</b> .....	<b>1</b>
1.1 <i>STAPLEE Scoring Materials</i> .....	<i>1</i>

## 1.1 STAPLEE Scoring Materials

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County

**Multi-Jurisdiction Hazard Mitigation Plan**

**Action STAPLEE Scoring Tool**

Action Title: Construct Safe Room	Jurisdiction: Perry Co
Action ID:Perry-1.1	

<b>STAPLEE Criteria</b>	<b>Score</b>
	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0
<b>S:</b> Is it <b>Socially</b> acceptable?	3
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	3
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
<b>P:</b> Is it <b>Politically</b> acceptable?	3
<b>L:</b> Is there <b>Legal</b> authority to implement?	3
<b>E:</b> Is it <b>Economically</b> beneficial?	3
<b>E:</b> Will the project have either a neutral or positive impact on the natural <b>Environment</b> ? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	0
Could it be implemented quickly?	2
<b>STAPLEE Score</b>	<b>22</b>

<b>Mitigation Effectiveness Criteria</b>	<b>Score</b>
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Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	1
<b>Mitigation Effectiveness Score</b>	<b>4</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 26

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

County

**Multi-Jurisdiction Hazard Mitigation Plan**

**Action STAPLEE Scoring Tool**

Action Title: Construct emergency warning sirens	Jurisdiction: Perry Co
Action ID:Perry-1.2	

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
Definitely NO = 0	
<b>S:</b> Is it <b>Socially</b> acceptable?	3
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	3
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
<b>P:</b> Is it <b>Politically</b> acceptable?	3
<b>L:</b> Is there <b>Legal</b> authority to implement?	3
<b>E:</b> Is it <b>Economically</b> beneficial?	2

<b>E: Will the project have either a neutral or positive impact on the natural Environment?</b> (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	0
Could it be implemented quickly?	2
<b>STAPLEE Score</b>	<b>21</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	2
<b>Mitigation Effectiveness Score</b>	<b>5</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 26

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

County

**Multi-Jurisdiction Hazard Mitigation Plan**

**Action STAPLEE Scoring Tool**

Action Title: Implement back-up generators	Jurisdiction: Perry Co
Action ID:Perry-2.1	

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
	Definitely NO = 0

<b>S:</b> Is it <b>Socially</b> acceptable?	3
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	3
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
<b>P:</b> Is it <b>Politically</b> acceptable?	3
<b>L:</b> Is there <b>Legal</b> authority to implement?	3
<b>E:</b> Is it <b>Economically</b> beneficial?	2
<b>E:</b> Will the project have either a neutral or positive impact on the natural <b>Environment</b> ? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	1
Could it be implemented quickly?	2
<b>STAPLEE Score</b>	<b>22</b>

<b>Mitigation Effectiveness Criteria</b>	<b>Score</b>
Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	2
<b>Mitigation Effectiveness Score</b>	<b>5</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 27

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

**County**

**Multi-Jurisdiction Hazard Mitigation Plan**

**Action STAPLEE Scoring Tool**

Action Title: Raise low water crossing	Jurisdiction: Perry Co
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Action ID:	
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STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
	Definitely NO = 0
<b>S:</b> Is it <b>Socially</b> acceptable?	3
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	2
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
<b>P:</b> Is it <b>Politically</b> acceptable?	3
<b>L:</b> Is there <b>Legal</b> authority to implement?	3
<b>E:</b> Is it <b>Economically</b> beneficial?	3
<b>E:</b> Will the project have either a neutral or positive impact on the natural <b>Environment</b> ? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	3
Will historic structures be saved or protected?	0
Could it be implemented quickly?	2
<b>STAPLEE Score</b>	<b>22</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	2
Will the implemented action result in a reduction of disaster damages to property?	2
<b>Mitigation Effectiveness Score</b>	<b>4</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 26

Priority Level: High (30+ points) Medium (25-29 points) 26 Low (less than 25 points)

ongoing

Perry County  
Multi-Jurisdiction Hazard Mitigation Plan  
Action STAPLEE Scoring Tool

Action Title: <u>Acquire Necessary general + specialized equipment for Hazard/Emergency response</u>	Jurisdiction: <u>City of Perryville</u>
Action ID: <u>Emergency Services Measures</u>	

STAPLEE Criteria	Score
	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0
<b>S:</b> Is it <b>Socially</b> acceptable?	<u>3</u>
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	<u>3</u>
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	<u>3</u>
<b>P:</b> Is it <b>Politically</b> acceptable?	<u>3</u>
<b>L:</b> Is there <b>Legal</b> authority to implement?	<u>3</u>
<b>E:</b> Is it <b>Economically</b> beneficial?	<u>3</u>
<b>E:</b> Will the project have either a neutral or positive impact on the natural <b>Environment</b> ? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	<u>2</u>
Will historic structures be saved or protected?	<u>2</u>
Could it be implemented quickly?	<u>3</u>
<b>STAPLEE Score</b>	<u>25</u>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	<u>3</u>
Will the implemented action result in a reduction of disaster damages to property?	<u>3</u>
<b>Mitigation Effectiveness Score</b>	<u>4</u>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 31

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

Completed by:

Name: William G Jones

Title: Emergency Management Director

Phone: 973-547-4546

Email: billjones@cityofperryville.com

Perry

County

Multi-Jurisdiction Hazard Mitigation Plan

Action STAPLEE Scoring Tool

New

Action Title: <i>Continue Purchasing Radios that are Interoperable with MORSWIN and other Surrounding Agencies</i>	Jurisdiction:
Action ID: <i>Emergency Services Measures</i>	<i>City of Perryville</i>

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
	Definitely NO = 0
S: Is it Socially acceptable?	3
T: Is it Technically feasible and potentially successful?	3
A: Does the jurisdiction have the Administrative capacity to execute this action?	3
P: Is it Politically acceptable?	3
L: Is there Legal authority to implement?	3
E: Is it Economically beneficial?	3
E: Will the project have either a neutral or positive impact on the natural Environment? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	1
Could it be implemented quickly?	3
<b>STAPLEE Score</b>	<b>24</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	3
<b>Mitigation Effectiveness Score</b>	<b>6</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 30

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

Completed by:

Name: William Jones

Title: Emergency Management Director

Phone: 573-547-4546

Email: billjones@cityofperryville.com

Perry

County

Multi-Jurisdiction Hazard Mitigation Plan

Action STAPLEE Scoring Tool

New

Action Title: <i>Continue Purchasing Radios that are Interoperable with MORGAN and other Surrounding Agencies</i>	Jurisdiction: <i>City of Perryville</i>
Action ID: <i>Emergency Services Measures</i>	

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
	Definitely NO = 0
S: Is it <b>Socially</b> acceptable?	3
T: Is it <b>Technically</b> feasible and potentially successful?	3
A: Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
P: Is it <b>Politically</b> acceptable?	3
L: Is there <b>Legal</b> authority to implement?	3
E: Is it <b>Economically</b> beneficial?	3
E: Will the project have either a neutral or positive impact on the natural <b>Environment</b> ? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	1
Could it be implemented quickly?	3
<b>STAPLEE Score</b>	<b>24</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	3
<b>Mitigation Effectiveness Score</b>	<b>6</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 30

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

Completed by:

Name: William Jones

Title: Emergency Management Director

Phone: 573-547-4546

Email: billjones@cityofperryville.com

Perry County  
 Multi-Jurisdiction Hazard Mitigation Plan  
 Action STAPLEE Scoring Tool

Ongoing

Action Title: <u>Provide Emergency Back up Power generators to Critical Facilities</u>	Jurisdiction: <u>City of Perryville</u>
Action ID: <u>Emergency Services Measures</u>	

STAPLEE Criteria	Score
	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0
S: Is it Socially acceptable?	3
T: Is it Technically feasible and potentially successful?	3
A: Does the jurisdiction have the Administrative capacity to execute this action?	3
P: Is it Politically acceptable?	3
L: Is there Legal authority to implement?	3
E: Is it Economically beneficial?	3
E: Will the project have either a neutral or positive impact on the natural Environment? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	3
Will historic structures be saved or protected?	1
Could it be implemented quickly?	3
<b>STAPLEE Score</b>	<b>25</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	2
<b>Mitigation Effectiveness Score</b>	<b>5</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 30  
 Priority Level:            High (30+ points)            Medium (25-29 points)            Low (less than 25 points)

Completed by:  
 Name: William G. Jones  
 Title: Emergency Management Director  
 Phone: 573-647-4546  
 Email: billjones@cityofperryville.com

ongoing

Perry

County

Multi-Jurisdiction Hazard Mitigation Plan

Action STAPLEE Scoring Tool

Action Title: <i>Extend outdoor Warming Systems in areas NOT covered</i>	Jurisdiction:
Action ID: <i>Emergency Service Measures</i>	<i>City of Perryville</i>

STAPLEE Criteria	Score
	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0
S: Is it Socially acceptable?	3
T: Is it Technically feasible and potentially successful?	3
A: Does the jurisdiction have the Administrative capacity to execute this action?	3
P: Is it Politically acceptable?	3
L: Is there Legal authority to implement?	3
E: Is it Economically beneficial?	3
E: Will the project have either a neutral or positive impact on the natural Environment? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	1
Could it be implemented quickly?	2
<b>STAPLEE Score</b>	<b>23</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	3
Will the implemented action result in a reduction of disaster damages to property?	1
<b>Mitigation Effectiveness Score</b>	<b>4</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 27

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

Completed by:

Name: William G. Jones

Title: Emergency Management Director

Phone: 573-547-4546

Email: bill.jones@cityofperryville.com

County

## Multi-Jurisdiction Hazard Mitigation Plan

### Action STAPLEE Scoring Tool

Action Title: Construct Safe Room	Jurisdiction: Perry Co School Dist No 32
Action ID:	

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
	Definitely NO = 0
<b>S:</b> Is it <b>Socially</b> acceptable?	3
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	3
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
<b>P:</b> Is it <b>Politically</b> acceptable?	3
<b>L:</b> Is there <b>Legal</b> authority to implement?	3
<b>E:</b> Is it <b>Economically</b> beneficial?	3
<b>E:</b> Will the project have either a neutral or positive impact on the natural <b>Environment</b> ? (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	0
Could it be implemented quickly?	2
<b>STAPLEE Score</b>	<b>22</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	3

Will the implemented action result in a reduction of disaster damages to property?	3
<b>Mitigation Effectiveness Score</b>	<b>6</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 28

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

County

**Multi-Jurisdiction Hazard Mitigation Plan**

**Action STAPLEE Scoring Tool**

Action Title: Acquire emergency generators for buildings	Jurisdiction: Perry Co School Dist No 32
Action ID:	

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
Definitely NO = 0	
<b>S:</b> Is it <b>Socially</b> acceptable?	3
<b>T:</b> Is it <b>Technically</b> feasible and potentially successful?	3
<b>A:</b> Does the jurisdiction have the <b>Administrative</b> capacity to execute this action?	3
<b>P:</b> Is it <b>Politically</b> acceptable?	3
<b>L:</b> Is there <b>Legal</b> authority to implement?	3
<b>E:</b> Is it <b>Economically</b> beneficial?	2

<b>E: Will the project have either a neutral or positive impact on the natural Environment?</b> (Score a 3 if positive, 2 if neutral, 1 if potentially adverse, 0 if definitely adverse)	2
Will historic structures be saved or protected?	0
Could it be implemented quickly?	3
<b>STAPLEE Score</b>	<b>22</b>

Mitigation Effectiveness Criteria	Score
Will the implemented action result in lives saved?	2
Will the implemented action result in a reduction of disaster damages to property?	2
<b>Mitigation Effectiveness Score</b>	<b>4</b>

Total Score (STAPLEE Score + Mitigation Effectiveness Score): 26

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

County

**Multi-Jurisdiction Hazard Mitigation Plan**

**Action STAPLEE Scoring Tool**

Action Title: Bury powerlines	Jurisdiction: Perry Co School Dist No 32
Action ID:	

STAPLEE Criteria	Score
	Definitely YES = 3
	Maybe YES = 2
	Probably NO = 1
	Definitely NO = 0

