# Cooper County, MO

## Natural Hazard Mitigation Plan

# 2017

**Prepared by:**
**Mid-Missouri Regional Planning Commission**
**206 East Broadway**
**P.O. Box 140**
**Ashland, MO 65010**
**Phone: (573) 657-9779**
**Fax: (573) 657-2829**
***Plan updates available online at [www.midmorpc.org](http://www.midmorpc.org)***

**Cover Photos**: the original Katy railroad bridge, Boonville, Missouri during the 1903 Missouri River flood, (Photo source: Friends of Historic Boonville archives).

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# Executive Summary

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

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

The Plan: The Cooper County Natural Hazard Mitigation Plan is a multi-jurisdictional plan prepared and written with the participation of Cooper County government and the following Cooper County communities, school districts, and levee districts: Blackwater, Blackwater School District, Boonville, Boonville School District, Bunceton, Otterville, Otterville School District, Pilot Grove, Prairie Home, Prairie Home School District, Wooldridge, Overton-Wooldridge Levee District, and Linneman-Weekley Levee District.

The following special districts participated in all aspects of the planning process but have not formally adopted the plan at this time: State Fair Community College – Boonville. All other school districts in Cooper County were also notified and invited to meetings, but have chosen not to participate.

The risk assessment (Section 4) profiles twelve natural hazards (dam failure, drought, earthquake, extreme heat, flood, levee failure, land subsidence/sinkhole, severe winter weather, wildfire, windstorm, tornado, and hailstorm) which threaten lives and/or property in some, or all, of the participating jurisdictions. All hazards were evaluated with regard to previous occurrence, probability and severity of future occurrence, existing mitigation strategies, and the potential impact on each jurisdiction.

2017 Mitigation Strategy: The current mitigation strategy, found in Section 5 of the plan, lays out a series of actions to be focused on during the coming five years. Each of the actions has been analyzed as to applicable jurisdiction(s), the agency or department which will lead the effort, and the means of implementing and financing the action. All of these decisions were made by jurisdictional representatives participating as members of the hazard mitigation planning committee.

The Cooper County Natural Hazard Mitigation Plan will be formally adopted by each of the participating jurisdictions before a final draft is approved by FEMA. Participation in, and formal adoption of, the plan qualifies a jurisdiction to apply for Federal Emergency Management

Agency (FEMA) pre-disaster mitigation grants and the mitigation portion of post-disaster mitigation grants.

While it is to be hoped that many of the mitigation actions in the strategy will have been completed before the next five-year update, as required by FEMA, nothing in the plan is legally binding on the participating jurisdictions. It will be evaluated and maintained on an annual basis prior to this update.

The 2017 county-wide mitigation strategy is shown in its entirety below, organized by the five major mitigation goals. (Actions continuing from the 2012 plan are in plain text while new actions for 2017 are in bold text.)

- Goal 1: Mitigation Planning - Mitigate effects of future natural hazards through public and private cooperation.

  - 1.1 Continue to enforce floodplain management ordinances in compliance with NFIP requirements.
  - 1.2 Develop agreements with local shelters.
  - 1.3 Encourage Utility Companies to maintain right of ways.
  - 1.4 Encourage cooperative agreements with utility providers to activate energy between utility districts.
  - 1.5 Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards.
  - 1.6 Encourage community participation in the annual Earthquake Awareness
  - 1.7 Day.
    Develop a Continuity of Operations Plan (COOP).

- Goal 2: Mitigation Policy - Develop policies that limit the impact of natural hazards on lives and property.

  - 2.1 Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures.
  - 2.2 Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts.
  - 2.3 Identify low water crossings and/or flood prone areas.
  - 2.4 Have alternate fueling sites/sources for emergency vehicles.

- Goal 3: Mitigation Programs - Implement cost effective and feasible mitigation programs to protect lives and property.

  - 3.1 Evaluate access problems to critical infrastructure.
  - 3.2 Provide back-up power to all critical infrastructure.
  - 3.3 Remove obstructive vegetation and/or combustible material from critical infrastructure.
  - 3.4 Recommend camping facilities, fairgrounds, and mobile home parks to have safe shelters on premises.

- 3.5 Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas.
- 3.6 Encourage school buses to be equipped with a multi-channel VHF High Band Devices on board and in schools.
- 3.7 Encourage shelters to have alternative heating sources.
- 3.8 Build a tornado safe room.
- 3.9 Maintain a system of temporary alternative placement sites ("safe houses") for temporary emergency evacuation and shelter of school populations.

- Goal 4: Public Awareness - Increase public awareness of natural hazards.

  - 4.1 Distribute public education hazard awareness information to the public.
  - 4.2 Continue to maintain and upgrade early warning weather warning systems.

- Goal 5: Future Development - Promote hazard-proof development.

  - 5.1 Develop a plan for upgrading and/or prioritizing low water crossings.
  - 5.2 Discourage development in known sinkhole areas.
  - 5.3 Install dry hydrants and/or standard hydrants as needed.
  - 5.4 Create secondary water supply sources through interconnections or agreements.
  - 5.5 Install additional pumping stations as needed.
  - 5.6 Thicken and/or maintain levee as needed to improve capabilities.
  - 5.7 Acquire destroyed or damaged properties and relocate people voluntarily.

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

The Federal Emergency Management Agency (FEMA) has both pre-disaster and post-disaster mitigation grant programs to help local jurisdictions with mitigation projects. These programs are outlined in Section 6.5 of the plan. The jurisdictions participating in the plan are eligible to apply for funding from these programs; a 25% local match is typically required for the funds received.

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

Planning Process: A plan is only as good as the planning process which developed it. A thorough update of the plan was completed with the active participation of representatives from Cooper

County jurisdictions and utility providers at regularly scheduled meetings over a six month period. The draft plan was presented at two public meetings of the Cooper County Commission, and published on the website of the Mid-MO Regional Planning Commission, to allow for input from the general public.

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

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

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

# Prerequisites

**Multi-Jurisdictional Plan Adoption**

| | |
|---|---|
| ***Requirement §201.6(c)(5):*** | ***For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.*** |

Adoption resolutions for the participating jurisdictions are included in Appendix A.

## Log of Post-Adoption Changes to Plan

| Date | Pages | Change | Reason | Name/Agency |
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# List of Major Acronyms Used In Plan

ACS – American Community Survey
ARES® - Amateur Radio Emergency Service
BCA – Benefit Cost Analysis
CDC – Centers for Disease Control and Prevention
CFR – Code of Federal Regulations
CDBG – Community Development Block Grant
COOP – Continuity of Operations Plan
CSIP – Comprehensive School Improvement Plan
DDoS - Distributed Denial of Service
DED – Department of Economic Development
DHSS - Department of Health and Senior Services
DNR – Department of Natural Resources
EAP – Emergency Action Plan
ECC – Emergency Communications Center
EF – Enhanced Fujita
EHS – Environmental Health and Safety
EMC – Emergency Management Coordinator
EMS – Emergency Medical Services
EOC – Emergency Operations Center
EOP - Emergency Operations Plan
EPA – Environmental Protection Agency
FAA – Federal Aviation Administration
FBI – Federal Bureau of Investigation
FCC – Federal Communications Commission
FDA – Food and Drug Administration
FEMA - Federal Emergency Management Agency
FIRM - Flood Insurance Rate Map
FMA – Flood Mitigation Assistance
GETS – Government Emergency Telecommunications Service
GIS – Geographic Information System
HAZUS/HAZUS-MH - Risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes
HMEP – Hazardous Materials Emergency Plan
HMGP – Hazard Mitigation Grant Program
IT – Information Technology
LEPC - Local Emergency Planning Committee
MDFS - Missouri Division of Fire Safety
MEERTS - Missouri Environmental Emergency Response Tracking System
Mid-MO RPC – Mid-Missouri Regional Planning Commission
MMI - Modified Mercalli Intensity Scale
MoDNR – Missouri Department of Natural Resources
MoDOT – Missouri Department of Transportation
MSA – Metropolitan Statistical Area

MSBA – Missouri School Board Association
MSHSAA - Missouri State High School Activities Association
MULES – a law enforcement computer data network used by the Missouri Highway Patrol
MURR – University of Missouri Research Reactor
MUSIC – Missouri United School Insurance Council
NAWAS – National Warning System
NCDC – National Climatic Data Center
NDMC - National Drought Mitigation Center
NFIP – National Flood Insurance Program
NMSZ - New Madrid Seismic Zone
NOAA - National Oceanic and Atmospheric Administration
NPSTC - National Public Safety Telecommunications Council
NWS – National Weather Service
OMB - U.S. Office of Management and Budget
PDM - Pre-Disaster Mitigation
PDSI - Palmer Drought Severity Index
PHHS – Public Health and Human Services
PHMSA – Pipeline and Hazardous Materials Safety Administration
POD – Point of Dispersion
PSJC – Public Safety Joint Communications
PWD – Public Water District
PWSD – Public Water Supply District
RHSOC – Regional Homeland Security Oversight Committee
RSMo – Revised Statutes of Missouri
SAME – Specific Area Message Encoding
SEMA - State Emergency Management Agency
SNS – Strategic National Stockpile
SoVI™ - Social Vulnerability Index
SPI - Standardized Precipitation Index
STAPLEE – a prioritization tool using Social, Technical, Administrative, Political, Legal, Economic, and Environmental factors for analysis
TSA – Transportation Safety Administration
USACE – United States Army Corps of Engineers
USDA - U.S. Department of Agriculture
USGS - United States Geological Survey
USFWS – United States Fish and Wildlife Service
WD – Water District
WUI – Wildland Urban Interface

# Section 1: Introduction and Planning Process

## 1.1 Purpose

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

The Federal Emergency Management Agency (FEMA) defines mitigation as "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects." A 2006 study by the Institute for Building Science found that $4 was saved in post-disaster response and recovery for every $1 spent on pre-disaster mitigation.

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

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

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

## 1.2 Background

Responding to and mitigating for natural disasters has been a subject of increasing focus for the federal government in the past decades.

The process for declaring Presidential Disasters was established with the passage of the Disaster Relief Act of 1974. In 1988, the Robert T. Stafford Disaster Relief and Emergency Assistance Act created the organizational framework through which funds and assistance would be provided after a Presidential Disaster Declaration; FEMA was designated to coordinate the relief efforts.

In 1993, FEMA created the Mitigation Directorate to oversee hazard mitigation. This established mitigation as the cornerstone of emergency management.

The Disaster Mitigation Act of 2000 further defined activities related to disaster relief and mitigation; one of its provisions encourages development of hazard mitigation measures, including land use and construction regulations.

## 1.3 History of the Cooper County Hazard Mitigation Plan

In November 2003, a "current and approved" hazard mitigation plan became a FEMA eligibility requirement for local jurisdictions applying for pre-disaster mitigation grants and the mitigation portion of post-disaster grant funds.

Due to this change in FEMA grant requirements, the Missouri State Emergency Management Agency (SEMA) contracted with the Missouri Council of Governments for the Regional Planning Commissions to direct hazard mitigation planning for interested counties within their respective regions. Cooper County, a member of the Mid-Missouri Regional Planning Commission (Mid-MO RPC), contracted with the Mid-MO RPC to facilitate the development of a hazard mitigation plan for the county.

A Project Steering Committee was formed to oversee the planning and writing of the original Cooper County Hazard Mitigation Plan in (2005). The plan was approved by FEMA and adopted by the participating jurisdictions on April 26, 2012.

### Maintenance of Hazard Mitigation Plan 2012 - 2017

The Cooper County Hazard Mitigation Plan 2012 was written to be a working document to guide participating jurisdictions in the county in the work of mitigating potential hazards. To this effect, the plan has been publicly available on the website of the Mid-MO RPC (www.mmrpc.org) since it was approved and adopted in 2012.

During the ensuing years, the Mid-MO RPC has kept the jurisdictions informed of mitigation grant opportunities through letters, the RPC's monthly newsletter (*The Current*), the Mid-Mo RPC website, and announcements at meetings of the RPC.

Several mitigation actions are currently being implemented and were retained for the 2017 plan. A full review of the 2017 mitigation actions is included in Section 5.1 of this plan.

The maintenance plan in the original document called for an annual review of the plan by the Cooper County Hazard Mitigation Steering Committee, facilitated by the Mid-MO RPC.

This plan update lays out a clearly defined maintenance process with a timetable for review and concrete tools to be employed in the review. This process is found in Section 5 of the plan.

## 1.4 Participating Jurisdictions

| | |
|---|---|
| ***Requirement §201.6(a)(3):*** | ***Multi-jurisdictional plans…may be accepted, as appropriate, as long as each jurisdiction has participated in the process….Statewide plans will not be accepted as multi-jurisdictional plans.*** |

The Cooper County Hazard Mitigation Plan is a multi-jurisdictional plan. Planners from the Mid-MO RPC (Plan Author) developed the following criteria for a jurisdiction to qualify as a participating jurisdiction:

1. Participation in planning meetings via either direct representation or by designated representative from outside the jurisdiction
2. Completion of a survey regarding capabilities, vulnerable assets, and future development
3. Development of plans for administration and implementation of mitigation actions for which the jurisdiction takes the lead
4. Formal adoption of the plan by resolution

The completion of the above criteria by jurisdictions participating in the 2012 and 2017 update planning processes are shown in Figure 1.1.

**Figure 1.1**

**Multi-jurisdictional Plan Participants**

| Jurisdiction | 2012 Part. Juris. | 2017 Planning Process | | | | 2017 Part. Juris. |
|---|---|---|---|---|---|---|
| | | Meetings | Survey | Actions | Adoption | |
| Cooper County | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Blackwater | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Boonville | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Bunceton | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Otterville | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Pilot Grove | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Prairie Home | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Windsor Place | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| City of Wooldridge | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Blackwater School District | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Boonville School District | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Otterville School District | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Prairie Home School District | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

The participating jurisdictions in the 2012 plan and those participating to any degree in the updated plan (2017) are shown in Figure 1.4.1. The chart also tracks the completion of the criteria for inclusion as a participating jurisdiction in the plan. The column on the far right of the chart in Figure 1.4.1 ("2017 Participating Jurisdictions") indicates those jurisdictions, which have completed the above requirements and are requesting approval of the plan prior to formal adoption.

All school districts in Cooper County were also notified and invited to meetings, but Prairie Home School District, Otterville School District, Boonville School District, and Blackwater School District were the only districts that participated in the planning process.

The term "planning area" is used in the plan to indicate, as a whole, all of the jurisdictions which participated in the planning process to any degree.

## 1.5 The Update Process

| | |
|---|---|
| ***Requirement §201.6(c)(1):*** | ***[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*** |

A Hazard Mitigation Plan must be updated and adopted by the participating jurisdictions every five years to be considered current. The update of the Cole County/Jefferson City County Hazard Mitigation Plan was directed by planners from Mid-MO RPC (Plan Author) as specified in a Memorandum of Agreement (MOA) with the Missouri State Emergency Management Agency (SEMA).

The general update planning process was as follows:

1. MOA for update finalized and signed (Sept. 2015)

2. Preliminary discussion with Cooper County Emergency Management Coordinator re: update (Oct. 2015)

3. Letter sent from Presiding Commissioner and Emergency Management Coordinator to all communities and school jurisdictions explaining update of plan, requesting appointment of a representative to the planning committee, and inviting them to initial update planning meeting (December 2016).

4. Announcement of initiation of planning process on front page of Mid-MO RPC website; specific invitation to any interested parties in the 6-county Mid-Missouri Region or surrounding counties to participate in the planning process (December 2016).

5. Planning Committee meetings (Oct. 2016 - March 2017).

6. Survey to officials of participating jurisdictions on capabilities, vulnerable assets, and future development (Jan. 2017).

7. Implementation strategies for mitigation actions within jurisdictions (Jan.- Feb 2017).

8. Draft of update submitted to SEMA (March 2017).

9. Final plan drafting and review; participating jurisdictions adopt plan (Feb. - April 2017).

10. Final plan submitted to FEMA (via SEMA) for approval (May 2017).

## Technical Steering Committee

The planning representatives for each jurisdiction are shown in Figure 1.2.

**Figure 1.2**

**Jurisdictional Planning Representatives**

| Jurisdiction | Planning Representatives | Position |
|---|---|---|
| Cooper County | Chris Howard | Emergency Management Director |
| | Larry Oerly | Emergency Management Director/Flood Plain |
| | Don Baragary | Presiding County Commissioner/Road and Bridge |
| | David Booker | County Commissioner/St. Joseph School |
| | Charlie Melkersman | Eastern County Commissioner |
| | Melanie Hutton | Health Department Director |
| | David Gehm | Cooper County Fire District |
| | Paul Langlotz | Cooper County Ambulance District |
| | Kevin Swartz | Cooper County Ambulance District |
| | Tony Babbitt | Cooper County Ambulance District |
| City of Boonville | Tim Carmichael | Division Chief (Fire) |
| | Darrell Harris | Fire Department |
| | Jim Gann | Economic Development |
| City of Blackwater | Randi Luscombe | City Clerk |
| City of Bunceton | Justin Hein | Mayor |
| | Tony Maddex | Public Works Administrator |
| City of Otterville | Judy Bailey | City Clerk |
| | Mark Blankenship | Fire District/School District |
| City of Pilot Grove | Dennis Knipp | Mayor |
| | Pete Busalacki | Police Department/EMA |
| | Karen Wolfe | City Councilman |
| City of Prairie Home | Linda Martin | City Clerk |
| Village of Windsor Place | Randon Leathers | Village Administrator/PWSD #1 |
| City of Wooldridge | Kurt Heiss | Township Councilman |
| Overton-Wooldridge Levee District | Robert Alpers | Representative |
| Linneman-Weekley Levee District | Jason Linneman | Representative |
| Blackwater School District | Tanya Brown | Superintendent |
| Boonville School District | Stuart Clark | Maintenance |
| Otterville School District | Kim Oelrichs | Superintendent |
| Prairie Home School District | David Heeb | Superintendent |

| | |
|---|---|
| ***Requirement §201.6(b):*** | ***In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*** |
| ***Requirement §201.6(b):*** | ***In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process;*** |

**Public Meetings for Comment and Input**

Two meetings were held for public comment and input on the update of this plan. The first meeting was held during the drafting stage and the second prior to the plan being submitted for approval by FEMA. Public notice was given for the meetings in accordance with Missouri's "Sunshine Law" (Revised Statutes of Missouri 610.010, 610.020, 610.023, and 610.024.) The meetings were also announced through various media outlets.

**First Public Meeting**

The first public meeting was held on October 12th, 2016 at the Emergency Operations Center in Boonville, MO. The public was invited to attend and provide input and discussion in the update process. A presentation was given on the process of the update and the importance of Hazard Mitigation planning. Another presentation was given on the plan itself, with information on where to read a copy of the draft and how to contact the Mid-MO RPC planners. An agenda sample, sign-in sheets, and meeting announcement sample is located in Appendix B.

Announcements were posted through the following outlets:

- Mid-Missouri Regional Planning Commission office - Announcement of public meeting was posted for public viewing September 2017. The announcement was visible to all public traffic in accordance with Missouri's "Sunshine Law".

- Announcements were sent to all participating jurisdictions to distribute and post in their respective communities and departments including:

    - Cooper Emergency Management
    - Cooper County Commission
    - Cooper County Public Health Department
    - Cooper County Road and Bridge Department
    - Prairie Home R-V School District
    - Boonville R-I School District

- Blackwater R-II School District
- Cooper County R-IV School District
- Otterville R-VI School District
- City of Pilot Grove
- Village of Wooldridge
- City of Boonville
- City of Blackwater
- City of Bunceton
- City of Otterville
- City of Pilot Grove
- City of Prairie Home
- Village of Windsor Place
- Village of Wooldridge
- Overton-Wooldridge Levee District
- Linneman-Weekly Levee District

- Announcements were also sent to all Region F RHSOC (Regional Homeland Security Oversight Committee) Emergency Management Directors (EMD) and Coordinators (EMC). This announcement included a news release for posting and a letter stating the upcoming planning process that would be coming to those counties in the future. The following county's EMDs received the announcement:

  - Audrain County
  - Boone County
  - Callaway County
  - Camden County
  - Cole County
  - Cooper County
  - Gasconade County
  - Howard County
  - Miller County
  - Moniteau County
  - Montgomery County
  - Morgan County
  - Osage County

**Second Meeting/Open House for Public Comment and Input**

The second public meeting was held on February 15, 2017 at the Emergency Operations Center in Boonville, MO. The public was invited to attend and provide input and discussion in the update process. A presentation was given on the process of the update and the importance of Hazard Mitigation planning. Another presentation was given on the plan itself, with information on where to read a copy of the draft and how to contact the Mid-MO RPC planners. An agenda sample, sign-in sheets, and meeting announcement sample is located in Appendix B.

Announcements were posted through the following outlets:

- Mid-Missouri Regional Planning Commission office - Announcement of public meeting was posted for public viewing on February 01, 2017. The announcement was visible to all public traffic in accordance with Missouri's "Sunshine Law".

- Announcements were sent to all participating jurisdictions to distribute and post in their respective communities and departments including:

    - Cooper Emergency Management
    - Cooper County Commission
    - Cooper County Public Health Department
    - Cooper County Road and Bridge Department
    - Prairie Home R-V School District
    - Boonville R-I School District
    - Blackwater R-II School District
    - Cooper County R-IV School District
    - Otterville R-VI School District
    - City of Pilot Grove
    - Village of Wooldridge
    - City of Boonville
    - City of Blackwater
    - City of Bunceton
    - City of Otterville
    - City of Pilot Grove
    - City of Prairie Home
    - Village of Windsor Place
    - Village of Wooldridge
    - Overton-Wooldridge Levee District
    - Linneman-Weekly Levee District

- Announcements were also sent to all Region F RHSOC (Regional Homeland Security Oversight Committee) Emergency Management Directors (EMD) and Coordinators (EMC). This announcement included a news release for posting and a letter stating the upcoming planning process that would be coming to those counties in the future. The following county's EMDs received the announcement:

    - Audrain County
    - Boone County
    - Callaway County
    - Camden County
    - Cole County
    - Cooper County
    - Gasconade County
    - Howard County
    - Miller County
    - Moniteau County
    - Montgomery County
    - Morgan County
    - Osage County

**Planning Committee Meetings**

Regular meetings of the Planning Committee were held from September 2016 through May 2017. A brief summary of each meeting is shown in Figure 1.3. Meeting announcements and sign-in sheets are included in Appendix.

All hazard mitigation planning meetings were open to the public and public notice was provided in accordance with Missouri's "Sunshine Law" (Revised Statutes of Missouri 610.010, 610.020, 610.023, and 610.024.) Notice of each meeting was posted at the Cooper County Courthouse in Boonville, MO (location of the County Commission and many County offices), the Mid-MO RPC office in Ashland, and on the website of the Mid-MO RPC (www.midmorpc.org).

| Figure 1.3<br>**Technical Steering Committee Meetings** | | |
|---|---|---|
| **Meeting** | **Agenda** | **Meeting Date** |
| Meeting No. 1 | This meeting was the initial meeting for the plan update. The group was given a presentation by Mid-MO RPC Staff about the update process. The group discussed possible changes to goals, objectives, and actions. Actions related to specific hazards will be discussed at subsequent meeting. Public meeting. | 10/12/2016 |
| Meeting No. 2 | Review and editing of mitigation actions pertaining to Flood and Levee Failure. Overview of NFIP. Committee was introduced to the STAPLEE prioritization method and Benefit/Cost. Probability and Severity was assessed by guidance from the State Hazard Mitigation Plan. | 10/26/2016 |
| Meeting No. 3 | Review and editing of mitigation actions pertaining to Dam Failure, Earthquake, and Land subsidence/Sinkholes. Committee rated actions using the STAPLEE prioritization method and Benefit/Cost. Probability and Severity was assessed by guidance from the State Hazard Mitigation Plan. | 11/30/2016 |
| Meeting No. 4 | Review and editing of mitigation actions pertaining to Severe Winter Weather, Tornado, Hailstorm, and Windstorm. Committee rated actions using the STAPLEE prioritization method and Benefit/Cost. Probability and Severity for each hazard was assessed by guidance from the State Hazard Mitigation Plan. Review FEMA funding for safe rooms. | 1/4/2017 |
| Meeting No. 5 | Review and editing of mitigation actions pertaining to Drought, Extreme Heat, and Wildfire. Committee rated actions using the STAPLEE prioritization method and Benefit/Cost. Probability and Severity was assessed by guidance from the State Hazard Mitigation. | 2/1/2017 |
| Meeting No. 6 | Review mitigation strategies for each community, school, levee district, and county. Review of warning siren funding information with USDA and warning siren suppliers to gain information needed for four communities (Bunceton, Pilot Grove, Windsor Place, and Wooldridge). Public meeting | 2/15/2017 |
| Meeting No. 7 | Review of draft Cooper County Hazard Mitigation Plan. Discussed adoption resolution process and timeline. | 3/15/2017 |

## Summary of Update of the Plan

The Planning Committee made the following general decisions regarding the update of the plan:

1. The effect of climate change on hazards profiled would be considered in the update.

2. Certain sections of the plan would be reorganized for better flow and organization of the material.

A general description of changes and updates made to the plan are shown in Figure 1.4.

**Figure 1.4**

**General Review and Update of Plan by Section**

| Description | Revised | Section (2012) | Pages (2012) | Section (2017) | Pages (2017) |
|---|---|---|---|---|---|
| Section 1: Introduction and Planning Process<br>Changes: Update of process, participants, etc. | Yes | 1 | 4-18 | 1 | 15-30 |
| Section 2: Planning Area Profile and Capabilities<br>Changes: Section restructured for ease of use. | Yes | 2 | 19-77 | 2 | 31-58 |
| Section 3: Risk Assessment | Yes | 3 | 78-178 | | 59-102 |
| Changes: This section has been divided into three sections: | | | | | |
| The asset information from Section 3.3 (2010 plan) is Section 3 (2015 plan). | | | | 3 | |
| The natural hazard profiles and vulnerability summaries are now Section 4. | | | | 4 | 103-226 |
| A risk assessment of technological/human-made hazards has been added to the plan as Section 5. | | | | 5 | 228-326 |
| Section 4: Mitigation Strategy<br>Changes: Strategy updated; this is now Section 6. | Yes | 4 | 179-229 | 6 | 327-330 |
| Section 5: Plan Maintenance Process<br>Changes: This is now Section 7. | Yes | 5 | 230-236 | 7 | N/A |
| Section 6: Maps<br>Changes: Section eliminated; maps integrated throughout plan | Yes | 6 | N/A | not applicable | not applicable |
| Appendices<br>Changes: Some material was integrated into body of plan, other information was not included in update, and Appendix A (2011) was updated with 2016 process and participant documentation | Yes | App. | App | Appendix | |

| | |
|---|---|
| ***Requirement §201.6(b):*** | ***In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*** |

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

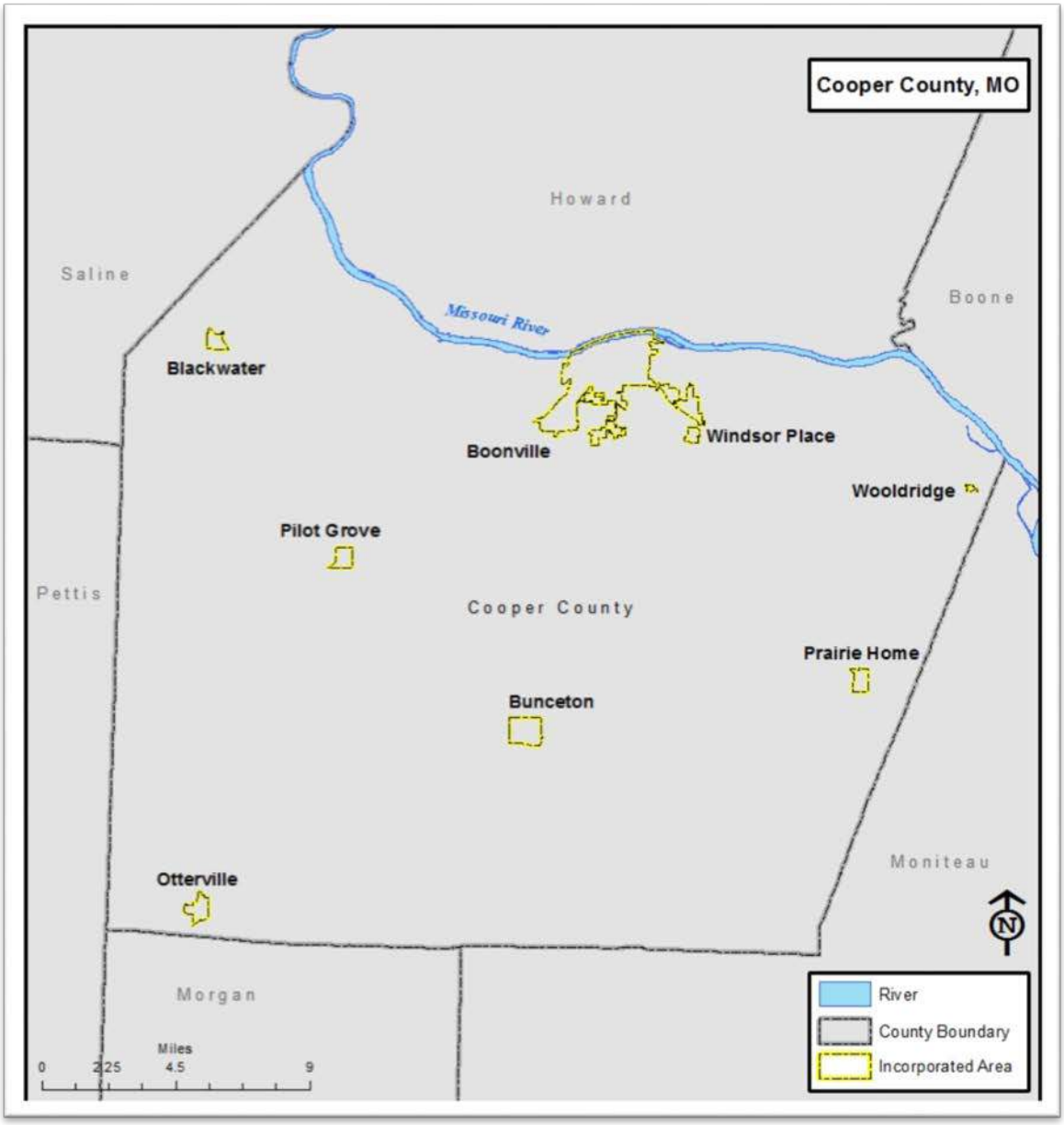
- Missouri State Hazard Mitigation Plan (2013), State Emergency Management Agency (SEMA)
- SEMA Situation Reports (http://sema.dps.mo.gov/SitReps/Situation%20Reports.htm)
- Comprehensive Economic Development Strategy for the Mid-MO Region (2016)
- Long Range Transportation Plan (LRTP), Missouri Department of Transportation
- Regional Transportation Plan (2016), Mid-MO Regional Planning Commission
- Atlas of Missouri Ecoregions, Missouri Department of Conservation
- Missouri Drought Plan (2002), Missouri Department of Natural Resources
- National Climatic Data Center (https://www.ncdc.noaa.gov/) - NOTE: The NCDC tries to use the best available information, but because of time and resource constraints, information from these sources may be unverifiable. For this reason, the accuracy or validity of the information is not guaranteed by the NCDC. The damage amount information is received from a variety of sources, including those listed above. The NCDC Website cautions that property and crop damage information "should be considered as a broad estimate."

# Section 2: Planning Area Overview

## 2.1 Geography and Ecology

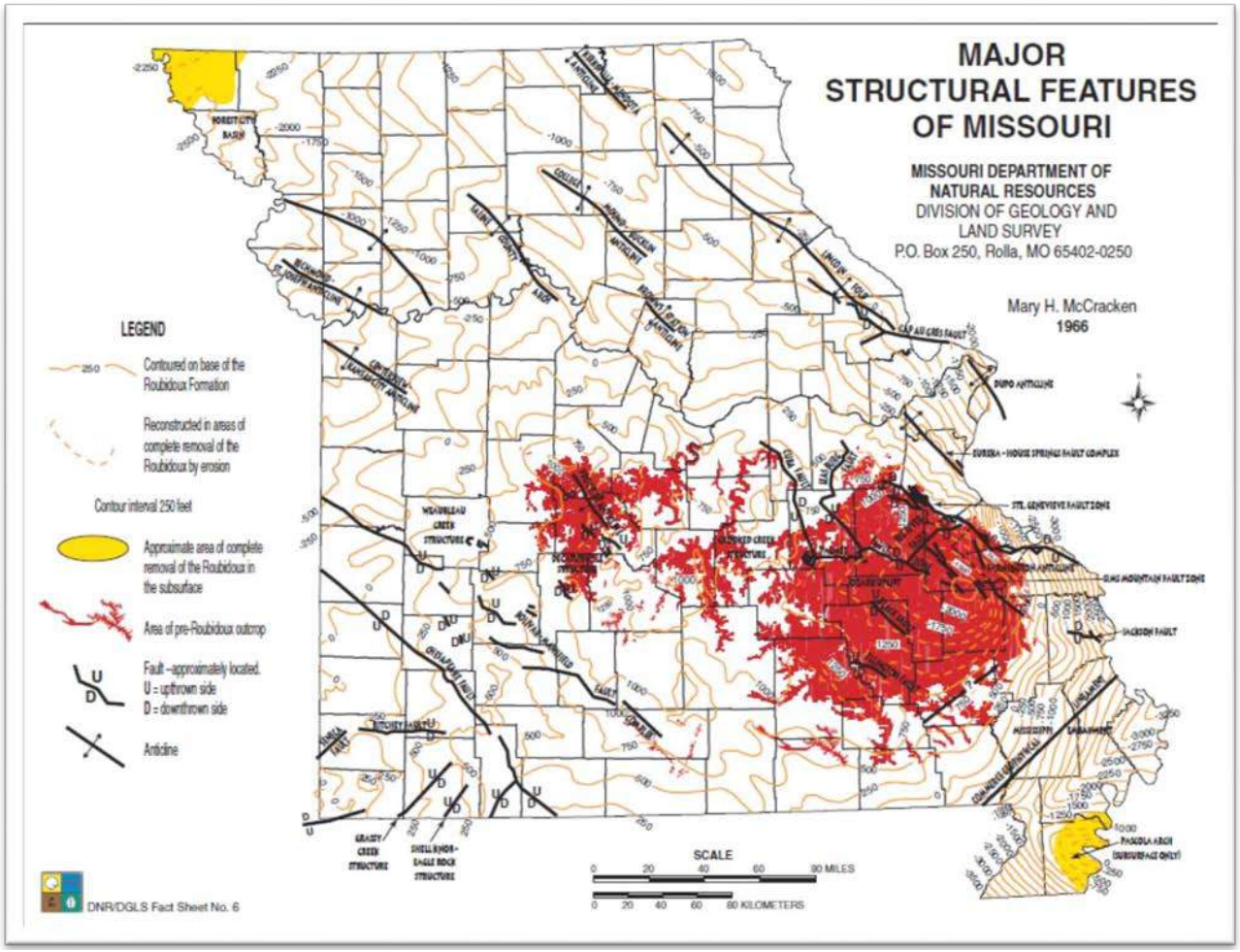
Cooper County is located in central Missouri with an area covering 570 square miles. It is approximately midway between Kansas City to the west and St. Louis to the east. The county is bordered on the north by the Missouri River, which separates it from Boone and Howard counties, on the west by Saline and Pettis counties, on the southwest by Morgan County, and on the south and southeast by Moniteau County.

**Figure 2.1**



Geologically, a part of Cooper County has been shaped by the Ozark uplift in the southeastern part of the state. This geology has implications for the hazards analyzed in this plan. Of particular concern is possible activity in the New Madrid Seismic Zone to the southeast.

**Figure 2.2**




The county is located in the northern part of the Ozark Highlands. The *Atlas of Missouri Ecoregions*, published by the Missouri Department of Conservation, describes the Ozark Highlands as:

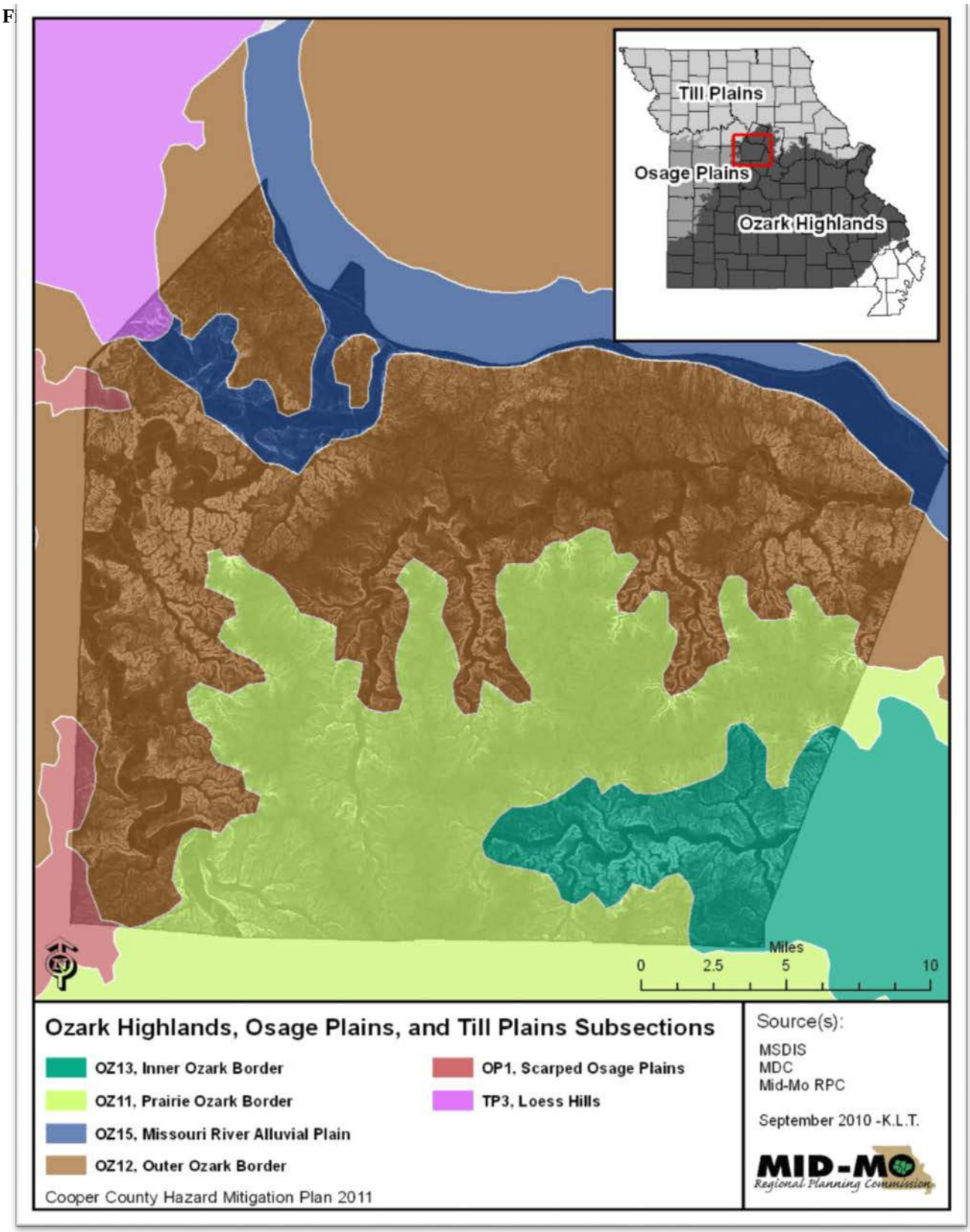
> "A distinctive biogeographic region that includes most of southern Missouri and much of northern Arkansas and small parts of Illinois, Oklahoma, and Kansas. Geologically, the Ozark Highlands is a low structural dome of essentially horizontally bedded strata that has been undergoing erosion and weathering for a quarter billion years into a thoroughly dissected plateau."

The Ozark Highlands is very diverse biologically and geographically with rugged hills, prairies, savannas, and open woodlands. The predominant underlying bedrock is carbonate (limestone

and dolomite), giving rise to karst topographic features such as caves, underground streams, and sinkholes. Natural springs provide an abundance of fresh water in many areas.

The land area of Cooper County falls mainly into four different subsections of the Ozark Highlands. These subsections are distinguished by differing landforms, soils, and vegetation (see Figure 2.1.1). In turn, these subsections give rise to differences in land use patterns, conservation needs, and vulnerability to certain natural hazards. In addition to the dominant Ozark Highlands Ecoregion, a small amount of land area in the southeastern and northeastern portion of the county falls into subsections of the Central Dissected Till Plains Ecoregion and the Osage Plains Ecoregion.

F


Till Plains
Osage Plains
Ozark Highlands
Miles
0
2.5
5
10
Ozark Highlands, Osage Plains, and Till Plains Subsections
OZ13, Inner Ozark Border
OZ11, Prairie Ozark Border
OZ15, Missouri River Alluvial Plain
OZ12, Outer Ozark Border
OP1, Scarped Osage Plains
TP3, Loess Hills
Cooper County Hazard Mitigation Plan 2011
Source(s):
MSDIS
MDC
Mid-Mo RPC
September 2010 -K.L.T.
MID-MO
Regional Planning Commission

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

**Inner Ozark Border**
This subsection constitutes a small portion of the southwestern corner of the county around the Moniteau River. It consists of dissected plains and hills with local reliefs averaging 100-150 feet. Historically, the area was largely oak savanna, woodland, and forest with frequent glades and small prairie openings. Currently, the area consists of row crops, pasture, second growth forests, and overgrown glades.

**Prairie Ozark Border**
This subsection extends from the south and into the central part of Cooper County. This subsection is a high, smooth plain with less than 100 feet of local relief. The underlying strata are limestone and dolomite and the area is blanketed with loess. This area is transitional between the wooded hills of the Ozarks and the open plains to the west; historically, it was mostly prairie with trees alongside streams. Currently, the land is mostly pasture with some significant tracts of cropland.

**Outer Ozark Border**
This subsection includes most of the northern and western parts of the county. This area is steep loess-covered hills and bluffs along the Missouri River. The underlying strata are limestone and dolomite. This area is the most rugged bluffland on the southern side of the Missouri River west of the Osage River. Prior to European settlement, oak savanna and woodlands dominated the higher areas and dense oak and mixed-hardwoods were found in the steep-sided limestone ravines. Currently, the uplands are primarily fescue pasture and the ravines are second-growth forests and cedar thickets.

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

The Missouri River's relationship to Cooper County deserves special attention because the river is the defining physical feature in Mid-Missouri and defines the northern border of the county. It is the longest river in the country and drains approximately one sixth of the United States. The location of population centers close to the river in Cooper County, which has meant significant flood damage in the county in the recent past (see Section 2.4).

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

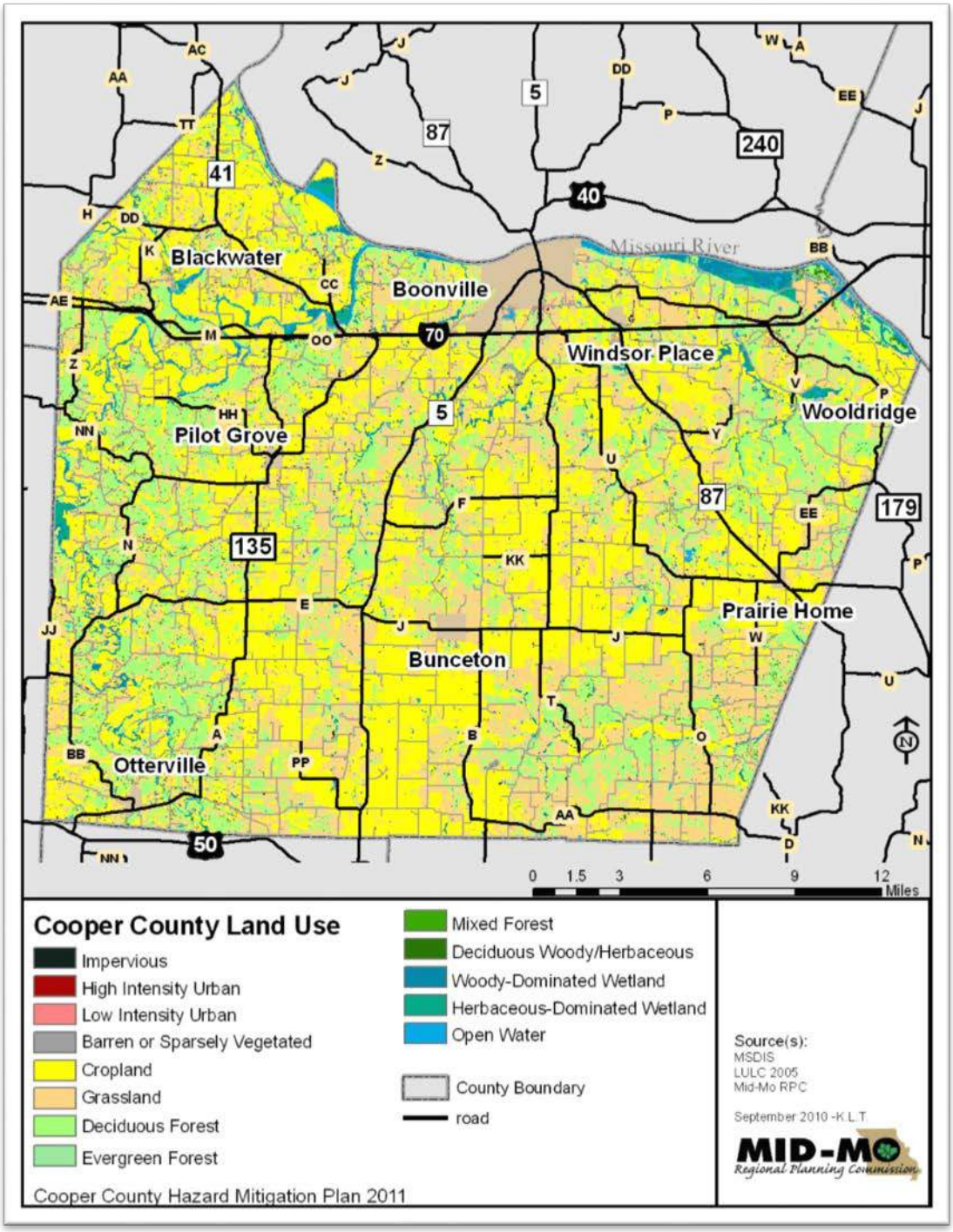
In both 1994 and 1995 the Missouri River was listed as one of the "10 Most Endangered Rivers in the Country" by American Rivers, a river conservation group (http://www.americanrivers.org/). This "Most Endangered" list does not reflect the rivers in the worst condition; rather, it seeks to highlight rivers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

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

**Cooper County Land Use**

The land use map of Cooper County shows clearly the amount of concentrated cropland throughout the entire county.

(Figure 2.4 - Reviewed by Beau Derque, September 2016).



## Public Land

There are over 13,736 acres of public land in Cooper County. These areas are owned and managed by state and federal agencies (see Figure 2.5).

| Figure 2.5 State or Federal Public Land | | |
|---|---|---|
| **Name** | **Responsible Agency** | **Acres** |
| Blackwater Bridge Access | Missouri Department of Conservation | 5 |
| De Bourgmont Access | Missouri Department of Conservation | 3 |
| Harriman Hill Access | Missouri Department of Conservation | 37 |
| Lamine River CA | Missouri Department of Conservation | 5977 |
| Prairie Home CA | Missouri Department of Conservation | 1461 |
| Roberts Bluff Access | Missouri Department of Conservation | 7 |
| Swinging Bridge Access | Missouri Department of Conservation | 25 |
| Taylors Landing Access | Missouri Department of Conservation | 10 |
| Overton Bottoms North Unit | US Fish and Wildlife Service | 2549 |
| Overton Bottoms South Unit (Cooper and Moniteau counties) | US Fish and Wildlife Service | 3662 |
| Katy Trail State Park (Cooper County Section) | Missouri Department of Natural Resources | ~ 25 Miles |
| Source: Missouri Department of Conservation (MDC), Missouri Spatial Data Server(MSDIS) | | |

## 2.2 CLIMATE

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

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

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

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

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

While Cooper County does have extreme variations in weather at times, there is a relative pattern of temperature and rainfall consistent with a humid continental climate (see Figures 2.6 and 2.7). The data shown in the charts was collected at the Boonville weather station in the years 1981-2010. The rainfall data showed an average of 43.5" of rainfall per year; average rainfall in this data set is defined as including precipitation of any form.

**Figure 2.6**

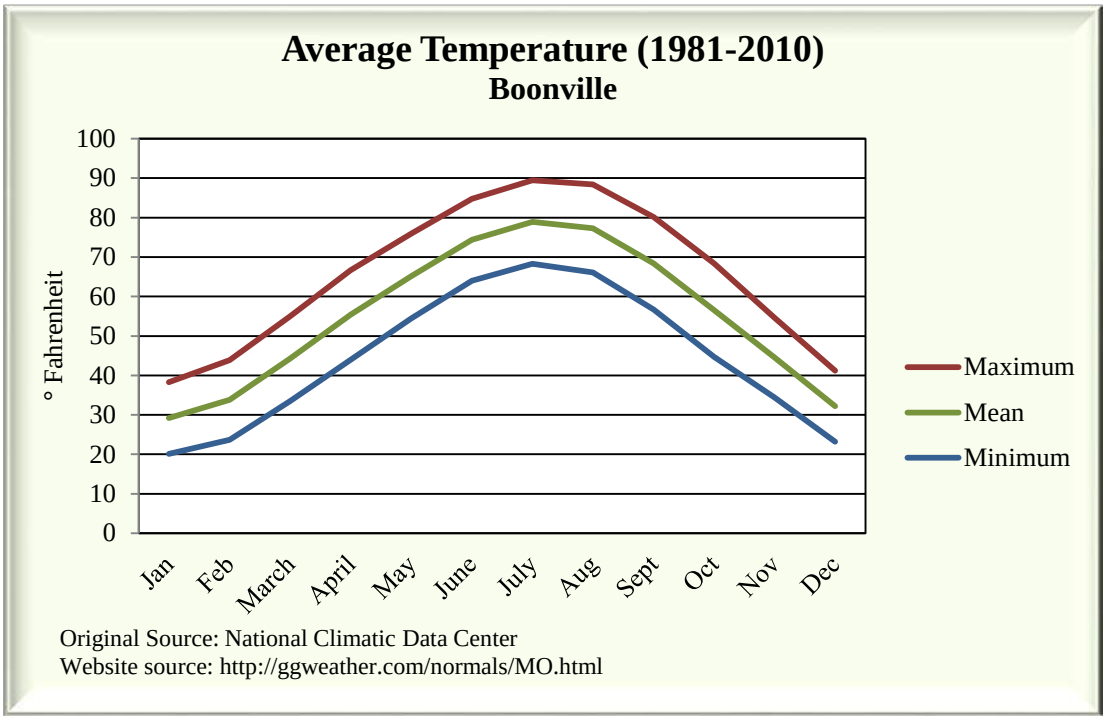
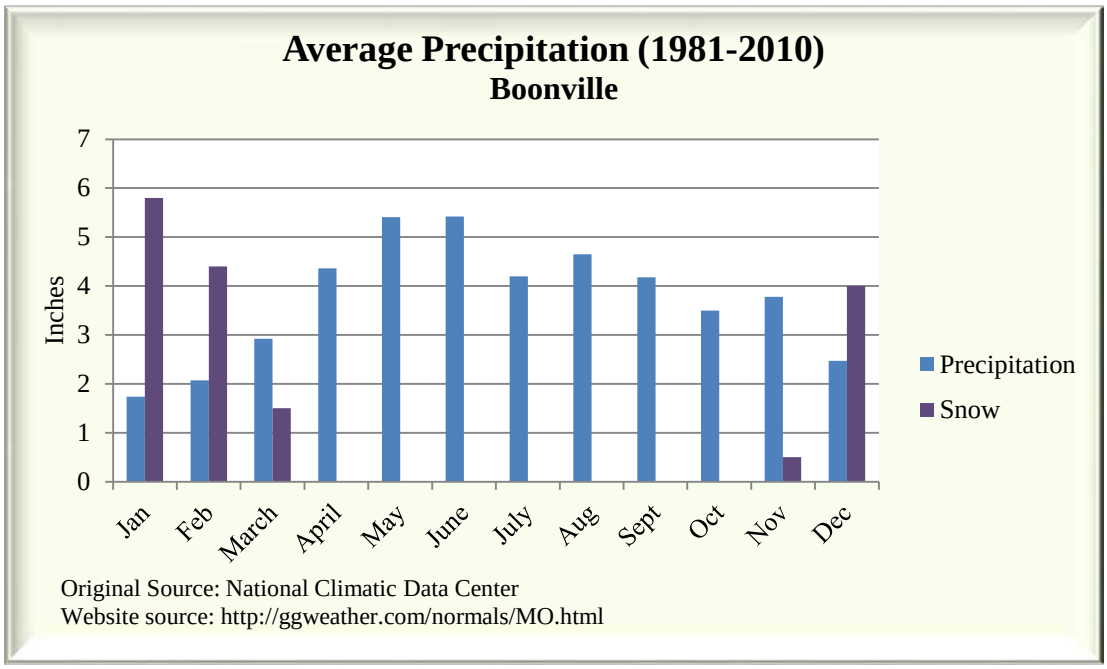



**Figure 2.7**



## 2.3 HISTORY

According to the official Cooper County website, the County was organized in 1818 and is named after brothers Sarshall and Benjamin Cooper, local frontiersmen. Cooper County had previously been part of Howard County, which now lies north of the Missouri River. The county, when first formed, encompassed a large area which has subsequently been divided into fifteen counties.

Cooper County was originally home to the Osage and other groups of indigenous people. White settlers from Kentucky and Tennessee began settling the area around 1816. With these white settlers came their southern culture and lifestyles, which included large plantations and slavery. By the mid 1800s, Cooper County and several other counties along the Missouri River became a thriving agricultural area known as “Little Dixie”. Cooper County and the surrounding area produced such crops as hemp, tobacco, and cotton. The area was also home to several Civil War battles.

Cooper County still maintains its agricultural roots and promotes tourism of its rich historical heritage.

## 2.4 NATURAL HAZARD HISTORY

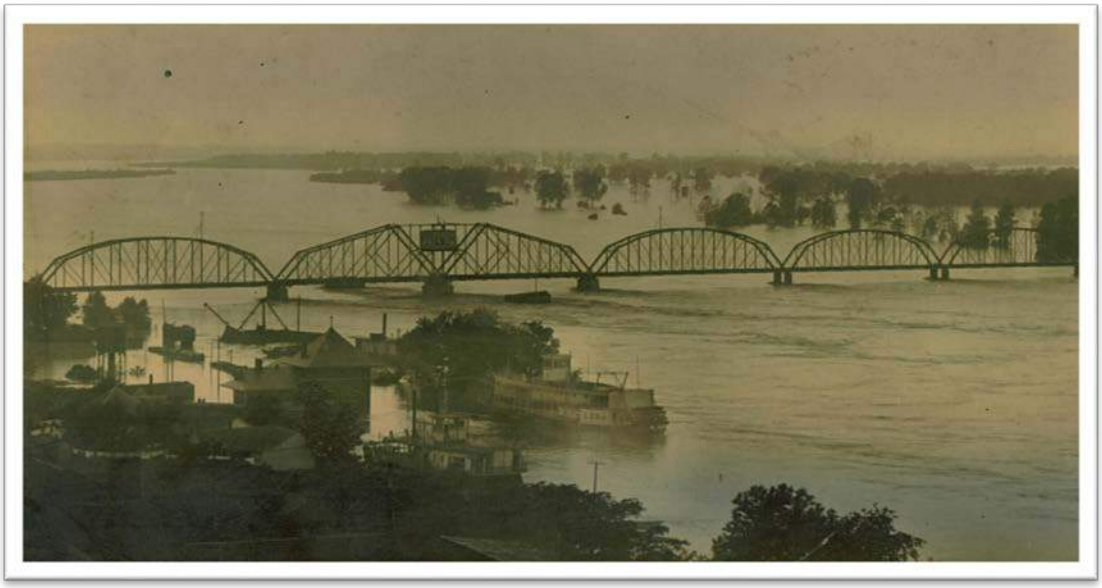
Cooper County has been subject to many natural hazards in the past. Floods, droughts, windstorms, hail, tornadoes, severe winter weather, and extreme heat have all taken their tolls; dam failure has threatened. A brief overview of the more recent natural hazard events in the county will be discussed here; more extensive history will be given with each Hazard Profile in Section 3 of the plan.

Probably the most prominent natural hazard within memory is the **Flood of 1993**. This flood was devastating to much of Missouri and the Midwest; it took a great toll in Cooper County. According to data from the U.S. Corps of Engineers, there was extensive damage in varying amounts in the following sectors:

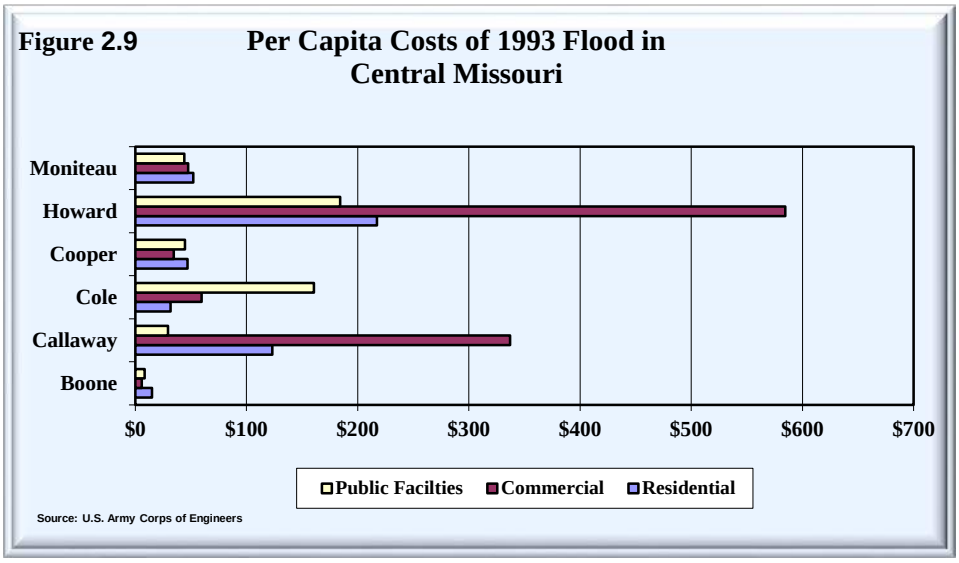
- Agricultural property $10Million to $50Million
- Transportation $1Million to $5Million
- Public Facilities $500,000 to $1Million
- Residential properties $500,000 to $1Million
- Commercial Properties $500,000 to $1Million
- Utilities $25,000 to $100,000
- Emergency Expenses less than $10,000

In addition to the 1993 flood, there have been several other flooding events that have touched the region. Figure 2.4.1 depicts the flood of 1903 and how close the river came to overtaking the original Katy Railroad Bridge.

**Figure 2.8 Boonville, 1903 – Photo Courtesy of Friends of Historic Boonville**



Estimates of the per capita costs of the 1993 flood for three sectors in the Mid-Missouri Region are shown in Figure 2.4.2. Note that this chart reflects *per capita cost* and that Cooper County has the fourth largest population in the region.




The devastating flood of 1993 was followed by floods in 1994, 1995, 2011, and late 2015. Cooper County was included in Presidential Disaster Declarations for flooding in 1993, 1995, and 2011. On January 2, 2016, Cooper County was included in a Presidential Emergency Declaration for flooding recovery and debris removal.

Although the county does not experience severe flooding every year, thunderstorms can be expected annually. In most years there are reports of associated high winds (**Windstorms**) and **Hail** someplace in the county. In a seven year period between 1993 and 2000, thunderstorm winds caused $184,000 in property damage. Severe hail was a problem in the springs of 1993 and 2009.

Less frequently, thunderstorms will spawn **Tornadoes** in the area. Cooper County experienced 17 tornadoes between 1950 and 2015 resulting in $1.6 million in property damage and $50,000 in crop damage. There were no injuries or deaths from these tornadoes, but this is an ever present concern due to the frequency of thunderstorm activity and the potential for formation of tornadoes.

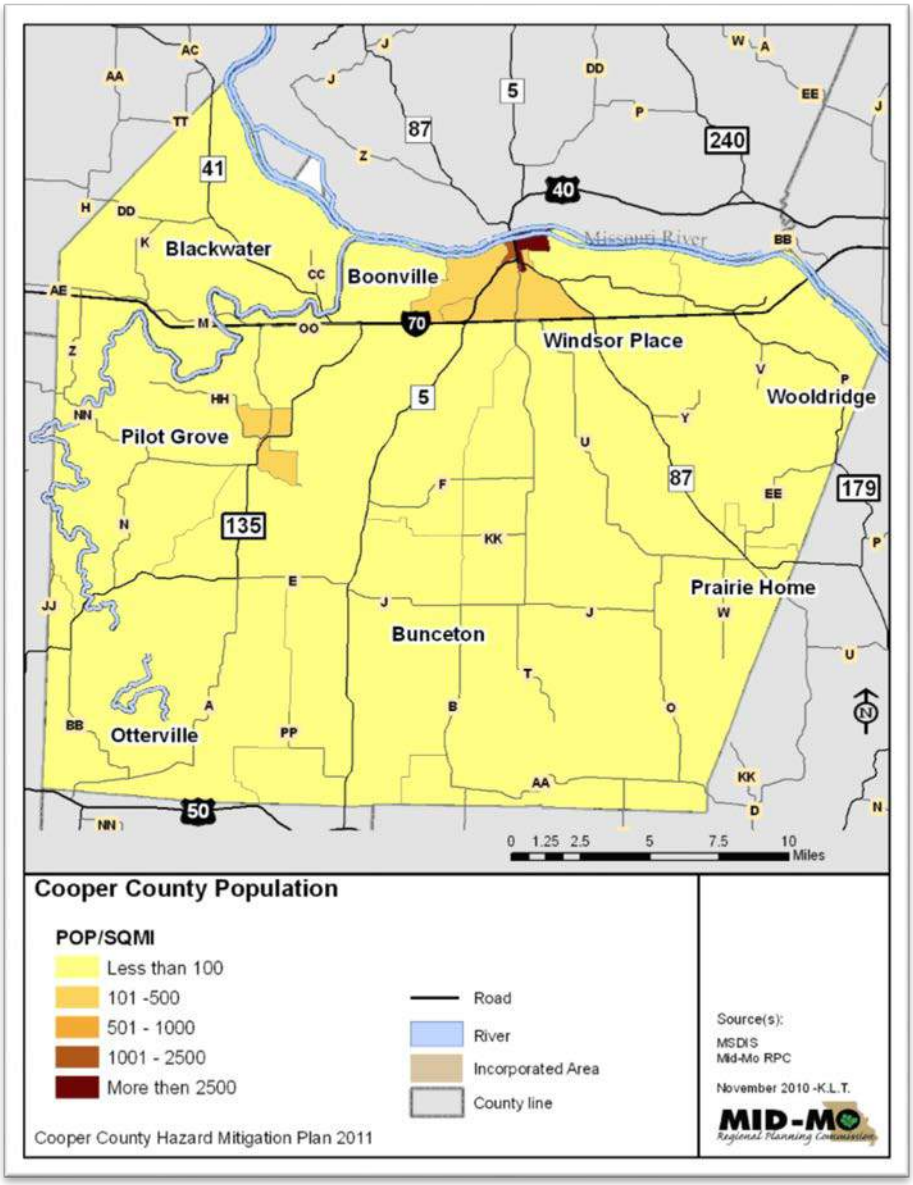
**Severe Winter Weather** can be expected in Cooper County nearly every year. The county has been included in five Presidential Disaster Declarations for severe winter weather since 2002. A winter storm that brought up to ¾ of an inch of ice in December 2007 caused widespread power outages leaving an estimated 165,000 residents without power in Cooper County and the surrounding counties of Bates, Chariton, Howard, Johnson, Pettis, and Saline. In 2011, a series of storms blanketed the region in near record amounts of snow and created blizzard conditions across a large portion of the state. Snow fall on February 1st, 2011 caused the closure of

Interstate 70 from Kansas City to St. Louis. Expenses from these storms are in excess of $14 million, according to SEMA.

On the other end of the temperature spectrum, periods of **Extreme Heat** also commonly occur in the county almost every year. **Drought** is an ever present possibility; 2000 was the driest year ever recorded for the county and the entire state.

## 2.5 POPULATION, HOUSING, and POVERTY

A mapping of Cooper County's population (2010 Census) by block group clearly shows that the highest population density is in the northern part of the county (Figure 2.10).



In Cooper County, the 2010 Census indicated a 6% increase in population and a 12% increase in housing units (Figure 2.11).

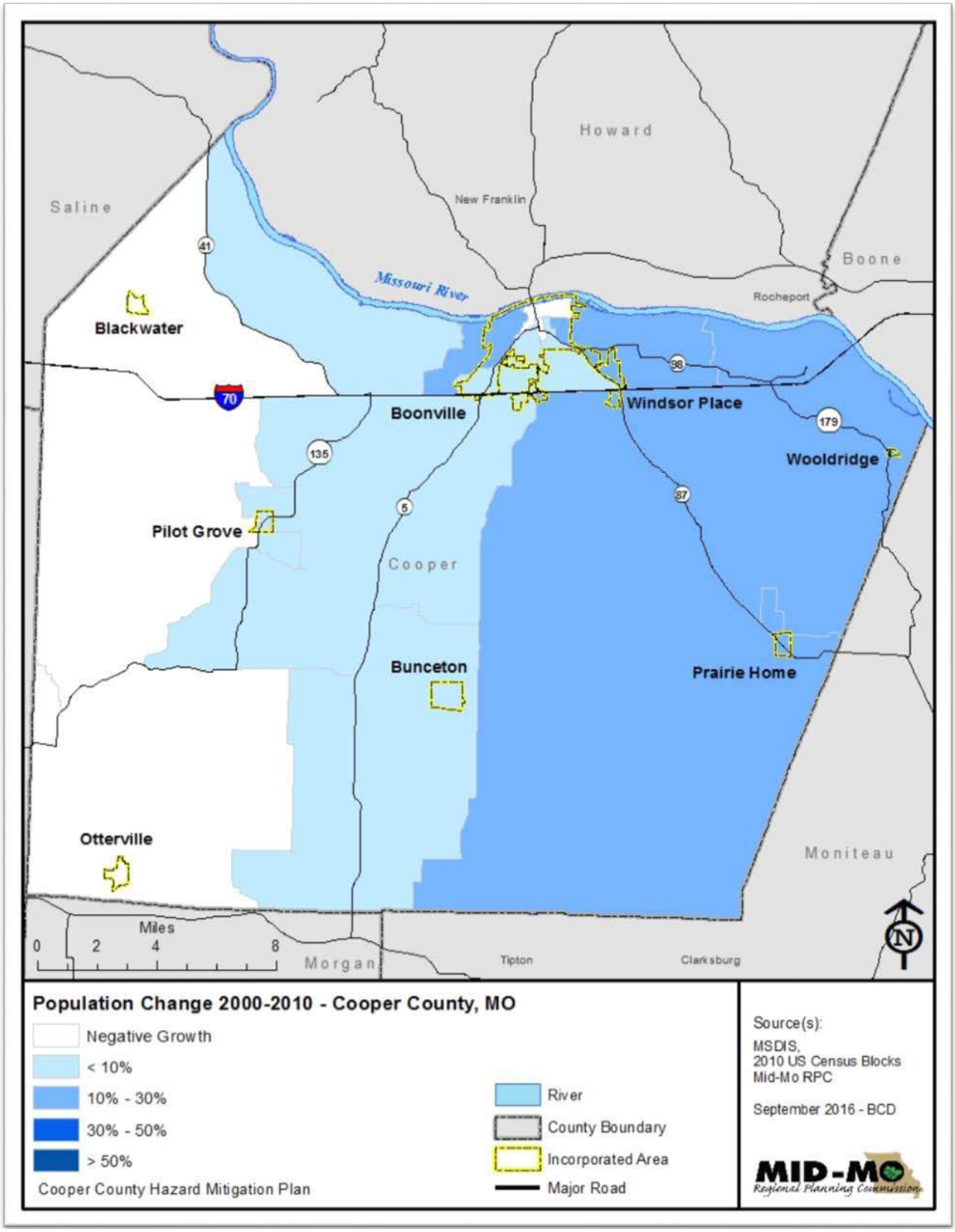
**Figure 2.11**

**Change in Population and Housing 2000-2010**

| | Population | | | | Housing Units | | |
|---|---|---|---|---|---|---|---|
| | **2010** | **2000** | **% Change** | | **2010** | **2000** | **% Change** |
| Cooper County (total)* | 17,601 | 16,670 | 6% | | 7,463 | 6,676 | 12% |
| Cooper County (unincorporated) | 6,894 | 6,241 | 10% | | 3,052 | 2,675 | 14% |
| Blackwater | 162 | 199 | -19% | | 87 | 96 | -9% |
| Boonville | 8,319 | 8,202 | 1% | | 3,294 | 3,041 | 8% |
| Bunceton | 354 | 348 | 2% | | 182 | 182 | 0% |
| Otterville | 454 | 476 | -5% | | 224 | 226 | -1% |
| Pilot Grove | 768 | 723 | 6% | | 334 | 317 | 5% |
| Prairie Home | 280 | 220 | 27% | | 132 | 118 | 12% |
| Windsor Place | 309 | 214 | 44% | | 119 | NA | NA |
| Wooldridge | 61 | 47 | 30% | | 39 | 21 | 86% |

Source: U.S. Census Bureau

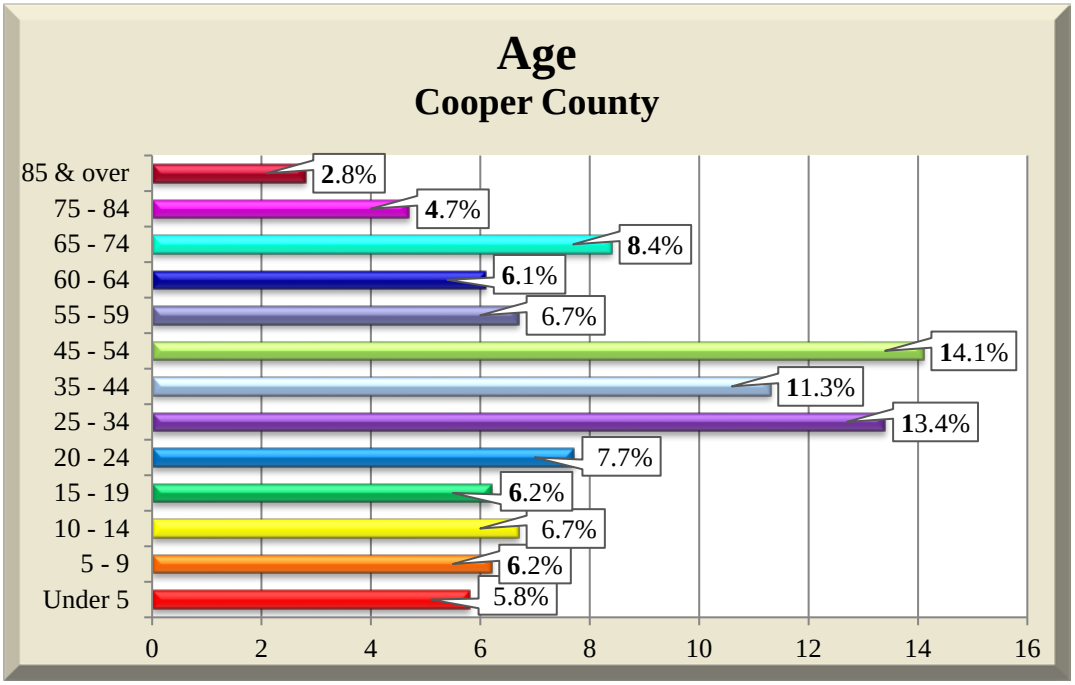
**Figure 2.12**


Howard
New Franklin
Saline
Boone
Missouri River
Rocheport
Blackwater
Boonville
Windsor Place
Wooldridge
Pilot Grove
Cooper
Bunceton
Prairie Home
Otterville
Moniteau
Miles
0 2 4 8
Morgan
Tipton
Clarksburg
Population Change 2000-2010 - Cooper County, MO
Negative Growth
< 10%
10% - 30%
30% - 50%
> 50%
River
County Boundary
Incorporated Area
Major Road
Cooper County Hazard Mitigation Plan
Source(s):
MSDIS,
2010 US Census Blocks
Mid-Mo RPC
September 2016 - BCD
MID-MO
Regional Planning Commission

### Vulnerable Populations

Some sectors of the population are more vulnerable in general to the threat of hazardous events. Children need the help and guidance of adults, especially in the extraordinary circumstances, and this is also true for some older citizens. Approximately 25% of the county's population is under the age of 18; approximately 16% is 65 years and older, according to 2014 estimates from the American Community Survey of the U.S. Census Bureau (see Figure 2.13).

**Figure 2.13**




**Source: 2010-2014 American Community Survey 5-Year Estimates**

http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF

Those living in group quarters are especially vulnerable in that they may need to be evacuated. Some of the elderly are grouped in specific facilities; this is also true for the seriously ill in hospitals and those recovering from health emergencies in nursing facilities. These critical facilities are listed and mapped in Section 3.1 (Figures 3.1.5 and 3.1.6).

The poor are also a vulnerable population. Poor housing conditions or lack of an housing, lack of reliable transportation, and inadequate insurance can all contribute to heightening the impacts of a hazard worse for people living in poverty. Approximately 14.7% of the population in the planning area is below the poverty threshold, according to the estimates from the American Community Survey 2010-2015 (Figure 2.14).

**Figure 2.14**

**Poverty Status, Cooper County**

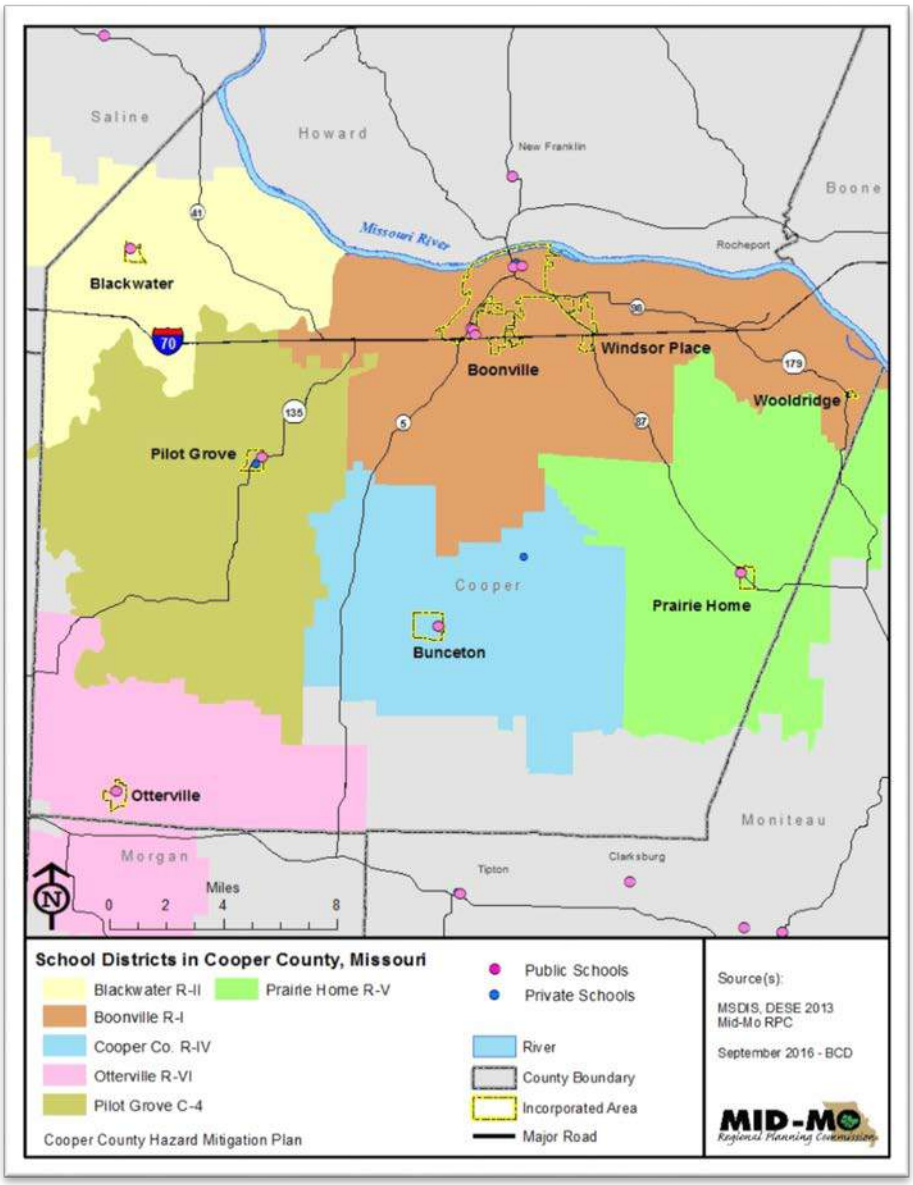
| **Subject** | **Number** | **%** |
|---|---|---|
| Persons for whom poverty status is determined | 16,031 | |
| **Persons below poverty** | **2,354** | **14.7** |
| | | |
| | | |
| Persons under 18 for whom poverty status is determined | 3853 | |
| Persons under 18 in poverty | 845 | 21.9 |
| | | |
| Persons aged 18 to 64 for whom poverty status is determined | 9,537 | |
| Persons aged 18 to 64 in poverty | 1,313 | 13.8 |
| | | |
| Persons over 65 for whom poverty status is determined | 2,635 | |
| Persons over 65 in poverty | 190 | 7.2 |
| | | |
| | | |
| Unrelated individuals for whom poverty status is determined | 2,945 | |
| Unrelated persons in poverty | 725 | 24.6 |

Source: 2010-2015 American Community Survey 5-Year Estimates

## 2.6 EDUCATION

Students are a vulnerable population as they are dependent on others for natural hazard information during the school day. A mitigation plan must take this into account. Often, this has been done by building schools out of floodplains and having safe areas within the school where the students can assemble in the event of a disaster. School buildings also have the potential to be built or reinforced to tornado safe-room specifications, and some school facilities may be used to assist with wider sheltering needs during or after a disaster.

**Figure 2.15**




The following six public school districts and three private schools are located in the Cooper County planning area: Blackwater R-II, Boonville R-I, Cooper County R-IV, Otterville RVI, Pilot Grove C-4, and Prairie Home R-V (Figure 2.15).

Each district has an elected Superintendent and School Board, along with several administrative staff. Combined the school districts employ more than 300 certified teachers and educate more than 2,700 students in public and private schools combined.

## 2.7 EMPLOYMENT AND INCOME

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

The major employers in Cooper County are shown in Figure 2.14. (Note that about 45 percent of county residents commute outside the county for work, and those statistics are not reflected here.)

**Figure 2.16**

**Major Employers in Cooper County**

| Employer | Employees | Employer | Employees |
|---|---|---|---|
| Isle of Capri | 540 | Cooper County | 70 |
| Boonville Correctional Center | 350 | Pilot Truck Stop | 70 |
| Caterpillar | 300 | C&R Market | 70 |
| Cooper County Memorial Hospital | 230 | McDonalds | 60 |
| Boonville R-1 School District | 225 | | |
| Walmart | 150 | | |
| Unlimited Opportunities | 150 | | |
| City of Boonville | 103 | | |

Source: Data Provided by City of Boonville, 2016 data

## Agriculture

Agriculture remains an important component of the economy in Cooper County. There are 307,128 acres in farmland in the county according to the 2012 Census of Agriculture from the U.S. Department of Agriculture (USDA); this is an increase from 302,429 acres in 2007 (Figure 2.15). Farmland comprises 85% of the land area of the county. Of the total farmland, 190,348 acres are cropland, and 162,209 acres were harvested in 2012.

Soybeans, corn, and hay are the major crops in the county; poultry, cattle and pigs are the main livestock. Other crops include grain sorghum, grapes, garden vegetables, nuts, fruit, native plants, trees, and shrubs. The total market value for all agricultural products (crops and livestock) sold in 2012 was $78,289,000.

**Figure 2.17**

**Agricultural Overview, Cooper County**

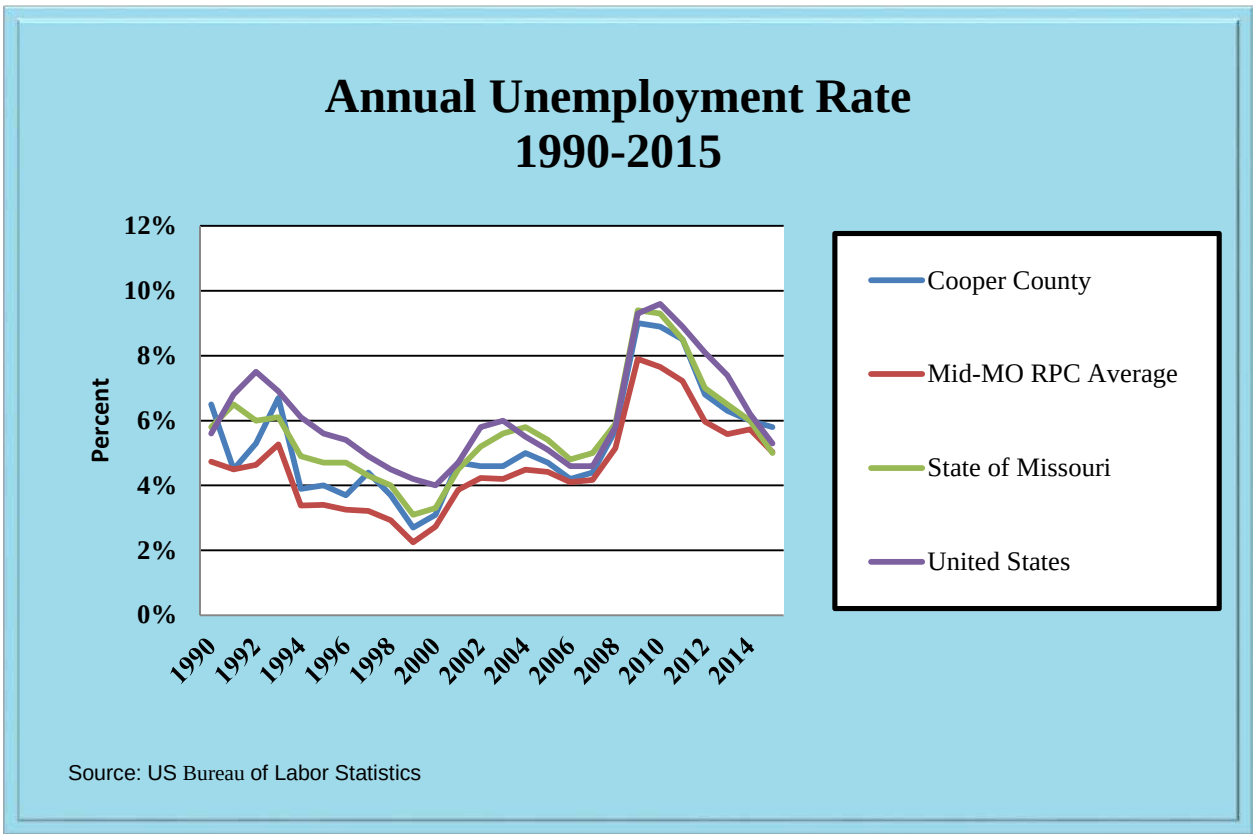
| | 2012 | 2007 | Change |
|---|---|---|---|
| **Approximate land area (acres)** | 361,450 | 361,450 | 0% |
| **Land in farms (acres)** | 307,128 | 302,429 | 1.3% |
| **Percentage in farms** | 85.0% | 83.7% | 1.3% |
| | | | |
| **Number of farms** | 928 | 942 | -1.5% |
| **Average size of farm (acres)** | 331 | 321 | 3.1% |
| **Estimated market value of land and buildings** | $872,598,000 | $673,181,000 | 29.6% |
| **Average value per farm** | $940,299 | $714,630 | 31.6% |
| **Average value per acre** | $2,841 | $2,226 | 27.6% |
| | | | |
| **Total sales** | $78,289,000 | $82,946,000 | -5.6% |
| **Average sales per farm** | $84,363 | $88,053 | -4.2% |

Source: USDA Census of Agriculture 2012, https://www.agcensus.usda.gov/Publications/2012/

## Unemployment Rates

The entire Mid-Missouri Region has lower unemployment rates than the state and nation (see Figure 2.18). Cooper County's unemployment rate usually falls below that of the nation and state, but is higher than that of the region.

**Figure 2.18**



## Income

The median household income in Cooper County ($44,102) is lower than the median household income for the state of Missouri ($47,764), according to the 2014 estimate from the American Community Survey (ACS) of the U.S. Census Bureau.

The distribution of household income and benefits in the county is shown in Figure 2.19.

**Figure 2.19 Household Income and Benefits**

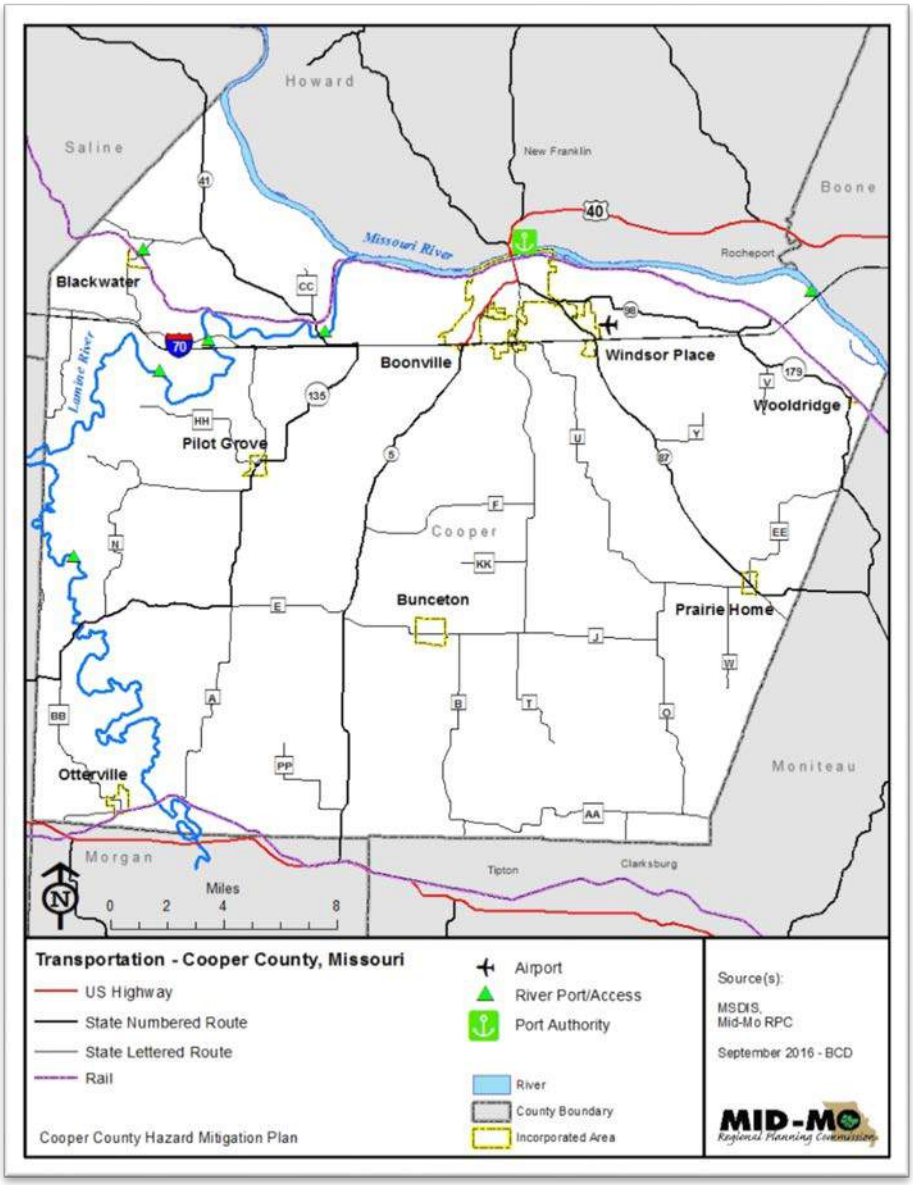
| Income | # of Households | % of Households |
|---|---|---|
| Less than $10,000 | 364 | 5.6 |
| $10,000 - $14,999 | 426 | 6.5 |
| $15,000 - $24,999 | 935 | 14.3 |
| $25,000 - $34,999 | 912 | 14.0 |
| $35,000 - $49,999 | 855 | 13.1 |
| $50,000 - $74,999 | 1249 | 19.2 |
| $75,000 - $99,999 | 733 | 11.2 |
| $100,000 - $149,999 | 837 | 12.8 |
| $150,000 - $199,999 | 118 | 1.8 |
| $200,000 or more | 91 | 1.4 |
| Median household income | $44,102 | |
| Mean household income | $60,283 | |

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-year estimates - http:// http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF

## 2.8 TRANSPORTATION AND COMMUTING PATTERNS

Cooper County, like most of the United States, is heavily dependent upon the personal vehicle and roads. Roads are the dominant transportation arteries in Cooper County (see Figure 2.20), moving most goods and services that flow in and out of the county. The Missouri Department of Transportation (MoDOT) takes care of all state and federal roads in the county; Cooper County Public Works maintains roads in unincorporated areas and the various jurisdictions maintain their own roads.

**Figure 2.20**




**Roadways**
There is one interstate and five state highways in Cooper County (I-70, MO 431, MO 135, MO 5, MO 87, MO 98, and MO 179). Interstate 70 runs east to west across to northern portion of the county through the City of Boonville and is the direct route between Kansas City and St. Louis. MO 5 provides access to the Lake of the Ozarks, a major recreational and tourism area approximately directly to the south of the county.

**Public Transportation**
OATS, Inc., a private not-for-profit corporation, was founded by a group of seniors in 1971 as a transportation service for older citizens. Its current mission is to provide reliable transportation for disadvantaged Missourians so they can live independently in their own communities. In Cooper County the organization provides transportation between Boonville and the communities of Blackwater, Bunceton, Prairie Home

and Pilot Grove. They also provide transportation to the City of Columbia in Boone County as well as adjacent and other counties.

The OATS schedule to Boonville from Bunceton, Blackwater, Pilot Grove and Prairie Home is the 1st, 3rd and 4th Thursday. Cooper County to Columbia is the 1st and 3rd Wednesday. The charges for this service is roundtrip within Boonville $5.00, within Cooper County $7.00. adjacent county $9.00 and beyond two counties is $7.00 per county.

The City of Boonville in conjunction with OATS operates the Katy Flyer, a transportation service within Boonville. It operates from 7:30 am to 5:00 pm on Tuesday, Wednesday and Thursday. It requires 24 hour advance notice with a cost of $2.00 per one way trip.

**Railroads**

Passenger Rail

While Cooper County does not have a rail station, there is an Amtrak station approximately 48 miles away in Jefferson City that provides passenger service to both Kansas City (and points westward) and St. Louis (and points eastward) via the *Missouri River Runner*. Two trains traveling in each direction stop daily at the Jefferson City Amtrak Station. The completion of a 9,000-foot rail siding extension just west of California, Missouri in November 2009 increased the on-time arrival percentage of the *Missouri River Runner* trains from 55-79% in recent years to over 90%, according to the Missouri Department of Transportation (MoDOT). With a better record of on-time arrivals, ridership has subsequently increased about 20%.

Rail Freight

A large amount of freight travels by rail through Cooper County. Union Pacific operates tracks through the northern part of the county. According to the Missouri Department of Transportation's Long-Range Transportation Plan (LRTP), 33 percent of all product movement in Missouri is conducted by rail. Kansas City and St. Louis are ranked as the 2nd and 3rd busiest rail hubs in the nation, according to the Missouri Economic Research and Information Center (MERIC).

**Air**

The Jesse P. Viertel Memorial Airport is owned and operated by the City of Boonville and is available for corporate and private planes, but does not support commercial services. The Columbia Regional Airport is located 45 minutes away in Boone County south of Columbia. The Columbia Regional Airport is serviced by American Airlines. Additionally, Kansas City International Airport and St. Louis Lambert International Airport are approximately 120 miles east and west of Boonville, along I-70.

**Water**

The Missouri River and Lamine River both have Missouri Department of Conservation public access boat ramps and several private access boat ramps. Most of these ramps and access points are designed for recreational use and allow access to the Missouri River and all points upstream and downstream. In addition to recreational use boat ramps, there is also a commercial port

operated by the Howard/Cooper County Regional Port Authority. The port is located in Howard County on the north side of the Missouri River, directly across from the City of Boonville. According to the Missouri Port Authority, the facility has storage capacity for 250,000 bushels of grain and 4 million gallons of liquid chemicals. The facility is also equipped with two cranes, a dock, two dry storage buildings, several support vehicles, and a 15,000 ton outside storage pad. The port is the only Missouri River public shipping access point between Kansas City and St. Louis. While the facility lies in Howard County, it is an important resource for Cooper County and other counties in the Mid-Missouri Region.

**Figure 2.21**

## Commuting Patterns

About 55% of Cooper County workers stay in the county to work; the rest commute to neighboring counties or states (see Figure 2.22). The metropolitan area of Columbia in neighboring Boone County provides several employment possibilities through the University of Missouri, hospitals, and service industries.

**Figure 2.22**

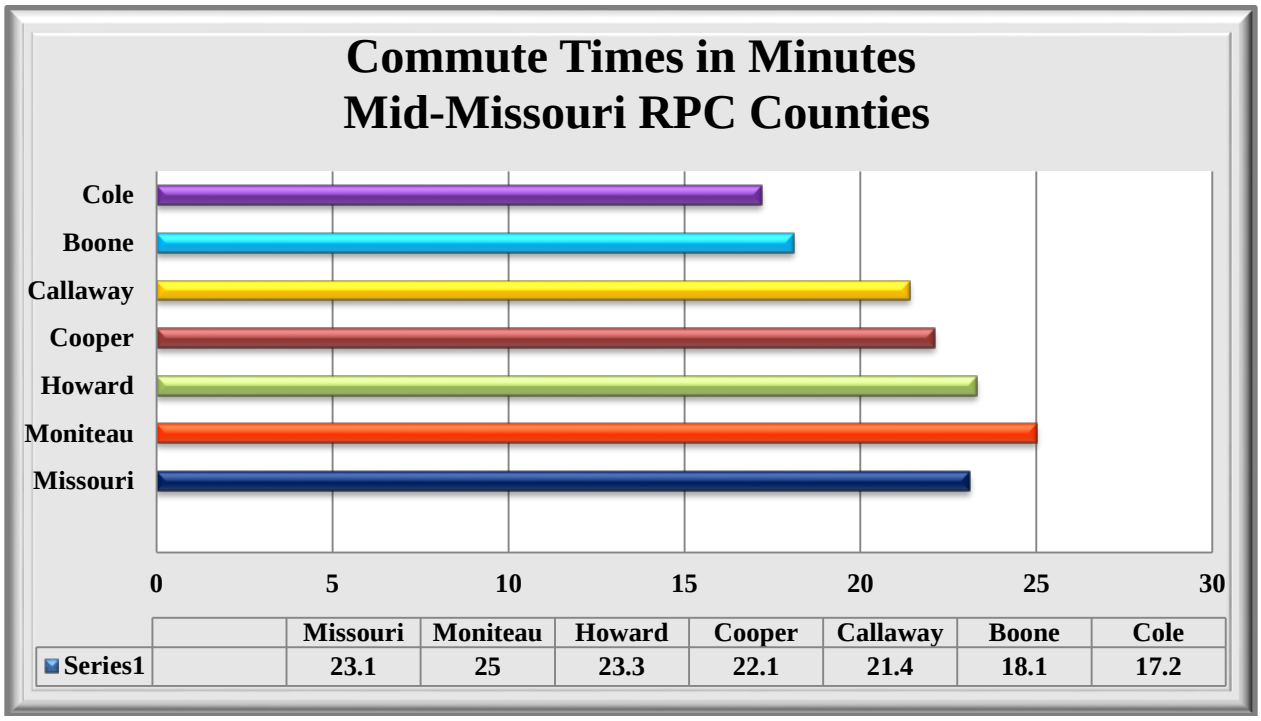
**Commuting Destinations of Cooper County Workers**

| Location of Work | # of Trips | % of Total Trips |
|---|---|---|
| **Missouri Counties** | | |
| Cooper | 4,395 | 55.77 |
| Boone | 1,998 | 25.36 |
| Pettis | 477 | 6.05 |
| Moniteau | 193 | 2.45 |
| Cole | 160 | 2.03 |
| Saline | 98 | 1.24 |
| Howard | 93 | 1.18 |
| Johnson | 55 | 0.70 |
| Morgan | 37 | 0.47 |
| Jackson | 18 | 0.23 |
| Audrain | 17 | 0.22 |
| Callaway | 15 | 0.19 |
| Cass | 14 | 0.18 |
| St. Louis | 9 | 0.11 |
| Camden | 8 | 0.10 |
| Benton | 2 | 0.03 |
| Other counties or states | 291 | 3.69 |
| **Total** | **7,880** | **100** |

Source: U.S. Census Bureau, 2009-2013 5-Year American Community Survey Commuting Flows

Commute times for workers residing in Cooper County are the third highest in the six-county region served by the Mid-Missouri Regional Planning Commission and somewhat lower than the state average (see Figure 2.23).

**Figure 2.23**




Source: 2010-2014 American Community Survey 5-Year Estimates

# Section 3: Planning Area Assets and Capabilities

The jurisdictions in the planning area have many human and material assets at risk from hazards. At the same time, these human and material assets provide a wide array of capabilities for mitigating, responding to, and recovering from damage and loss.

This section begins with an overview of the critical infrastructure in the planning area.

This is followed by a profile of each participating jurisdiction, which includes the following:

- key demographic and governing information
- assessed property values from the Cooper County Assessor's Office
- counts and value of property owned by the jurisdiction, to the extent available
- any changes since 2012 with potential relevance to hazard mitigation planning
- any plans for future development with potential relevance to hazard mitigation planning
- any other information deemed relevant

## 3.1 CRITICAL FACILITIES OVERVIEW

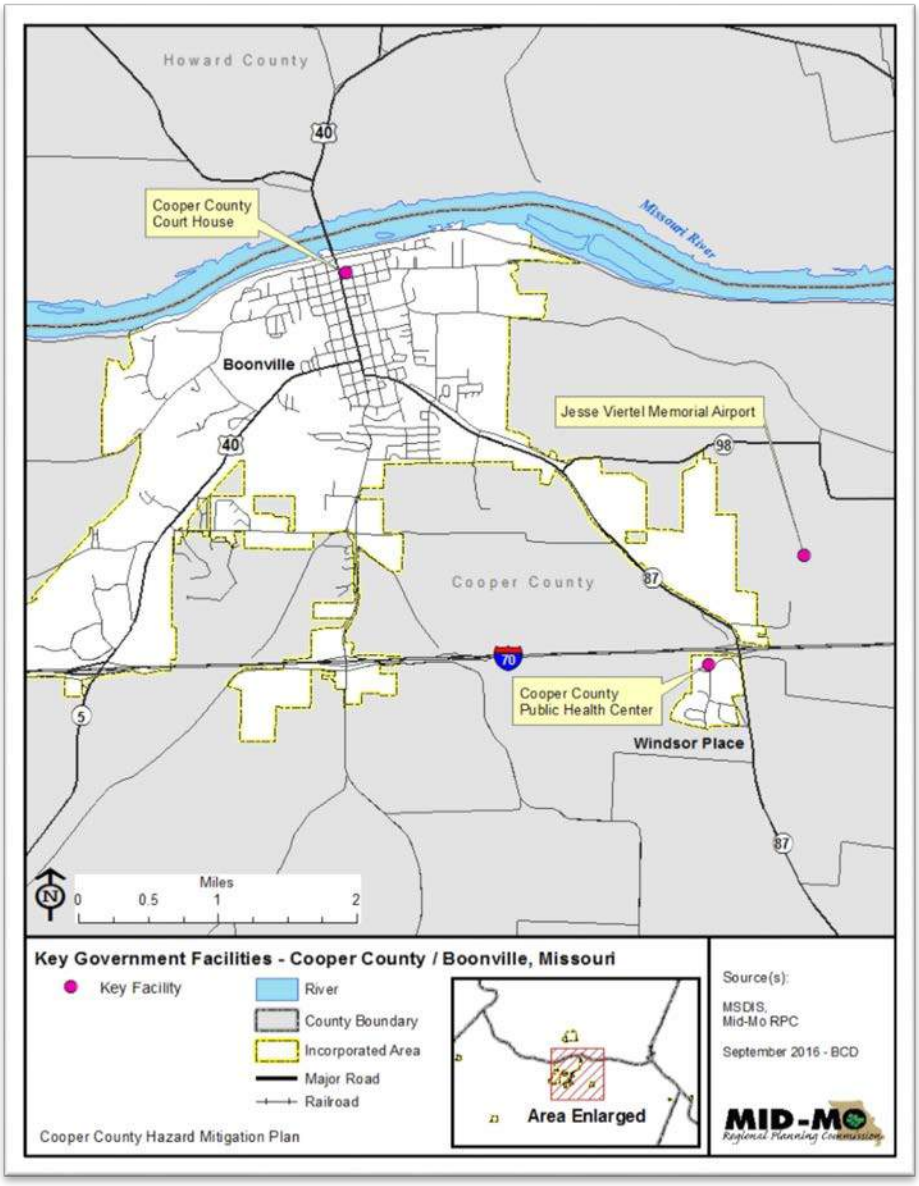
Critical facilities are defined by FEMA as "all manmade structures or other improvements that, because of their function, size, service area, or uniqueness, have the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if they are destroyed, damaged, or if their functionality is impaired."

Critical facilities commonly include all public and private facilities that a community considers essential for the delivery of vital services and for the protection of the community (Figures 3.1 through 3.7). The adverse effects of damaged critical facilities can extend far beyond direct physical damage. Disruption of health care, fire, and police services can impair search and rescue, emergency medical care, and even access to damaged areas.

## GOVERNMENT

Cooper County has buildings that are critical to the functioning of the county. The Cooper County Court House in Boonville is home to many government offices, including Assessor, Clerk, Circuit Court, Juvenile, Public Administrator, Sheriff, Treasurer, Recorder, Commissioner, and Emergency Management (Figure 3.1).

**Figure 3.1**



## FIRE PROTECTION

There are 6 fire protection districts which respond to fires, accidents, and other emergencies within the Cooper County planning area (see Figure 3.2). Mutual aid agreements exist between all the departments and also with surrounding county departments. The fire districts have been proactive in public education campaigns, updating training, and general outreach efforts to ensure the community at large is safe. The fire districts are key players in hazard mitigation and preparedness activities.

**Figure 3.2**

**Cooper County Fire Protection Districts**

| Fire Protection District | Type | # Fire Stations | Firefighters | | | Other Employees | Other Volunteers |
|---|---|---|---|---|---|---|---|
| | | | Career | Volunteer | Paid-per-Call | | |
| Blackwater Rural Fire Department | Volunteer | 1 | 0 | 19 | 0 | 0 | 0 |
| Boonville Fire Department | Mostly Volunteer | 2 | 7 | 28 | 28 | 0 | 0 |
| Cooper County Fire Protection District | Mostly Volunteer | 6 | 0 | 27 | 0 | 0 | 0 |
| Otterville Fire Protection District | Volunteer | 1 | 0 | 22 | 0 | 0 | 0 |
| Pilot Grove Rural Fire Department, Inc. | Volunteer | 1 | 0 | 14 | 0 | 0 | 0 |
| Prairie Home Rural Fire Protection District | Volunteer | 1 | 0 | 12 | 0 | 0 | 0 |

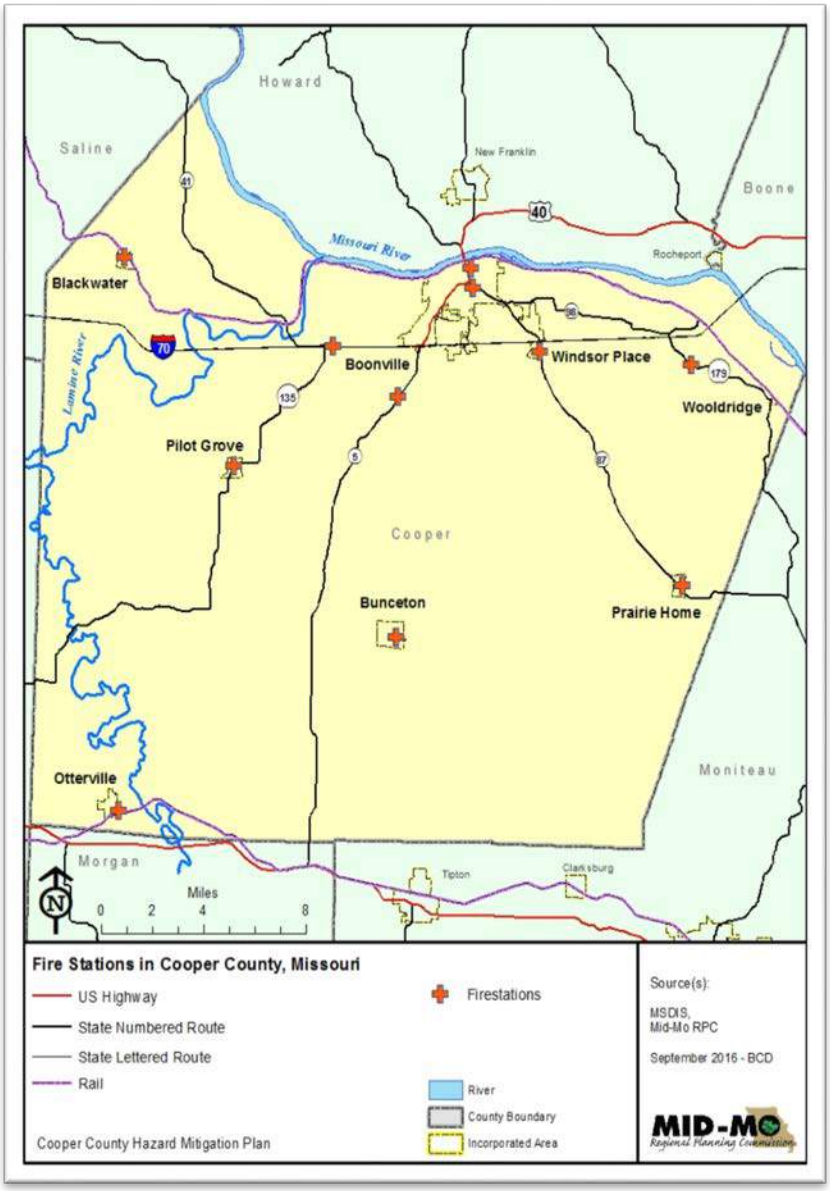
Source: http://missouri.firedepartments.net/county/MO/CoooperCounty.html, Fire Department Staff

The following fire districts are based outside of Cooper County, but respond to some areas of the county.

- Jamestown Rural Fire District
- Fortuna Fire District
- Tipton Rural Fire District
- California Fire Department
- Clifton City Volunteer Fire Department

Fire stations respond to fires, accidents, and other emergencies from stations located throughout the planning area (Figure 3.3).

**Figure 3.3**




According to the Cooper County Fire Department website, "The Cooper County Fire Protection District is an all-volunteer organization of 27 dedicated men and women providing services to a District area of approximately 198 square miles. In addition to protecting a population of over 3,400 residents, we stand ready to provide services to the estimated 100,000 vehicles that pass daily through our community on Interstate 70."

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

The fire districts have been proactive in public education campaigns, updating training, and general outreach efforts to ensure the community at large is safe. The fire districts are key players in hazard mitigation and preparedness activities.

## WATER SUPPLY

There are three Public Water Supply Districts (PWSD) located in the planning area.

Each water district is composed of an elected board. The districts are responsible for maintaining existing water supply infrastructure and developing new infrastructure.

Water districts are primarily related to mitigation activities focused on drought, wildfire, and flood. Connecting water supplies so that areas have multiple water supplies is an important mitigation strategy. The areas served and interconnections of all water providers in the planning area are shown in Figure 3.4

**Figure 3.4**

**Water Providers Serving Planning Area**

| Provider | Area Served |
|---|---|
| PWSD #1 | Cooper County (unincorp.), Wooldridge |
| Consolidated PWSD #1 | Cooper County (unincorp.), Blackwater, Boonville, Windsor Place |

Sources: PWSDs, MSDIS, https://www.dnr.mo.gov/DWW/JSP/WaterSystems.jsp?PointOfContactType=none&number=&name=&county=Cooper

## WASTEWATER

Cooper County uses the Cooper County Waste Water Treatment Program. According to the Cooper County Public Health Center website, "On June 15, 1995, the Cooper County Commission passed a commission order that the County of Cooper will follow current State Of Missouri Laws on permitted wastewater treatment systems." Each incorporated areas have own wastewater system besides Wooldridge and Clifton City.

## MEDICAL FACILITIES

There is one federally qualified health center, seven nursing homes, and a health department located within Cooper County (see Figure 3.5). The majority of the critical medical facilities are located in the highest populated area in the Northern region of Cooper County, within the City of Boonville. The Cooper County Memorial Hospital has developed its own emergency plan, in accordance with state and federal regulations; these plans are exercised regularly and can act independently or in coordination with the LPHEP and/or the EOP.

There is one federally qualified health center, Cooper County Memorial Hospital, located in Boonville.

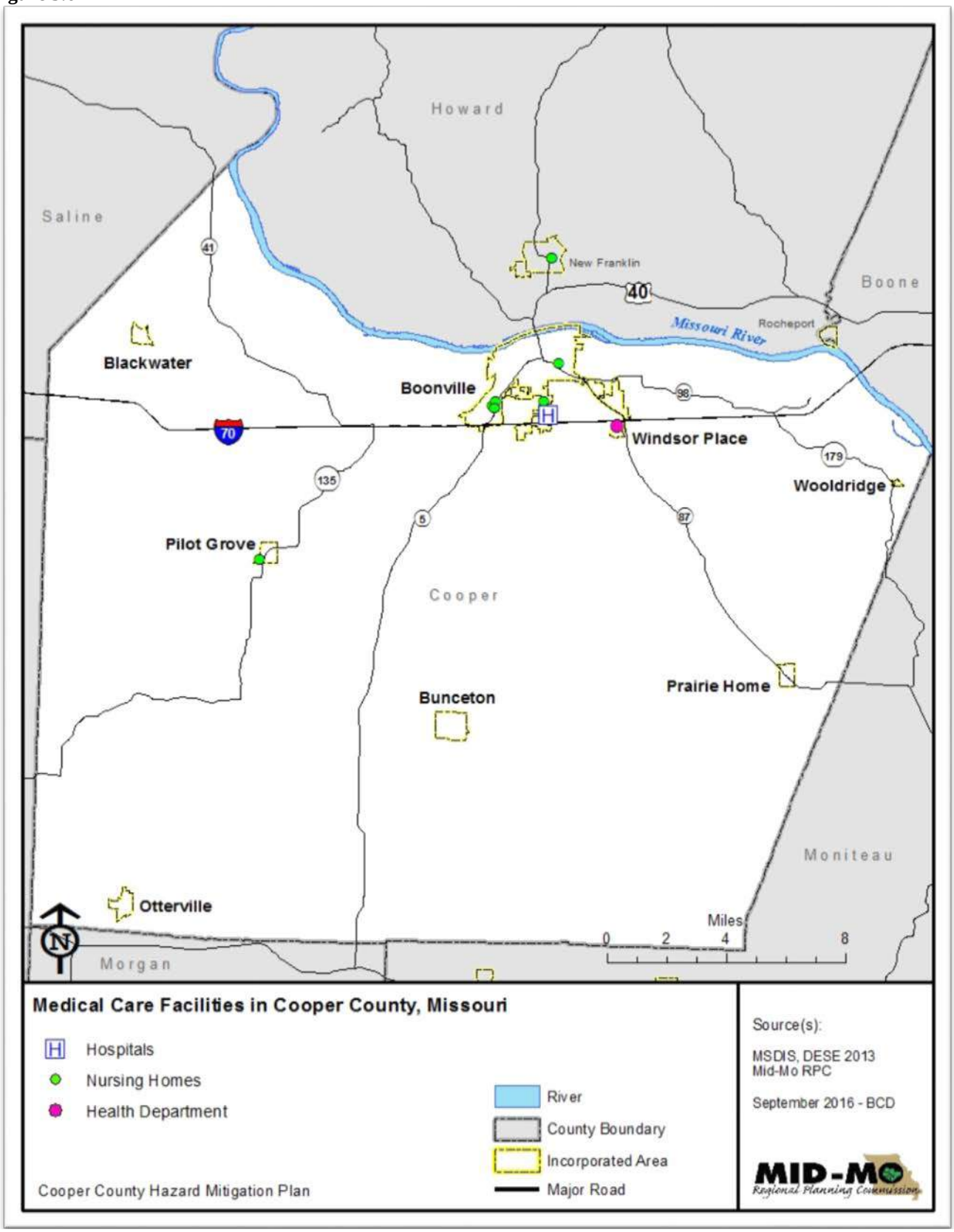
**Figure 3.5** **Critical Medical Facilities**

| **Federally Qualified Health Centers** | **City** |
|---|---|
| Cooper County Memorial Hospital | Boonville |
| **Nursing Home Facilities** | |
| Ashley Manor Care Center | Boonville |
| Bristol Manor of Boonville | Boonville |
| Hartmann Village-Assisted Living By Americare | Boonville |
| Katy Manor | Pilot Grove |
| Lakeview Healthcare and Rehabilitation Center | Boonville |
| Riverdell Care Center | Boonville |
| Valley Hope | Boonville |

Source: Missouri Department of Health and Senior Services Information Technology Services Division

Ambulance service for Cooper County is currently provided by the Cooper County Ambulance District located in Boonville, Missouri. The location for each medical care facility in Cooper County is shown in Figure 3.5.

**Figure 3.6**


Howard
Saline
Boone
New Franklin
40
Missouri River
Rocheport
Blackwater
Boonville
98
70
Windsor Place
179
Wooldridge
135
5
87
Pilot Grove
Cooper
Prairie Home
Bunceton
Moniteau
Otterville
Miles
0 2 4 8
Morgan
Medical Care Facilities in Cooper County, Missouri
Hospitals
Nursing Homes
Health Department
River
County Boundary
Incorporated Area
Major Road
Source(s):
MSDIS, DESE 2013
Mid-Mo RPC
September 2016 - BCD
Cooper County Hazard Mitigation Plan
MID-MO
Regional Planning Commission

## EMERGENCY MANAGEMENT AGENCY

The Cooper County Emergency Management Agency (EMA) is in charge of protecting the lives and property of all Cooper County residents from major disasters. EMA personnel are responsible for emergency contingency planning, public education, and emergency response coordination. EMA personnel write and update the Emergency Operations Plan (EOP), conduct ongoing public education related to emergency information, and identify and fix gaps in emergency response, preparedness, and mitigation. EMA personnel have had extensive training from SEMA, FEMA, and other bodies in emergency response, preparedness, mitigation, and overall emergency management.

EMA personnel play a critical role in hazard mitigation due to their strong network of connections, awareness of hazard threats, wide-ranging experience of all facets of emergency management, and work with public education. Cooper County EMA personnel are well-trained and well-equipped to respond to disasters of all types.

**Emergency Operations Plan (EOP)**

An EOP is an essential tool in helping reduce the threat of hazards. The *Cooper County Emergency Operations Plan* is a comprehensive document that covers emergency response and recovery. The mission statement of the EOP and the Emergency Operations Center is "to protect the lives and property of all residents when major disasters threaten public safety in any city, county or region of Cooper County."

Areas covered in the plan that relate to mitigation are communications and warning systems, media points of contact, acquisition of resources and supplies in preparation for emergency events, evacuation plans for flood, dam failure, levee failure, and sheltering procedures. Also included is information on response to severe thunderstorm/tornado, summer heat, lightning safety, flash flood/flooding, earthquake preparedness, and winter weather preparedness.

## Warning Sirens

The Cooper County 911 system can activate the outdoor warning sirens for all communities that have a siren. These warning sirens can be activated as one group, individually, or customized to a specific area. Testing of the sirens is set on the first Saturday of every month, weather permitting. The sirens are owned and maintained by each individual community. The following communities in Cooper County have warning sirens:

**Figure 3.7**

- Blackwater (1)
- Boonville (5)
- Bunceton (1, not working - currently working on obtaining new siren)
- Otterville (2)
- Pilot Grove (1)
- Prairie Home (1)
- Windsor Place (currently working on obtaining new siren)
- Wooldridge (currently working on obtaining new siren)

**Media**

The ability to distribute timely and reliable information to the public in the event of an emergency is vital. The nationwide Emergency Alert System (EAS)—jointly coordinated by the Federal Communications Commission, FEMA, and the National Weather Service (NWS)—provides a link between the government agencies monitoring potential emergencies and local broadcasters who can inform the public in a timely manner. The planning area is located in the Central Missouri EAS Operational Area.

Local media outlets can provide avenues for educating the public about emergency preparedness and the need for certain mitigation actions. The media points of contact are listed in the Cooper County Emergency Operations Plan. The points of contact include radio stations, television stations, cable television companies, and newspapers.

**Weather Radio**

The planning area is within range of broadcasts of the NOAA Weather Radio network, operated by the NWS. Transmitters and towers are located in Carrollton (Carroll County) and Jamestown (Moniteau County). Special radio units that receive this transmission can be purchased from many local retail stores. Severe weather updates, flash flood warnings, and other 24-hour weather advisories from the NWS are broadcast over the network.

**Missouri Uniform Law Enforcement System (MULES)**

MULES is a law-enforcement computer data network operated by the Missouri State Highway Patrol primarily for law-enforcement operations. MULES is also used to disseminate emergency information such as weather conditions, flood stages, and road conditions. A MULES terminal is located in the Cooper County EOC.

## Evacuation and Sheltering

The American Red Cross has agreements in place with 15 shelters in Cooper County (Figure 3.8). *Need to Review- Update Shelter Agreements. Larry Oerly (Boonville EMA)*

**Figure 3.8**

| Cooper County Shelters | | | | |
|---|---|---|---|---|
| **City** | **Shelter Name** | **Address** | **Shelter Agreement*** | **Survey**** |
| Boonville | Bethel-Purim Ministries | 1640 Radio Hill Rd. | 2/15/2010 | 1/21/2010 |
| Boonville | Boonslick Heartland YMCA | 757 Third St. | 1/8/2008 | |
| Boonville | Concerned Citizens for the Black Community | 111 Rural St. | | 1/21/2010 |
| Boonville | Cooper County Youth Fair | Dunkles Road | | |
| Boonville | First Baptist Church | 625 Main St. | | |
| Boonville | First Presbyterian Church of Boonville | 417 Vine St. | | |
| Boonville | Knights of Columbus | 1515 Radio Hill Road | | |
| Boonville | New Hope Christian Center | 600 6th St. | 7/19/2010 | 7/9/2010 |
| Boonville | Open Bible Praise Center | 16991 Highway 87 | 1/15/2008 | 1/16/2008 |
| Boonville | Saints Peter and Paul Catholic Church | 322 7th St. | | 1/23/2008 |
| Boonville | United Church of Christ | 416 7th St. | | |
| Bunceton | Bunceton Lions Club | 311 West Main St. | | |
| Bunceton | Bunceton R-IV | 500 West Main St. | 2/11/2010 | 2/10/2010 |
| Otterville | City of Otterville | 204 Cherry St. | | |
| Otterville | First Baptist Church | 101 West Union Ave. | 1/13/2010 | 1/13/2010 |
| Otterville | Otterville R-6 | 100 Spring St. | 1/13/2010 | 1/13/2010 |
| Pilot Grove | St. Joseph Church | 407 Harris St. | | |
| Pilot Grove | Pilot Grove Community Center | | | |
| Pilot Grove School | | 107 School St. | | |
| Prairie Home | Prairie Home R-V School | 301 Highway 87 | 12/21/2009 | 12/21/2009 |
| *Date of written shelter agreement. **Date of facility survey by American Red Cross.<br>Source: American Red Cross | | | | |

## 3.2 COUNTY AND COMMUNITIES

## COOPER COUNTY

| Figure 3.9<br>**Cooper County Profile** | |
|---|---|
| Classification | 3rd class county |
| Total population | 17,593 |
| Median household income (2015 dollars)* | $44,549 |
| Median owner-occupied housing value* | $112,400 |
| Total housing units | 7,459 |
| Water service | Consolidated PWSD #1 and PWSD #1 |
| Electric service | Co-Mo Electric Cooperative, Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Fire service | Rural and City Departments |
| Master plan | No |
| Emergency Operations Plan | Yes – Updated 2017 |
| Building regulations | No |
| Zoning regulations | No |
| Subdivision regulations | Yes – overseen through MO DNR |
| Storm water regulations | No |
| NFIP participation | Yes |
| Floodplain regulations | Yes |
| Sources: US Census Bureau; Community Survey * Estimates from surveys conducted in 2010-2015 by the American Community Survey (ACS) of the U.S. Census Bureau; includes entire incorporated and non-incorporated area of county. Website: http://www.coopercountymo.org/ | |

Cooper County is governed by an elected three-member Board of Commissioners composed of an Eastern Commissioner, a Western Commissioner, and a Presiding Commissioner. The Commission carries out the following responsibilities: establishes Cooper County policy**,** approves and adopts the annual budget for all County operations**,** approves actual expenditures for each department**,** supervises the operations of County departments**,** ensures County-wide compliance with numerous statutory requirements**,** acts as liaison with County boards, commissions, and other local and regional governmental entities

Cooper County has the following departments and offices: Assessor, Circuit Court, Collector, Commissioner, Coroner, County Clerk, Emergency Management, Juvenile, Prosecuting Attorney, Public Administrator, 911 Service, Public Works, Recorder of Deeds, Sheriff, and Treasurer.

**Technical Capabilities**

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

**Road and Bridge Department -** This department is an integral part of mitigation planning. Decisions about new roads and maintenance of current infrastructure are intertwined with the overall mission of hazard mitigation planning.

**Ambulance District –** This department services Cooper County and is located on Main and Bingham Street. The department currently maintains three fire trucks and has 25 staff members.

## Historic Properties

There are 42 sites located in Cooper County that are registered on the National Register of Historic Places.

| Figure 3.10 Cooper County - National Register of Historic Places | |
|---|---|
| **National Register-listed Property** | **Location** |
| Andrews-Wing House , 733 Main St. | Boonville |
| Beckett, William S. and Mary, House, 821 3rd St. | Boonville |
| Blackwater Commercial Historic District | Blackwater |
| Blackwater Residential Historic District | Blackwater |
| Blakey, Albert Gallatin, House, 226 W Spring St. | Boonville |
| Cobblestone Street , 100 Main St. | Boonville |
| Dauwalter, John S. House, 817 7th St. | Boonville |
| Dick-Kobel Homestead, Jamestown vicinity | Cooper Co. |
| Diggs, Duke and Mary, House, 1217 Rural St. | Boonville |
| Fessler-Secongost House, 119 W Morgan St. | Boonville |
| Gantner, Andrew, House, 1308 6th St. | Boonville |
| Hamilton-Brown Shoe Co. Building, 1st St. | Boonville |
| Harley Park Archaeological Site | NA Restricted |
| Historic District A, Vine and 2nd Sts. | Boonville |
| Historic District B, 4th and E Spring Sts. | Boonville |
| Historic District C, E High and 4th Sts. | Boonville |
| Historic District D, High and Main Sts. | Boonville |
| Historic District E, High, Spring and Morgan Sts. | Boonville |
| Historic District F, extends N and S along 6th and 7th Sts. | Boonville |
| Historic District H, SE corner E Morgan St. and Reformatory Dr. | Boonville |
| Imhoff Archaeological Site | NA Restricted |
| Johnson, Juliet Trigg, House, 1304 Main St. | Boonville |
| Johnson, Wilbur T. and Rhoda Stephens, House, 821 Main, | Boonville |
| Lyric Theater, Main and Vine Sts. | Boonville |
| Meierhoffer House, 120 E High St. | Boonville |
| Meierhoffer Sand Co. Office Building, 201 2nd St. | Boonville |
| Mellor Village and Mounds Archaeological Site | NA Restricted |
| Mellor Village and Mounds Archaeological District | NA Restricted |
| Missouri, Kansas and Texas Railroad Depot, 320 1st St. | Boonville |
| Morton-Myer House, 1000 11th St. | Boonville |
| Mount Nebo Baptist Church, SR E, Pilot Grove vicinity | Pilot Grove |
| Nelson, Thomas, House, 700 10th St. | Boonville |
| New Lebanon Cumberland Presbyterian Church and School | New Lebanon |
| New Lebanon Historic District | New Lebanon |
| Pigott, Josephine Trigg, House, 1307 6th St. | Boonville |
| Pleasant Green, 8 mi. SW of Pilot Grove on US 135 | Pilot Grove |
| Prairie View, E of Pleasant Green off MO 135 | Pleasant Green |
| Ravenswood, NW of Bunceton on MO 5 | Bunceton |
| Roeschel-Toennes-Oswald Property, 515 W Spring, | Boonville |
| St. Matthew's Chapel A.M.E. Church, 309 Spruce St. | Boonville |
| Sumner Public School, 321 Spruce St. | Boonville |
| **Woolridge Archaeological Site** | NA Restricted |
| Source: http://www.dnr.mo.gov/shpo/Cooper.htm | |

## Assessed and Appraised Values

| Figure 3.11 | Cooper County 2016 Assessed Values | |
|---|---|---|
| **Real Estate Property** | Agricultural | $13,895,830 |
| | Residential | $91,518,290 |
| | Commercial | $37,818,230 |
| | **Total** | **$143,232,350** |
| | Local Assessed: Railroad & Utility | $3,721,438 |
| | State Assessed: Railroad & Utility | $32,002,061 |
| | **Real Estate Property Total** | **$178,955,849** |
| **Personal Property** | County Assessed Personal Property | $51,264,317 |
| | Local Assessed: Railroad & Utility | $950,290 |
| | State Assessed: Railroad & Utility | $8,994,450 |
| | **Personal Property Total** | **$61,209,057** |
| | **Grand Total** | **$240,164,906** |
| Source: Cooper County Clerk's Office | | |

Figure 3.12 shows Cooper County owned property and replacement costs as stated in the January 2017 insurance statement.

**Figure 3.12**

| Physical Address | Zip Code | Description | Building Value | Content Value |
|---|---|---|---|---|
| | | **Cooper County Owned Assets** | | |
| 17040 Klinton Drive | 65237 | Fair Grounds Building | $170,000 | $0 |
| 12175 Hwy J | 65237 | 120' Communication Tower | $48,176 | $0 |
| 12175 Hwy J | 65237 | Maintenance Building | $292,789 | $20,000 |
| 12175 Hwy J | 65237 | Repeater Equipment Building | $2,408 | $0 |
| 12175 Hwy J | 65237 | Salt and Sand Storage Building | $41,826 | $0 |
| 12175 Hwy J | 65237 | Storage Building | $52,983 | $0 |
| 15041 Hwy 5 | 65233 | 90' Communications Tower | $27,886 | $0 |
| 15041 Hwy 5 | 65233 | Cinder/Salt Building | $42,367 | $0 |
| 15041 Hwy 5 | 65233 | Equipment & Maintenance Building | $256,922 | $50,000 |
| 200 Main Street | 65233 | CPU Tower 1 | $17,429 | $0 |
| 200 Main Street | 65233 | Courthouse & Jail Building | $11,981,385 | $600,000 |
| 200 Main Street | 65233 | EMA Contents in Courthouse & EOC | $0 | $225,000 |
| 22415 Highway J | 65068 | 300' Communications Tower | $48,799 | $0 |
| 22415 Highway J | 65068 | Repeater Equipment Building | $27,886 | $0 |
| 22415 Highway J | 65068 | Small Repeater Equipment Building | $2,790 | $0 |
| 422 E. Spring Street | 65233 | Prosecuting Attorney Office | $0 | $37,089 |
| 529 E. Morgan Street | 65233 | Repair and Parking Garage | $547,789 | $15,000 |
| 8151 Highway 135 | 65276 | 120' Communication Tower | $48,799 | $0 |
| 8151 Highway 135 | 65276 | Repeater Equipment Building | $4,182 | $0 |
| | Totals | | $13,614,416 | $947,089 |
| Source: Naught-Naught Insurance Agency | | | | |

## Agriculture

Figure 3.13 shows value estimates for agricultural land in Cooper County and estimates of crop and livestock production. Since 82.5% of the land area of Cooper County is farmland, the impact of agricultural losses due to a natural hazard could be a potential threat to the economic stability of the region.

| **Figure 3.13** | |
|---|---|
| **2017 Cooper County Agricultural Overview** | |
| Number of Farms | 928 |
| Land In Farms | 307,128 acres<br>(82.5% of Cooper County) |
| Market Value of Products Sold | $78.289,000 |
| Crop Sales | $45,029,000 |
| Livestock Sales | $33,260,000 |
| 2012 Census of Agriculture, County Profiles; https://www.agcensus.usda.gov/Publications/2012/ | |

## Relevant Changes since 2012

In July 2013, Cooper County was named as a disaster declaration county for severe storms, straight-line winds, tornadoes, and flooding. In December 2013, Cooper County was designated for Secretarial Disaster Designation due to drought.

## Future Development Plans

There are no known development plans at this time.

## Blackwater

| Figure 3.14<br>**Blackwater Profile** | |
|---|---|
| Classification | 4th Class |
| Population | 456 |
| Median household income | $22,411 |
| Median owner-occupied housing value | $43,000 |
| Total housing units | 189 |
| Water service | Saline County PWSD #3 |
| Electric service | Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | City |
| Fire service | Blackwater Rural Fire Department |
| Master plan | No |
| Emergency Operations Plan | Yes, Cooper County EOP |
| Building regulations | Yes |
| Zoning regulations | Yes |
| Subdivision regulations | No |
| Storm water regulations | No |
| NFIP participation | Yes |
| Floodplain regulations | Yes |
| Sources: US Census Bureau 2005-2009 American Community Survey and individual community surveys | |
| **City Owned Assets** | |
| **Property** | **Replacement Cost (Buildings and Contents)** |
| Buildings: | |
| Caboose #1 | $24,088 |
| Lift Station | $21,077 |
| Emergency Warning Siren | $12,044 |
| Gift/Sandwich Shop | $42,154 |
| City Hall | $5,000 |
| Caboose #2 | $24,088 |
| Community Center | $120,440 |
| Stainless Steel Pit, Radio, Valves, Sump Pump, Radio &30 Foot Antenna, Dehumidifier, Water & Logistics Equipment | $42,154 |
| Storage Building | $18,066 |
| Water Standpipe (65,000 gallons) | $97,499 |
| Lift Station | $21,077 |
| Vehicles | N/A |
| Source: City of Blackwater Insurance Statement (2017) | |

## Assessed Values

| Figure 3.15 | Blackwater 2016 Assessed Values | |
|---|---|---|
| **Real Estate Property** | Agricultural | $4,270 |
| | Residential | $433,500 |
| | Commercial | $149,820 |
| | **Total** | **$587,590** |
| | Local Assessed: Railroad & Utility | $33,137 |
| | State Assessed: Railroad & Utility | $449,608 |
| | **Real Estate Property Total** | **$1,070,335** |
| **Personal Property** | County Assessed Personal Property | $270,312 |
| | Local Assessed: Railroad & Utility | $6,463 |
| | State Assessed: Railroad & Utility | $110,781 |
| | **Personal Property Total** | **$387,556** |
| | **Grand Total** | **$1,457,891** |
| Source: Cooper County Clerk's Office | | |

## Relevant Changes since 2012

There are no known relevant changes since 2012.

## Future Development Plans

There are no known development plans at this time.

## Boonville

| Figure 3.16<br>**Boonville Profile** | |
|---|---|
| Classification | 3rd Class |
| Population | 8,350 |
| Median household income | $34,705 |
| Median owner-occupied housing value | $107,200 |
| Total housing units | 3,310 |
| Water service | City |
| Electric service | Ameren UE and CoMo Electric |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | City |
| Fire service | City |
| Master plan | Yes, 2003 Comprehensive Plan |
| Emergency Operations Plan | Yes, Cooper County EOP |
| Building regulations | Yes |
| Zoning regulations | Yes |
| Subdivision regulations | Yes |
| Storm water regulations | Yes |
| NFIP participation | Yes |
| Floodplain regulations | Yes |
| Sources: US Census Bureau 2005-2009 American Community Survey and individual community surveys | |
| **City Owned Assets** | |
| **Property** | **Replacement Cost (Buildings and Contents)** |
| See Appendix E for detailed listing | 36,138,761 |
| Source: City of Boonville Insurance Statement (2017) | |

**Website:** http://www.boonvillemo.org/

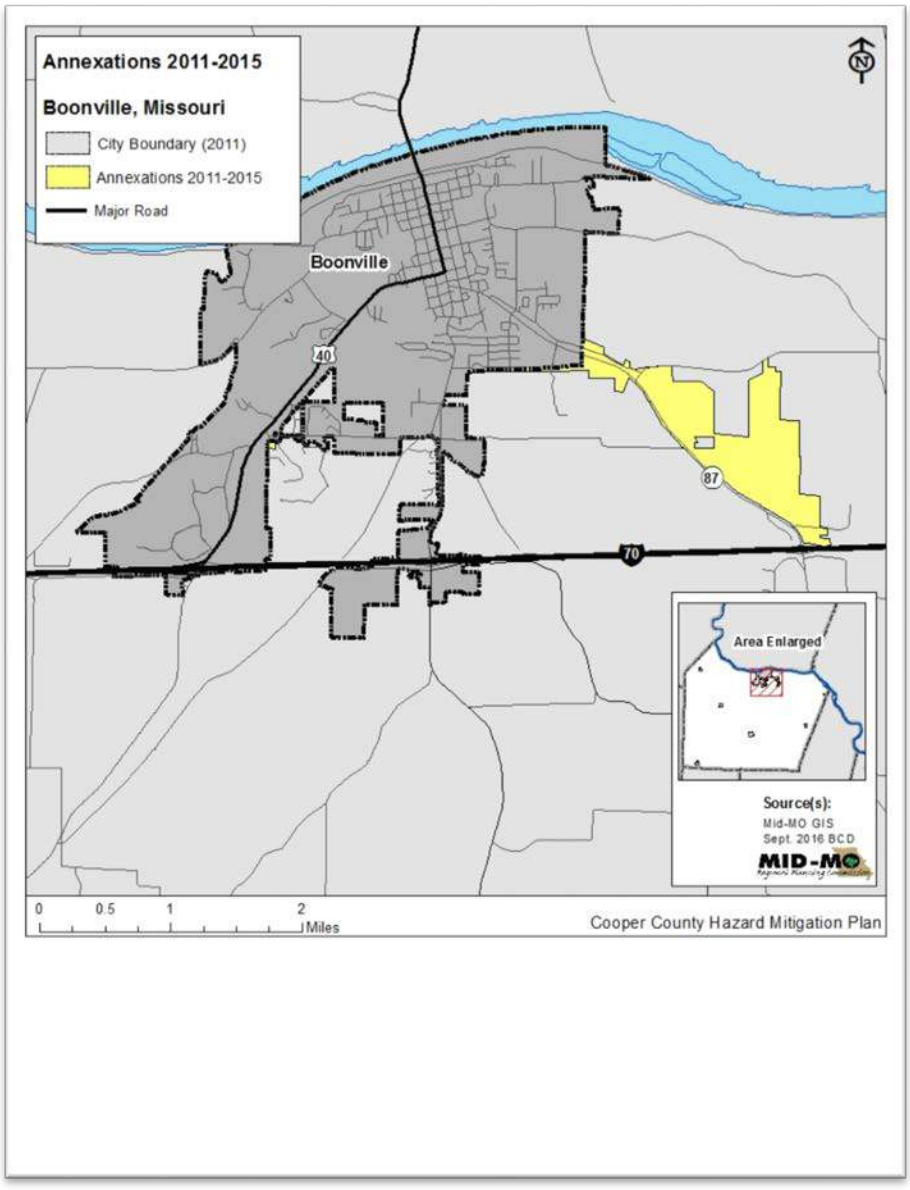
## Assessed Values

| Figure 3.17 | Boonville 2016 Assessed Values | |
|---|---|---|
| **Real Estate Property** | Agricultural | $145,720 |
| | Residential | $40,428,910 |
| | Commercial | $29,408,620 |
| | **Total** | **$69,983,250** |
| | Local Assessed: Railroad & Utility | $3,364,080 |
| | State Assessed: Railroad & Utility | $3,723,922 |
| | **Real Estate Property Total** | **$77,071,252** |
| **Personal Property** | County Assessed Personal Property | $19,225,562 |
| | Local Assessed: Railroad & Utility | $625,562 |
| | State Assessed: Railroad & Utility | $712,119 |
| | **Personal Property Total** | **$20,563,243** |
| | **Grand Total** | **$97,634,495** |

Source: Cooper County Clerk's Office

**Relevant Changes since 2012**

Boonville has added annexations since 2012 (Figure 3.18).




**Future Development Plans**

There are no known development plans at this time.

## Bunceton

| Figure 3.19<br>**Bunceton Profile** | |
|---|---|
| Classification | 4th Class |
| Population | 354 |
| Median household income | $35,938 |
| Median owner-occupied housing value | $57,500 |
| Total housing units | 150 |
| Water service | City of Bunceton |
| Electric service | Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | City of Bunceton |
| Fire service | Cooper County Fire Protection District |
| Master plan | No |
| Emergency Operations Plan | Yes |
| Building regulations | No |
| Zoning regulations | No |
| Subdivision regulations | Yes |
| Storm water regulations | No |
| NFIP participation | Yes |
| Floodplain regulations | Yes |
| Sources: US Census Bureau 2005-2009 American Community Survey and individual community surveys | |
| **City Owned Assets** | |
| **Property** | **Replacement Cost (Buildings and Contents)** |
| City Hall | $105,253 |
| City Park | $1,986 |
| Water Tower and Pump House | $81,238 |
| Pump house/Shed | $10,612 |
| Storage building | $13,238 |
| Maintenance Building | $78,000 |
| Source: City of Bunceton Insurance Statement (2017) | |

## Assessed Values

| Figure 3.20 | Bunceton 2016 Assessed Values | |
|---|---|---|
| **Real Estate Property** | Agricultural | $14,600 |
| | Residential | $1,019,190 |
| | Commercial | $101,150 |
| | **Total** | $1,134,940 |
| | Local Assessed: Railroad & Utility | $0 |
| | State Assessed: Railroad & Utility | $426,965 |
| | **Real Estate Property Total** | **$1,561,905** |
| **Personal Property** | County Assessed Personal Property | $468,394 |
| | Local Assessed: Railroad & Utility | $0 |
| | State Assessed: Railroad & Utility | $51,182 |
| | **Personal Property Total** | **$519,376** |
| | **Grand Total** | **$2,081,281** |
| Source: Cooper County Clerk's Office | | |

## Relevant Changes since 2012

There are no known relevant changes since 2012.

## Future Development Plans

Bunceton is working toward accomplishing a weather warning siren project in 2017 to replace the existing siren that has been inoperable since 2012.

## Otterville

| Figure 3.21<br>**Otterville Profile** | |
|---|---|
| Classification | 4th class city |
| Population | 498 |
| Median household income | $42,083 |
| Median owner-occupied housing value | $46,200 |
| Total housing units | 191 |
| Water service | City of Otterville |
| Electric service | Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | City of Otterville |
| Fire service | Otterville Fire Protection District |
| Master plan | No |
| Emergency Operations Plan | Yes |
| Building regulations | No |
| Zoning regulations | No |
| Subdivision regulations | No |
| Storm water regulations | Yes |
| NFIP participation | Yes |
| Floodplain regulations | Yes |
| Sources: US Census Bureau 2005-2009 American Community Survey and individual community surveys | |
| **City Owned Assets** | |
| **Property** | **Replacement Cost (Buildings and Contents)** |
| Vehicles (3) | $45,000 |
| Heavy Equipment and Machinery | $91,775 |
| Community Building – City Hall | $134,900 |
| Well | $21,700 |
| Water Tower | $225,600 |
| Senior Citizens Center | $122,300 |
| Equipment Building | $148,600 |
| Shelter House | $9,000 |
| Gazebo | $4,600 |
| Bio Sewer Plant | $1,800,000 |
| Source: City of Otterville Insurance Statement (2011) | |

## Assessed Values

| Figure 3.22 | Otterville 2016 Assessed Values | |
|---|---|---|
| Real Estate Property | Agricultural | $2,760 |
| | Residential | $1,403,860 |
| | Commercial | $210,940 |
| | **Total** | **$1,617,560** |
| | Local Assessed: Railroad & Utility | $0 |
| | State Assessed: Railroad & Utility | $549,155 |
| | **Real Estate Property Total** | **$2,166,715** |
| Personal Property | County Assessed Personal Property | $790,663 |
| | Local Assessed: Railroad & Utility | $0 |
| | State Assessed: Railroad & Utility | $127,141 |
| | **Personal Property Total** | **$917,804** |
| | **Grand Total** | **$3,084,519** |
| Source: Cooper County Clerk's Office | | |

Website: http://www.cityofotterville.com

## Relevant Changes since 2012

Added a new bio sewer plant and combined the community building with the city hall.

## Future Development Plans

Recently passed a bond issue to fund the replacement cost of city streets.

## Pilot Grove

| Figure 3.23 | |
|---|---|
| **Pilot Grove Profile** | |
| Classification | 4th class |
| Population | 768 |
| Median household income | $34,500 |
| Median owner-occupied housing value | $76,700 |
| Total housing units | 334 |
| Water service | City |
| Electric service | Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | City |
| Fire service | Pilot Grove Rural Fire Protection District |
| Master plan | No |
| Emergency Operations Plan | Yes, Cooper County EOP |
| Building regulations | No |
| Zoning regulations | No |
| Subdivision regulations | No |
| Storm water regulations | Yes |
| NFIP participation | Yes |
| Floodplain regulations | Yes |
| Sources: City Staff, US Census, ACS (American Community Survey 2010-2014) | |

| City Owned Assets | | | |
|---|---|---|---|
| **Property** | **Replacement Cost (Buildings and Contents)** | | |
| | **Count** | **Value** | |
| Buildings | 3 | $162,360 | (Replacement) |
| Vehicles | 3 | $13,000 | (Insured) |
| Source: Jurisdictional Insurance Statement | | | |

## Assessed Values

| Figure 3.24 | Pilot Grove 2016 Assessed Values | |
|---|---|---|
| Real Estate Property | Agricultural | $7,750 |
| | Residential | $2,679,210 |
| | Commercial | $584,840 |
| | **Total** | **$3,271,800** |
| | Local Assessed: Railroad & Utility | $180,603 |
| | State Assessed: Railroad & Utility | $329,854 |
| | **Real Estate Property Total** | **$3,782,257** |
| Personal Property | County Assessed Personal Property | $1,259,094 |
| | Local Assessed: Railroad & Utility | $187,561 |
| | State Assessed: Railroad & Utility | $40,182 |
| | **Personal Property Total** | **$1,486,837** |
| | **Grand Total** | **$5,269,094** |

Source: Cooper County Clerk's Office

## Relevant Changes since 2012

Pilot Grove recently completed a demolition project, a sewer collection project, and replacing water lines and fiber optic cable lines in 2016.

## Future Development Plans

Future development projects for Pilot Grove include: building a waste water treatment facility, a street improvement project, and upgrading to new weather warning sirens.

## Prairie Home

| Figure 3.25 | |
|---|---|
| **Prairie Home Profile** | |
| Classification | 4th class |
| Population | 280 |
| Median household income | $39,444 |
| Median owner-occupied housing value | $76,700 |
| Total housing units | 166 |
| Water service | City (2 wells) |
| Electric service | Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | City Lagoon |
| Fire service | Prairie Home Rural Fire Protection District |
| Master plan | No |
| Emergency Operations Plan | Cooper County EOP |
| Building regulations | No |
| Zoning regulations | No |
| Subdivision regulations | No |
| Storm water regulations | No |
| NFIP participation | No |
| Floodplain regulations | No |
| Sources: City Staff, US Census, ACS (American Community Survey 2010-2014) | |

| City Owned Assets | | |
|---|---|---|
| **Property** | **Replacement Cost (Buildings and Contents)** | |
| | **Count** | **Value** |
| Buildings | (Replacement) | |
| City Hall, 416 Highway Drive | 1 | $40,000 |
| Lot #24 Sells Court | 1 | $7,500 |
| Lot #25 Sells Court | 1 | $7,500 |
| Equipment | (Replacement) | |
| Storm siren | 1 | $14,000 |
| 25.55 AC Land (Lagoon Area) | 1 | $63,875 |
| 3-Cell No Discharge Lagoon (with electronic equipment & center pivot) | 1 | $421,713 |
| 514 Main Street (Well House) | 1 | $60,000 |
| Main Well House in Park | 1 | $50,000 |
| Standpipe Water Tower | 1 | $200,000 |
| Lift Station | 1 | $15,000 |
| 1976 Ford Tractor & implements | 1 | $7,800 |
| Vehicles | (Insured) | |
| 2005 Chevy Impala (Police Department) | | $2,800 |
| Source: Jurisdictional Insurance Statement | | |

## Assessed Values

| Figure 3.26 | Prairie Home 2016 Assessed Values | |
|---|---|---|
| Real Estate Property | Agricultural | $5,000 |
| | Residential | $1,276,540 |
| | Commercial | $177,000 |
| | **Total** | **$1,458,540** |
| | Local Assessed: Railroad & Utility | $77,960 |
| | State Assessed: Railroad & Utility | $140,712 |
| | **Real Estate Property Total** | **$1,677,212** |
| Personal Property | County Assessed Personal Property | $439,380 |
| | Local Assessed: Railroad & Utility | $7,108 |
| | State Assessed: Railroad & Utility | $22,548 |
| | **Personal Property Total** | **$469,036** |
| | **Grand Total** | **$2,146,248** |

Source: Cooper County Clerk's Office

## Relevant Changes since 2012

The City of Prairie Home acquired 25.55 acres of land on Highway 87 and has built a three cell lagoon (no discharge wastewater site. Two sections of city-owned sidewalks (one section along Highway 87 and the other at Teal Street and Highway 87) have been added. The Prairie Home Fair Board finished a large livestock confinement building for their annual livestock show.

## Future Development Plans

The City of Prairie Home is working on demolition projects of several residences that have been deemed uninhabitable. They are working toward a possible water loop around the City of Prairie Home to provide uninterrupted water line service. The City of Prairie Home is working on developing a Community Preparedness Plan. A Dollar General Store is in the process of being built in a 9,100 square foot retail space within the city limits of Prairie Home and will employ 4-6 employees.

## Windsor Place

| Figure 3.27<br>**Windsor Place Profile** | |
|---|---|
| Classification | Village |
| Population | 309 |
| Median household income | $62,083 |
| Median owner-occupied housing value | $136,500 |
| Total housing units | 119 |
| Water service | Cooper County Cons. Public Water Supply Dist. #1 |
| Electric service | Ameren UE |
| Ambulance service | Cooper County Ambulance District |
| Sewer service | Windsor Place |
| Fire service | Cooper County Fire Protection District |
| Master plan | No |
| Emergency Operations Plan | Cooper County EOP |
| Building regulations | No |
| Zoning regulations | Yes |
| Subdivision regulations | Yes |
| Storm water regulations | No |
| NFIP participation | No |
| Floodplain regulations | No |
| Sources: City Staff, US Census, ACS (American Community Survey 2010-2014) | |

| **City Owned Assets** | | | |
|---|---|---|---|
| **Property** | **Replacement Cost (Buildings and Contents)** | | |
| | **Count** | **Value** | |
| Buildings | 1 | $5,000 | (Replacement) |
| Vehicles | 0 | $0 | (Insured) |
| Source: Jurisdictional Insurance Statement | | | |

## Assessed Values

| Figure 3.28 | Windsor Place 2016 Assessed Values | |
|---|---|---|
| Real Estate Property | Agricultural | $36,970 |
| | Residential | $2,543,560 |
| | Commercial | $1,148,860 |
| | **Total** | **$3,729,390** |
| | Local Assessed: Railroad & Utility | $181,060 |
| | State Assessed: Railroad & Utility | $279,069 |
| | **Real Estate Property Total** | **$4,189,579** |
| Personal Property | County Assessed Personal Property | $868,354 |
| | Local Assessed: Railroad & Utility | $158,762 |
| | State Assessed: Railroad & Utility | $45,284 |
| | **Personal Property Total** | **$1,017,400** |
| | **Grand Total** | **$5,261,919** |
| Source: Cooper County Clerk's Office | | |

## Relevant Changes since 2012

There are no known relevant changes since 2012. (Windsor Place did not participate in the 2012 plan update.) A new wastewater treatment plant has been recently completed.

## Future Development Plans

It is expected that future home development will occur in the next five years. Current work is being considered with the water supply district within a five million dollar bond issue to run water along Highway 87 and to have well ground storage added. The addition of a warning siren may also be a future project for Windsor Place.

## Wooldridge

| Figure 3.29<br>**Wooldridge Profile** | | | |
|---|---|---|---|
| Classification | Village | | |
| Population | 35 | | |
| Median household income | $8,750 | | |
| Median owner-occupied housing value | $23,300 | | |
| Total housing units | 20 | | |
| Water service | PWSD#1 | | |
| Electric service | Co Mo Electric | | |
| Ambulance service | Cooper County Ambulance District | | |
| Sewer service | No | | |
| Fire service | Cooper County Fire Protection District | | |
| Master plan | No | | |
| Emergency Operations Plan | Yes, Wooldridge Evacuation Plan and Cooper County EOP | | |
| Building regulations | No | | |
| Zoning regulations | No | | |
| Subdivision regulations | No | | |
| Storm water regulations | No | | |
| NFIP participation | Yes | | |
| Floodplain regulations | Yes | | |
| **City Owned Assets** | | | |
| **Property** | **Replacement Cost (Buildings and Contents)** | | |
| | **Count** | **Value** | |
| Property | 1 | $5,000 | (Donated to Village) |
| Vehicles | 0 | $0 | (Insured) |
| Source: Jurisdictional Insurance Statement | | | |

The village does own the levee which protects the town. There is no value statement available for the levee at this time. The village is working on grant funds to purchase equipment.

## Assessed Values

| Figure 3.30 | Wooldridge 2016 Assessed Values | |
|---|---|---|
| Real Estate Property | Agricultural | $820 |
| | Residential | $97,630 |
| | Commercial | $0 |
| | **Total** | **$98,450** |
| | Local Assessed: Railroad & Utility | $0 |
| | State Assessed: Railroad & Utility | $89,474 |
| | **Real Estate Property Total** | **$187,924** |
| Personal Property | County Assessed Personal Property | $42,867 |
| | Local Assessed: Railroad & Utility | $0 |
| | State Assessed: Railroad & Utility | $36,566 |
| | **Personal Property Total** | **$79,433** |
| | **Grand Total** | **$267,357** |

Source: Cooper County Clerk's Office

## Relevant Changes since 2012

Some houses have been demolished since 2012 in Wooldridge.

## Future Development Plans

Wooldridge would like to gain a severe weather warning siren in 2017. There are more houses that need demolished in the near future and the lots may be acquired by the Village of Wooldridge.

## 3.3 Special Districts

This section profiles the special districts in the planning area, including: Levee Districts and School Districts.

### Levee Districts

There are two Levee Districts located in the Planning Area. Each levee district is composed of an elected board. The districts are responsible for maintaining the levees and setting an annual budget. Both levee districts are organized through the Cooper County Commission.

It should be noted that the Overton-Wooldridge levee district is also referred to in some federal and state documentation as "Cooper County Levee District No. 1". The name Overton-Wooldridge appears on all county documentation and taxing information.

Figures 3.3.1 and 3.3.2 give a list of assets for each levee district. A more detailed profile of the levee districts can be found in Section 4.7 under Levee Failure.

**Figure 3.31**

**Overton-Wooldridge Levee District Assets**

| Equipment | Replacement Cost |
|---|---|
| 3 Pumps ($10,000 each) | $30,000 |
| 50' of hose for each pump | $8,000 |
| 3 Gear Heads (6,000 each) | $18,000 |
| 3 diesel power units ($16,000 each) | $48,000 |
| 1 - 16" portable pump and hose | $15,000 |
| 1 - 12" portable pump and hose | $15,000 |
| Concrete Structure for each pump | $60,000 |
| **Total** | **$194,000** |

*Source: Overton-Wooldridge Levee District*

**Figure 3.32**

**Linneman-Weekly Levee District Assets**

| Equipment | Replacement Cost |
|---|---|
| 1 - 20"pump | $30,000 |
| 2 - 24"pump | $72,000 |
| 3 - Irrigation Systems | $625,000 |
| 3 Wells | $75,000 |
| **Total** | **$802,000** |

*Source: Linneman-Weekly Levee District*

The following are assets gained for Linneman-Weekly Levee District since 2012: (1) 24" pump, (2) irrigation systems, and (1) well.

**School Districts Pre K-12**

Of the 6 public school districts, there are approximately 2,423 students and 296 teachers in 13 public schools (see Figure 3.3.3) there are also 268 students and 19 teachers in three private schools (see Figure 3.3.4). Each district has an elected Superintendent and School Board along with several administrative staff.

A mitigation plan must take this into account that students are a vulnerable population as they are dependent on others for natural hazard information during the school day. Often, this is accomplished by building schools out of floodplains and having safe areas within the school where the students can assemble in the event of a disaster. School buildings also have the potential to be built or reinforced to tornado safe-room specifications, and some school facilities may be used to assist with wider sheltering needs during or after a disaster.

**3.33 Cooper County Public School District Populations**

| School District | Grades | Certificated Staff | Students |
|---|---|---|---|
| **Blackwater R-II** | | | |
| Blackwater Elementary School | Pre-K-8 | 16 | 116 |
| **Totals:** | **1 School** | **16** | **116** |
| **Boonville R-I** | | | |
| David Barton Elementary School | 3-5 | 26 | 335 |
| Hannah Cole Primary School | Pre K-2 | 28 | 334 |
| Laura Speed Elliott Middle School | 7-12 | 34 | 361 |
| Boonville High School | 9-12 | 61 | 512 |
| **Totals:** | **4 Schools** | **149** | **1542** |
| **Cooper Co. R-IV** | | | |
| Bunceton Elementary School | K-6 | 16 | 50 |
| Bunceton High School | 7-12 | 13 | 70 |
| **Totals:** | **2 Schools** | **29** | **120** |
| **Otterville R-VI** | | | |
| Otterville Elementary School | K-6 | 14 | 130 |
| Otterville High School | 7-12 | 21 | 123 |
| **Totals:** | **2 Schools** | **35** | **253** |
| **Pilot Grove C-4** | | | |
| Pilot Grove Elementary School | Pre K-5 | 17 | 120 |
| Pilot Grove High School | 9-12 | 19 | 145 |
| **Totals:** | **2 Schools** | **36** | **265** |
| **Prairie Home R-V** | | | |
| Prairie Home Elementary School | K-6 | 17 | 82 |
| Prairie Home High School | 7-12 | 14 | 61 |
| **Totals:** | **2 Schools** | **31** | **143** |

Source: MO Department of Elementary and Secondary Education - Revised: 11/27/ 2016 Student – 12/2/2016 Certified Staff

| Figure 3.34 Cooper County Private Schools | | | |
|---|---|---|---|
| **Private** | **Schools** | **Teachers/staff** | **Students** |
| Immanuel Lutheran Church | 1 | 3 | N/A |
| St. Joseph School | 1 | 8 | 64 |
| St. Peter and Paul School | 1 | 12 | 207 |
| Zion Lutheran School | 1 | 2 | 32 |
| Source: http://www.privateschoolreview.com/county_private_schools/stateid/MO/county/29051, school administration | | | |

Figure 3.3.5 gives an overview of value estimates and population statistics for each district.

| Figure 3.35 Cooper County School Districts Assessed Values | | | |
|---|---|---|---|
| **School District** | **Buildings** | **Replacement Cost (building and contents)** | **Assessed Valuation** |
| Blackwater R-II | 4 | $3,316,501 | $8,795,113 |
| Boonville R-I | 14 | $48,310,777 | $138,802,703 |
| Cooper Co. R-IV | 2 | $8,051,188 | $9,527,460 |
| Otterville R-VI | 4 | 9,182,581 | $13,892,734 |
| Pilot Grove C-4 | 4 | $11,535,098 | $18,420,889 |
| Prairie Home R-V | 4 | $6,112,904 | $13,271,127 |
| Source: MO Department of Elementary and Secondary Education - Revised: 12/4/ 2016, School District Insurance Statement | | | |

**STATE FAIR COMMUNITY COLLEGE KEMPER CAMPUS IN BOONVILLE**

State Fair Community College (SFCC) averages 200 students every semester and have anywhere between thirty to forty adjunct teaching staff for each term.

State Fair Community College (SFCC) offers classes and services in Boonville at the former Kemper Military School, now known as The Kemper Campus. The building includes thirteen classrooms with additional office space and a student lounge space.

State Fair Community College (SFCC) has its own Emergency Operations Plan set up for their campus in Boonville, MO and for the college as a whole.

**Relevant Changes since 2012**
Started building expansion in 2016 to add ten more classrooms.

**Future Development Plans**

**The transition into the new classrooms, including the new science lab and computer lab, will take place over a three to four year plan period.**

### 3.4 Non-Governmental and Volunteer Organizations

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

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

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

## 3.5 Policy, Planning, and Program Capabilities

This part of the capability assessment is designed to summarize and evaluate existing plans, polices, programs, and ordinances in the Planning Area which are involved in some way with hazard mitigation. A summary of the plans and regulations in the Planning Area is shown in Figure 3.5.1.

**Figure 3.36**

**Plans and Regulations**
**Cooper County and Incorporated Communities**

| = Plan or regulations in place | Cooper County | Blackwater | Boonville | Bunceton | Otterville | Prairie Home | Pilot Grove | Windsor Place | Wooldridge |
|---|---|---|---|---|---|---|---|---|---|
| Master plan | | | ■ | | | | | | |
| Emergency Operations Plan | ■ | | ■ | ■ | ■ | | ■ | ■ | ■ |
| Building regulations | | ■ | ■ | | | | | | |
| Zoning regulations | | ■ | ■ | | | | | ■ | |
| Subdivision regulations | | | ■ | ■ | | | | ■ | |
| Stormwater regulations | | | ■ | | ■ | | ■ | | |
| NFIP participation | ■ | ■ | ■ | ■ | ■ | | ■ | | ■ |
| Floodplain regulations | ■ | ■ | ■ | ■ | ■ | | ■ | | ■ |

### Legal Authority

Cooper County has at its disposal a variety of powers given to it by the State of Missouri relevant to mitigation activities. A brief review of these powers is listed below.

- **Police Powers -** The police are responsible for protecting the overall public; local governments can add requirements pertinent to hazard mitigation.
- **Land Use and Building Codes -** The State of Missouri has given local governments the right to create and enforce planning and zoning regulations around construction and development including areas within designated floodplains and subdivisions.
- **Acquisition -** Local governments may find the most effective method for completely "hazard-proofing" a particular piece of property or area is to acquire the property (either in fee or a lesser interest, such as an easement); this removes the property from the private market and eliminates or reduces the possibility of inappropriate development.

Missouri legislation empowers cities, towns, and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease or eminent domain.

- **Taxation -** The power to levy taxes and special assessments is an important tool delegated to local governments by Missouri law. The power of taxation extends beyond the collection of revenue, and impacts the pattern of development in the community.

  Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, or improving protective structures within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of necessary services within municipal or county boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development. The major constraint in using special assessments is political.

**Spending -** Local governments have the power to make expenditures in the public interest. A community can control its growth to some extent by tentatively committing itself to a timetable for the provision of capital to extend services, especially when the provision of on-site sewage disposal and water supply to the surrounding area is unusually expensive. A local community can also regulate the extension of and access to services. This tactic can help guide development away from hazard prone areas.

## POLITICAL WILLPOWER

Cooper County has seen firsthand the effects of natural hazards, most notably during the flood of 1993. Citizens are well aware of the potential impacts to life and property of such events. Due to this high degree of awareness, it is expected that the current and future political climates are favorable for supporting and advancing the suggested mitigation strategies in the Planning Area.

### Community and Regional Partnerships

The Cooper County government has working relationships with the towns and cities located within the county as well as with neighboring counties. This is particularly evident in mutual aid agreements that exist between fire and law enforcement jurisdictions.

Cooper County jurisdictions have partnered successfully through and with the Mid-MO RPC on regional transportation planning and multiple local grant applications; local governments have representation on Mid-MO RPC transportation and economic development advisory committees.

<u>Regional Homeland Security Oversight Committee</u>

Cooper County participates in the Region F Homeland Security Oversight Committee (RHSOC). This committee addresses homeland security initiatives in a thirteen county region. A Mass Care Coordinator funded through the RHSOC has worked to increase the number of shelters throughout the region. In addition, there are three Homeland Security Response Teams available for emergency response incidents, both manmade and natural.

## COOPER COUNTY MASTER PLAN

Cooper County does not have a master plan.

## COOPER COUNTY EMERGENCY OPERATIONS PLAN

The *Cooper County Emergency Operations Plan* is a comprehensive document that covers emergency response and recovery. The Mission Statement of the EOP and the Emergency Operations Center is "to protect the lives and property of all residents when major disasters threaten public safety in any city, county or region of Cooper County."

Areas covered in the plan that relate to mitigation are communications and warning systems, media points of contact, acquisition of resources and supplies in preparation for emergency events, evacuation plans for flood, dam failure, levee failure, and sheltering procedures. Also included is information on response to severe thunderstorm/tornado, summer heat, lightning safety, flash flood/flooding, earthquake preparedness, and winter weather preparedness. The City of Boonville, City of Bunceton, City of Otterville, City of Pilot Grove, Windsor Place, and the City of Wooldridge have adopted the Cooper County EOP.

## BOONVILLE COMPREHENSIVE PLAN

In 2003, Boonville developed a comprehensive plan, which is adopted by the Planning and Zoning Commission and the City Council. This plan is a policy guide for decisions about the physical community and provides a vision for how the citizens want Boonville to develop in the next 10 to 20 years. The purpose of the comprehensive plan is to provide a rational and comprehensive guide for development that fosters economic growth and encourages compatible and high-quality land development.

## BUILDING REGULATIONS

Building regulations and codes can have a large impact on mitigating the effects of natural hazards. Periodic evaluation is important to ensure that the codes are appropriate to the area; enforcement is essential for the codes to be effective.

Cooper County does not currently have a planning and zoning commission or building codes. The County does have a floodplain ordinance in place to maintain compliance with NFIP. The County has also adopted in the International Building Codes (IBC) 2006; although, enforcement is extremely limited due to lack of funding for staffing. Building regulations in the Planning Area exist in the City of Blackwater and the City of Boonville.

## ZONING REGULATIONS

Appropriate zoning regulations can be an effective mitigation strategy; zoning guides development in such a way as to keep the general population and property safe.

Zoning ordinances can be a tool to discourage development in areas where desired services cannot be provided in a cost-effective manner and/or the safety of citizens could be jeopardized due to the fact that the area is not readily accessible to fire protection, law enforcement, and ambulance services.

Cooper County does not currently have a Planning or Zoning department. Zoning ordinances in the Planning Area exist in the City of Blackwater, City of Boonville and Windsor Place and are enforced by the fire department.

## SUBDIVISION REGULATIONS

Subdivision regulations serve to protect the public health and general welfare of the community by keeping development out of hazard prone areas. Subdivision regulations do this by providing specific guidelines that new developments must meet in order to be in compliance with safety and management decisions. Policy additions such as subdivision regulations are one of the more effective mitigation tools because they allow the community to design hazard-resistant places and avoid late costly retrofits or property buyouts.

Cooper County does not have any subdivision regulations, although they do exist in the City of Boonville, Bunceton, and Windsor Place.

## STORM WATER REGULATIONS

Storm water regulations, similar to other policy related mitigation strategies, can help the community design disaster resistant communities.

Cooper County does not have Storm Water Regulations; although, the City of Boonville, the City of Pilot Grove, and the City of Otterville do.

## NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

The following description from FEMA describes the history of the NFIP:

> *"The U.S. Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods."*

The jurisdictions in the Planning Area which participate in the NFIP are shown in Figure 3.5.2.

**Figure 3.37**

**Cooper County Participation in NFIP**

| Jurisdiction | Date of Entry | Effective Map |
|---|---|---|
| Blackwater | 4/25/1975 | 5/3/2011(M) |
| Boonville | 1/23/1974 | 5/3/2011 |
| Bunceton | 4/25/1975 | 5/3/2011(M) |
| Cooper County | 11/16/1983 | 5/3/2011 |
| Otterville | 4/25/1975 | 5/3/2011 |
| Pilot Grove | 7/25/1975 | 5/3/2011(M) |
| Wooldridge | 4/25/1975 | 5/3/2011 |

* (M) no elevation determined

Source: http://www.fema.gov/fema/csb.shtm

# Section 4: Risk Assessment

| | |
|---|---|
| **Requirement §201.6(c)(2)(i):** | ***[The risk assessment shall include a] description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*** |
| **Requirement §201.6(c)(2)(ii):** | ***[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2009 must also address NFIP insured structures that have been repetitively damaged by floods.*** |
| **Requirement §201.6(c)(2)(iii):** | ***For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*** |

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

## Identification of Hazards

The following natural hazards have been identified as posing potential risk in the planning area*:*

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

The Missouri State Hazard Mitigation Plan (2013) indicates that expansive soils, landslides, and rock falls are recognized as hazards in Missouri, but occur infrequently and with minimal impact. For this reason, those hazards were not profiled in the state plan nor will they be profiled in the Cooper County plan.

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

Technological hazards and human hazards will not be addressed in this plan.

## Risk Assessments for Identified Hazards

A risk assessment has been conducted for each hazard identified as affecting the planning area. The remainder of this section includes these risk assessments, which are organized according to the following outline:

**DESCRIPTION OF HAZARD**

**Location**

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

**Previous Occurrences**

**Probability of Future Events** (Natural Hazards) - The probability of future events is, for the most part, based on historical data while also taking into account the expected impact of climate change. It is assigned based on the following scale, which was slightly modified from that found in the *Missouri State Hazard Mitigation Plan (2013)*:

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

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

**IDENTIFICATION OF COMMUNITY ASSETS** potentially affected by or helping to mitigate the effects of the hazard in each participating jurisdiction. This is covered in Section 2 of the plan.

**ANALYSIS OF RISK** presented by the hazard, including a **measure of severity** for each participating jurisdiction. The **measure of severity** is an estimate of the deaths, injuries, or damage (property or environmental) that could result from the hazard. It is also broadly based on the scale found in the Missouri State Hazard Mitigation Plan (2013):

Low – Few or minor damage or injuries are likely.

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

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

## SUMMARY OF VULNERABILITY

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

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

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

- Cooper County have alternate methods/locations in place for fueling emergency vehicles. The Emergency Operations Center vehicles have extra fuel tanks that hold 300 gallons of gas and diesel fuel. In the future, Cooper County would like to form a partnership with MFA Oil to utilize bulk trucks for emergency fuel needs. Diesel and gasoline is delivered to City of Boonville tanks weekly. There is one 1,000 gallon tank for each product at City Services Building and one 500 gallon tank for each product at Parks Department shop. If there is reason to believe that an upcoming snow event will interfere with the normal weekly delivery the fuel tanks will be topped off prior to. Fuel levels in the emergency generators are monitored and topped off as necessary. Other smaller communities within Cooper County store extra fuel when possible.

- Interconnections are in place between the City of Boonville and Consolidated PSWD #1.

- All school districts have buses with two-way radios on board except Pilot Grove.

- Agreements are in place with local shelters in the planning area.

- General evacuation procedures are included in the Cooper County Emergency Operation Plan.

Other current mitigation activities are aimed at mitigating the effects of a specific hazard and are described under the specific hazard profile. Cooper County does not currently have a planning and zoning commission or building codes.

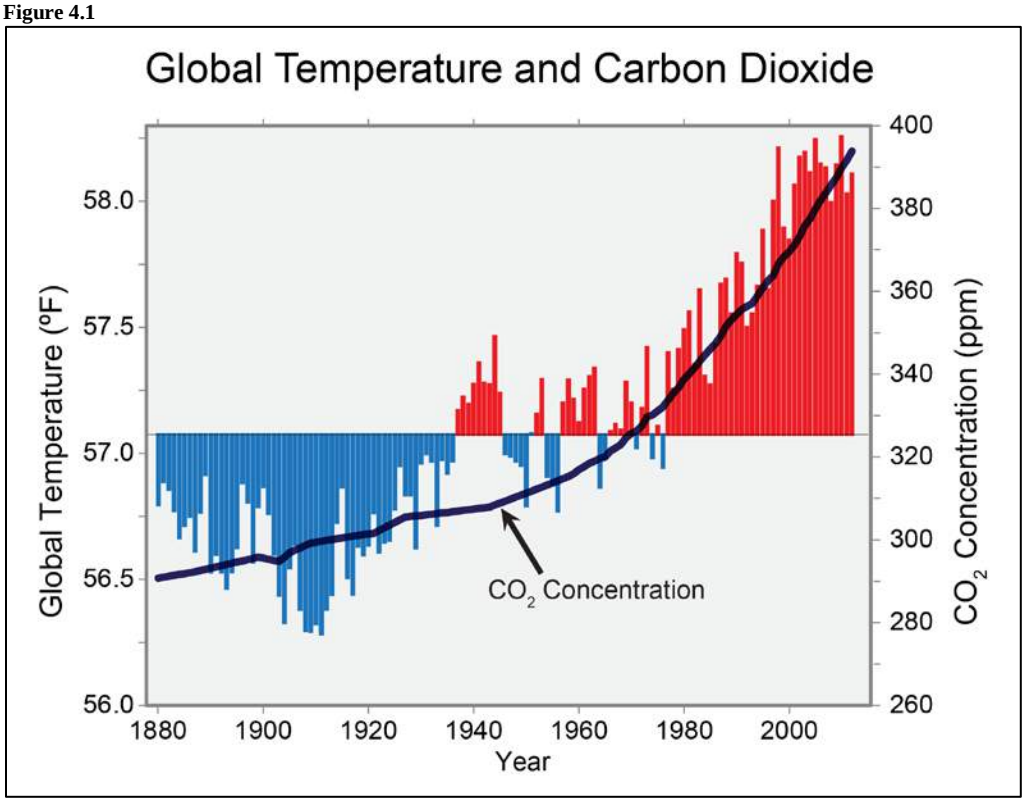
## THE EFFECTS OF CLIMATE CHANGE ON HAZARDS

While climate change remains a contentious political issue in the United States, the scientific data is overwhelmingly clear: the climate is changing. The Cooper County Hazard Mitigation Planning Committee deemed it important to include a consideration of the effect of climate change on the hazards profiled. This is not required for county-level plans but, as of March 2016, will be required for state hazard mitigation plans.

The information for this section is taken primarily from *The National Climate Assessment 2014*. The 2014 assessment was put together by a team of 300 experts under the guidance of a 60-member Federal Advisory Committee. The assessment was reviewed by the public and other experts in the field, including the federal agencies and a panel from the National Academy of Sciences. The full report can be accessed at GlobalChange.gov. A number of charts from *The National Climate Assessment 2014* have been included to indicate just some of the scientific data supporting the conclusion that the climate is changing.

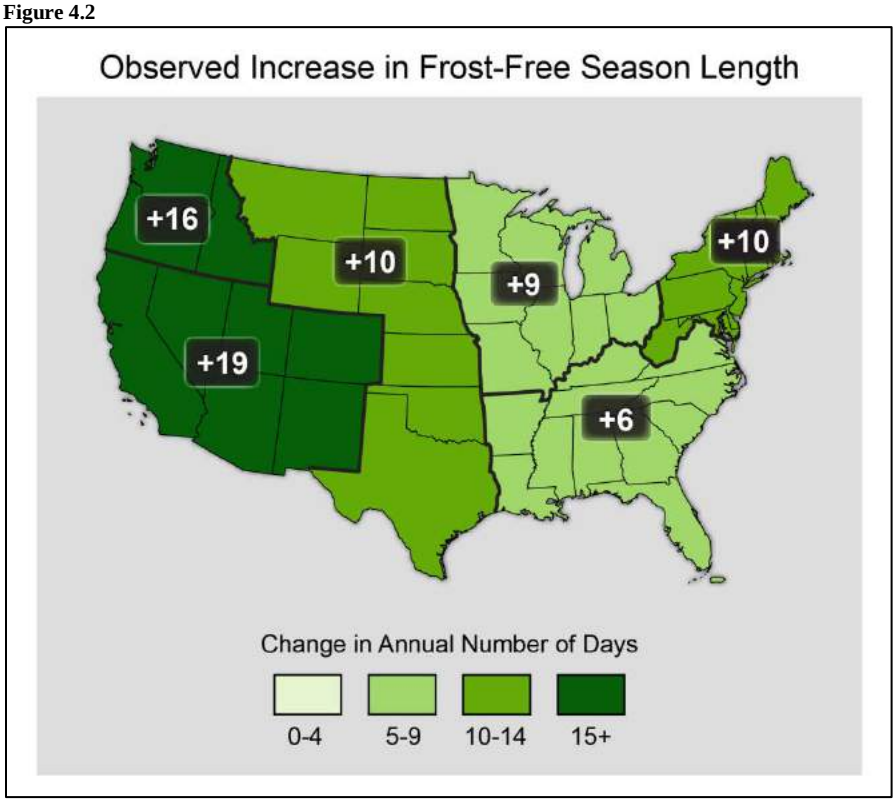
Global temperatures show a sharp increase which correlates with the increasing CO2 concentration in the atmosphere (Figure 4.1).

**Figure 4.1**



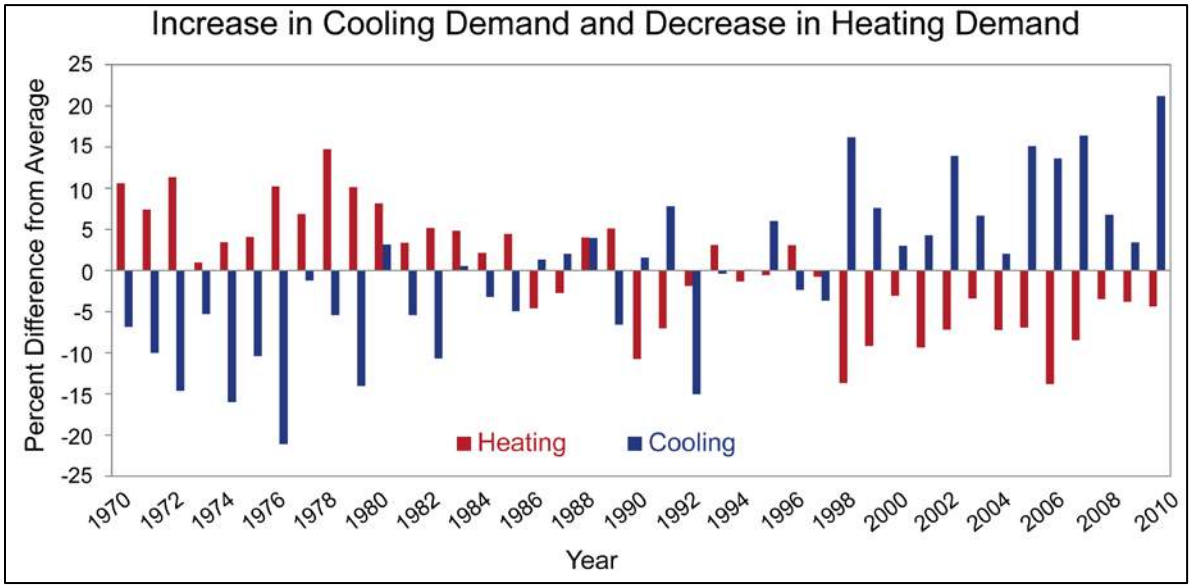
There has been a significant increase in frost-free days across the continental U.S. in the past two decades when compared with the average for the period 1901-1961 (Figure 4.2).

**Figure 4.2**



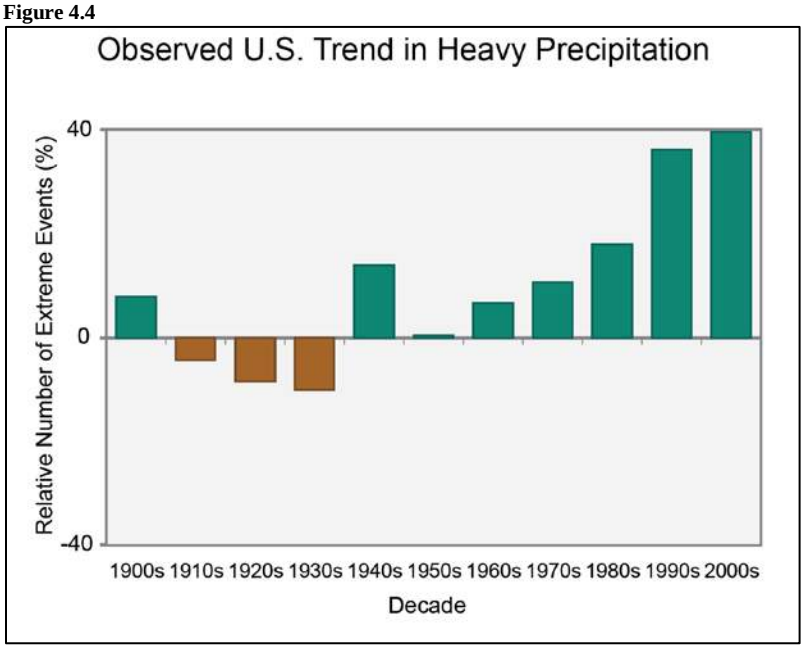

Likewise, there has been a trend of increased cooling demand in the past two decades (Figure 4.3).

**Figure 4.3**



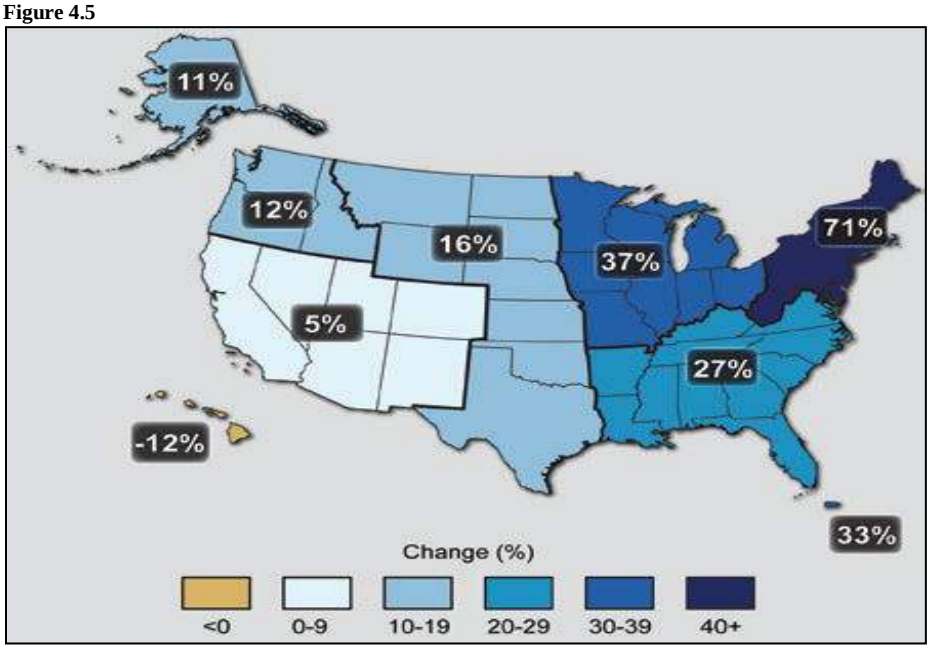
There is a strong upward trend in heavy precipitation for the U.S. as a whole, beginning in the 1940s (Figure 4.4). (The horizontal line at zero represents the average precipitation for the period 1901-1960.)

**Figure 4.4**




However, this heavier precipitation is affecting different regions of the country to varying degrees; the Northeast and the Midwest are experiencing the largest increase in sudden torrential downpours (Figure 4.5).

**Figure 4.5**



*The National Climate Assessment 2014* states that the current data indicates observed increases in the following: winter storms, extreme heat, heavy downpours, and the intensity, frequency, and duration of hurricanes. All of these have potential effects on hazards profiled for Cooper County and its jurisdictions:

- Cooper County has been included in five Presidential Disaster Declarations for severe winter weather since 2002. It would be expected that severe winter weather events will continue to be of greater importance in the planning area.

- Extreme heat is already the number one weather-related killer in the United States. The increase in extreme heat makes it even more urgent that all jurisdictions ensure their citizens, especially the most vulnerable, are both aware of the dangers of extreme heat and have cooling resources/locations available.

- Heavy downpours are a causative factor for flash flooding and small stream flooding. It would be expected that flash flooding may become a larger problem in areas already prone to it and a problem in some areas previously unaffected.

- The increase in hurricane intensity can affect the planning area both directly and indirectly. The remnants of Hurricane Ike spread over the Midwest (and the planning area) in September 2008, causing flash flooding and road closures in the Mid-Missouri region. In June 2015, the planning area received heavy rains from the remnants of Hurricane Bill; numerous roads were closed because of flooding, and the Missouri River, already moderately high, rose even further.

  Indirectly, the high cost of huge disasters, such as those caused by hurricanes, further strains the FEMA budget; pre-disaster mitigation project funding has become increasingly difficult to obtain. This has an indirect, but very real and problematic, impact on the planning area.

This list of the probable effects of climate change on the hazards profiled is conservative by design and not intended to be exhaustive. There are some natural hazards for which the effects of climate change are still unclear. *The National Climate Assessment 2014* indicates that the trends for tornadoes, hail, and damaging thunderstorm winds are still uncertain at this point.

## NATURAL HAZARDS AFFECTING THE PLANNING AREA

A summary of the probability and severity ratings for natural hazards in each of the participating jurisdictions is shown in Figure 4.6.

**Figure 4.6**
**Participating Jurisdictions' Probability, Severity, and Vulnerability Overview**

| | |
|---|---|
| Probability = P | High = H |
| Severity = S | Medium/Moderate = M |
| Vulnerability = V | Low = L |

| | **Hazard** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Dam Failure** | | | **Drought** | | | **Earthquake** | | | **Extreme Heat** | | | **Flood** | | | **Hailstorm** | | | **Land Subsidence/ Sinkhole** | | | **Levee Failure** | | | **Severe Winter Weather** | | | **Tornado** | | | **Wildfire** | | | **Windstorm** | | |
| **Participating Jurisdiction** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** | **P** | **S** | **V** |
| Planning Area | L | L | L | L | L | L | H | M | H | M | M | M | H | M | H | M | M | M | M | L | L | M | H | H | H | M | M | H | H | H | L | L | L | H | H | H |
| Cooper County | L | L | L | L | L | L | H | M | H | M | M | M | H | M | H | M | M | M | M | L | L | M | H | H | H | M | M | H | H | H | L | L | L | H | H | H |
| Blackwater | | | | L | L | L | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Boonville | L | L | L | L | L | L | H | M | H | M | M | M | H | M | H | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Bunceton | | | | L | L | L | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Otterville | | | | L | L | L | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Pilot Grove | | | | L | L | L | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Prairie Home | | | | L | L | L | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Windsor Place | | | | L | L | L | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Wooldridge | | | | L | L | L | H | M | H | M | M | M | H | H | H | M | M | M | | | | M | H | H | H | M | M | H | H | H | L | L | L | H | H | H |
| Linneman-Weekly Levee District | | | | | | | | | | | | | H | H | H | | | | | | | M | H | H | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overton-Wooldridge Levee District | | | | | | | | | | | | | H | H | H | | | | | | | M | H | H | | | | | | | | | | | | |
| Blackwater School District | | | | | | | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Boonville School District | | | | | | | H | M | H | M | M | M | H | M | H | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Otterville School District | | | | | | | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| Prairie Home R-V Schools | | | | | | | H | M | H | M | M | M | L | L | L | M | M | M | | | | | | | H | M | M | H | H | H | L | L | L | H | H | H |
| NOTE: Grayed out box means not applicable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## 4.1 SEVERE WINTER WEATHER (INCLUDING ICE, SNOW, AND SEVERE COLD)

### Description of Hazard

Cooper County generally experiences severe winter weather at least every other year; certain years are particularly notable for their storm frequency and/or intensity. Winter storms in central Missouri contain ice, snow, severe cold, sleet, and wind; each of these has the potential to disrupt life in the region by making normal activity difficult and/or dangerous.

Winter storms pose a threat to central Missouri by creating disruptions in electricity, telephone, and other critical infrastructures. Employees may be unable to get to work due to icy conditions, unplowed roadways, and disruptions in transportation services, or facility damage. A shortage of supplies may ensue with a longer stretch of severe winter weather.

Snowstorms do not generally impact the region for long periods of time, but ice storms have shut down schools and businesses for extended periods. Ice is also the biggest threat to reliable power and phone service.

### Location

The entire planning area is at risk from severe winter weather.

### Extent

The historical data for the planning area (Figure 4.7) provides information regarding both the duration and severity of winter weather events.

Duration: Severe winter weather events involving some type of precipitation (freezing rain, sleet, ice, or snow) have an average duration of over a day and a half.

Severity: Cooper County experienced 33 officially recorded winter storms or periods of extreme cold during the period from January 14, 1994, through March, 2014, according to data from NOAA and FEMA. Figure 4.7 shows available data for these storms including additional information from SEMA Situation Reports.

Winter storms typically move through a large area. The deaths, injuries, and estimated costs reflect all counties in Missouri affected by the storm. The death associated with one of the periods of extreme cold did not occur in Cooper County; information on the locations of the injuries was not available. While it can be seen from the data that severe winter weather can result in great financial cost, the exact cost of these storms to Cooper County was not available in the data.

In some cases, more cost information is available for storms for which Presidential Disaster Declarations were made. After a Presidential Disaster Declaration, Public Assistance (PA) and/or Individual Assistance (IA) is made available through FEMA. The PA can be further specified as a specific category; the categories relevant to this data are Category A for debris removal and Category B for emergency protective measures.

Since 2006, there have been five Presidential Disaster Declarations for severe winter weather in Missouri, three of these included Cooper County (#1673, #1676, #1736, and #1961). In all of these disasters, Public Assistance (PA) was made available to Cooper County through FEMA. There have also been two Presidential Emergency Declarations due to severe winter weather for the entire state of Missouri since 2006 (#3281 and #3303). Public Assistance (PA), limited to direct Federal Assistance, was made available during these Emergencies.

The Governor of Missouri declared a State of Emergency in the State for the winter storm of November 30 through December 1, 2006; this declaration allowed state funds to be used in disaster response. SEMA Situation Reports indicate a dairy farmer lost 23 head of cattle and other facilities valued at more than $1 million in damage from this storm; other individuals in Cooper County reported roofs collapsing on barns and greenhouses.

The severe winter weather in the first two weeks of December 2007 resulted in a Presidential Emergency Declaration (#3281) for the ice storm beginning on December 8, 2007. Neighboring counties received a Presidential Disaster Declaration (#1736) for the entire 10-day period of severe winter weather. SEMA activated the State Emergency Operations Center, and the Governor of Missouri declared a State Emergency which made state resources available to assist local governments.

According to the National Climate Data Center, the February 2011 blizzard was the first to strike central Missouri in several years. Over 20 inches of snow fell over a 24-hour period coupled with 40-mile-per-hour winds, which resulted in both a Presidential Emergency Declaration (#3317) and a Presidential Disaster Declaration (#1961). Interstate 70 was shut down from Warren County to just east of Kansas City. The National Guard was called to clear county roads and assist with emergency transportation. The region was brought to a standstill for several days. A Federal disaster declaration was obtained for many counties in order to assist with the cost of snow removal. Light freezing rain and sleet started on January 31 with an inch of sleet accumulating by the early morning hours of February 1. By midday, the precipitation had changed to snow and the wind began increasing. By late afternoon, travel became extremely dangerous. SEMA activated the State Emergency Operations Center, and the Governor of Missouri declared a State Emergency, which made state resources available to assist local governments.

## Previous Occurrences

| Figure 4.7<br>Severe Winter Weather Events in Cooper County (1996 – May 2016) | | | |
|---|---|---|---|
| **Date** | **Storm Type** | **Duration (days)** | **Description** |
| 1/9/1997 | Heavy Snow | 1 | Up to 7 inches of snow in Boonville. |
| 1/10/1997 | Cold/Wind Chill | 4 | Very cold arctic air settled over Northwest and West Central Missouri from the 10th through the 13th. |
| 1/12/1998 | Ice Storm | 1 | A light freezing drizzle began late on the evening of January 11, then blossomed into a steady light freezing rain. Icy roads and walkways resulted in numerous problems during the morning commute on January 12. |
| 3/11/2000 | Heavy Snow | 1 | 6 inches of heavy snow fell along and south of a line from Clinton through Sedalia to Boonville. |
| 10/6/2000 | Extreme Cold | 5 | Lows dropped below freezing for 5 consecutive days. |
| 12/10/2000 | Extreme Cold | 22 | Arctic air gripped the region from around December 10 through the end of the month. Except for a few hours on December 15 and 16, temperatures remained below freezing through the entire period. Snow cover persisted from December 13 through the end of the month. |
| 12/11/2000 | Ice Storm | 1 | Ice accumulations of up to 3/8 of an inch were reported from Marshall and Sedalia into the Boonville area. |
| 12/13/2000 | Heavy Snow | 1 | Snow overspread west-central Missouri during the overnight hours on December 12 and 13. The snow fell heavily at times, and accumulations reached 6 inches by early afternoon. |
| 1/28/2001 | Winter Storm | 1 | A storm system brought a mixed bag of wintry precipitation to northern Missouri on January 28 and 29. |
| 2/9/2001 | Winter Storm | 1 | The area reported 1/4 to 1/2 inch of ice accumulation, with snowfalls of 1 to 5 inches on top of the ice. |
| 1/30/2002 | Ice Storm | 2 | A long-lived major ice and snow storm blasted much of northwest, northern, and central Missouri from late Tuesday, January 29, until Thursday, January 31. |
| 3/1/2002 | Heavy Snow | 2 | 2 to 6 inches of snow. Strong gusty northwest winds caused considerable blowing and drifting of the snow. |
| 1/2/2003 | Winter Storm | 1 | A storm system on January 2 brought a band of heavy snows across southern portions of Pettis and Cooper counties. Snowfall amounts ranged from 5 to 8 inches. |
| 12/10/2003 | Winter Storm | 1 | The first winter storm of the season produced a general 2 to 5 inches of snow across the area. |
| 1/25/2004 | Winter Storm | 1 | A widespread freezing rain event left a general 1/4" of ice, with 3 to 4 tenths reported from Cass County eastward through Cooper County. |
| 11/30/2006 | Heavy | 1 | 10 to 16 inches of snow was common from Butler to |

| | | | |
|---|---|---|---|
| | Snow | | Harrisonville, extending northeast through Clinton, Warrensburg, Sedalia, Boonville, and Moberly. |
| 12/1/2006 | Heavy Snow | 1 | 10 to 16 inches of snow was common from Butler to Harrisonville, extending northeast through Clinton, Warrensburg, Sedalia, Boonville, and Moberly. |
| 12/9/2007 | Ice Storm | 3 | Up to a half inch of ice was reported across the county. Several tree branches and power lines were reported down. |
| 1/12/2007 | Winter Storm | 3 | One to two inches of sleet and freezing rain across the county. |
| 2/28/2009 | Heavy Snow | 1 | The extreme southwest portion of the county had as much as 6 inches of snow in Otterville and 4 miles west of Bunceton. |
| 1/10/2011 | Winter Weather | 2 | Four to six inches of snow was reported across the county. |
| 1/19/2011 | Winter Storm | 2 | The emergency manager measured 10.5 inches of snow in Boonville. |
| 2/1/2011 | Blizzard | 1 | Blizzard conditions were observed across the county, with frequent wind gusts up to 45 miles per hour, visibility less than 1/4 of a mile, and heavy snow of up to 19 inches reported in Boonville. |
| 3/14/2011 | Winter Weather | 1 | There was up to 5.5 inches of snow observed in Boonville. |
| 2/13/2012 | Winter Weather | 1 | Three to four inches of snow was measured across the county. |
| 12/21/2013 | Ice Storm | 2 | Trained weather spotters from across the area reported between .20 and .50 of freezing rain on December 21. Once the freezing rain ended, light snow accumulated throughout the area during the overnight hours. Between 1 and 3 inches of snow fell on top of the ice accumulation. |
| 2/4/2013 | Heavy Snow | 2 | 6 to 10 inches of snow. Many areas reported drifts of 2 to 3 feet. |
| 2/21/2013 | Winter Storm | 2 | Boonville measured 9.5 inches of snow. |
| 2/25/2013 | Winter Storm | 3 | Ten and a half inches of snow was measured near Boonville. |
| 3/23/2013 | Winter Storm | 2 | Eight inches of snow was measured in Boonville. |
| 1/6/2014 | Cold/Wind Chill | 1 | Wind chill values were around 30 degrees below zero for the morning of January 6. |
| 3/1/2014 | Winter Storm | 2 | Trained spotters across the area reported about a half inch to an inch of sleet. Snowfall approaching 3 to 6 inches also accumulated. |
| Source: www.ncdc.noaa.gov/stormevents | | | |

The following is a wind chill chart (Figure 4.8) indicating wind chill levels.

Figure 4.8

| Wind (mph) | Temperature (°F) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
| 5 | 36 | 31 | 25 | 19 | 13 | 7 | 1 | -5 | -11 | -16 | -22 | -28 | -34 | -40 | -46 | -52 | -57 | -63 |
| 10 | 34 | 27 | 21 | 15 | 9 | 3 | -4 | -10 | -16 | -22 | -28 | -35 | -41 | -47 | -53 | -59 | -66 | -72 |
| 15 | 32 | 25 | 19 | 13 | 6 | 0 | -7 | -13 | -19 | -26 | -32 | -39 | -45 | -51 | -58 | -64 | -71 | -77 |
| 20 | 30 | 24 | 17 | 11 | 4 | -2 | -9 | -15 | -22 | -29 | -35 | -42 | -48 | -55 | -61 | -68 | -74 | -81 |
| 25 | 29 | 23 | 16 | 9 | 3 | -4 | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 | -64 | -71 | -78 | -84 |
| 30 | 28 | 22 | 15 | 8 | 1 | -5 | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 | -67 | -73 | -80 | -87 |
| 35 | 28 | 21 | 14 | 7 | 0 | -7 | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 | -69 | -76 | -82 | -89 |
| 40 | 27 | 20 | 13 | 6 | -1 | -8 | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 | -71 | -78 | -84 | -91 |
| 45 | 26 | 19 | 12 | 5 | -2 | -9 | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 | -72 | -79 | -86 | -93 |
| 50 | 26 | 19 | 12 | 4 | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 | -74 | -81 | -88 | -95 |
| 55 | 25 | 18 | 11 | 4 | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 | -75 | -82 | -89 | -97 |
| 60 | 25 | 17 | 10 | 3 | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 | -76 | -84 | -91 | -98 |

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

**Probability of Future Events – High for all participating jurisdictions**
Several years witnessed multiple winter-weather events. Based on this historical data, there is a high probability that winter-weather events will occur in the future.

**ANALYSIS OF RISK**
**Measure of Severity** - Moderate for all participating jurisdictions, except for Prairie Home R-V Schools (low).

Severe winter weather presents a risk to both life and property in the planning area. Some of the damage is direct, but some comes in the form of economic losses due to closed businesses and schools and slowed or halted transportation (Figure 4.8).

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

Strenuous outdoor activity in extreme cold can also be life threatening. The elderly are especially vulnerable to excessive and/or prolonged cold (or heat). The 2010 Census recorded 2,702 citizens (15.3 percent of the population) as 65 years and older in Cooper County.

Severe winter weather may require that people without power be sheltered and fed.

**Potential Impact - Existing Structures**

Much of the property damage that occurs from severe winter weather is due to some type of utility failure:

> Power Lines - Ice storms often adversely impact consistent power supplies. Ice buildup on wires can cause them to fall; downed tree limbs can knock out power lines. Prolonged power outages can be a threat for those relying on electricity for heat. This is a particular concern for more vulnerable populations such as the elderly.
>
> Water Lines - Winter storms and the associated cold weather can be problematic for water lines, especially if a rapid freeze/thaw cycle is involved. As the ground freezes and thaws, pipes can shift and sometimes break, causing a lack of potable water. Broken pipes can cause extensive and expensive damage to property. Frozen and burst water pipes are a real concern for the homeowner.

Severe winter weather can be expected in Cooper County nearly every year. The county has been included in five disaster declarations for severe winter weather since 2002. A winter storm that brought up to three-fourths of an inch of ice in December 2007 caused widespread power outages, leaving an estimated 165,000 residents without power in Cooper County and the surrounding counties of Bates, Chariton, Howard, Johnson, Pettis, and Saline. Most recently, in 2011, a series of storms blanketed the region in near record amounts of snow and created blizzard conditions across a large portion of the state. Snow fall on February 1, 2011, caused the closure of Interstate 70 from Kansas City to St. Louis. Expenses from these storms are in excess of $14 million, according to SEMA.

**Figure 4.9**

**Federal Emergency and Disaster Declarations for Severe Winter Weather**
**Cooper County, Missouri, 2002-2015**

| Emergency (EM) or Disaster (DR) Declaration | Incident Period | Event Type | # of Counties | Public Assistance (PA) Grants* | | Type of Assistance Provided in Cooper County |
|---|---|---|---|---|---|---|
| | | | | Emergency Work Categories A-B | Permanent Work Categories C-G | |
| DR-1403 | 1/29/02-2/13/02 | Ice Storm | 43 counties | $34,013,640.27 | $9,715,546.90 | IA |
| EM-3281 | 12/8/07-12/15/07 | Severe Winter Storms | entire state | Not available | Not available | PA (A,B) |
| EM-3303 | 1/26/09-1/28/09 | Severe Winter Storm | entire state | Not available | Not available | PA (B) |
| EM-3317 | 1/31/11-2/5/11 | Severe Winter Storm | 115 counties | Not available | Not available | PA (B) |
| DR-1961 | 1/31/11-2/5/11 | Severe Winter Storm and Snowstorm | 64 counties | $7,036,419.52 | $2,451,128.68 | PA |

*Money obligated for all counties in disaster declaration

Source: http://www.fema.gov/disasters

*Missouri State Hazard Mitigation Plan (2013)* Analysis:

The *Missouri State Hazard Mitigation Plan (2013)* analyzed data for all counties in the state to develop vulnerability ratings for Severe Winter Weather.

The following data was analyzed:

- National Climatic Data Center (NCDC) storm event data (1993 to December 2012)
- U.S. Census Data (2000)
- Total building exposure from HAZUS-MR4
- FEMA Public Assistance (PA) funds from Disasters #1672, #1736, #1748, #1822, and #1961
- Census of Agriculture 2007 (USDA)
- Crop Insurance Claims data (1998-2012) from the Risk Management Agency of the USDA
- Calculated Social Vulnerability Index (SoVI™) for Missouri Counties from the Hazards and Vulnerability Research Institute of the Geography Department at the University of South Carolina

The results for Cooper County and its communities as a whole (the planning area) are shown in Figure 4.10.

**Figure 4.10**

**Impact Assessment - Severe Winter Weather - Cooper County**

| Total Incidents 1993-2012 | Housing Units/ sq. mile | Total Building Exposure ($) | Total Property Loss ($) | 2007 Crop Exposure ($) | Total Crop Insurance Paid ($) |
|---|---|---|---|---|---|
| 26 | 13.2 | $1,698,351,000 | $32,650,000 | $42,447,000 | $827,470 |

Source: *Missouri State Hazard Mitigation Plan (2013)*

Each factor analyzed was given a vulnerability rating from 1 to 5 with 1 indicating Low Vulnerability and 5 indicating High Vulnerability, and an overall Vulnerability Rating for Severe Winter Weather was determined. The results for Cooper County are shown in Figure 4.11.

**Figure 4.11**

**Vulnerability Analysis - Severe Winter Weather - Cooper County**

| Incident Likelihood Rating | Housing Density Rating | Property Loss Ratio Rating | Crop Exposure Rating | Crop Loss Ratio Rating | Social Vulnerability Index | Total Score and Vulnerability | Vulnerability Rating |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 4 | 3 | 4 | 1 | 17 | Medium-High |

Source: *Missouri State Hazard Mitigation Plan (2013)*

The *Missouri State Hazard Mitigation Plan (2013)* analysis determined an overall Medium-High Vulnerability rating for Cooper County in regards to severe winter weather.

The actual cost of structural damage associated with winter storm events is probably higher than the data indicates. The data is a combination of the Public Assistance for Presidential Disaster Declaration events and NCDC data for undeclared events. It should be remembered that PA only covers uninsured losses; any individual private losses due to these winter storm events would not be recorded in this data. In addition, the NCDC data is based on early estimates, and local knowledge indicates that the NCDC data does not contain significant losses associated with many events.

**Potential Impact - Future Development**

There is no known future development that will have a particular impact on the vulnerability to severe weather. However, as with many non-locale specific hazards, growth and development increase the size of the population and the assets at risk.

**Existing Mitigation Activities**

Shelters: The planning area is well prepared with Red Cross certified shelters (Figure 3.7).

Cooper County and Boonville Public Works Departments both have snowplowing plans which prioritize critical roads and streets for plowing. Both Public Works Departments maintain stocks of chemicals and fuel at appropriate levels for responding to severe winter weather events. The City of Boonville is divided into sections with drivers assigned to plow all streets within the assigned section. Typically, streets are plowed radiating out from the boundaries of the sections. With major streets being a boundary and leading into and through an assigned section those streets are cleared first. The key is all streets are cleared during a snow event. The City of Boonville has a snow route ordinance. Emergency snow routes are declared by the City Administrator when a particular snow event reaches such a scale that normal snow plowing routine can't keep ahead of the storm. Depending on the scope of a forecasted snow event, the snow plowing crews are worked in 8 to 12 hour shifts with regular public works department staff being augmented by employees from other departments and/or temp hire employees.

The City of Boonville maintains a supply of road salt on-hand, currently there is approximately 2,000 tons in the salt storage shed. In the August–September time frame Public Works Department will call for bids for supplying road salt for the upcoming winter season. The amount of salt to be supplied for the bid is based on what material is on-hand and a judgment call on how much material will be used based on an evaluation of long range weather forecasts. A provision for the City of New Franklin is included in the road salt supply bid. All material is delivered to the salt storage shed at the Boonville City Services Building.

Utility Companies

Utility companies in Cooper County have policies regarding tree trimming and brush removal around power lines. Consistent maintenance of trees and brush around utility lines limits the possibility of power outages during a severe winter storm. Maintenance also makes financial sense because repairing fallen utility lines and poles is costly and dangerous.

National Weather Service and Local Media

The Kansas City Office of the National Weather Service coordinates with local jurisdictions and media outlets to disperse information regarding severe winter storm watches and warnings.

Early warning allows the public to prepare for a severe storm. If a storm reaches catastrophic proportions and officials need to communicate directly with the public, the Emergency Alert System exists to spread that information.

The National Weather Service sets up winter weather warnings in stages of severity. These stages are shown in Figure 4.12.

| Figure 4.12<br>**National Weather Service Winter Warnings** | |
|---|---|
| **Winter Weather Advisory** | Winter weather conditions are expected to cause significant inconveniences and may be hazardous. If caution is exercised, these situations should not become life-threatening. The greatest hazard is often to motorists. |
| **Winter Storm Watch** | Severe winter conditions, such as heavy snow and/or ice, are possible within the next day or two. |
| **Winter Storm Warning** | Severe winter conditions have begun or are about to begin in your area. |
| **Blizzard Warning** | Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill. Seek refuge immediately. |
| **Frost/Freeze Warning** | Below freezing temperatures are expected and may cause significant damage to plants, crops, or fruit trees. In areas unaccustomed to freezing temperatures, people who have homes without heat need to take added precautions. |

## SUMMARY OF VULNERABILITY

Severe winter weather is one of the most common and costly natural hazards to affect the planning area; it has been responsible for three federal Emergency Disaster Declarations and two Presidential Disaster Declarations for Cooper County since 2002. In addition, climate data indicates that winter storms are increasing due to changes in the climate. All participating jurisdictions are vulnerable to this hazard.

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

The planning area has numerous mitigation activities in place that help mitigate the hazards associated with severe winter weather: active tree-trimming programs to protect power lines; excellent media coverage of winter weather advisories/warnings and preparedness information; two-way radio communication on schools buses; maintenance of chemical and fuel stocks in both Cooper County and Boonville for event response; snowplowing plans in the County and Boonville that prioritize routes; backup power at many government facilities in Cooper County and Boonville; and abundant Red Cross certified shelters.

However, there is still a need for more backup generators and transfer switches in the planning area. This is a difficult issue as the expense is great and the funding possibilities are limited. In addition, there is a need to find reliable transportation for vulnerable populations in need of transfer to shelters.

## 4.2 SEVERE THUNDERSTORMS (INCLUDING DAMAGING WINDS, HAIL, AND LIGHTNING)

### DESCRIPTION OF HAZARD

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

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

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

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

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

- Gust front – Gusty winds out ahead of a thunderstorm, characterized by a wind shift and temperature drop.

- Downburst – A strong downdraft with a width of greater than 2.5 miles, which results in an outward burst of damaging winds near the ground, may possibly produce damage similar to that of a strong tornado.

- Microbursts – A small concentrated downburst with a width less than 2.5 miles, generally short-lived, lasting only 5 to 10 minutes with maximum wind speeds up to 168 miles per hour.

Much of the damage caused by high winds occurs because of falling trees; people, buildings, and vehicles may be damaged by falling trunks and branches. Power lines may be blown or knocked

down and people left without electricity. In some cases, roofs are directly blown off buildings, and windows are shattered.

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

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

**Location**

The entire planning area is at risk from severe thunderstorms and all the related threats accompanying them.

**Extent**

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

For the 10-year period from May 31, 2006, through May 31, 2016, the average estimated wind gust for damaging winds reported in Cooper County (Figure 4.13) was 54 knots.

For the same period, the average measured diameter of severe hail reported in Cooper County was over 1 inch in size. The largest hail reported measured 4.25 inches in diameter (Boonville, June 17, 2009). In total, there were 34 reports of hail of 0.75-inch diameter or larger during the 10-year period (Figure 4.14).

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

**Previous Occurrences**

Historical data from NOAA for damaging winds (thunderstorm winds), hail, and lightning are shown in Figures 4.13, 4.14, and 4.15.

Damaging Winds

According to NOAA, there were 17 thunderstorm wind events in Cooper County in the 10-year period ending on May 31, 2016 (see Figure 4.13).

**Figure 4.13**

**Thunderstorm Wind Events, Cooper County, 5/31/2006 - 5/31/2016**

| Location | Date | Mag (knots) |
|---|---|---|
| Boonville | 7/13/06 | 52 EG |
| Boonville Airport | 10/17/07 | 52 EG |
| Boonville | 10/17/07 | 52 EG |
| Otterville | 08/28/08 | 52 EG |
| Pisgah | 08/28/08 | 52 EG |
| Boonville | 6/27/09 | 52 EG |
| Boonville Airport | 6/27/09 | 52 EG |
| Boonville | 10/1/2009 | 61 EG |
| Boonville Viertel Airport | 7/30/2010 | 61 EG |
| Boonville Viertel Airport | 5/22/2011 | 52 EG |
| Boonville | 8/7/2011 | 61 EG |
| Prairie Home | 6/4/2014 | 61 EG |
| Otterville | 7/4/2014 | 52 EG |
| Otterville | 10/1/2014 | 50 EG |
| Bunceton | 7/24/2015 | 52 EG |
| Lick | 7/26/2015 | 52 EG |
| Boonville | 3/30/2016 | 52 EG |

EG = Estimated Gust

Source: http://www.ncdc.noaa.gov/stormevents/

Hail

NOAA lists 34 separate reports of hail (of at least 0.75 inch in diameter) in the planning area in the 10-year period from May 31, 2006, through May 31, 2016 (Figure 4.14). These reports occurred on 16 different days. There was a report of 4.25-inch diameter hail with a 2009 storm and numerous storms that spawned hail of 1-inch diameter or larger.

**Figure 4.14**

**Hail Events in Cooper County, 5/31/2006 - 5/31/2016**

| Location | Date | Size | Location | Date | Size |
|---|---|---|---|---|---|
| Boonville | 6/10/2006 | 0.88 in. | Bunceton | 4/17/2013 | 0.75 in. |
| Boonville | 6/10/2006 | 0.75 in. | Otterville | 3/27/2014 | 1.75 in. |
| Bunceton | 6/10/2006 | 1.00 in. | Pisgah | 3/27/2014 | 1.25 in. |
| Otterville | 1/7/2008 | 0.88 in. | Boonville | 4/3/2014 | 1.00 in. |
| Bunceton | 1/7/2008 | 0.75 in. | Pleasant Green | 4/3/2014 | 0.88 in. |
| Boonville | 4/3/2008 | 0.75 in. | Pilot Grove | 4/3/2014 | 0.75 in. |
| Clifton City | 4/23/2008 | 1.00 in. | | | |
| Pilot Grove | 5/7/2009 | 0.75 in. | | | |
| Boonville | 6/10/2009 | 1.00 in. | | | |
| Boonville | 6/17/2009 | 1.00 in. | | | |
| Boonville Viertel Airport | 6/17/2009 | 1.75 in. | | | |
| Boonville | 6/17/2009 | 2.5 in. | | | |
| Boonville | 6/17/2009 | 4.25 in. | | | |
| Overton | 6/17/2009 | 1.00 in. | | | |
| Boonville | 4/4/2010 | 1.00 in. | | | |
| Lone Elm | 5/11/2010 | 0.88 in. | | | |
| Pilot Grove | 5/22/2011 | 1.00 in. | | | |
| Boonville | 5/22/2011 | 1.00 in. | | | |
| Clarks Fork | 5/22/2011 | 2.75 in. | | | |
| Boonville | 5/22/2011 | 1.50 in. | | | |
| Boonville | 5/22/2011 | 1.00 in. | | | |
| Lick | 5/22/2011 | 1.75 in. | | | |
| Boonville | 6/10/2011 | 1.00 in. | | | |
| Boonville | 6/13/2011 | 1.00 in. | | | |
| Boonville | 6/13/2011 | 1.75 in. | | | |
| Boonville | 6/13/2011 | 1.50 in. | | | |
| Boonville | 3/28/2012 | 0.75 in. | | | |
| Boonville | 9/7/2012 | 1.50 in. | | | |

Source: http://www.ncdc.noaa.gov/stormevents/

Lightning

According to data from the NWS, lightning ranked as the third leading cause of weather-related fatalities over the 30-year period of 1983-2012, causing an average of 52 fatalities in the U.S. each year. According to the *Missouri State Hazard Mitigation Plan (2013)*, lightning was responsible for eight deaths in Missouri during the period 2006-2012 and caused over $2.37 million in property damages in Missouri over that same period.

**Figure 4.15**

**Lightning Events in Cooper County, 1/1/2000 - 5/31/2016**

| Location | Date | Deaths | Injuries | Damage | | Incident Details |
|---|---|---|---|---|---|---|
| | | | | Property | Crops | |
| Boonville | 5/24/2000 | 0 | 0 | 5K | 0 | A house in Boonville was damaged by a lightning strike. |
| **Totals:** | | **0** | **0** | **5K** | **0** | |

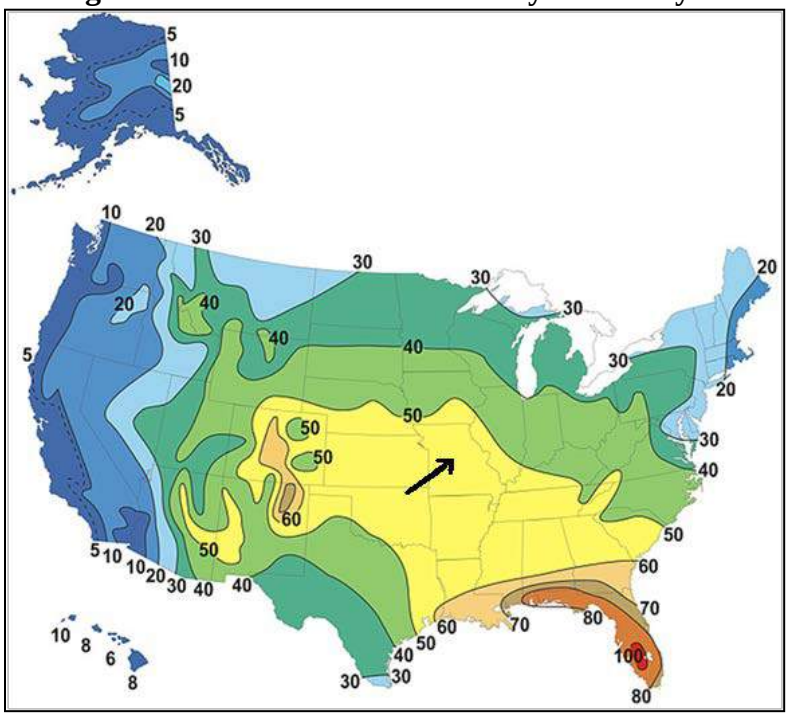
Source: http://www.ncdc.noaa.gov/stormevents/

**Probability of Future Events**

High for damaging winds and hail – all participating jurisdictions.
Low for lightning – all participating jurisdictions.

National Weather Service data indicates an average of 50 to 60 thunderstorm days per year in Missouri (Figure 4.16).

**Figure 4.16**
**Average Number of Thunderstorm Days Annually in U.S.**




**Source: NOAA**

Data from NOAA for the recent 10-year period (5/31/2006-5/31/2016) indicates 17 thunderstorm wind events in Cooper County (Figure 4.13). There were two years in this period when an event was not reported. Based on this data, the calculated probability of a future severe thunderstorm wind event in any given year is 80 percent.

Data from NOAA for the same 10-year period indicates 34 reported severe hail events in the planning area (Figure 4.14). There were two years without severe hail events in the planning area during this period. Based on this data, the calculated probability of a future severe hail event in any given year is 80 percent.

Data from NOAA shows that since the year 2000, only one lightning event that caused property damage or injury has occurred in the planning area (Figure 4.15). Based on this data, the probability of a future lightning event causing property damage, injury, or death in any given year is low.

## ANALYSIS OF RISK

**Measure of Severity** –

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

**Potential Impact - Life**

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

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

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

### Potential Impact - Existing Structures

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

The annualized losses calculated for the planning area in the *Missouri State Hazard Mitigation Plan (2013)* are shown in Figure 4.17. The annualized losses were calculated by combining historical loss data from the NOAA database and paid crop insurance claims from USDA's Risk Management Agency (RMA) for the period 1993 to July 2013.

**Figure 4.17**

**Annualized Property Loss and Crop Claims**
**Severe Thunderstorm in Cooper County**

| | |
|---|---|
| **Damaging Wind** | $65,872 |
| **Hail** | $8,943 |
| **Lightning** | $333* |
| **Total** | **$75,148** |

*Property damage alone

Source: *Missouri State Hazard Mitigation Plan (2013)*

NOAA data, from which the annualized losses are calculated, vastly underestimates the cost of these hazards in the planning area. Local information indicates that many instances of property damage are not reflected in the NOAA data.

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

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

**Potential Impact - Future Development**

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

There has been growth in population and housing in certain parts of the planning area in recent years. While Census figures indicate an overall population growth rate of 6 percent in the planning area (Cooper County) between 2000 and 2010, the population growth in Prairie Home and Windsor Place was 27 percent and 44 percent, respectively. Housing units in the planning area increased by 12 percent during this period (Figure 2.11).

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

**Existing Mitigation Activities**

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

Cooper County has been recognized by the National Weather Service as a StormReady® Community. In order to become recognized as StormReady®, the Emergency Management Agency is evaluated on its abilities to do the following:

- receive real-time weather information from the NWS
- disseminate the information to the public
- transmit real-time information to the NWS
- educate the public regarding weather hazards/protection

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

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

Safe Rooms Hannah Cole Elementary School in Boonville was built in 2016 with a safe room built to FEMA standards incorporated into its gymnasium.

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

Shelters There are numerous Red Cross Certified Shelters in the planning area should sheltering become necessary (Figure 3.7).

Insurance Industry The insurance industry is heavily invested in finding mitigation strategies for hail damage as it is one of the most costly hazards for the industry. The fifth largest payout made by State Farm Insurance ($245 million) was for a 1992 hailstorm in Texas. (The only higher payouts were for Hurricane Andrew in 1992, an earthquake in Los Angeles in 1994, Hurricane Hugo in 1989, and wildfires in Oakland, California, in 1991.)

High insurance claims for hail damage, especially in the Midwestern states, are one reason for an increase in insurance premiums. The type of roofing material used in construction can greatly affect vulnerability to hail. In an effort to have a multifaceted approach to the problem of high damages and increasing premiums, the industry has supported research and testing standards in roofing materials.

In 1996, a testing standard (UL2218) was developed to grade the impact resistance of roofing materials. There are four rated classes of resistant materials with Class IV shingles providing the most resistance against both hail and high winds.

In the past, impact-resistant roofing (mostly made of aluminum, copper, plastic, and resin) was not affordable for most homeowners. Recent research has resulted in "modified asphalt" shingles, which are much more affordable; some of these achieve the Class IV rating.

Installing impact-resistant roofing can have an added benefit on insurance rates. In Texas, all insurers subject to Texas rate regulations were required in 1998 to begin offering premium discounts for customers who have installed impact-resistant roofs. In Missouri, some insurers offer these discounts on a voluntary basis.

## SUMMARY OF VULNERABILITY

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

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

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

## 4.3 TORNADO

### DESCRIPTION OF HAZARD

A tornado is a violently rotating column of air that is usually generated by a super cell thunderstorm. The movement speed of a tornado is typically around 10 to 20 miles per hour but can range from almost stationary to more than 60 miles per hour, according to NOAA's National Severe Storms Laboratory. Tornadoes often travel from southwest to northeast but can move in any direction.

Tornadoes occur most frequently in late afternoon and early evening but can occur at any time; they tend to dissipate as fast as they form. Unlike a hurricane, which can last for multiple hours, tornadoes are often in one place for no more than a few minutes. The seasonal, temporal, and spatial uncertainties surrounding thunderstorms and tornadoes make widespread and year-round preparedness essential.

### Location

The entire planning area is at risk from tornadoes.

### Extent

The Enhanced Fujita or EF-Scale (Figure 4.18) is currently used in the United States to classify tornadoes. It is based on engineering studies of the wind effects on 28 different types of structures (buildings, towers, poles, trees). This indirect measurement of speed is used because it is currently not possible to measure ground-level speeds in strong tornadoes; the winds destroy the instruments needed for measurement.

In addition to estimated wind speeds, averaged data from tornadoes can give an idea of the length and width of tornadoes in the different classifications.

**Figure 4.18**

**Tornado Extent**

| EF-Scale Number | Wind Speed* (mph) | Length** (miles) | Width** (feet) |
|---|---|---|---|
| EF0 | 65-85 | 0.9 | 93 |
| EF1 | 86-110 | 2.9 | 210 |
| EF2 | 111-135 | 6.6 | 413 |
| EF3 | 136-165 | 14.0 | 865 |
| EF4 | 166-200 | 27.1 | 1,511 |
| EF5 | Over 200 | 33.9 | 1,823 |

*3 second gust

**Source: FEMA Benefit-Cost Analysis Course, Student Manual Version 4.5

The EF-Scale has been in use since 2007. It uses the same ratings as the original Fujita Scale (F-Scale), which it replaced, but the wind speeds have been adjusted to reflect current knowledge and give a more realistic estimate of wind speeds for all tornadoes, including historical ones in

the NOAA database. The ratings of tornadoes prior to 2007 were not changed in the NOAA database with the adoption of the EF-Scale.

There continue to be limitations even with the EF-Scale since the scale is based on sustained damage. As noted on the NOAA website, "Damage rating is (at best) an exercise in educated guessing. Even experienced damage-survey meteorologists and wind engineers can and often do disagree among themselves on a tornado's strength."

Another issue with tornadoes is speed of onset. Technological advances—such as Doppler radar, computer modeling, and Emergency Warning Systems—have increased the amount of time the general public has to respond to a tornado. Despite these advances, tornadoes can still strike an area with little warning. Often, people have no more than a few minutes to get to safety. Being able to quickly get to a safe place is absolutely imperative in order to prevent loss of life.

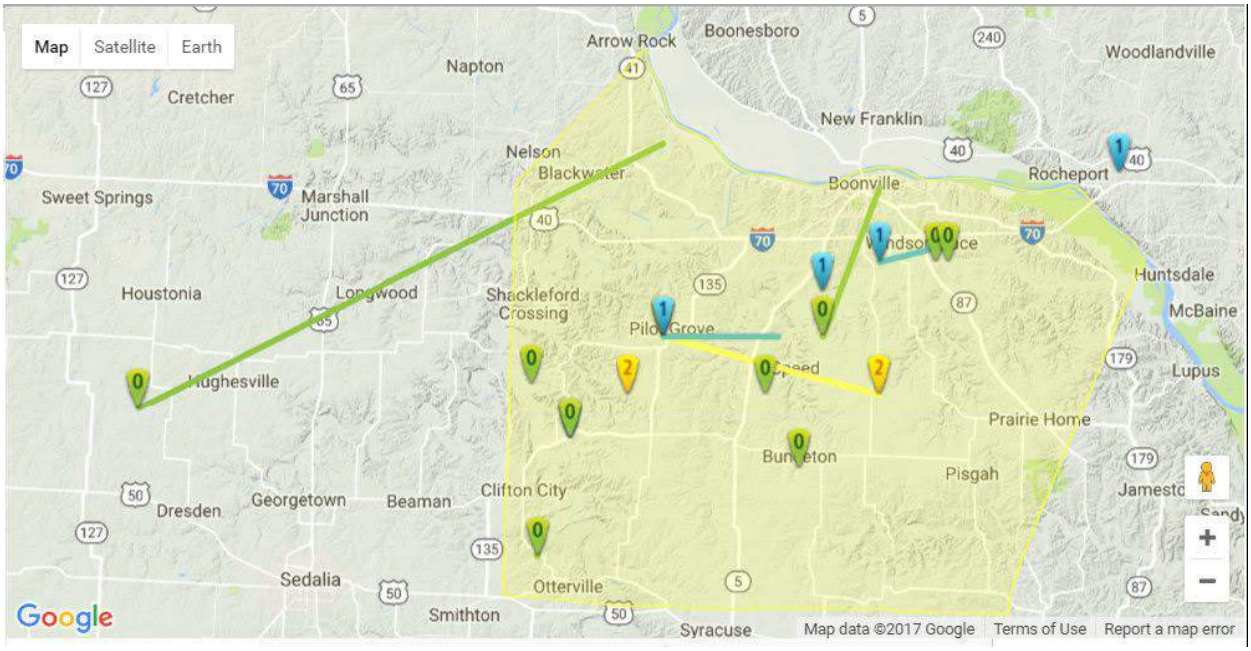
**Previous Occurrences**

The planning area has experienced 17 tornado events since October 1966, as officially recorded by NOAA (Figure 4.19).

The historical record in the planning area over this 50-year period indicates tornadoes in the EF0 to EF2 range. While history is informative, it is not necessarily predictive of the future; there is the possibility that the planning area could experience a tornado above the EF2 level in the future.

In addition, many historical tornadoes may have been stronger than the data indicates. According to the NOAA website, "Because the only way we can compare all tornadoes is by whatever damage they caused, and EF5/F5 damage is only possible when tornadoes hit well-built structures, the true 'violence' of most historical tornadoes is unknown—especially before the middle to late 20th century."

| Figure 4.19<br>**Tornado Events in Cooper County, 10/14/1966 - 5/31/2016** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Location** | **Date** | **Time** | **Magnitude** | **Deaths** | **Injuries** | **Property Damage** | **Crop Damage** |
| County | 6/11/1968 | 17:00 | F0 | 0 | 0 | 0.03K | 0 |
| County | 4/20/1973 | 13:50 | F1 | 0 | 0 | 2.5K | 0 |
| County | 4/20/1973 | 18:35 | F2 | 0 | 0 | 25K | 0 |
| County | 5/21/1973 | 16:50 | F1 | 0 | 0 | 2.5K | 0 |
| County | 7/19/1975 | 20:00 | F0 | 0 | 0 | 2.5K | 0 |
| County | 4/20/1976 | 19:30 | F0 | 0 | 0 | 0 | 0 |
| County | 5/14/1982 | 20:20 | F2 | 0 | 0 | 25K | 0 |
| County | 5/14/1982 | 20:30 | F1 | 0 | 0 | 25K | 0 |
| County | 4/29/1984 | 16:40 | F0 | 0 | 0 | 0 | 0 |
| County | 7/11/1992 | 16:15 | F0 | 0 | 0 | 0 | 0 |
| County | 9/7/1992 | 18:40 | F2 | 0 | 0 | 250K | 0 |
| Boonville | 4/8/1999 | 16:30 | F1 | 0 | 0 | 750K | 50K |
| Pilot Grove | 4/10/2001 | 17:11 | F1 | 0 | 0 | 25K | 0 |
| Boonville | 8/13/2005 | 14:53 | F0 | 0 | 0 | 50K | 0 |
| Blackwater | 3/12/2006 | 16:04 | F0 | 0 | 0 | 5K | 0 |
| Otterville | 3/12/2006 | 16:30 | F0 | 0 | 0 | 0 | 0 |
| Pleasant Green | 5/25/2011 | 12:04 | EF0 | 0 | 0 | 0 | 0 |
| **TOTALS:** | | | | 0 | 0 | 1.163M | 50K |
| Source: http://www.ncdc.noaa.gov/stormevents/ | | | | | | | |




(http://www.tornadohistoryproject.com/exports/tornadodata-13394.csv

**Probability of Future Events**

**High - all participating jurisdictions**

For the period from October 1966 through May 2016, a period of approximately 50 years, the NOAA database reports 12 years with at least one tornado event in the planning area. Based on this historical data, the calculated probability of a future tornado event of any magnitude in a year is about 24 percent.

The probabilities of occurrence of the different magnitudes of tornadoes in any given year, based on historical data, have also been calculated (Figure 4.20). While the calculated probabilities for an EF3, EF4, or EF5 tornado are 0 percent, this does not mean tornadoes of these magnitudes could not occur in the planning area; it just means they have not occurred in the historical record.

**Figure 4.20**

**Probability of Future Tornado Events**

| EF-Scale | # of years with tornado event (1966-2016) | Probability | Probability Rating |
|---|---|---|---|
| **All** | 12 | 24% | High |
| **EF0** | 8 | 16% | High |
| **EF1** | 4 | 8% | Moderate |
| **EF2** | 3 | 6% | Moderate |
| **EF3** | 0 | 0% | Low |
| **EF4** | 0 | 0% | Low |
| **EF5** | 0 | 0% | Low |

## ANALYSIS OF RISK

**Measure of Severity**
**High - all participating jurisdictions**

The destructive effects of a tornado depend on the strength of the winds, proximity to people and structures, the strength of structures, and how well a person is sheltered. They are obviously a hazard with the potential to cause both great loss of life and catastrophic destruction.

**Potential Impact - Life**

While tornadoes can strike anywhere, there is a greater chance of injury and loss of life (and destruction of property) in population centers. This is especially true of a tornado with a large path.

There have been no reported injuries associated with recorded tornadoes in the planning area.

**Potential Impact - Existing Structures**

Tornadoes cause the most costly physical destruction when they touch ground in urban areas. High winds affect all structure types differently; non-permanent and wood-framed structures are especially vulnerable to destruction.

In addition to a direct hit on a building by a tornado, damage to trees poses a serious threat. People, buildings, power lines, and vehicles are all at risk from falling branches, uprooted trees, and windblown debris.

There has been $1.163 million in reported property damages associated with recorded tornadoes in the planning area.

The Enhanced Fujita Scale was developed by studying wind effects on various structures types (Figure 4.21). Inspection of this information gives an idea of the damage that might be expected with tornadoes of different magnitudes.

**Figure 4.21**

**Tornado Strength and Damage**

| EF-Scale Number | Intensity Phrase | Wind Speed* (mph) | Type of Damage Done |
|---|---|---|---|
| F0 | Gale tornado | 65-85 | Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards. |
| F1 | Moderate tornado | 86-110 | The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed. |
| F2 | Significant tornado | 111-135 | Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated. |
| F3 | Severe tornado | 136-165 | Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted. |
| F4 | Devastating tornado | 166-200 | Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated. |
| F5 | Incredible tornado | Over 200 | Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged. |

*3 second gust

Impact Assessment on Total Property

An assessment has been developed for the impact of EF0 through EF3 tornadoes in each of the incorporated communities participating in the hazard mitigation plan (Figure 4.23).

The average area of the different magnitudes of tornadoes was calculated from the average length and width of tornado paths established from historical data (Figure 4.22).

**Figure 4.22**

**Average Tornado Size**

| EF Class | Length (miles) | Width (feet) | Width (miles) | Area (square miles) |
|---|---|---|---|---|
| **EF0** | 0.9 | 93 | 0.02 | 0.02 |
| **EF1** | 2.9 | 210 | 0.04 | 0.12 |
| **EF2** | 6.6 | 413 | 0.08 | 0.53 |
| **EF3** | 14.0 | 865 | 0.16 | 2.24 |
| **EF4** | 27.1 | 1,511 | 0.29 | 7.86 |
| **EF5** | 33.9 | 1,823 | 0.35 | 11.87 |

Source: FEMA Benefit-Cost Analysis Course, Student Manual Version 4.5

The following conservative estimates have been made in developing the assessment:

- The entire tornado path is within the given jurisdiction.
- The total property value in the jurisdiction is the sum of the real, personal, and government-owned property as reported in the jurisdictional profile charts in Section 3.2
- The total property value is evenly distributed in the tornado path.
- The percentage factors used (4% - EF0, 9% - EF1, 17% - EF2, and 25% - EF3) for calculating the Tornado Vulnerability Analysis were established by the committee as appropriate assessed values for property damage in the respective tornado category. The totals are calculated using the total market value of property by the percentage for each tornado category (i.e., Blackwater $1,457,891 x $.04 = $58,315.64 in damage for EF0 – as shown in below table)

| Figure 4.23 | | | | | | |
|---|---|---|---|---|---|---|
| **Tornado Vulnerability Analysis - Major Population Areas** | | | | | | |
| **Jurisdictional Data** | | | **Estimated Property Damage - Real and Personal** | | | |
| | | | **4%** | **9%** | **17%** | **25%** |
| **Jurisdiction** | **Area (square miles)** | **Total Market Value of Property*** | **EF0** | **EF1** | **EF2** | **EF3** |
| **Blackwater** | 0.3 | $1,457,891 | 58,315.64 | 131,210.19 | 247,841.47 | 364,472.75 |
| **Boonville** | 7.2 | $97,634,495 | 3,905,379.80 | 8,787,104.55 | 16,597,864.15 | 24,408,623.75 |
| **Bunceton** | 0.9 | $2,081,281 | 83,251.24 | 187,315.29 | 353,817.77 | 520,620.25 |
| **Otterville** | 0.5 | $3,084,519 | 123,380.76 | 277,606.71 | 524,368.23 | 771,129.75 |
| **Pilot Grove** | 0.4 | $5,269,094 | 210,763.76 | 474,218.46 | 895,745.98 | 1,317,273.50 |
| **Prairie Home** | 0.4 | $2,146,248 | 85,849.92 | 193,162.32 | 364,862.16 | 536.562.00 |
| **Windsor Place** | 0.2 | $5,261,919 | 210,476.76 | 473,572.71 | 894,526.23 | 1,315,479.75 |
| **Wooldridge** | 0.1 | $267,357 | 10,694.28 | 24,062.13 | 45,450.69 | 66,839.25 |
| *Total of Personal and Real Property Market Values plus Government-Owned Property Values (Section 3.2 - Property and Valuation Charts) | | | | | | |

There are some obvious limitations to this assessment. Some of these are listed below:

- The analysis is based on numerous assumptions and estimates.
- Property value is not distributed evenly in jurisdictions.
- Conversion of the length and width of a tornado path into area will cause an overestimation of damage in smaller jurisdictions.
- The analysis does not take into account the type of construction; this is a major factor in structure vulnerability.

*Missouri State Hazard Mitigation Plan (2013)* Analysis: The State Plan set the Total Building Exposure in the planning area at $1,698,351,000.

### Potential Impact - Future Development

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

There has been growth in population and housing in certain parts of the planning area in recent years. While Census figures indicate an overall population growth rate of 6 percent in the planning area (Cooper County) between 2000 and 2010, the population growth in Prairie Home and Windsor Place was 27 percent and 44 percent, respectively. Housing units in the planning area increased by 12 percent during this period (Figure 2.11).

It would be wise to consider mitigation strategies for tornadoes and other high-wind situations during the planning phase of any new development. The type of construction greatly affects vulnerability to tornadoes and high winds. Design and construction choices and the inclusion of hardened areas for safe rooms can save lives.

**Existing Mitigation Activities**

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

Cooper County has been recognized by the National Weather Service as a StormReady® Community. In order to become recognized as StormReady®, the Emergency Management Agency is evaluated on its abilities to do the following:

- receive real-time weather information from the NWS
- disseminate that information to the public
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- educate the public regarding weather hazards/protection

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

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

Safe Rooms Hannah Cole Elementary School in Boonville was built in 2016 with a safe room built to FEMA standards incorporated into its gymnasium.

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

Shelters There are numerous Red Cross Certified Shelters in the planning area should sheltering become necessary (Figures 3.7).

## SUMMARY OF VULNERABILITY

The entire planning area is vulnerable to the potentially devastating impact of tornadoes. Their random nature and potentially quick speed of onset pose particular risks for human life. Tornadoes of the magnitude known to historically occur in the area can wreak extensive and costly structural damage.

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

identified needs have been targeted for action in the mitigation strategy, but funding remains an issue for the costly safe rooms and generators/power transfer hookups.

## 4.4 FLOOD

### DESCRIPTION OF HAZARD

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

Cooper County and its jurisdictions are at great risk for flooding because the northern border of the County is situated on the bank of the Missouri River, the longest river in the United States. The Missouri River drains approximately one-sixth of the area of the continental United States, according to the USGS. It drains over half the state of Missouri as it flows eastward to join the Mississippi River at St. Louis. Since Cooper County is located less than 200 miles upstream from the mouth of this 2,540 mile river, it is obvious that flooding is a major concern for the county. There are also numerous creeks throughout the county with year-round water flows draining into the Missouri River.

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

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

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

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

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

**Location**

The entire planning area is at risk from some type of flooding. Boonville, Bunceton, Otterville, Pilot Grove, Wooldridge, and the unincorporated areas of Cooper County near the Missouri River, Lamine River, and Petite Saline Rive are at higher risk of riverine flooding than the rest of the county.

The current Flood Insurance Rate Map (FIRM) for Cooper County is dated May 3, 2011; it shows the flood zones for these jurisdictions at greater risk. Flood zones are geographic areas defined according to varying levels of flood risk; each zone reflects the severity or type of flooding in the area.

The FIRMs for the participating jurisdictions at greater risk are included (see figures 4.24 through 4.29).

**Figure 4.24 (reviewed by Beau Derque, September 2016)**

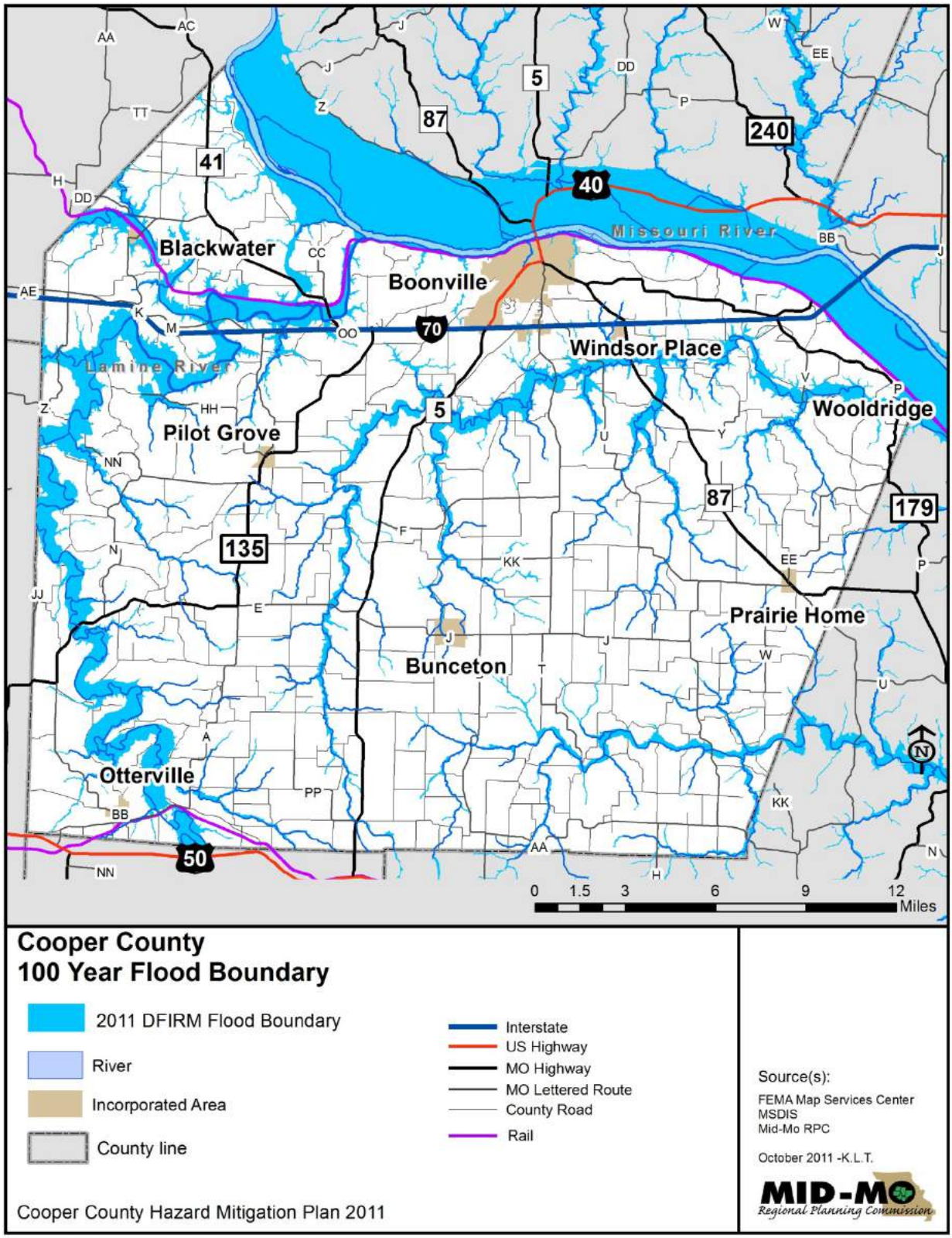


**Figure 4.25 (reviewed by Beau Derque, September 2016)**

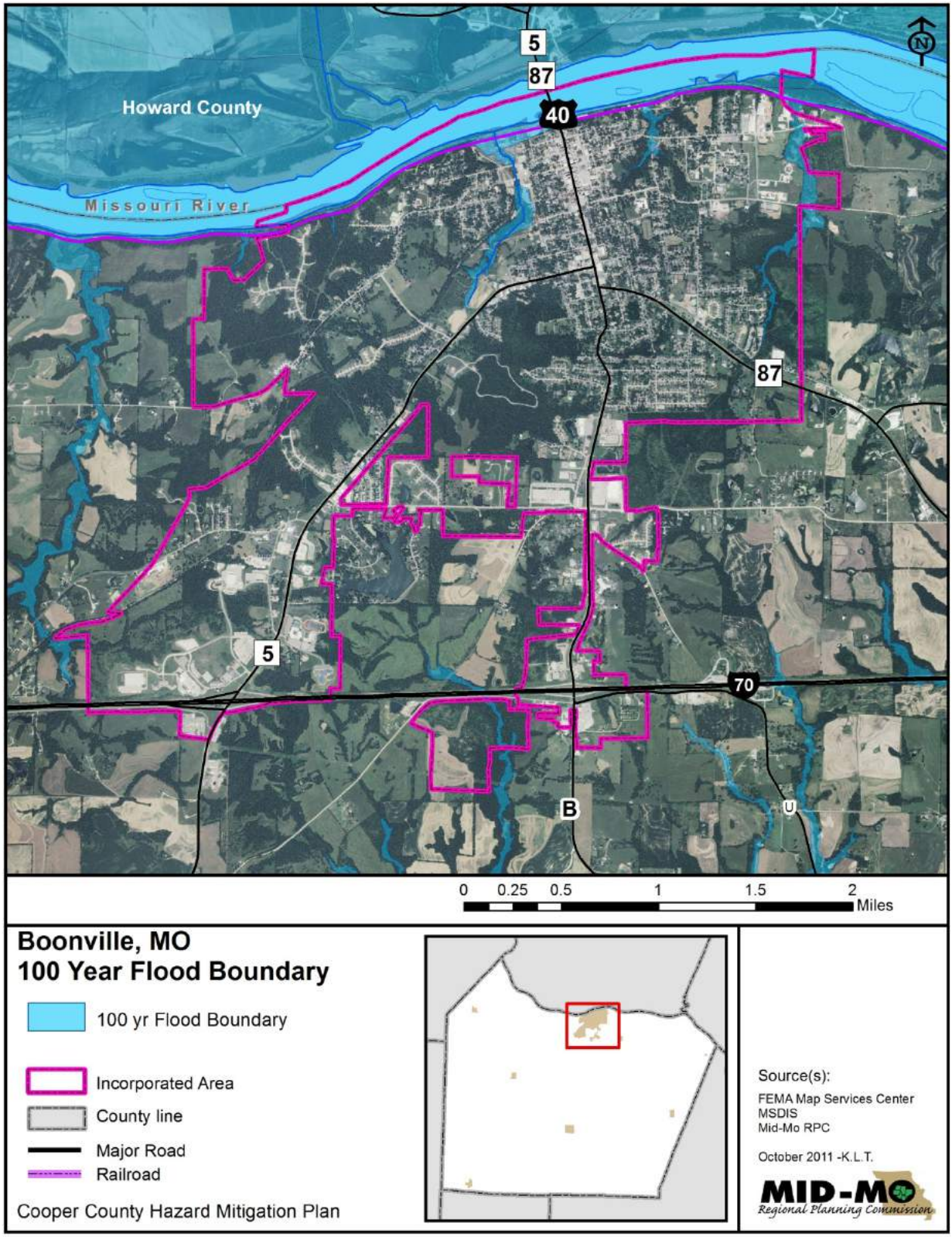


**Figure 4.26 (reviewed by Beau Derque, September 2016)**

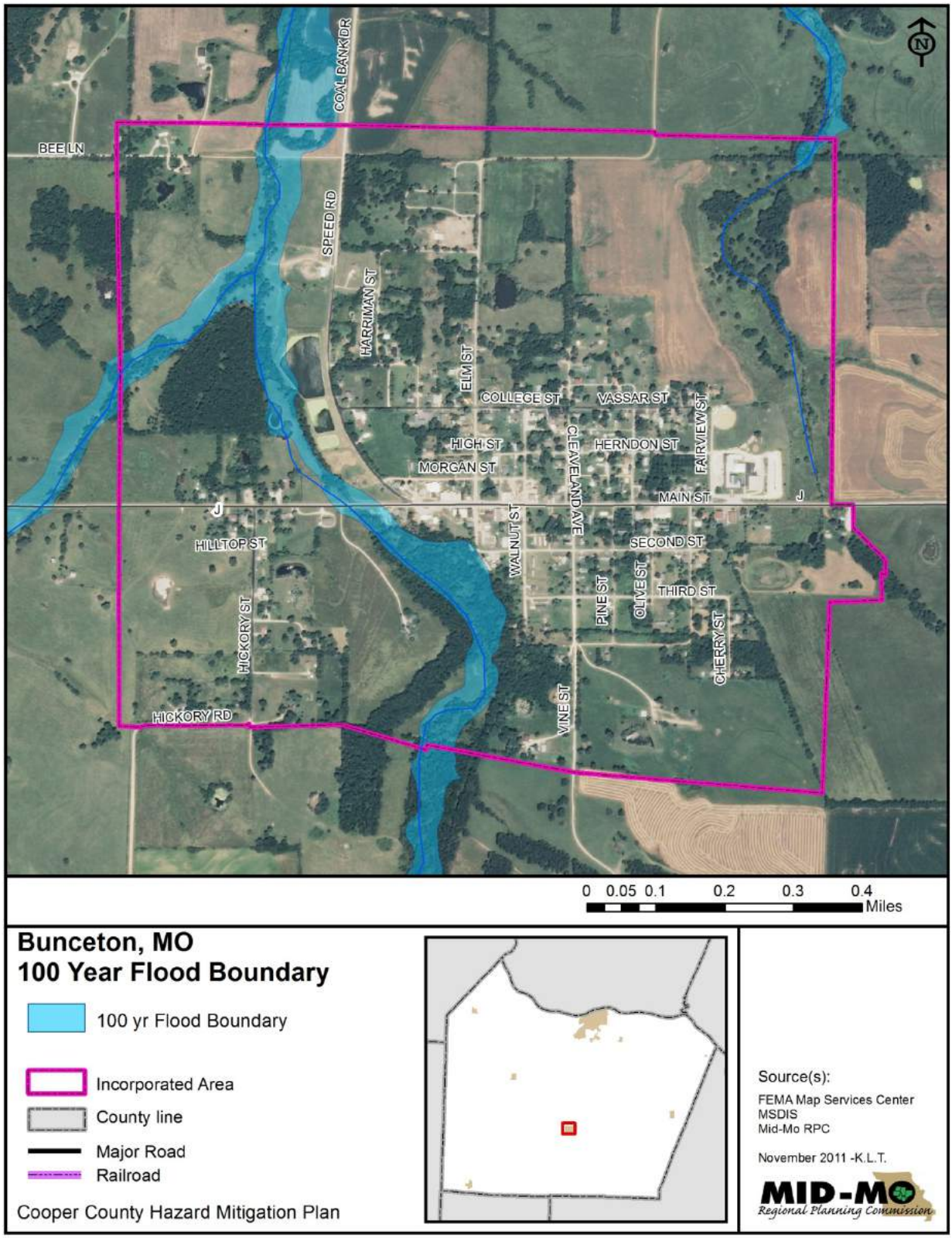


**Figure 4.27 (reviewed by Beau Derque, September 2016)**

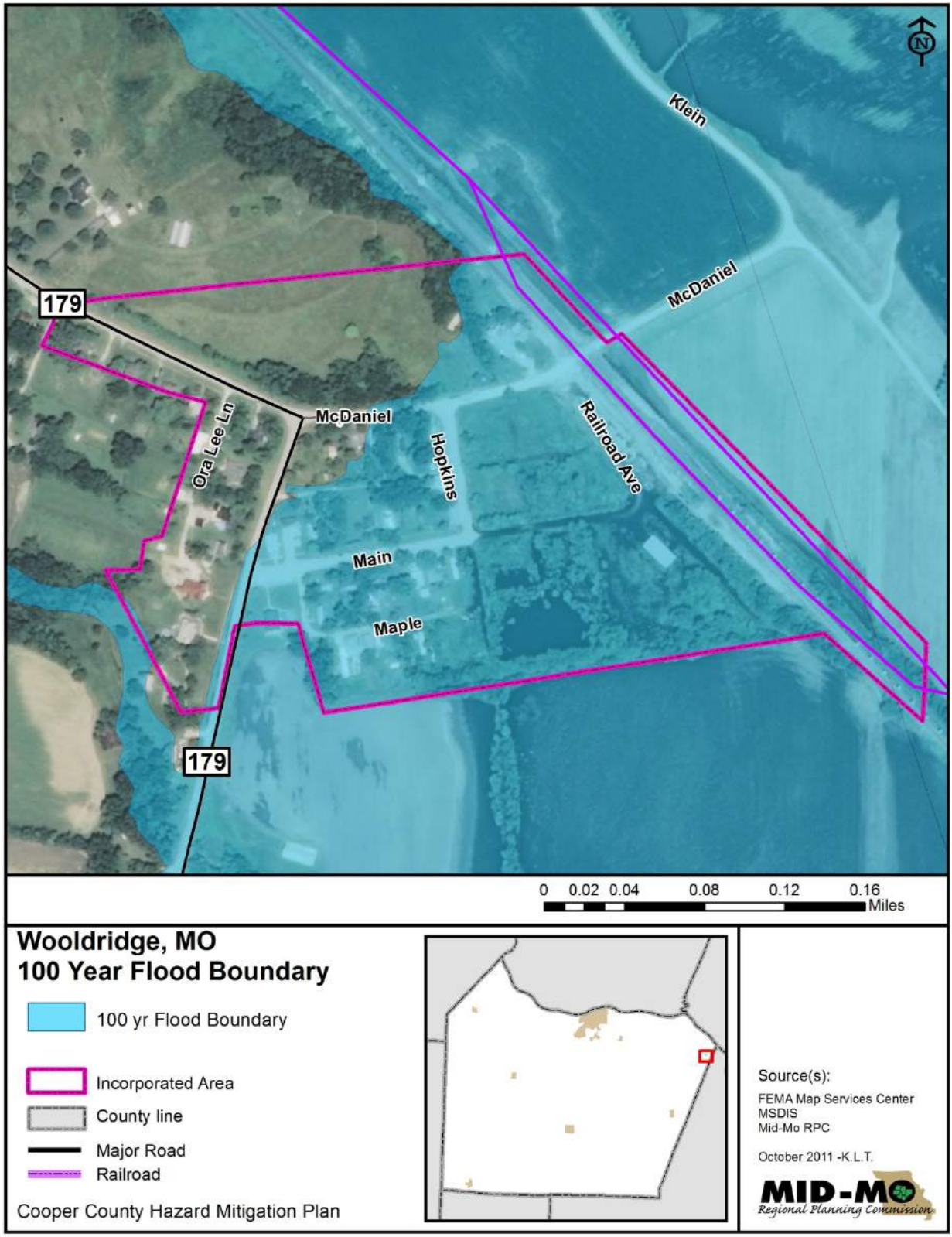


**Figure 4.28 (reviewed by Beau Derque, September 2016)**

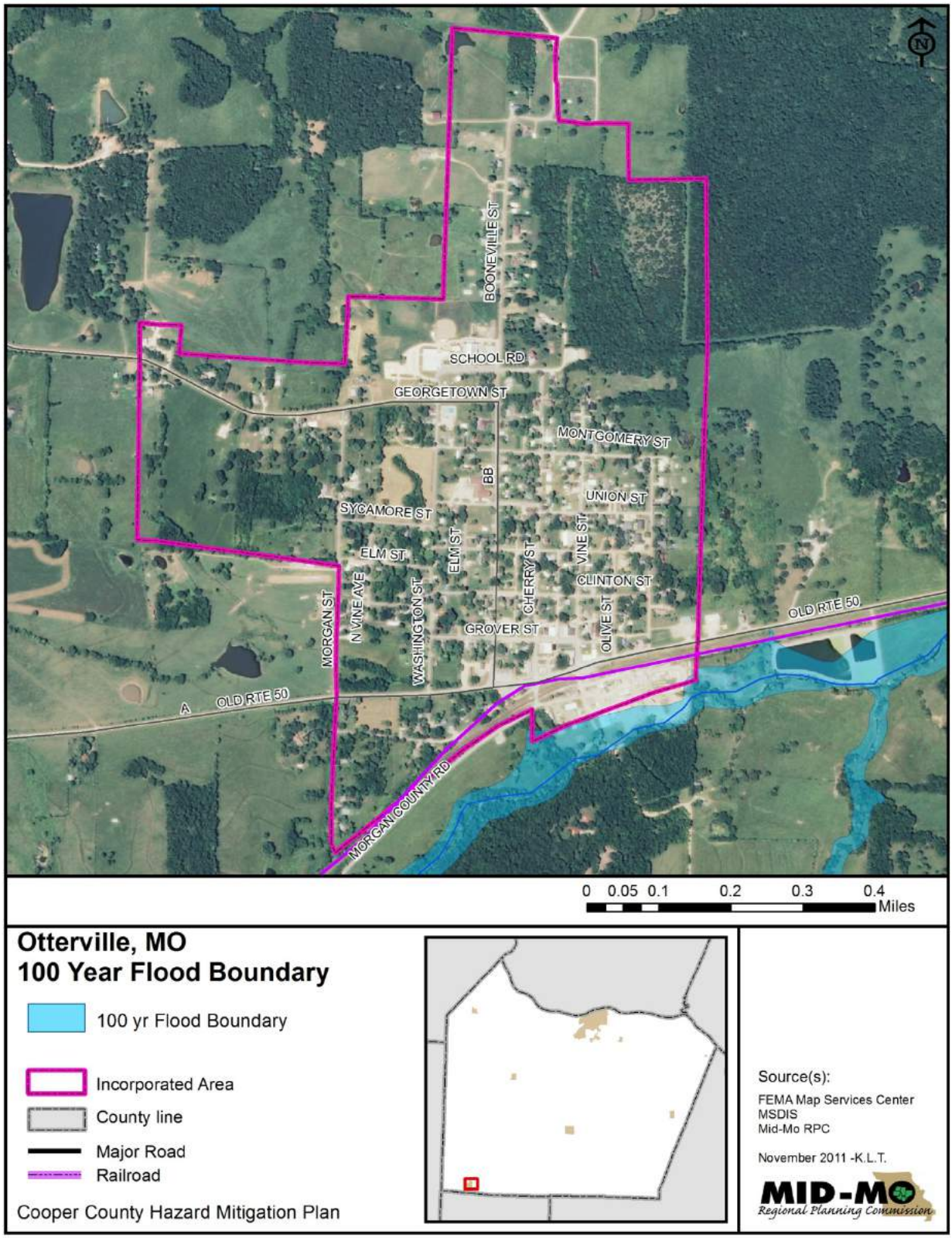
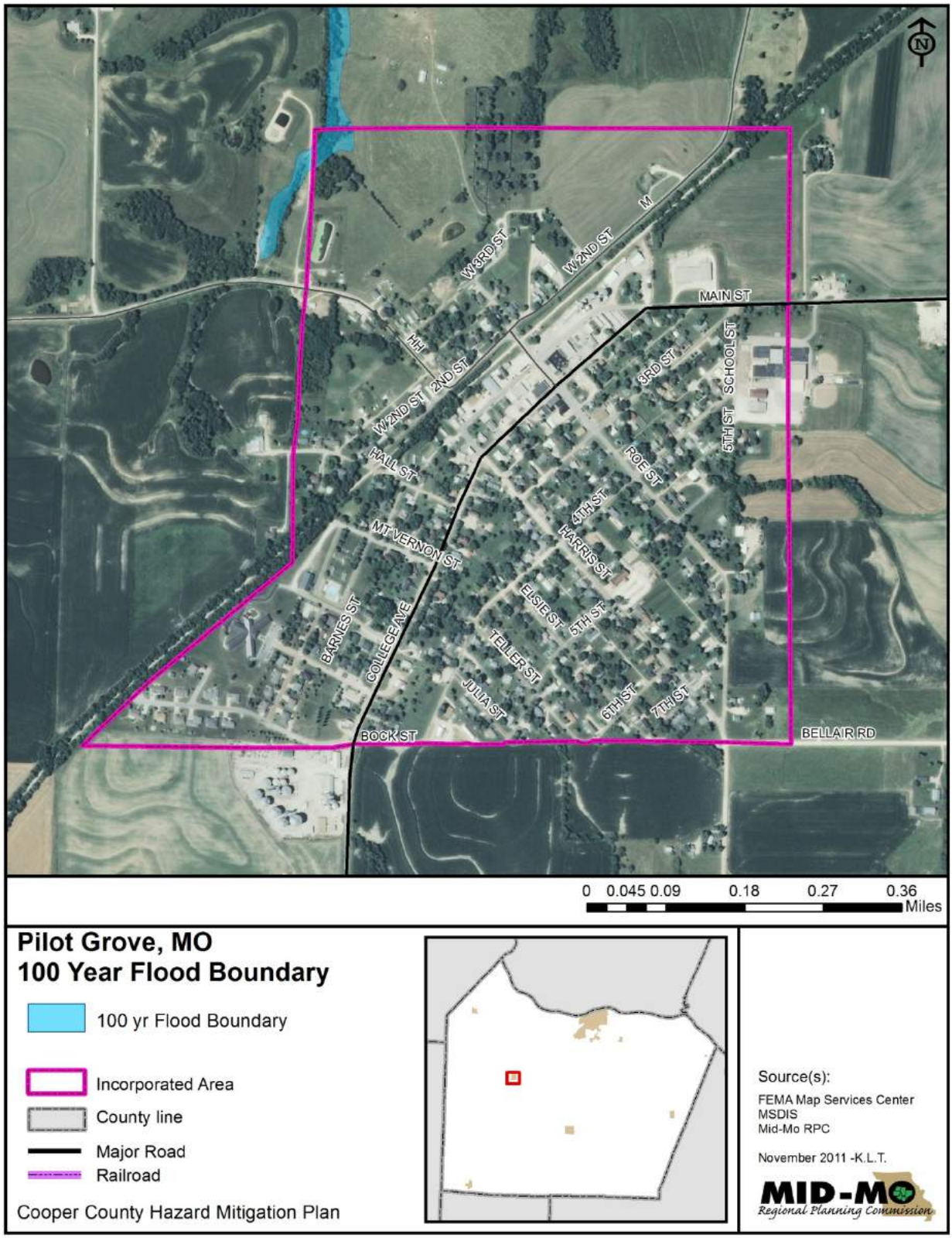


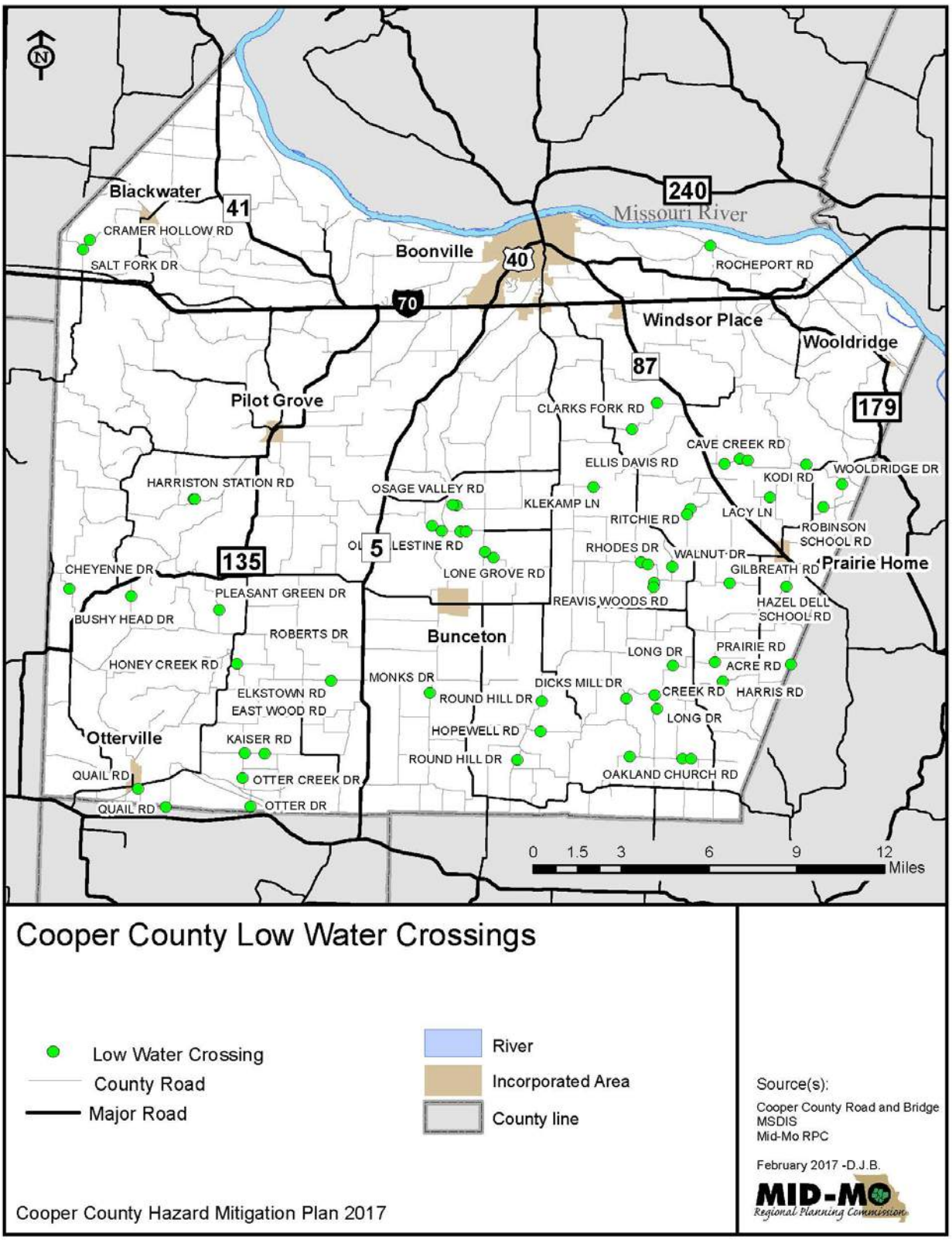
**Figure 4.29 (reviewed by Beau Derque, September 2016)**



Flash flooding areas are a concern for all jurisdictions in the planning area. Flash flooding occurs throughout the planning area; as a result, low water crossings can be potentially high-risk areas for accidents due to high water. Road closures in these areas are rare due to the quick rise and fall of water levels. Figure 4.30a depicts low water crossing locations.

Cooper County Public Works Department maintained low water crossings for the 2017 update of the hazard mitigation plan. The information was reviewed and approved as current by Cooper County Public Works Department during the 2017 update.

**Figure 4.30**


Blackwater
41
240
Missouri River
CRAMER HOLLOW RD
SALT FORK DR
Boonville
40
ROCHEPORT RD
70
Windsor Place
Wooldridge
87
Pilot Grove
179
CLARKS FORK RD
CAVE CREEK RD
ELLIS DAVIS RD
WOOLDRIDGE DR
KODI RD
HARRISTON STATION RD
OSAGE VALLEY RD
KLEKAMP LN
LACY LN
RITCHIE RD
ROBINSON SCHOOL RD
5
LESTINE RD
RHODES DR
WALNUT DR
135
CHEYENNE DR
LONE GROVE RD
GILBREATH RD
Prairie Home
PLEASANT GREEN DR
REAVIS WOODS RD
HAZEL DELL SCHOOL RD
BUSHY HEAD DR
ROBERTS DR
Bunceton
LONG DR
PRAIRIE RD
HONEY CREEK RD
ACRE RD
MONKS DR
DICKS MILL DR
ELKSTOWN RD
CREEK RD
HARRIS RD
ROUND HILL DR
EAST WOOD RD
LONG DR
HOPEWELL RD
Otterville
KAISER RD
ROUND HILL DR
QUAIL RD
OTTER CREEK DR
OAKLAND CHURCH RD
QUAIL RD
OTTER DR
0 1.5 3 6 9 12
Miles
Cooper County Low Water Crossings
Low Water Crossing
County Road
Major Road
River
Incorporated Area
County line
Source(s):
Cooper County Road and Bridge
MSDIS
Mid-Mo RPC
February 2017 -D.J.B.
MID-MO
Regional Planning Commission
Cooper County Hazard Mitigation Plan 2017

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

Riverine flooding –

- Speed of onset - Riverine flooding is a hazard that allows for mitigation, preparation, and potential evacuation because of the relatively long speed of onset.

- Duration - An examination of the NOAA data for riverine flooding from January 1, 1996, through May 31, 2016, indicates an average duration of approximately 3.9 days per event (Figure 4.31).

| **Figure 4.31** | | | |
|---|---|---|---|
| **Cooper County Historic Data** | | | |
| **River Flooding** | | | |
| **January 1, 1996 - May 31, 2016** | | | |
| **Location** | **Date** | **River** | **Duration (days)** |
| Otterville | 1996: 5/6/96-5/8/96 | Lamine | 3 |
| Boonville | 1996: 5/8/96-5/16/96 | Missouri | 9 |
| Boonville | 1996: 5/25/96-5/31/96 | Missouri | 7 |
| Boonville | 1996: 6/1/96-6/11/96 | Missouri | 11 |
| Boonville | 1996: 6/18/96-6/20/96 | Missouri | 3 |
| Boonville | 1996: 6/25/96-6/30/96 | Missouri | 6 |
| Otterville | 1996: 7/21/96-7/23/96 | Lamine | 3 |
| Boonville | 1996: 7/21/96-7/24/96 | Missouri | 4 |
| 13 counties | 1997: 2/21/97-2/28/97 | Missouri | 8 |
| 5 counties | 1997: 2/26/97-2/27/97 | Lamine | 2 |
| 6 counties | 1997: 4/11/97-4/27/97 | Missouri | 17 |
| 6 counties | 1997: 5/3/97-5/11/97 | Missouri | 9 |
| 7 counties | 1997: 5/26/97-5/28/97 | Lamine | 3 |
| 7 counties | 1998: 3/8/98-3/9/98 | Lamine | 2 |
| 14 counties | 1998: 3/31/98-3/31/98 | Missouri | 1 |
| 12 counties | 1998: 4/1/98-4/6/98 | Missouri | 6 |
| 10 counties | 1998: 4/10/98-4/16/98 | Missouri | 7 |
| Otterville | 1998: 6/4/98-6/5/98 | Lamine | 2 |
| 3 counties | 1998: 6/8/98-6/9/98 | Lamine | 2 |
| 6 counties | 1998: 6/15/98-6/25/98 | Missouri | 11 |
| 10 counties | 1998: 6/20/98-6/23/98 | Lamine | 4 |

| | | | |
|---|---|---|---|
| 2 counties | 1998: 7/1/98-7/1/98 | Missouri | 1 |
| 2 counties | 1998: 7/26/98-7/27/98 | Lamine | 2 |
| Otterville | 1998: 7/29/98-7/29/98 | Lamine | 1 |
| 6 counties | 1998: 7/30/98-7/31/98 | Lamine | 2 |
| 4 counties | 1998: 8/1/98-8/1/98 | Missouri | 1 |
| 9 counties | 1998: 9/15/98-9/16/98 | Missouri | 2 |
| 15 counties | 1998: 10/5/98-10/11/98 | Missouri | 7 |
| 9 counties | 1998: 10/19/98-10/21/98 | Missouri | 3 |
| 14 counties | 1998: 11/2/98-11/14/98 | Missouri | 13 |
| 6 counties | 1999: 1/31/99-1/31/99 | Lamine | 1 |
| 5 counties | 1999: 2/1/99-2/1/99 | Lamine | 1 |
| 5 counties | 1999: 2/7/99-2/7/99 | Lamine | 1 |
| 6 counties | 1999: 3/8/99-3/9/99 | Lamine | 2 |
| 16 counties | 1999: 4/16/99-4/21/99 | Lamine | 6 |
| 12 counties | 1999: 4/23/99-4/30/99 | Missouri | 8 |
| 6 counties | 1999: 5/1/99-5/2/99 | Missouri | 2 |
| 12 counties | 1999: 5/4/99-5/8/99 | Missouri | 5 |
| 6 counties | 1999: 5/14/99-5/27/99 | Missouri | 14 |
| 2 counties | 1999: 6/3/99-6/3/99 | Missouri | 1 |
| 12 counties | 1999: 6/28/99-6/30/99 | Missouri and Lamine | 3 |
| 8 counties | 1999: 7/1/99-7/5/99 | Missouri | 5 |
| 3 counties | 2000: 2/18/00-2/19/00 | Lamine | 2 |
| 2 counties | 2000: 5/26/00-5/29/00 | Lamine | 4 |
| 3 counties | 2001: 1/29/01-1/30/01 | Lamine | 2 |
| 16 counties | 2001: 2/24/01-2/25/01 | Lamine | 2 |
| 4 counties | 2001: 4/3/01-4/5/01 | Lamine | 3 |
| 5 counties | 2001: 5/7/01-5/9/01 | Missouri | 3 |
| Otterville | 2002: 1/31/02-1/31/02 | Lamine | 1 |
| 4 counties | 2002: 5/8/02-5/17/02 | Missouri | 10 |
| 4 counties | 2002: 5/8/02-5/10/02 | Lamine | 3 |
| Otterville | 2003: 12/23/03-12/23/03 | Lamine | 1 |
| Otterville | 2004: 7/24/04-7/25/04 | Lamine | 2 |
| Otterville | 2004: 8/25/04-8/25/04 | Lamine | 1 |
| Otterville | 2004: 11/1/04-11/3/04 | Lamine | 3 |
| Otterville | 2004: 11/24/04-11/24/04 | Lamine | 1 |

| | | | |
|---|---|---|---|
| Otterville | 2004: 11/27/04-11/28/04 | Lamine | 2 |
| Otterville | 2005: 1/5/05-1/6/05 | Lamine | 2 |
| Otterville | 2005: 1/13/05-1/14/05 | Lamine | 2 |
| Otterville | 2005: 2/13/05-2/14/05 | Lamine | 1 |
| Boonville | 2005: 6/13/05-6/15/05 | Missouri | 3 |
| Otterville | 2005: 8/26/05-8/27/05 | Lamine | 2 |
| Otterville | 2007: 4/14/07-4/15/07 | Lamine | 2 |
| Boonville | 2007: 5/7/07-5/19/07 | Missouri | 13 |
| Otterville | 2007: 6/30/07-6/30/07 | Lamine | 1 |
| 5 counties | 2007: 7/1/07-7/1/07 | Lamine | 1 |
| 6 counties | 2008: 2/17/08-2/18/08 | Lamine | 2 |
| 9 counties | 2008: 3/18/08-3/19/08 | Lamine | 2 |
| Otterville | 2008: 4/10/08-4/11/08 | Lamine | 2 |
| 7 counties | 2008: 4/24/08-4/25/08 | Lamine | 2 |
| Otterville | 2008: 5/8/08-5/8/08 | Lamine | 1 |
| Average duration of river flooding in planning area (days) | | | 3.9 |
| Source: http://www.ncdc.noaa.gov/stormevents | | | |

Small Stream and Flash Flooding –

- Speed of onset - In contrast to riverine flooding, small stream flooding and flash flooding occur very quickly with heavy rains.

- Duration - Flash flooding in the planning area usually takes place within the span of one day, according to the NOAA data (Figure 4.32). The data of reported events in the NOAA database indicates an average duration of 4.4 hours.

**Figure 4.32**

**Cooper County Historic Data**

**Flash Flooding**

**January 1, 1996 – May 31, 2016**

| Location | Date | Duration (hours) |
|---|---|---|
| South portion of Cooper County | 5/26/2000 | 8 |
| Bunceton | 4/10/2001 | 1 |
| Boonville | 5/7/2002 | 3 |
| Boonville | 5/8/2002 | 3 |
| Pilot Grove | 5/19/2004 | 3 |
| Wooldridge | 5/25/2004 | 3 |
| Wooldridge | 5/25/2004 | 3 |
| Boonville | 5/30/2004 | 3 |
| Boonville | 8/4/2004 | 6 |
| Pilot Grove | 1/12/2005 | 5 |
| Prairie Home | 6/8/2005 | 5 |
| Boonville | 8/18/2005 | 4 |
| Boonville | 8/26/2005 | 3 |
| Bunceton | 6/10/2007 | 4 |
| Otterville | 6/10/2007 | 4 |
| Blackwater | 6/29/2007 | 4 |
| Prairie Home | 9/12/2008 | 6 |
| Bunceton | 9/12/2008 | 6 |
| Boonville Viertel Airport | 9/12/2008 | 6 |
| Blackwater | 6/15/2009 | 6 |
| Bunceton | 4/29/2012 | 6 |
| Bunceton | 5/20/2013 | 6 |
| Boonville | 5/31/2013 | 6 |
| Boonville | 9/1/2014 | 1 |
| Average duration of flash flooding in planning area (hours) | | 4.4 |

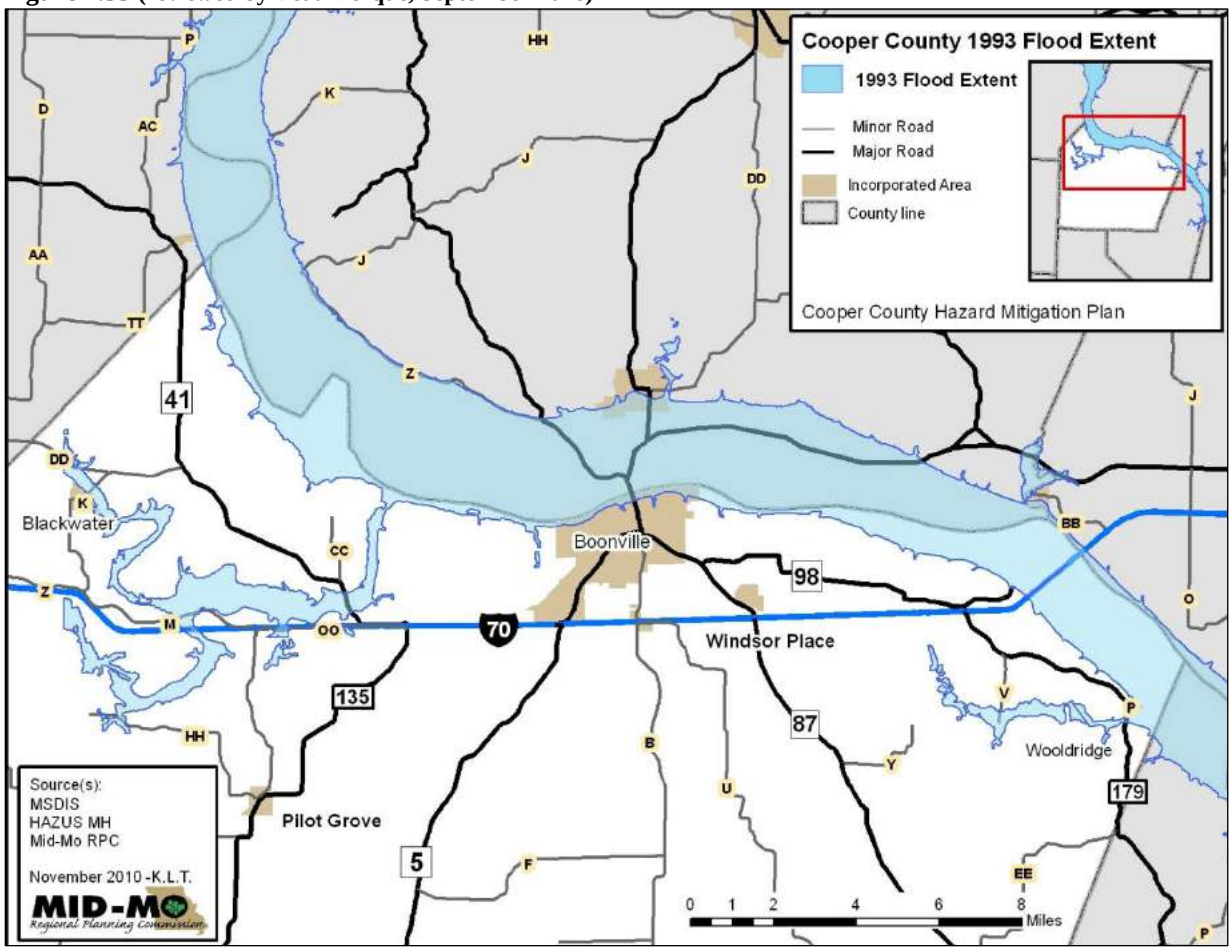
Source: http://www.ncdc.noaa.gov/stormevents

Previous Occurrences

The floods of 1993 and 1995 were the worst repetitive flood events in Missouri history, according to the Missouri State Hazard Mitigation Plan (2007). There was also severe flooding in the state in 1994. There were five presidential disaster declarations for flooding during this period; Cooper County was included in Disaster Declaration 995 (July 9, 1993) and Disaster Declaration 1054 (June 2, 1995). Figure 3.5.8 depicts the extent of the 1993 flood waters. Figures 4.28 and 4.29 give a list of documented flooding events in the county.

After a Presidential Disaster Declaration, Public Assistance (PA) and/or Individual Assistance (IA) is made available through FEMA. Cooper County was eligible for both PA and IA from each of these disaster declarations.

**Figure 4.33 (reviewed by Beau Derque, September 2016)**




In the summer of 2011, the Missouri River flooded again, this time stemming not from significant precipitation in the Mid-Missouri Region but from high precipitation and snow melt in Montana and North Dakota. Higher than normal rain and snow in the winter and spring of 2011 caused wide scale flooding in several states, including North Dakota, South Dakota, Nebraska, Iowa, Kansas, and Missouri. According to the National Weather Service, the Upper Missouri River Valley received more rainfall in the month of May than it does in an entire year.

While Cooper County was spared from incurring damage to residences or businesses, unlike upriver neighbors, it was not spared from seepage through levee walls. All levee districts in Cooper County had to pump water from inside levee walls during the months of June and July. Cooper County was part of both the Emergency Declaration 3325 and the Presidential Disaster Declaration 1980 and eligible for PA and IA. Significant pumping was needed in all levee districts as well as sandbagging and maintenance of the levee in the Village of Wooldridge. The levee that protects a portion of Wooldridge had been in serious disrepair. As flood waters were rising, volunteers, county workers, and the National Guard worked to clear debris on the levee and then placed sandbags to add extra protection. Thankfully, the river crested without reaching the levee.

In addition to the river floods of 1993, 1995, and 2011, data from NOAA indicates numerous other flooding events in Cooper County since 1993. The Missouri River flood in April 1994 caused $5 million in property damage and $5 million in crop damage across 79 Missouri counties; the portion of this reported loss that occurred in Cooper County is not indicated in the NOAA data.

Flash flooding can be particularly hazardous in that there may be very little warning for travelers. The NOAA data contains specific information about two flash flooding events where travelers were endangered in Cooper County. Two cars were swept off Highway 5 near Bunceton in the flash flood on June 10, 2007. In the other incident, a car was stalled on Highway W near Prairie Home with floodwaters reaching the door of the vehicle (September 12, 2008). No indication of injury was given in the data for these incidents.

There have been 24 reported flash flooding events since 1996 (Figure 4.32.)

The death reported from the flooding in June 1999 did not occur in Cooper County.

## Probability of Future Events

| Figure 4.34 | | | |
|---|---|---|---|
| **Probability of Future Flooding Events** | | | |
| **EF-Scale** | **# of years with flood event (1996-2016)** | **Probability** | **Probability Rating** |
| River flood | 12 | 57% | High |
| Flash flood | 11 | 52% | High |

Probability: High – Cooper County, Boonville, Wooldridge, Linneman-Weekley Levee District, and the Overton-Wooldridge Levee District

Low – Bunceton, Otterville, Pilot Grove

## ANALYSIS OF RISK

Severity: High – Wooldridge, Linneman-Weekley Levee District, and the Overton-Wooldridge Levee District

Moderate – Cooper County

Low – Bunceton, Otterville, Pilot Grove

**National Flood Insurance Program Repetitive Loss Properties**

| | | | |
|---|---|---|---|
| | **Requirement §201.6(c)(2)(ii) :** | ***[The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.*** | |
| | | | |

The NFIP defines a **Repetitive Loss Property** as "any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978." A repetitive loss property may or may not currently be insured by the NFIP. There are no Repetitive Loss Properties in Cooper County, according to the Missouri State Hazard Mitigation Plan (2013).

**A Severe Repetitive Loss (SRL)** property is defined as a **residential property** that is covered under an NFIP flood insurance policy and:

> (a) Has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
>
> (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
>
> For both (a) and (b) above, at least two of the referenced claims must have occurred within any 10-year period, and must be greater than 10 days apart.

There are no Severe Repetitive Loss Properties in Cooper County, according to the Missouri State Hazard Mitigation Plan (2013).

**Potential Impact – Life**

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

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

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

**Potential Impact on Existing Structures**

Cooper County residents, structures, and infrastructure lying in or near the Missouri River Floodplain or Lamine River Floodplain are all vulnerable to the effects of a major flood. Other structures not within designated floodplains are also vulnerable to the effects of flash flooding brought on by storm water or sheet flooding. Figures 4.24 through 4.29 depict the 100-year flood plain for Cooper County. Through the use of high resolution 2007 aerial imagery from the Missouri Spatial Data Service at the University of Missouri, a GIS Specialist for the Mid-Missouri Regional Planning Commission was able to see and count structures in the floodplain. It was found that only Cooper County (unincorporated area), Boonville, Bunceton, and Wooldridge had structures in the floodplain. There were 359 structures in all of Cooper County, with 24 of those in Boonville, one in Bunceton, and 36 in Wooldridge. These structures may consist of businesses, residences, towers, outbuildings, or other manmade structures. Further analysis of the data may give a more precise categorization of the structures.

It can be said with certainty that there are not fire stations, schools, nursing homes, hospitals, prisons, government centers, or police stations in the 100-year floodplain.

Both the City of Bunceton and the City of Otterville have their wastewater lagoons located partially within the 100-year floodplain. This has not posed a significant problem for either community.

## Existing Mitigation Activities

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

National Flood Insurance Program (NFIP)

The National Flood Insurance Act of 1968 established the National Flood Insurance Program (NFIP) to help encourage wise development and reduce losses from flood. Communities participating in the NFIP agree to adopt and enforce floodplain management ordinances to reduce risks to new and improved structures in Special Flood Hazard Areas. (A Special Flood Hazard Area (SFHA) is an area of land that has a 1-percent chance of being inundated by a flood in any given year; this area is also called the "base flood" or commonly referred to as the "100-year flood" area.)

A county or community's membership in the NFIP enables property owners to purchase flood insurance at a more affordable cost than market-based insurance. This also helps reduce the post-disaster assistance required in flood damage situations.

Participation in the National Flood Insurance Program is a critical aspect of hazard mitigation planning because it provides communities with direct resources that can be used for controlling the potentially devastating impacts of floods. Furthermore, participation in the program helps communities more easily recover from flood impacts.

The NFIP statuses of jurisdictions in the planning area are shown in Figure 4.35.

**Figure 4.35**

**Cooper County Jurisdictions - NFIP Status**

**Participating**

| Jurisdiction | Entry into Program | Date of Current FIRM | Community ID (CID) |
|---|---|---|---|
| Cooper County | 9/1/1989 | 5/3/2011 | 290794 |
| Blackwater | 12/7/1984 | 5/3/2011 | 290109 |
| Boonville | 10/16/1984 | 5/3/2011 | 290110 |
| Bunceton | 1/7/2016 | 5/3/2011 | 290111A |
| Pilot Grove | 11/24/2008 | 5/3/2011 | 290678 |
| Wooldridge | 12/4/1984 | 5/3/2011 | 290112 |
| Otterville | 4/25/1976 | 5/3/2011 | 290556 |

*Sanction Date indicates the date that a community decided not to participate in the NFIP (or was suspended for noncompliance).

Source: NFIP Community Status Book

A comparison of NFIP insurance policies in effect in the planning area in 2011 and 2016 indicates an overall increase of only one policy (Figure 4.36). While the amount of property insured decreased, the premiums being paid increased by 14.48 percent. This reflects the increase in the price of flood insurance, even when purchasing it through the NFIP.

**Figure 4.36**

**NFIP Policies in Cooper County**

| Community | Policies In-Force | | Insurance In-Force Whole | | Written Premium In-Force | |
|---|---|---|---|---|---|---|
| | 11/7/2011 | 7/31/2016 | 11/7/2011 | 7/31/2016 | 11/7/2011 | 7/31/2016 |
| Cooper County* | 3 | 3 | $388,000 | $148,000 | $1,244 | $1,540 |
| Blackwater | NA | 1 | NA | $30,000 | NA | $521 |
| Boonville | 1 | 1 | $1,000,000 | $1,000,000 | $1,457 | $1,552 |

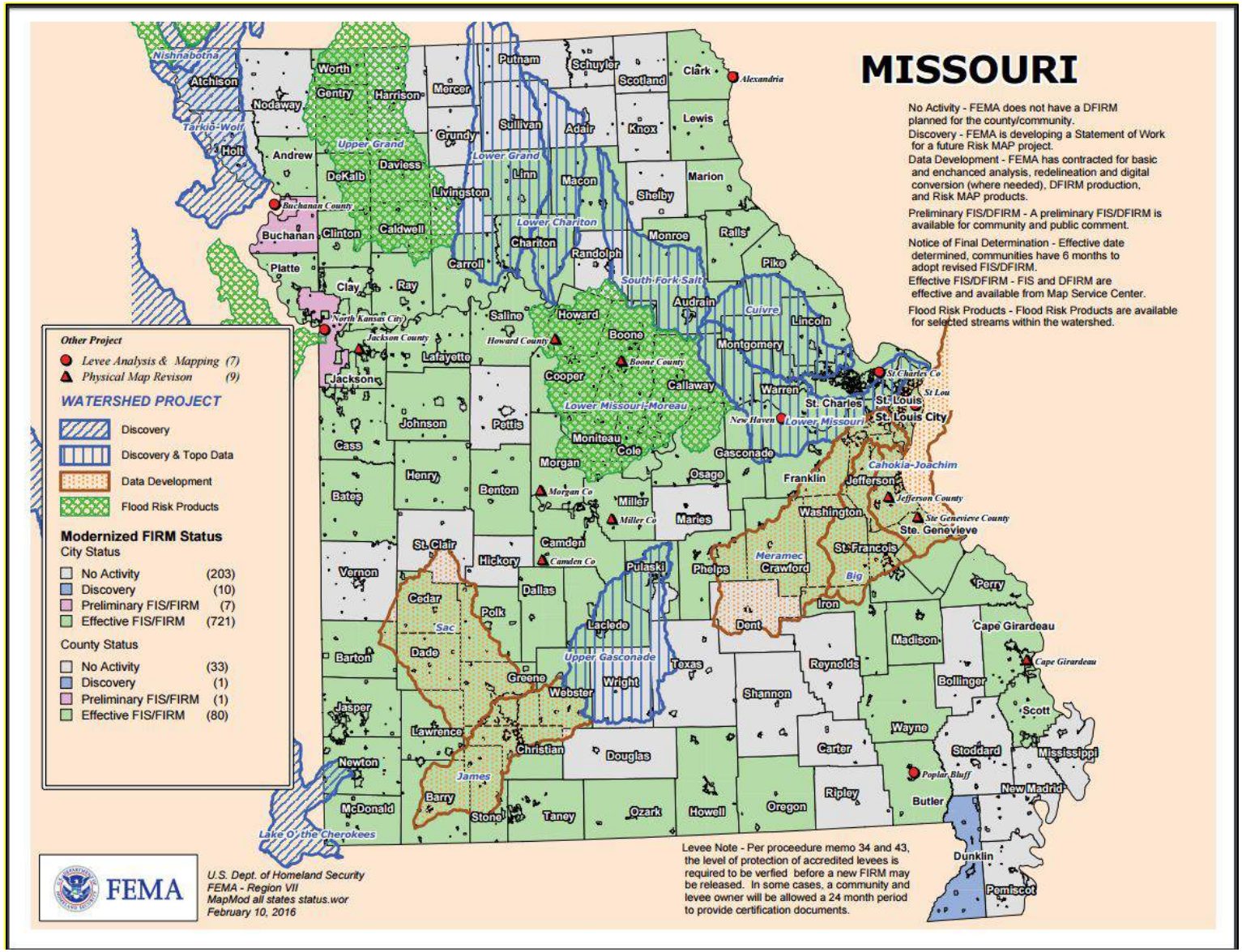
*Unincorporated areas of county only

Source: bsa.nfipstat.fema.gov/reports/1011.htm#MOT

## Risk MAP

Risk MAP is a FEMA program focused on flood risk reduction. According to FEMA, the program "provides communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens. Through more accurate flood maps, risk assessment tools, and outreach support, Risk MAP builds on Map Modernization and strengthens local ability to make informed decisions about reducing risk."

**Figure 4.37**


MISSOURI
No Activity - FEMA does not have a DFIRM planned for the county/community.
Discovery - FEMA is developing a Statement of Work for a future Risk MAP project.
Data Development - FEMA has contracted for basic and enchanced analysis, redelineation and digital conversion (where needed), DFIRM production, and Risk MAP products.
Preliminary FIS/DFIRM - A preliminary FIS/DFIRM is available for community and public comment.
Notice of Final Determination - Effective date determined, communities have 6 months to adopt revised FIS/DFIRM.
Effective FIS/DFIRM - FIS and DFIRM are effective and available from Map Service Center.
Flood Risk Products - Flood Risk Products are available for selected streams within the watershed.
Other Project
Levee Analysis & Mapping (7)
Physical Map Revison (9)
WATERSHED PROJECT
Discovery
Discovery & Topo Data
Data Development
Flood Risk Products
Modernized FIRM Status
City Status
No Activity (203)
Discovery (10)
Preliminary FIS/FIRM (7)
Effective FIS/FIRM (721)
County Status
No Activity (33)
Discovery (1)
Preliminary FIS/FIRM (1)
Effective FIS/FIRM (80)
Levee Note - Per proceedure memo 34 and 43, the level of protection of accredited levees is required to be verfied before a new FIRM may be released. In some cases, a community and levee owner will be allowed a 24 month period to provide certification documents.
FEMA
U.S. Dept. of Homeland Security
FEMA - Region VII
MapMod all states status.wor
February 10, 2016
Nishnabotna
Atchison
Nodaway
Worth
Gentry
Harrison
Mercer
Putnam
Schuyler
Scotland
Clark
Alexandria
Tarkio-Wolf
Holt
Andrew
Upper Grand
Grundy
Sullivan
Adair
Knox
Lewis
Lower Grand
Daviess
DeKalb
Linn
Macon
Shelby
Marion
Buchanan County
Buchanan
Clinton
Caldwell
Livingston
Lower Chariton
Chariton
Monroe
Ralls
Platte
Carroll
Randolph
Pike
Clay
Ray
South Fork Salt
Audrain
Cuivre
Lincoln
North Kansas City
Jackson County
Saline
Howard
Howard County
Boone
Boone County
Montgomery
Jackson
Lafayette
Cooper
Callaway
Warren
St. Charles Co
St. Louis
St. Charles
St. Louis City
Lower Missouri-Moreau
New Haven
Lower Missouri
Johnson
Pettis
Moniteau
Cole
Gasconade
Cass
Morgan
Osage
Franklin
Cahokia-Joachim
Jefferson
Jefferson County
Henry
Benton
Morgan Co
Miller
Washington
Ste Genevieve County
Bates
Miller Co
Maries
Ste. Genevieve
St. Clair
Camden
St. Francois
Hickory
Camden Co
Pulaski
Meramec
Crawford
Big
Vernon
Phelps
Perry
Cedar
Dallas
Polk
Iron
Sac
Laclede
Dent
Cape Girardeau
Madison
Dade
Upper Gasconade
Texas
Reynolds
Cape Girardeau
Barton
Greene
Webster
Wright
Shannon
Bollinger
Scott
Jasper
Lawrence
Christian
Douglas
Carter
Wayne
Stoddard
Mississippi
Newton
James
Poplar Bluff
New Madrid
Barry
Ripley
Butler
McDonald
Stone
Taney
Ozark
Howell
Oregon
Lake O' the Cherokees
Dunklin
Pemiscot

### County

Cooper County posts signs at some of their low-water crossing to warn of flooding. Also, many state routes in the county have flood warning signs.

### Boonville

Boonville enforces floodplain ordinances; building codes and zoning contribute to this enforcement.

### Pilot Grove

Pilot Grove enforces floodplain ordinances.

### Wooldridge

The village has performed extensive maintenance to their levee and flood gate to prepare for future events that may occur.

### Other

The National Weather Service issues flooding hazard alerts according to three response levels (Figure 4.38). These alerts are broadcast through local media.

| **Figure 4.38** | |
|---|---|
| **Flood Response Levels** | |
| **Level** | **Description** |
| Flood Watch | Flash flooding or flooding is possible within a designated area |
| Flood Warning | Flash flooding or flooding has been reported or is imminent |
| Flood Advisory | Flooding of small streams, streets, and low lying areas—such as railroad underpasses and some urban drains—is occurring |

**Potential Impact - Future Development**
Impact on future development is directly related to floodplain management and regulations set forth by the county and individual communities.

There is a high level of awareness in the planning area regarding the dangers and potential of flooding. Participation in the NFIP means that floodplain ordinances are in place that regulate development in the floodplains of those jurisdictions.

It is now known that climate change is causing an increase in the type of heavy downpours that trigger flash flooding; it is reasonable to expect that flash flooding will become even more of a problem in the planning area than it has been in the past. Any increase in impervious surface means an increase in runoff. It is important that development projects are closely monitored to ensure compliance with all applicable storm water regulations in order to minimize the negative effects of flash flooding.

## SUMMARY OF VULNERABILITY

Large-scale floods, such as the 1993 flood, are devastating events for entire regions of the country. Not only was Mid-Missouri impacted, but the entire Midwest suffered large losses in life, property, and crop damage, which carried over to the rest of the United States. Transit routes were disrupted, people lost jobs, and crops never made it to market. Small-scale floods or flash flooding can impact a neighborhood or a city but are limited in their spatial extent.

The entire planning area is at risk from some type of flooding. The most common types of flooding in the area are flash and sheet flooding associated with heavy downpours. This type of flooding can impact a neighborhood or a city but are limited in their spatial extent. Flash flooding is of particular concern in the unincorporated parts of Cooper County, where roads can become impassable. Climate change is causing an increase in heavy downpours, and this will, in turn, most likely increase the frequency and/or severity of flash flooding.

Flooding of the Missouri River and the Lamine River (and their branches) is a potential problem for the areas near those rivers and branches.

NFIP membership, floodplain regulations, and a high awareness of the threat of potential flooding all act to help mitigate the vulnerability to this hazard.

## 4.5 LEVEE FAILURE

### DESCRIPTION OF HAZARD

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

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

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

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

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

Federally authorized and some non-federal levees may be eligible for Corps of Engineers rehabilitation assistance funding. It is important to note that current levees in the planning area are agricultural levees and as such are built to withstand only 50-year floods.

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

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

**Location**

The levee districts in Cooper County are found along the Missouri River on the northern and northeastern boundaries of Cooper County (see Figures 4.39 and 4.40). The levee that protects a portion of the Village of Wooldridge is located in northeastern Cooper County and protects the community from riverine flooding stemming from the Petite Saline Creek (see Figure 4.39). The Petite Saline Creek floods a large area of Cooper County when the Missouri River rises and backs up into this tributary.

**Figure 4.39 (reviewed by Beau Derque, September 2016)**

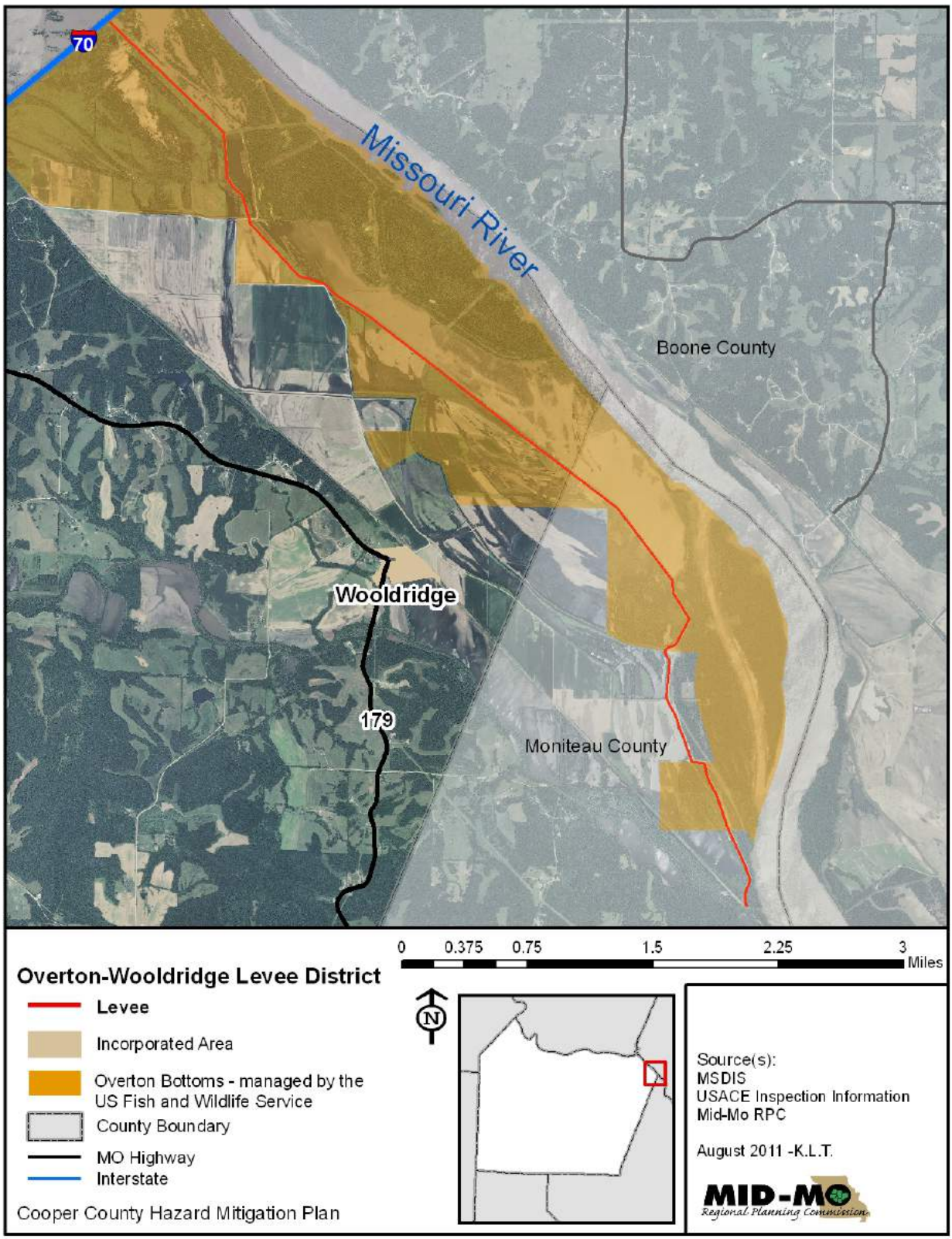


**Figure 4.40 (reviewed by Beau Derque, September 2016)**

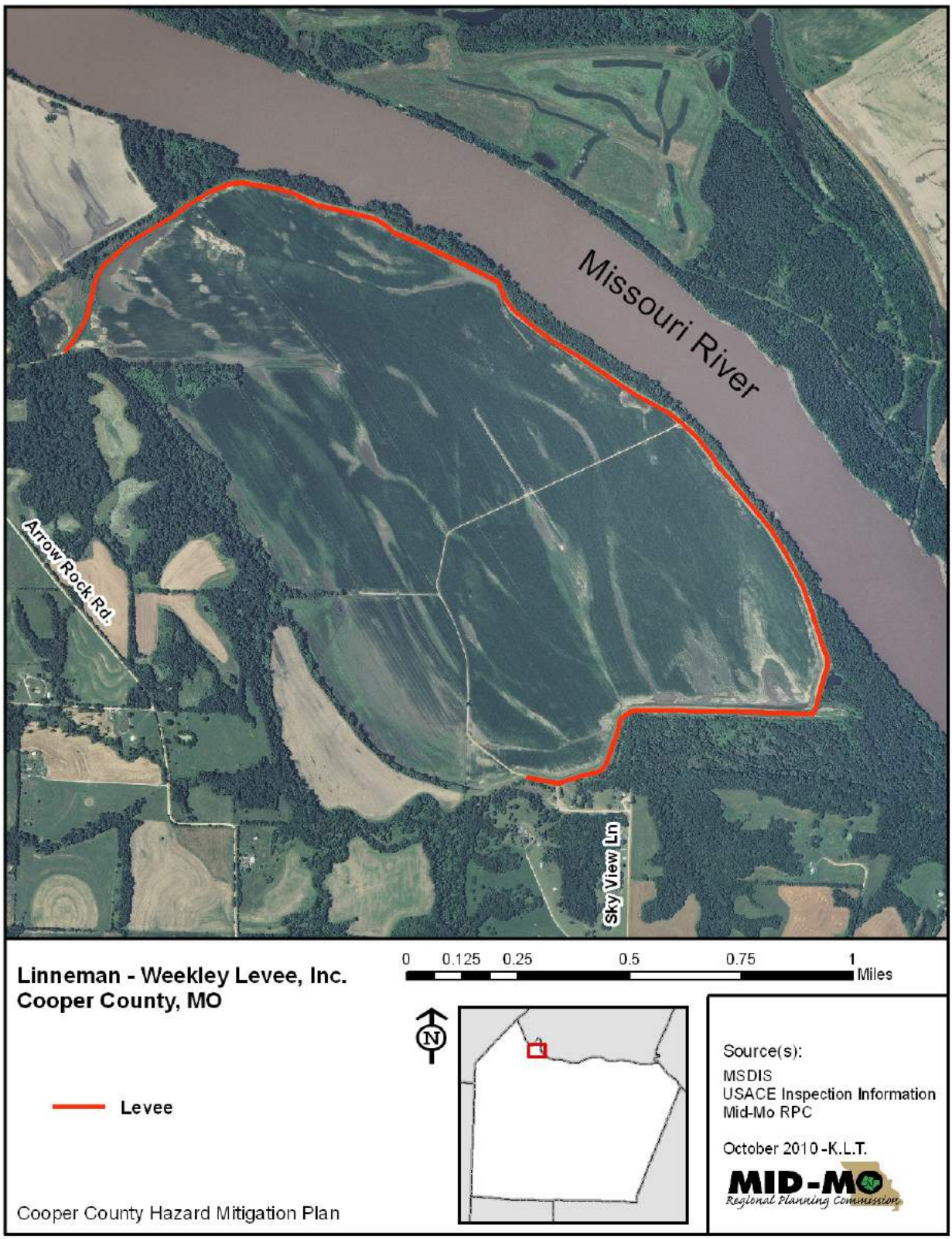
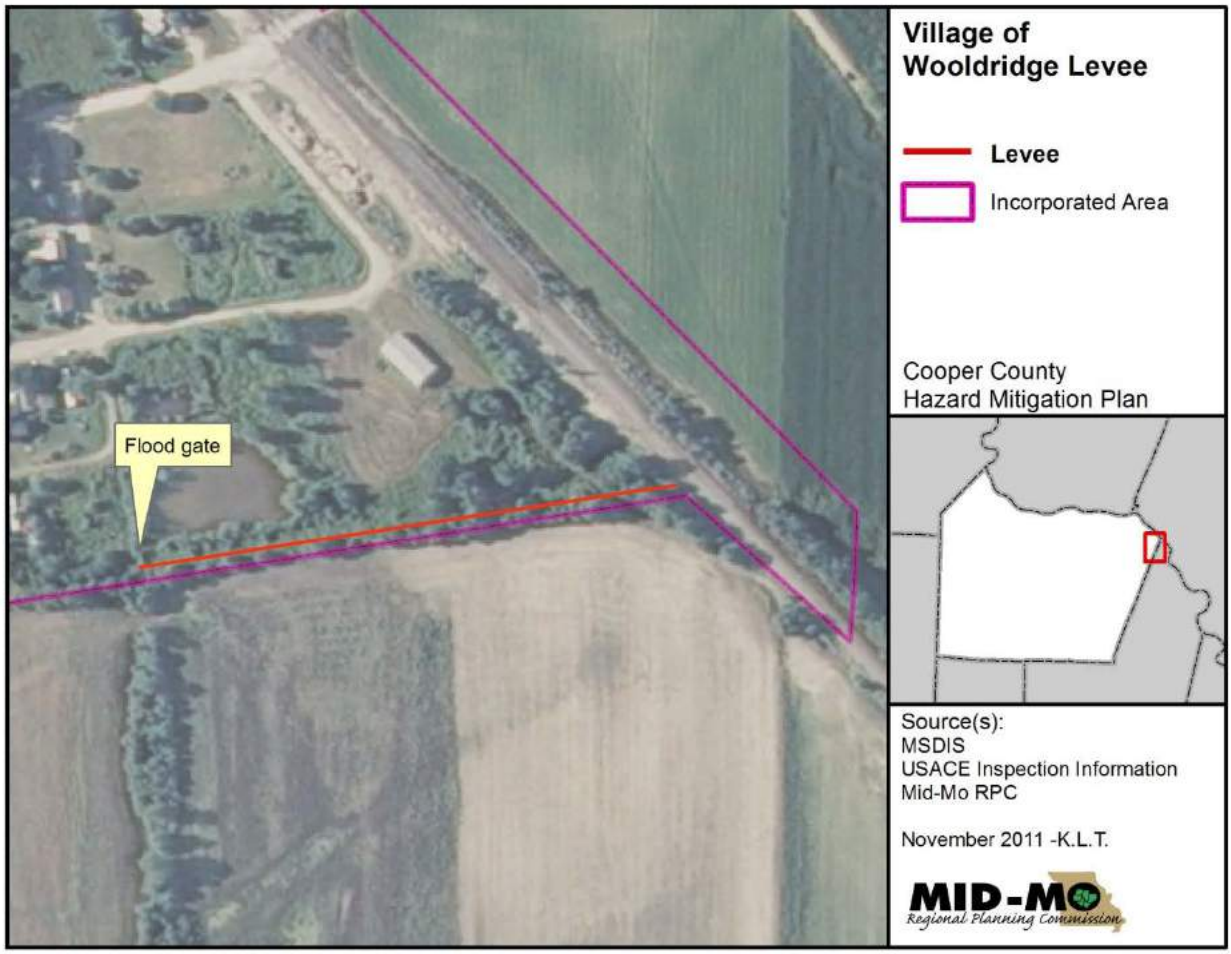


**Figure 4.41 (reviewed by Beau Derque, September 2016)**



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

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

The levee ratings from the most recent inspections in 2013, along with other information, are shown in Figure 4.42.

**Figure 4.42**

**Major Levees in the Planning Area**

| Levee Name | Segment Length (miles) | Levee Area Acreage | Inspection Date | Inspection Rating |
|---|---|---|---|---|
| Linneman-Weekley Levee | 3.75 | 888.11 | 5/13/2013 | Minimally acceptable |
| Overton-Wooldridge Levee District | x | x | x | x |
| Village of Wooldridge Levee | x | x | x | x |

Sources: USACE National Levee Database: USACE Levee Inspection Reports

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

**Extent**

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

- **Overtopping -** When a large flood occurs, water can flow over a levee. The stress exerted by the flowing water can cause rapid erosion.
- **Piping -** Levees are often built over old stream beds. Flood waters will follow these subgrade channels, causing a levee to erode internally, thereby allowing flood waters to rupture the levee structure.
- **Seepage and Saturation** - If flood waters sit up against a levee for a long period, the levee may become saturated and eventually collapse.
- **Erosion -** Most levees are constructed of sand or soil, which erodes easily under high-velocity flood waters.
- **Structural Failures -** Lack of regular maintenance is a key reason levees fail at gates, walls, or closure sites.

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

**Previous Occurrences**

According to the US Army Corps of Engineers, all levees in Cooper County and most of the surrounding counties failed during the 1993 Flood, resulting in the inundation of land and structures being protected.

Structures and communities that were affected by the levee breaches include the City of Boonville, Blackwater, the Blackwater Wastewater Facility, Wooldridge, and several residences and businesses. While the levees do not directly protect these areas, the breaches increased flooding in these locations.

In the summer of 2011, high levels of flooding occurred along the Missouri River, stemming from releases from the Gavin's Point Reservoir near Yankton, South Dakota. The water that was released from the reservoir and other reservoirs upstream resulted in large-scale flooding in the upper Missouri River Valley. These flooded areas included North Dakota, South Dakota, Nebraska, Iowa, Kansas, and Missouri. While flood waters from this event caused severe damage to levees in northwestern Missouri, the central portion of the state fared much better. There were no failures of levees in Cooper County.

While levee failures did not occur, there were instances of seepage coming under levees and causing damage to agricultural fields and roadways. Both the Linneman-Weekley and Overton-

Wooldridge levee districts incurred damage to agricultural fields and had to maintain pumps to keep water out of protected areas.

Wooldridge also took measures to mitigate the effects of the 2011 flooding. On July1, 2011, the Missouri National Guard arrived in Wooldridge to prepare sandbags for the levee. At that time, the Petite Saline Creek, which is a tributary to the Missouri River, was backing up into town. Soldiers, volunteers, and prisoners worked to clear vegetation, fill sandbags, and place the bags on the levee. Water levels did not overtop the levee.

In addition to major flooding events, smaller flooding events have caused damage for levee districts. The Overton-Wooldridge Levee District experiences periodic flooding stemming from seepage under their levee. Water from the adjoining wetland area seeps under the levee through sandy soil and causes pooling of water farther inland that should be protected by the levee. Levee district board members stated that this seepage did not occur until the creation of a side channel or chute in the wetland by the US Fish and Wildlife Service in 2001. According to the US Fish and Wildlife Service, the 1.5-mile chute at Overton Bottoms only receives water from the Missouri River at high river stages and is used for fish sampling.

**Probability of Future Events**

Probability: Moderate

**ANALYSIS OF RISK**
**Severity:** High

**Impact – Life**

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

**Impact - Existing Structures**

Structures in Cooper County that would be vulnerable to the effects of levee failure would include those that lie in areas in or near the Missouri River floodplain and its tributaries. Since the 1993 Flood, many structures have been relocated, bought out, abandoned, elevated, or remodeled; this has reduced the amount of vulnerable structures and people in areas where levees could potentially fail.

Information on the agricultural land and built environment protected by the major levees in the planning area is shown in Figures 4.40-4.41.

| **Figure 4.43** |
|---|
| **Linneman-Weekley Levee District Inc.** |
| **Levee Embankment Data** |
| **LEVEE DESIGNED GAGE FUNCTION READING/STATION:** 34.0 – Boonville Gage |
| **LEVEL OF PROTECTION PROVIDED:** Exceeds a 10-year flood event. |
| **AVERAGE HEIGHT OF LEVEE:** 6’ to 12’ |
| **AVERAGE CROWN WIDTH:** 8’ to 16’ |
| **AVERAGE SIDE SLOPE:** Landside slope 1 on 3 to 1 on 4 |
| Riverside ranges from 1 on 3 to 1 on 6 |
| **Protected Features** |
| **TOTAL ACRES PROTECTED:** 1,000 |
| **TOTAL AGRICULTURAL PRODUCTION ACRES PROTECTED:** 1,000 |
| **TOWNS:** 0 |
| **BUSINESSES:** 0 |
| **RESIDENCES:** 0 |
| **ROADS:** Approximately 2 miles of unimproved farm to market roads. |
| **UTILIITES:** 0 |
| **BARNS:** 0 |
| **MACHINE SHEDS:** 0 |
| **OUTBUILDINGS:** 0 |
| **IRRIGATION SYSTEMS:** 0 |
| **GRAIN BINS:** 0<br>**OTHER FACILITIES:** 0 |
| Source: USACE Inspection Report |

A levee system was established under the guidelines of a Not-For-Profit Corporation and was last inspected on May 13, 2013. Information about this Levee District can be obtained by contacting Jason Linneman at 660-846-2600.

| Figure 4.44 |
|---|
| **Overton-Wooldridge Levee** |
| **Levee Embankment Data** |
| **LEVEE DESIGNED GAGE FUNCTION READING/STATION:** 32.0 Boonville Gage |
| **LEVEL OF PROTECTION PROVIDED:** Exceeds a 10-year-flood event |
| **AVERAGE HEIGHT OF LEVEE:** Varies from a low of 8' to a high of 14' above the landside natural ground surface. |
| **AVERAGE CROWN WIDTH:** Varies from 10' to 12' |
| **AVERAGE SIDE SLOPE: L/S:** 1 on 3 **R/S:** 1 on 3 |
| **ANNUAL MAINTENANCE COSTS:** Approximately $2,500.00 |
| **Protected Features** |
| **TOTAL ACRES PROTECTED:** Approximately 3,500 (Approx. 1,435 acres of MO River Mitigation Project lands – known as Overton Bottoms Conservation Area South.) |
| **TOTAL AGRICULTURAL PRODUCTION ACRES PROTECTED:** Approximately 3,400 (Note: MO River Mitigation Project lands are agriculturally leased on a year-to-year basis.) |
| **TOWNS:** 0 |
| **BUSINESSES:** 0 |
| **RESIDENCES:** 0 |
| **ROADS:** Approximately 5.20 miles of gravel surfaced County roads and approximately 5.00 miles of non-surface farm service roads. |
| **UTILIITES:** Approximately 4.50 miles of overhead power lines. |
| **BARNS:** 5 |
| **MACHINE SHEDS:** 0 |
| **OUTBUILDINGS:** 3 |
| **IRRIGATION SYSTEMS:** 0 |
| **GRAIN BINS:** 1 |
| **OTHER FACILITIES:** Limited protection afforded to approximately 6.00 miles of railroad embankment. |

This levee is sponsored by the Cooper County Commission and was last inspected in 2015. Information about this Levee District can be obtained by contacting Robert Alpers at 660-621-4404.
(The data in Figures 4.40 and 4.41 was provided by Engineer Cliff Sanders of the US Army Corps of Engineers in Glasgow, Missouri. The data includes protected area information from a "Supplemental Levee Inspection Information" form collected during the inspections in 2005 and 2006.)

### Impact - Future Development

Impact on future development is directly related to floodplain management and regulations set forth by the county and individual communities through levee management and regulations which are not clearly defined. It is important to note that levees in Cooper County are located in designated floodplains. This means that all new construction in these areas fall under Cooper County's floodplain regulations and must adhere to that coding.

**Existing Mitigation Strategies**

The US Army Corps of Engineers oversees the inspection of the Linneman-Weekley Levee District and the Overton-Wooldridge Levee District; it is up to the owner or sponsor to inspect and fix their levees. Both levee districts and the Village of Wooldridge have a maintenance plan in place.
Most areas behind the three levees in the planning area are in designated floodplains and new construction must meet floodplain regulations and/or NFIP guidelines.

## SUMMARY OF VULNERABILITY

**Jurisdictions:** Cooper County, Wooldridge, Overton-Wooldridge Levee District, and Linneman-Weekley Levee District

The two main levees in the planning area (Overton-Wooldridge Levee District and Linneman-Weekley Levee District) are addressed in this plan. Vulnerability assessments are not being completed for the private levees in the planning area due to the lack of official data on their locations.

The Overton-Wooldridge Levee District and Linneman-Weekley Levee District levees in the planning area are agricultural levees. Agricultural levees are usually built to withstand a 50-year flood, but these three levees fall well below that protection level at 10- to 25-year flood event levels. The Village of Wooldridge Levee is not part of the USACE Levee Rehabilitation Program and does not have an inspection report. It has been estimated by the Wooldridge Board of Trustees that there are approximately 12 to 15 residences that are protected by the levee.

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

## 4.6 DAM FAILURE

### DESCRIPTION OF HAZARD

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

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

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

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

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

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

> **Piping:** internal erosion caused by embankment leakage, foundation leakage, and deterioration of pertinent structures appended to the dam.
>
> **Erosion:** inadequate spillway capacity causing overtopping of the dam, flow erosion, and inadequate slope protection.
>
> **Structural Failure:** caused by an earthquake, slope instability, or faulty construction.

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

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

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

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

A summary of the federal and state classification systems, how the two systems relate to each other, and inspection requirements for regulated dams is shown in Figure 4.45.

**Figure 4.45**

**Dam Hazard Classification Systems**

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

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

**Dam Regulation in Missouri**

Pursuant to Chapter 236 of the Revised Statutes of Missouri, a dam must be 35 feet or higher to be state regulated; regulation makes a dam subject to permit and inspection requirements. For regulated dams, the state classification system dictates the required inspection cycle. According to the Association of State Dam Safety Officials, 5,206 dams in Missouri have been classified, and only 653 are regulated by the state.

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

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

There are currently 22 dams in Cooper County, according to the Department of Natural Resources database. Of these, only two are regulated by the state (see Figure 4.46).

| Figure 4.46 | Hazard Categories of Cooper County Dams | | | |
|---|---|---|---|---|
| **Hazard Category** | **Regulated Dams** | **Unregulated Dams** | **All County Dams** | **Percentage of Total Dams** |
| High | 0 | 2 | 2 | 9% |
| Significant | 0 | 0 | 0 | 0% |
| Low | 2 | 18 | 20 | 91% |
| Total | 2 | 20 | 22 | 100% |

Note that one of the unregulated high hazard dams is dry and thus not a threat at the present time.

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

Specific information for the 2 regulated dams and the 20 unregulated dams can be found in Figures 3.1.3 and 3.1.4. Again, it is important to note that, according to information from Missouri DNR, much of this data, perhaps most of it, for the unregulated dams has not been updated since the dam survey was first conducted in the late 1970s and early 1980s. The heights of the unregulated dams may be, in some cases, the only currently reliable information.

**Location**

The dams in the planning area are located in unincorporated Cooper County and Boonville (see Figure 4.47).

Dam failure is not an issue for Blackwater, Bunceton, Otterville, Pilot Grove, Prairie Home, Windsor Place, Wooldridge, Blackwater R-II Schools, Boonville R-I Schools, Cooper County R-IV Schools, Otterville R-VI Schools, Pilot Grove C-4 Schools, and Prairie Home R-V Schools. Even though the Boonville R-I School District is in Boonville where there are dams, the structures of these educational institutions are not within the estimated inundation areas of the dams.

**Figure 4.47**

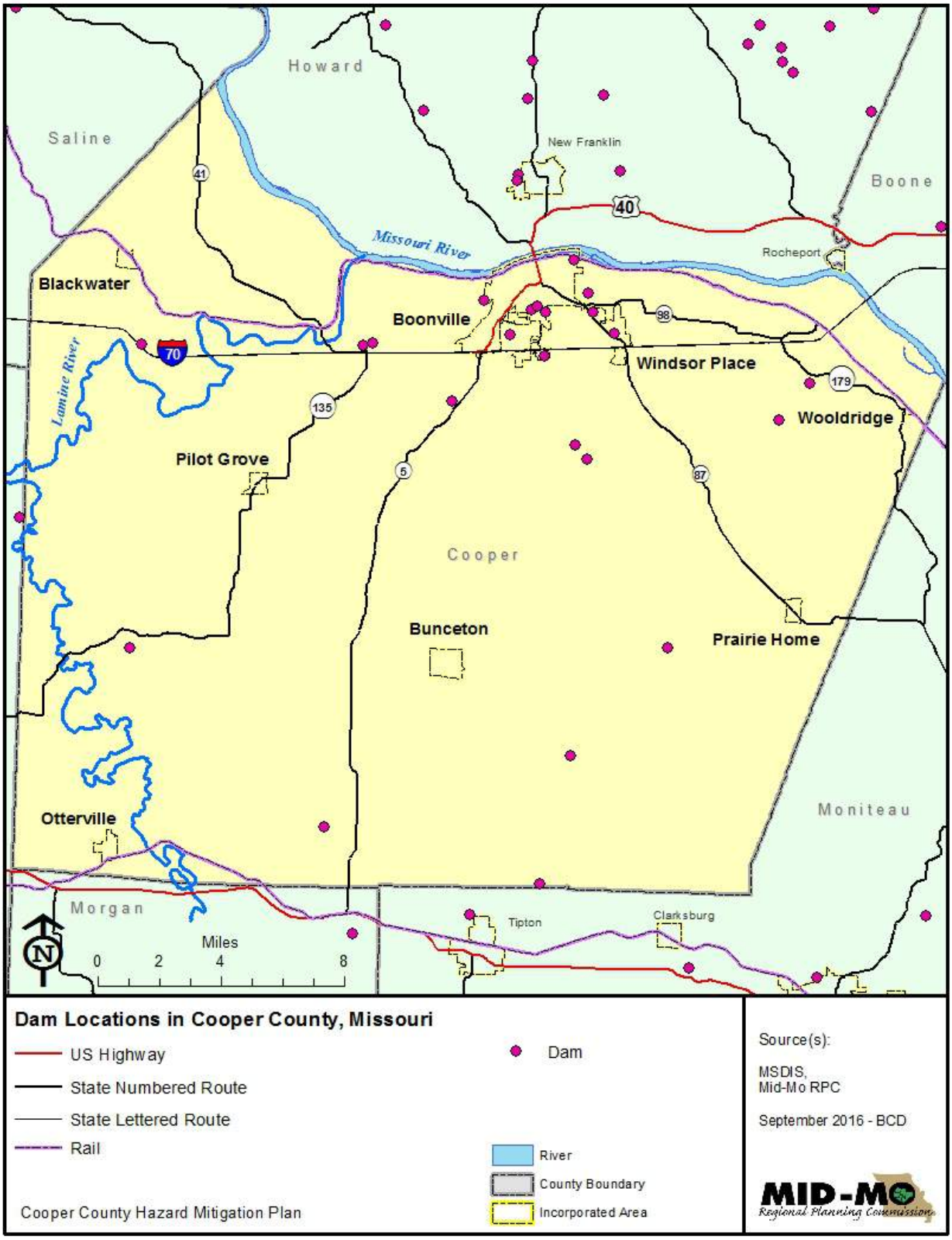
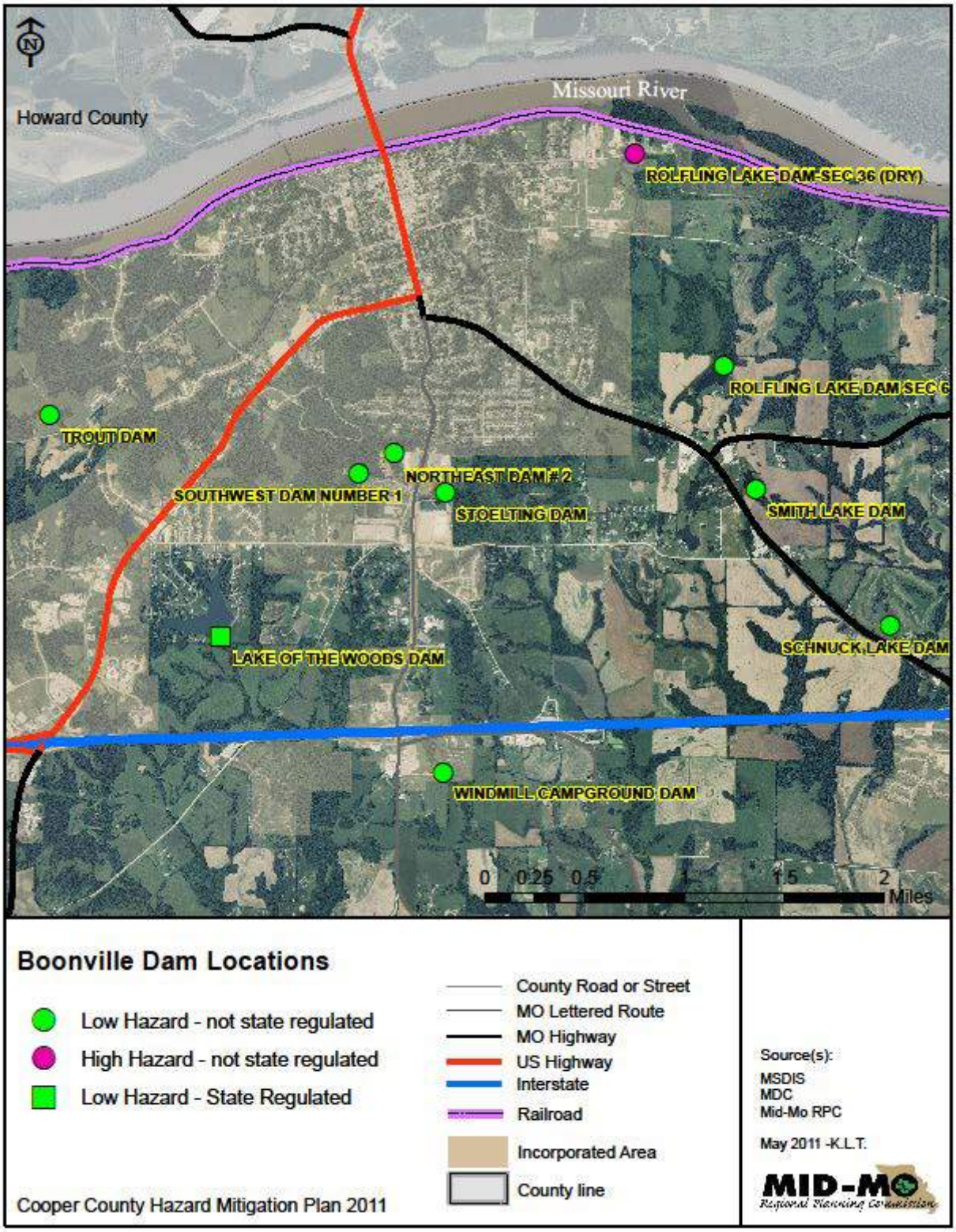

Howard
Saline
New Franklin
Boone
Missouri River
Rocheport
Blackwater
Boonville
Windsor Place
Wooldridge
Lamine River
Pilot Grove
Cooper
Bunceton
Prairie Home
Otterville
Moniteau
Morgan
Tipton
Clarksburg
Miles
0 2 4 8
Dam Locations in Cooper County, Missouri
US Highway
State Numbered Route
State Lettered Route
Rail
Dam
River
County Boundary
Incorporated Area
Source(s):
MSDIS,
Mid-Mo RPC
September 2016 - BCD
Cooper County Hazard Mitigation Plan
MID-MO
Regional Planning Commission

**Figure 4.48**

| REGULATED Cooper County Dams | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Map ID # | Name | Year Built | Ht (feet) | Reservoir Area (Acres) | Drainage Area (Acres) | Latitude | Longitude | Federal Class | State Class |
| 6 | LAKE OF THE WOODS DAM | 1968 | 39 | 28 | 328 | 38.9433516 | -92.7600314 | L | 3 |
| 15 | HAMMOND LAKE DAM | 1985 | 48 | 9 | 34 | 38.745342 | -92.724942 | L | 3 |
| **NON REGULATED Cooper County Dams** | | | | | | | | | |
| 12 | BECKER-MILLER-MARCUM LAKE DAM | 1974 | 25 | 5 | 60 | 38.6856804 | -92.7434567 | L | 3 |
| 14 | FENICAL LAKE DAM | 1977 | 25 | 3 | 34 | 38.9391982 | -92.9820874 | L | 3 |
| 19 | FRIEDRICH LAKE DAM | 1970 | 22 | 9 | 48 | 38.9123885 | -92.7950688 | H | 2 |
| 5 | HOLTZCLAW LAKE DAM | 1961 | 34 | 9 | 30 | 38.938777 | -92.8484423 | L | 3 |
| 20 | LANGKOP LAKE DAM | 1969 | 17 | 14 | 325 | 38.7121609 | -92.8725471 | L | 3 |
| 11 | LENZ LAKE DAM | 1975 | 20 | 9 | 23 | 38.795856 | -92.6663235 | L | 3 |
| 2 | NORTHEAST DAM # 2 | 1970 | 25 | 3 | 60 | 38.956585 | -92.7438654 | L | 3 |
| 13 | PHILLIPS LAKE DAM | 1976 | 30 | 5 | 15 | 38.7963794 | -92.9895115 | L | 3 |
| 16 | ROBINSON'S DAM | 1959 | 20 | 5 | 33 | 38.9028635 | -92.5988421 | L | 3 |
| 4 | ROLFLING LAKE DAM SEC 6 | 1957 | 29 | 13 | 91 | 38.9628937 | -92.7131784 | L | 3 |
| 3 | ROLFLING LAKE DAM-SEC 36 (DRY) | 1957 | This lake is dry | | | 38.9783333 | -92.7213889 | | |
| 22 | SCHNUCK | 1997 | 31 | 2 | 0 | 38.92 | -92.58 | L | |
| 9 | SCHNUCK LAKE DAM | 1977 | 32 | 7 | 30 | 38.9439716 | -92.6977937 | L | 3 |
| 21 | SCHRADER LAKE DAM | 1965 | 25 | 10 | 64 | 38.9397345 | -92.8429927 | L | 3 |
| 10 | SMITH LAKE DAM | 1977 | 30 | 4 | 25 | 38.9539433 | -92.7102226 | L | 3 |
| 1 | SOUTHWEST DAM NUMBER 1 | 1969 | 21 | 2 | 30 | 38.9551489 | -92.7471637 | L | 3 |
| 8 | STOELTING DAM | 1965 | 21 | 4 | 19 | 38.9537619 | -92.7391235 | L | 3 |
| 7 | TROUT DAM | 1960 | 20 | 4 | 20 | 38.9595031 | -92.7758811 | L | 3 |
| 0 | WINDMILL CAMPGROUND DAM | 1971 | 20 | 2 | 90 | 38.933468 | -92.7394135 | L | 3 |
| 18 | WINDSOR PLACE NUMBER 1 | 1951 | 22 | 6 | 62 | 38.8848699 | -92.714099 | L | 3 |
| 17 | WINDSOR PLACE NUMBER 2 | 1945 | 23 | 4 | 37 | 38.8912599 | -92.7215193 | L | 3 |
| Source: http://www.dnr.mo.gov/env/wrc/damsft/Crystal_Reports/cooper_dams.pdf | | | | | | | | | |

**Figure 4.49 (reviewed by Beau Derque, September 2016)**



**Extent**

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

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

**Previous Occurrences**

While there have been no dam failures in Cooper County in recent history, the issue was highlighted in the mid-Missouri region by a dam failure in nearby Boone County in 2008 and a near failure in Cole County in 2009.

The Moon Valley Lake Dam in Columbia (Boone County) failed in March 2008. This 18-foot high unregulated dam had been built in 1964; it drained 2,100 acres and had a 13-acre reservoir, according to the DNR database. Moon Valley Lake Dam was classified as high hazard, but there was no loss of life with the dam failure. This may be partially attributable to the fact that Moon Valley Lake was silted in and the main release from the dam failure was silt, which went down the Hominy Branch into the Hinkson Creek. The added silt has caused greater flooding problems on the Hinkson Creek since the time of the dam failure. The City of Columbia estimated the cost of removing the sediment and stabilizing about 2,000 feet of the stream bank to be about $400,000.

Failure of the Renn's Lake Dam in Jefferson City (Cole County) was averted in late October and early November 2009 through the work of emergency crews and volunteers who relieved pressure on the earthen dam by pumping thousands of gallons of water from 7-acre Renn's Lake. The 30-foot high unregulated dam, built in 1950, had been weakened by the growth of trees; heavy rainfall caused a 15-foot section to erode. Renn's Lake is located immediately to the west of U.S. Highway 54, and the failure of the dam would have threatened the highway. The deed to Renn Lake was subsequently transferred to Cole County with plans to breach the dam and drain the lake.

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

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

All of these dam failures indicated that this is a serious problem that needs attention. Many of Missouri's smaller dams are becoming a greater hazard as they continue to age and deteriorate. While hundreds of them need to be rehabilitated, a lack of available funding and questions of ownership loom as obstacles difficult to overcome.

**Probability of Future Events**

Probability: Low
Severity: Low

**ANALYSIS OF RISK**

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

There is one dam in Cooper County that is considered to pose high hazard should there be a dam break: Friedrich Lake Dam. This dam is privately owned and not regulated by the state and thus not subject to inspection requirements. Friedrich Lake Dam is located south of Boonville on State Highway 5.

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

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

**Potential Impact – Life**

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

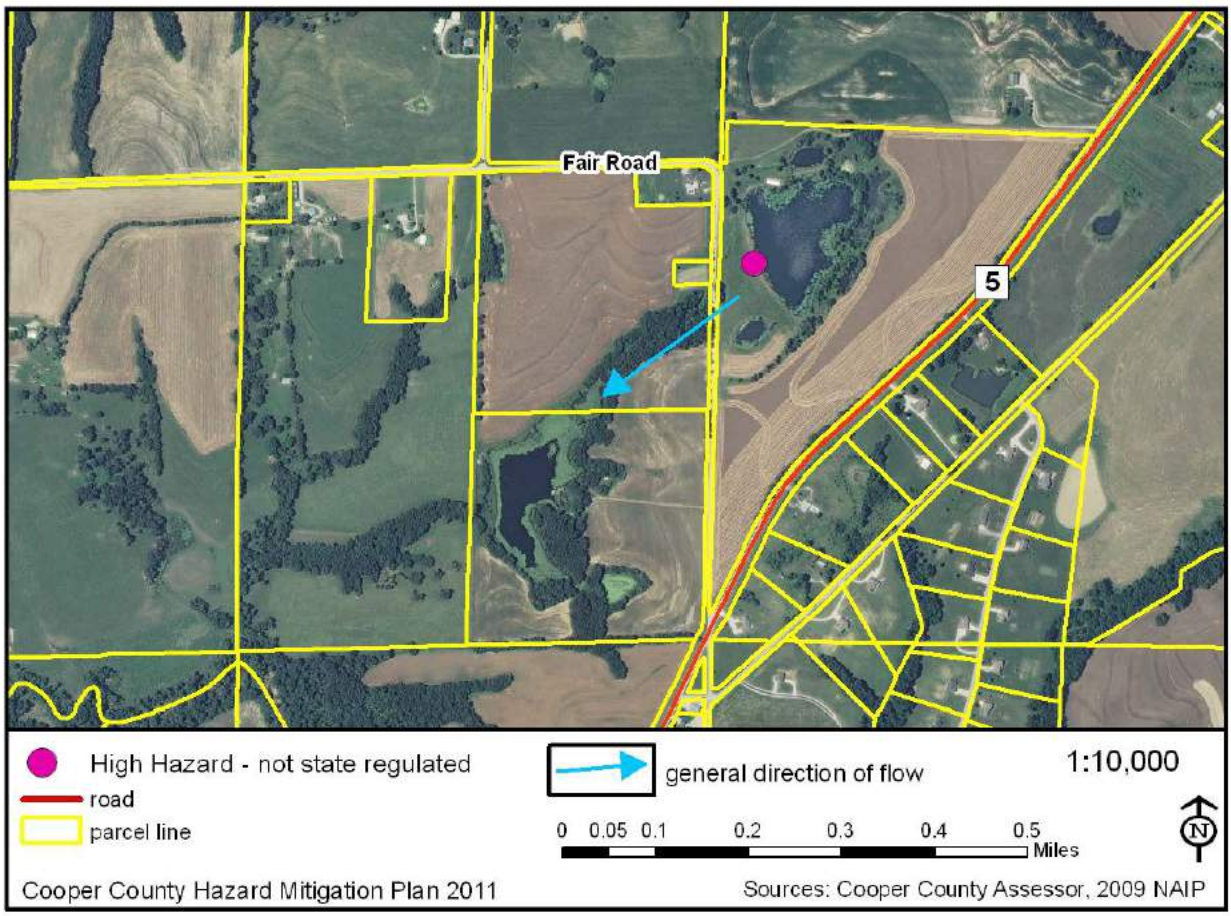
**Potential Impact - Existing Structures**

Boonville is the only jurisdiction, aside from unincorporated areas of Cooper County, to have dams inside or within a mile upstream of its corporate boundary. Structures downstream of these dam locations could potentially be at risk if a failure were to occur, depending on the size of the reservoir behind the dam. Throughout the county, several other dams lie upstream of structures that have the potential of being impacted. The Missouri State Hazard Mitigation Plan 2010 states vulnerability statistics for *State Regulated* dam failure in Cooper County. According to the state plan there are no structures or populations vulnerable to the failure of a *State Regulated* dam.

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

Figure 4.50 depicts the downstream areas and parcels that are within a half mile of the dam. Because inundation information is not available at this time, it is not possible to know exactly the severity or distance of a dam failure.

**Figure 4.50 (reviewed by Beau Derque, September 2016)**



**Impact - Future Development**

Dam failure has the potential to impact future development in the county and its jurisdictions. Because many dams in Cooper County are privately owned and not regulated by the state, the potential for development below aging or unsafe dams is an issue that needs to be addressed. If development occurs without the knowledge of a problem dam that lies upstream, that development is put in jeopardy.

Future impacts may be addressed by inundation studies being done by the Natural Resources Conservation Service's Water Resources Center. The following is an excerpt from their website:

"The Water Resources Center has developed a methodology to complete dam breach inundation studies and produce inundation maps downstream of regulated dams. The Federal Emergency Management Agency (FEMA) has indicated that future funding of state dam safety programs will be linked to the completion of Emergency Action Plans (EAPs) for regulated dams. The WRC's Dam and Reservoir Safety program has prioritized Missouri counties for completion of mapping."

**Existing Mitigation Strategies**

State-regulated dams are inspected, according to classification, through the Dam Safety Program of the DNR. According to the Missouri DNR, dam owners with dams over 35 feet in height are required to complete an Emergency Action Plan (EAP). The Dam and Reservoir Safety Program coordinates with dam owners, county Emergency Management Directors, and other state and federal agencies to develop plans for all regulated dams. An EAP must include the following criteria:

- Guidance for evaluating emergency situations occurring at a dam.
- Notification charts and emergency contact information.
- A list of residents, businesses, and entities within the downstream inundation zone.
- A list of resources available for responding to a dam emergency.
- An inundation zone map (estimated boundary of the maximum water elevation resulting from a dam breach).
- Basic physical and geographical data for the regulated dam.

The Cooper County emergency management director can provide critical emergency contact information and assistance in identifying structures located within the downstream inundation area.

As of August 2011, Emergency Management Agencies in each county will keep a copy of an owner's EAP for high hazard dams. A template for creating an EAP is available through the Missouri DNR Dam Safety website.

**SUMMARY OF VULNERABILITY**

There are no dams lying upstream from any school district structures.

Most of the dams in the planning area are located in unincorporated Cooper County. The results of a dam failure could range from very minimal environmental damage to a significant loss of life and infrastructure. All impacts are dependent upon several variables: water, debris, people, and structures. A dam failure would include the breach of a dam wall or embankment allowing the water and debris to flow downstream from the dam.

The dam inventory for the state of Missouri was compiled in the late 1970s and early 1980s. The state has classified two of Cooper County's dams as "High Hazard". One of those High Hazard dams no longer holds water and does not pose a threat. Both High Hazard dams are unregulated. According to data provided by the Missouri Department of Natural Resources, none of the 20 unregulated dams have ever been documented as having been inspected. Because these are unregulated dams, the state has no jurisdiction over maintenance and leads into the overall problem of dam location and development downstream.

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

## 4.7 EXTREME HEAT

### DESCRIPTION OF HAZARD

Extreme heat is the number one weather-related killer in the United States, according to the National Weather Service (Figure 4.54). In contrast to the visible, destructive, and violent nature of floods, hurricanes, and tornadoes, extreme heat is a silent killer.

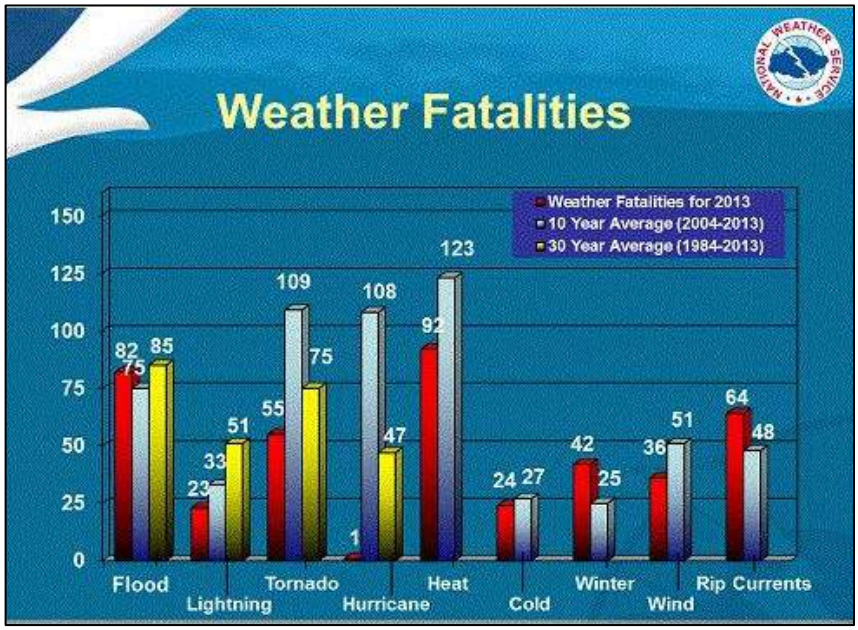



**Figure 4.51**
As can be seen in the NWS graph, there are no 30-year averages for heat fatalities or a number of other weather-related fatalities. Fatality data on these hazards began to be recorded more recently than fatalities from the more dramatic causes of death such as flood, lightning, tornado, and hurricane.

As the data shows, extreme heat resulted in an average of 92 deaths per year when looked at over a 10-year period; this is 10 more deaths per year than the number caused by flood, the next most frequent cause of death.

### Location

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

### Extent

The planning area routinely experiences prolonged periods with heat indices over 100 (Figure 4.55). The duration of these periods of extreme heat can last two weeks. During the period from 1994 through June 2016, the average length of an extreme heat event was 5.8 days.

## Previous Occurrences

**Figure 4.52**

**Periods of Extreme Heat in Cooper County, December 2005-December 2016**

| Date | Heat Index | Deaths | Injuries | Property Damage | Crop Damage | Duration (days) |
|---|---|---|---|---|---|---|
| 07/16/2006 | 105-115 | 0 | 0 | 0 | Unknown | 4 |
| 07/29/2006 | 105-115 | 0 | 0 | 0 | Unknown | 3 |
| 08/01/2006 | 105-115 | 0 | 0 | 0 | Unknown | 2 |
| 08/06/2007 | 105-115 | 0 | 0 | 0 | Unknown | 12 |
| 07/18/2012 | 100-110 | 0 | 0 | 0 | Unknown | 8 |
| **TOTALS** | | 0 | 0 | 0 | Unknown | 29 |

Source: https://www.ncdc.noaa.gov/stormevents/

## ANALYSIS OF RISK

### Measure of Probability and Severity - Moderate for all participating jurisdictions

### Potential Impact – Life

Heat kills by overloading a body's capacity to cool itself. The human body cools itself by perspiring; the evaporation of perspiration carries excess heat from the body. High humidity often accompanies heat in Missouri and increases the danger to warm-blooded humans and animals. High humidity makes it difficult for perspiration to evaporate and thus interferes with this natural cooling mechanism.

The Heat Index devised by the NWS (Figure 4.56) is a measure of how hot it really feels. The Heat Index takes into account both air temperature and relative humidity. It also gives an indication of the added risk presented by high humidity to bodies attempting to cool.

**Figure 4.53**

**HEAT INDEX**

**Relative Humidity (%)**

| Air Temperature (°F) | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110° | 136 | | | | | | | | | | | | |
| 108° | 130 | 137 | | | | | | | | | | | |
| 106° | 124 | 130 | 137 | | | | | | | | | | |
| 104° | 119 | 124 | 131 | 137 | | | | | | | | | |
| 102° | 114 | 119 | 124 | 130 | 137 | | | | | | | | |
| 100° | 109 | 114 | 118 | 124 | 129 | 136 | | | | | | | |
| 98° | 105 | 109 | 113 | 117 | 123 | 128 | 134 | | | | | | |
| 96° | 101 | 104 | 108 | 112 | 116 | 121 | 126 | 132 | | | | | |
| 94° | 97 | 100 | 102 | 106 | 110 | 114 | 119 | 124 | 129 | 135 | | | |
| 92° | 94 | 96 | 99 | 101 | 105 | 108 | 112 | 116 | 121 | 126 | 131 | | |
| 90° | 91 | 93 | 95 | 97 | 100 | 103 | 106 | 109 | 113 | 117 | 122 | 127 | 132 |
| 88° | 88 | 89 | 91 | 93 | 95 | 98 | 100 | 103 | 106 | 110 | 113 | 117 | 121 |
| 86° | 85 | 87 | 88 | 89 | 91 | 93 | 95 | 97 | 100 | 102 | 105 | 108 | 112 |
| 84° | 83 | 84 | 85 | 86 | 88 | 89 | 90 | 92 | 94 | 96 | 98 | 100 | 103 |
| 82° | 81 | 82 | 83 | 84 | 84 | 85 | 86 | 88 | 89 | 90 | 91 | 93 | 95 |
| 80° | 80 | 80 | 81 | 81 | 82 | 82 | 83 | 84 | 84 | 85 | 86 | 86 | 87 |

Source: http://www.nws.noaa.gov/om/heat/index.shtml

Since 2007, there have been 46 deaths and over 2,877 injuries in Missouri from extreme heat events. The recorded deaths and injuries occurred in St. Louis and St. Louis County; none of the deaths recorded in the data occurred in the planning area.

While these most recent deaths and injuries took place in a major metropolitan area, research shows that residents of both urban and rural areas are vulnerable to excessive heat. Data from the Missouri Department of Health and Senior Services (DHSS) indicates that 39 percent of the 214 deaths in the state from extreme heat in the years 2000 through 2009 occurred outside of the counties of the two major metropolitan areas (Kansas City and St. Louis). This percentage

correlates fairly closely with the percentage of the population residing outside those metropolitan areas, according to the 2010 U.S. Census. It cannot be said that extreme heat is a concern only for major cities.

Many factors, such as age, general level of health, outdoor activity level, alcohol and drug consumption, and availability of air conditioning, affect the actual risk level. The elderly in general are vulnerable to the effects of extreme and/or prolonged heat; the 2010 Census recorded 2,702 citizens in Cooper County (15.3 percent of the population) as 65 years and older. However, any residents without access to air conditioning, or shade and water if outside, are very vulnerable to this hazard. One known death occurred in Boone County, the county just east of the planning area, in August 2002 when a 59-year-old man died from heat exhaustion after collapsing while doing yard work.

Extreme heat events can also result in livestock deaths and fish kills. Drought in conjunction with extreme heat exacerbates the situation.

**Potential Impact - Existing Structures**

While illness and loss of life are of the most concern with extreme heat, structural impacts may also occur. Structural impacts depend on the length of the period of extreme heat and exacerbating factors such as concurrent drought. Road damage and electrical infrastructure damage may occur with intense and prolonged heat.

**Potential Impact - Future Development**

Thoughtful future development has the potential to include mitigation for extreme heat in its design. This is true on all levels ranging from actions by individual homeowners to larger redevelopment projects planned by cities. Properly placed shade trees can contribute greatly to lowering inside temperatures and the load placed on cooling systems. Planning for adequate green space as cities infill allows for air movement and shaded locations.

**Existing Mitigation Activities**

The following departments, agencies, and organizations are involved in educating the public about the dangers of extremely hot weather and/or issuing alerts when the threat of extreme heat is imminent.
Cooper County Emergency Management and the Cooper County Health Department issue alerts to notify the public of extreme heat conditions. The alerts urge the public to check on their neighbors and to seek cooling in local shopping centers or library, if needed.
Local Media such as television and radio stations issue heat advisories during extreme heat events.
The Missouri Department of Health and Senior Services announces statewide hot weather health alerts according to the following criteria:

- **Hot Weather Health Alert –** Heat indices of 105°F in a large portion of the state are first reached (or predicted).

- **Hot Weather Health Warning –** Heat indices have been 105°F or more for two days in a large portion of the state, or weather forecasts call for continued heat stress conditions for at least 24 to 48 hours over a large portion of the state.

- **Hot Weather Health Emergency –** When extensive areas of the state meet all of the following criteria:
    - High sustained level of heat stress (Heat Index of 105°F for 3 days)
    - Increased numbers of heat-related illnesses and deaths statewide
    - The NWS predicts hot, humid temperatures for the next several days for a large portion of the state.

The National Weather Service (NWS) has devised a method to warn of advancing heat waves up to seven days in advance. The new Mean Heat Index is a measure of how hot the temperatures actually feel to a person over the course of a full 24 hours. It differs from the traditional Heat Index in that it is an average of the Heat Index from the hottest and coldest times of each day. The National Weather Service initiates alert procedures when the Heat Index is expected to exceed 105°- 110°F for at least two consecutive days. (The exact Heat Index temperature used depends on specifics of the local climate.) The following are released to the media and over NOAA All-Hazard Weather Radio:

- Heat Index values are included in zone and city forecasts.
- Special Weather Statements and/or Public Information Statements are issued; they present a detailed discussion of the Heat Index Values, who is most at risk, and safety rules for reducing risk.
- In severe heat waves, State and local health officials are assisted in preparing Civil Emergency Messages, which include Special Weather Statements and more detailed medical information, advice, and names and telephone numbers of health officials.

The Missouri Department of Health and Human Services also maintains a searchable online map/database of cooling centers throughout the state (https://ogi.oa.mo.gov/DHSS/coolingCenter/index.html).

As of October 2016, the following cooling centers are listed for Cooper County:

- Boonslick Senior Center, 512 Jackson Road, Boonville
- Boonville Library, 618 Main Street, Boonville

The Missouri State High School Activities Association (MSHSAA) provides coaches with educational pamphlets on the dangers of excessive heat.

Weather Forecast Offices of the National Weather Service (NWS) can issue the following warnings about excessive heat:

- **Excessive Heat Outlook**: Potential exists for an excessive heat event in the next 3 to 7 days. An outlook is used to indicate that a heat event may develop. It is intended to provide information to those who need considerable lead time to prepare for the event, such as public utilities, emergency management, and public health officials.

- **Excessive Heat Watch**: Conditions are favorable for an excessive heat event in the next 12 to 48 hours. A watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so, such as established individual city excessive heat event mitigation plans.

- **Excessive Heat Warning/Advisory**: An excessive heat event is expected in the next 36 hours. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

## SUMMARY OF VULNERABILITY

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

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

The elderly in general are vulnerable to the effects of extreme and/or prolonged heat; the 2010 Census recorded 2,702 citizens in Cooper County (15.3 percent of the population) as 65 years and older. However, any residents without access to air conditioning, or shade and water if outside, are very vulnerable to this hazard.

Boonville, the major population center in the planning area, is equipped with cooling centers to help protect those most vulnerable. Warnings regarding the dangers of extreme heat are widely broadcast during times of threat.

In addition to the human toll, prolonged extreme heat can result in livestock deaths, fish kills, and infrastructure damage; drought in conjunction with extreme heat exacerbates the situation.

## 4.8 DROUGHT

### DESCRIPTION OF HAZARD

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

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

The period of lack of precipitation needed to produce a supply drought will vary between regions, and the particular manifestations of a drought are influenced by many factors. As an aid to analysis and discussion, the research literature has defined different categories of drought (Figure 4.54). The most common type of drought in Mid-Missouri is the agricultural drought.

**Figure 4.54**

**Drought Categories**

| | |
|---|---|
| **Agricultural** | Defined by soil moisture deficiencies |
| **Hydrological** | Defined by declining surface and groundwater supplies |
| **Meteorological** | Defined by precipitation deficiencies |
| **Hydrological and land use** | Defined as meteorological drought in one area that has hydrological impacts in another area |
| **Socioeconomic** | Defined as drought impacting supply and demand of some economic commodity |

Source: *Missouri Drought Plan, 2002* (Mo DNR)

### Location

The entire planning area is potentially at risk for drought. However, since agricultural drought is most common in Missouri, the unincorporated agricultural areas of Cooper County are most at risk. This is the area where farmers are at risk for crop failure from drought and would suffer the most immediate and severe economic loss.

## Extent

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

Palmer Drought Severity Index: One of the oldest and most widely used indices is the Palmer Drought Severity Index (PDSI, Figure 4.55), which is published jointly by NOAA and the U.S. Department of Agriculture (USDA).

**Figure 4.55**

**Palmer Drought Severity Index (PDSI)**

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

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

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

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

The NDMC uses the PDSI, SPI, and three other indicators to classify the severity of droughts throughout the country on a 5-point scale ranging from DO Abnormally Dry to D4 Exceptional Drought for reports on the U.S. Drought Monitor (Figure 4.56).

**Figure 4.56**

**U.S. Drought Monitor - Drought Severity Classification**

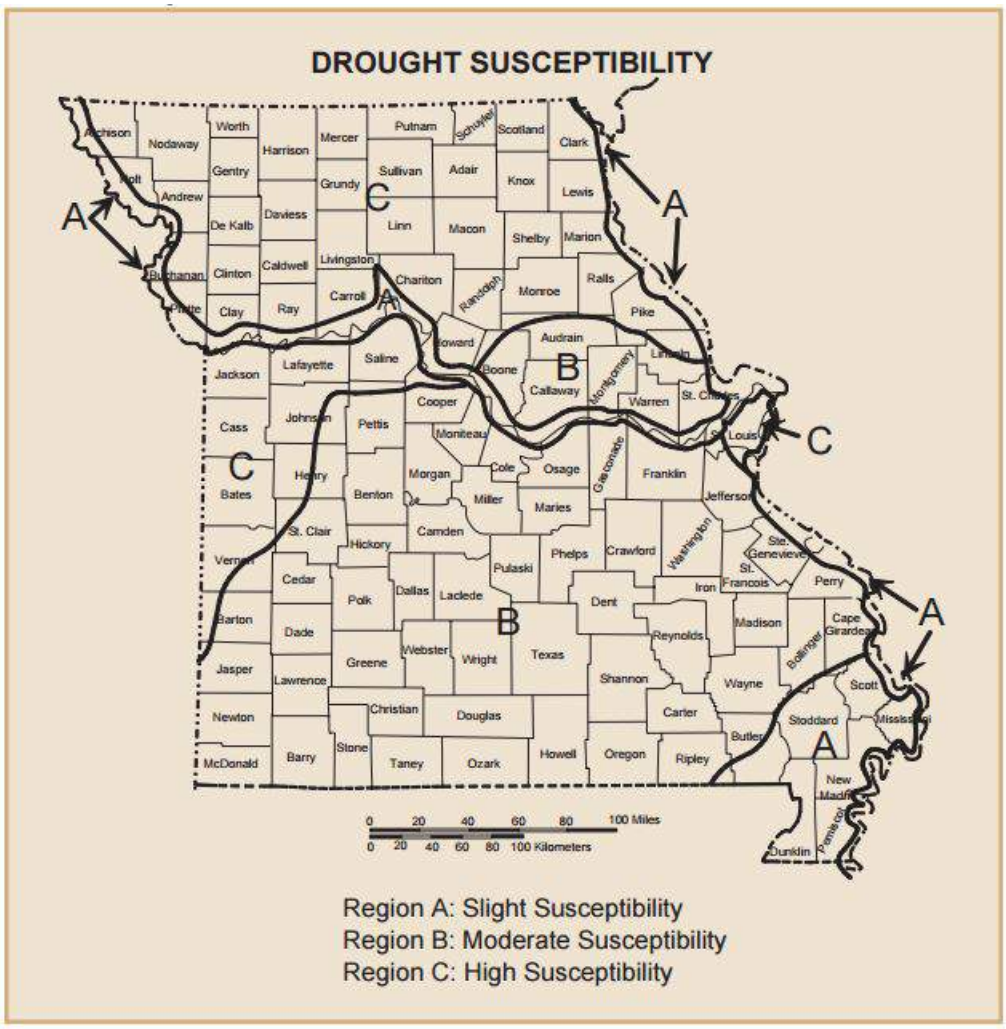
| Category | Description | Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | Possible Impacts | Palmer Drought Index | CPC Soil Moisture Model (Percentiles) | USGS Weekly Streamflow (Percentiles) | Standardized Precipitation Index (SPI) | Objective Short and Long-term Drought Indicator Blends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

Source: http://droughtmonitor.unl.edu

Based on the Drought Severity Classification from the NDMC, Cooper County is subject to droughts ranging from D1 (Moderate Drought) to D4 (Exceptional Drought). The most common droughts are in the D1-D2 range. The 2000-2015 data indicates that, in recent years, the average drought in the planning area has lasted 3.4 months.

The Missouri Department of Natural Resources has defined different regions of drought susceptibility in the *Missouri Drought Plan, 2002* (Figure 4.57).

**Figure 4.57**




Cooper County is primarily in Region B (moderate drought susceptibility) with a northwestern part of the county in Region C (severe drought vulnerability) and a northern strip bordering the Missouri River in Region A (slight drought susceptibility).

More specific information for all three regions is shown in Figure 4.58.

| Figure 4.58<br>**Missouri Drought Susceptibility Regions** | | |
|---|---|---|
| **Region** | **Description** | **Location in planning area** |
| A | "…minor surface and groundwater supply drought susceptibility. It is a region underlain by saturated sands and gravels (alluvial deposits). Surface and groundwater resources are generally adequate for domestic, municipal, and agricultural needs." | Northern area bordering the Missouri River |
| B | "…moderate drought susceptibility. Groundwater resources are adequate to meet domestic and municipal water needs, but due to required well depths, irrigation wells are very expensive. The topography generally is unsuitable for row-crop irrigation." | Majority of the planning area |
| C | "…severe drought vulnerability. Surface water resources usually become inadequate during extended drought. Groundwater resources are normally poor, and typically supply enough water only for domestic needs. Irrigation is generally not feasible. When irrigation is practical, groundwater withdrawal may affect other uses. Surface water sources are used to supplement irrigation supplied by groundwater sources." | Northwest part |
| Source: *Missouri Drought Plan, 2002* | | |

## Previous Occurrences

The Dust Bowl years of the 1930s and early 1940s were dry in Missouri but not as dry as the period from 1953 through 1957. A major nationwide drought in the late 1980s resulted in low water and decreased barge traffic on the Mississippi River and the Missouri River. The fall of 1999 was another serious drought period in the state; in October of that year, all counties in Missouri were declared agricultural disaster areas by the USDA.

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

Even though Cooper County averages between 38 to 42 inches of precipitation per year, it has been subject to droughts in the past. Between 1999 and 2008, Cooper County had $12,028,047 in Total Crop Insurance Payments for drought damage.

Historical information concerning droughts prior to the 20th century is difficult to find. However, tree-ring research at the University of Missouri, chronicling the years 1912 to 2004, indicates a regular 18.6-year cycle of drought in the Midwest.

More information is available for droughts in the 20th and current centuries. Missouri suffered drought in the 1930s and the early 1940s, along with most of the central United States. These were the Dust Bowl years in the southern plains.

The years from 1953 through 1957 were actually drier years in Missouri than the Dust Bowl years. Missouri was specifically hit in 1954 and 1956 by an extreme decrease in precipitation. Crop yields were down by as much as 50 percent, leading to negative impacts on the agricultural and regional economies of the region.

The last major nationwide drought was in the late 1980s. The 1980s drought hit the Northern Great Plains and Northern Midwest particularly hard. Missouri suffered economic losses due to decreased barge traffic and low water in the Missouri River and the Mississippi River. Furthermore, some municipalities suffered from very low water resources and in some instances exhausted all of their normal water sources, according to the Missouri Hazard Analysis (SEMA, August 1997).

Most of Missouri was in a drought condition during the last half of 1999, according to the Missouri State Hazard Mitigation Plan (2010). In September, the governor declared an agricultural emergency for the entire state. In October, all counties were declared agricultural disaster areas by the U.S. Secretary of Agriculture. By May of 2000, the entire state was under a Phase 2 Drought Alert. The drought continued through the summer of 2000 in various parts of the state.

Another drought hit western and northwestern Missouri in the years 2002 to 2004; Cooper County was on the eastern edge of the serious drought but was put in a Phase 1 Drought Advisory in the summer of 2003.

The county did not fare as well in the drought years of 2005 and 2006, however. The droughts of 2005 and 2006 caused great hardship for many crop and livestock producers in the state. Cooper County was one of 30 Missouri counties in Phase 3 Conservation in July 2005. In August, all 114 Missouri counties and the City of St. Louis were designated as natural disasters for physical and/or production loss loan assistance from the Farm Service Agency (FSA); conditions began to improve in late August/September 2005. By September of 2006, however, the county was again in Phase 3 Conservation, which persisted through most of November. In October, Cooper County was one of 85 Missouri counties designated by the USDA as primary natural disaster areas due to losses from the drought conditions of 2006. Conditions began to improve with a large snowstorm in late November/early December.

Cooper County was in a Phase 1 Drought Advisory in both February and October of 2007.

## Drought Vulnerability in Cooper County

### Overview

All jurisdictions in the planning area are vulnerable to the effects of drought; the unincorporated agricultural areas of Cooper County are most vulnerable to the effects of drought because of crop loss. In addition to damage to crops, produce, livestock, and soil, and the resulting economic consequences, the arid conditions created by drought pose an increased risk of fire.

### Potential Impact on Existing Structures

Excessive drought can cause damage to roads, streets, water mains, and building foundations. The arid conditions created by drought also pose an increased risk of fire and wildfire and thus to structures.

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

Structural impact in regard to this hazard is minimal to non-existent. Drought does, however, have far reaching economic consequences in regard to crop failure and high economic loss. The economic loss incurred would heavily impact the agricultural industry and those businesses dependent upon that industry for products. The following damage information is from the Missouri State Hazard Mitigation Plan 2013:

| **Figure 4.59**<br>**Drought Damage in Cooper County, Missouri** | |
|---|---|
| Total Crop Insurance Paid For Drought Damage 1998-2012 | $39,925,217 |
| Crop Claims Ratio Rating | 4 |
| Annualized Crop Insurance Claims/Drought Damage | $2,661,681 |
| Crop Exposure (2007 Census of Agriculture) | $42,447,000 |
| Annual Crop Claims Ratio | 6.27% |
| Crop Loss Ratio Rating | 4 |
| Missouri State Hazard Mitigation Plan (2013) | |

### Potential Impact on Future Development

Future development in the county can be at risk from the effects of drought. Good land management techniques are crucial in mitigating future impacts.

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

mitigating future impacts. Good land management techniques and the interconnection of water supplies will become increasingly important in mitigating the impacts of drought as growth occurs.

## ANALYSIS OF RISK

**Probability and Severity:** Low

The primary effect of drought in the planning area is on the economic livelihood of those in the agricultural sector. According to the *2012 US Census of Agriculture*, 85 percent of Cooper County land use is tied to farming activities. In 2012 the market value of Cooper County farm products was estimated at almost $78.3 million.

### Potential Impact – Life

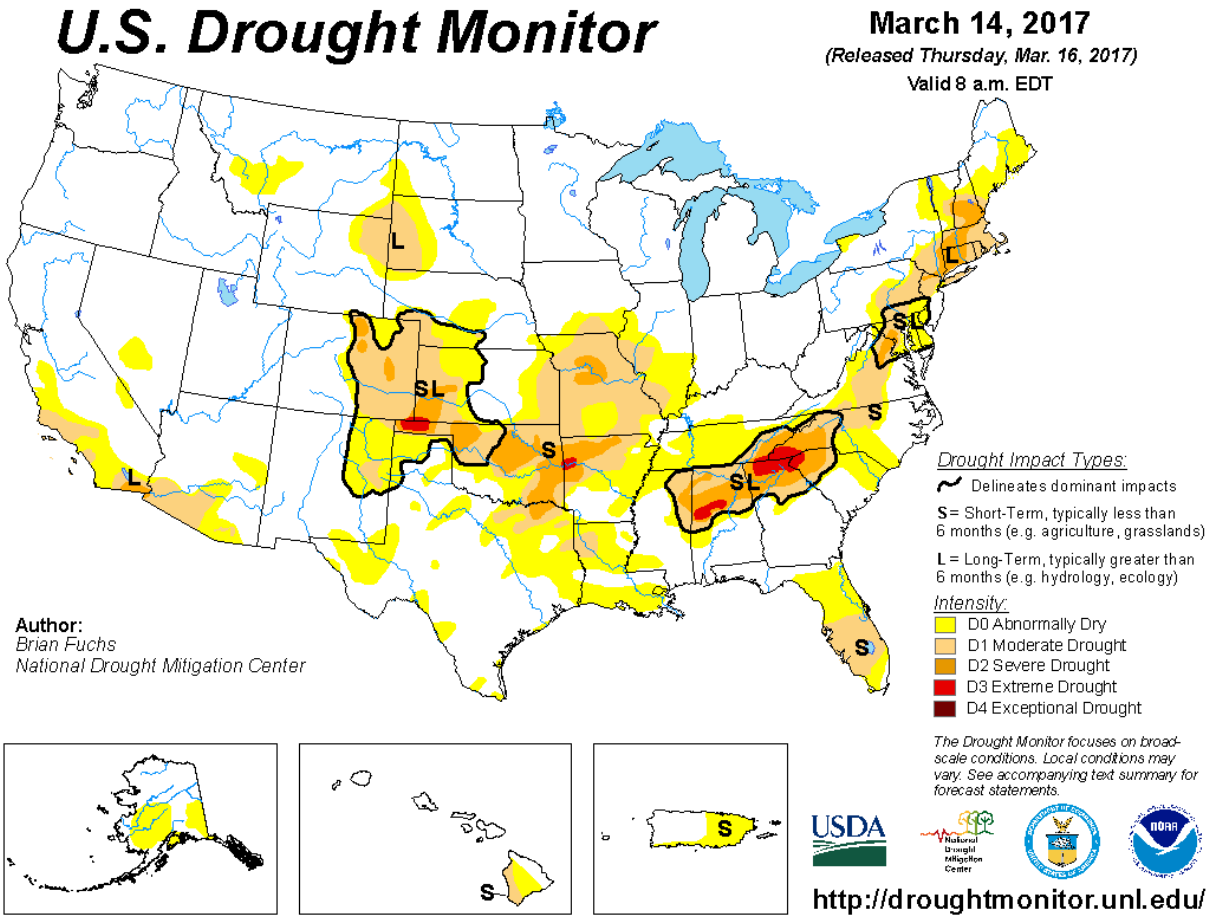
Both crops and livestock are at risk from drought. During the exceptional drought conditions in 2012, there were large sell-offs of livestock in the mid-Missouri region.

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

### Existing Mitigation Activities

The Missouri Department of Natural Resources publishes a weekly map from The Drought Monitor on their website at http://www.dnr.mo.gov/env/wrc/drought/nationalcondition.htm. The Drought Monitor is a comprehensive drought monitoring effort involving numerous federal agencies, state climatologists, and the National Drought Mitigation Center. It is located at the National Drought Mitigation Center in Lincoln, Nebraska. The new Drought Monitor Map, based on analysis of data collected, is released weekly on Thursday at 8:30 a.m. Eastern Time. The map focuses on broad-scale conditions and is linked to the data sets analyzed.

Figure 4.60




The University of Missouri Extension has a number of publications for both farmers and homeowners to help mitigate the effects of drought. The publications are available at http://extension.missouri.edu/main/DisplayCategory.aspx?C=257

The National Drought Mitigation Center (NDMC) is located at the University of Nebraska-Lincoln. The following is a description of their activities from their website (http://drought.unl.edu/):

"The National Drought Mitigation Center (NDMC) helps people and institutions develop and implement measures to reduce societal vulnerability to drought, stressing preparedness and risk management rather than crisis management. Most of the NDMC's services are directed to state, federal, regional, and tribal governments that are involved in drought and water supply planning. The NDMC, established in 1995, is based in the School of Natural Resources at the University of Nebraska-Lincoln. The NDMC's activities include maintaining an information clearinghouse and drought portal; drought monitoring, including participation in the preparation of the U.S. Drought Monitor and maintenance of the web site (drought.unl.edu/dm); drought planning and mitigation; drought policy; advising policy makers; collaborative research; K-12 outreach; workshops for federal, state, and foreign governments and international organizations;

organizing and conducting seminars, workshops, and conferences; and providing data to and answering questions for the media and the general public. The NDMC is also participating in numerous international projects, including the establishment of regional drought preparedness networks in collaboration with the United Nations' Secretariat for the International Strategy for Disaster Reduction."

**SUMMARY OF VULNERABILITY**

Drought of some degree is a common occurrence in the planning area. The unincorporated agricultural areas of Cooper County are the most vulnerable, but all jurisdictions are potentially vulnerable to cascading economic effects during extended and serious drought conditions. In addition to damage to crops, produce, livestock, soil and the resulting economic consequences, the arid conditions created by drought pose an increased risk of fire. There is also the risk of damage to infrastructure from drought.

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

The Missouri Rural Water Association can assist with backup generators when needed and available.

## 4.9 WILDFIRE

### DESCRIPTION OF HAZARD

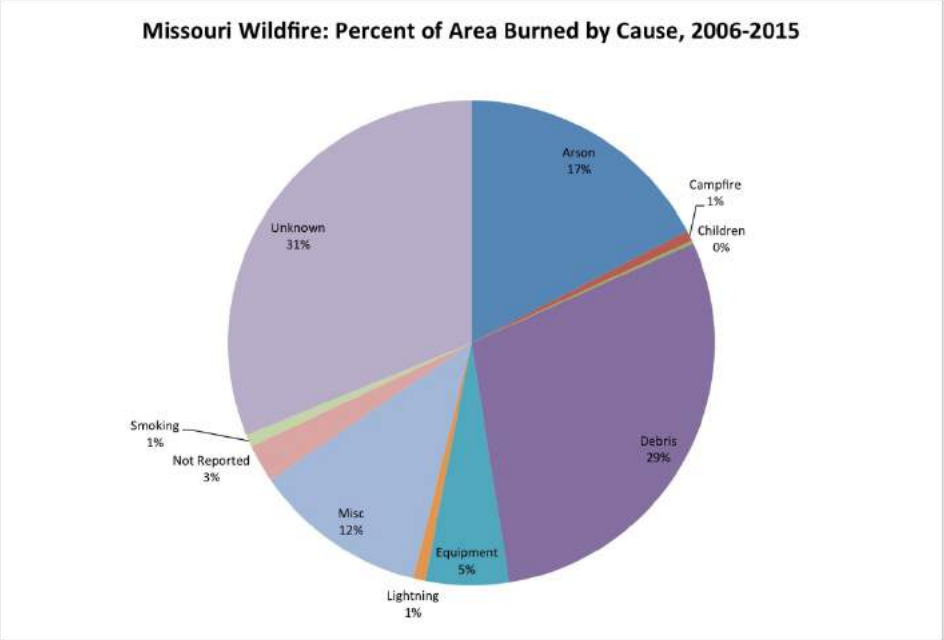
Large and widespread wildfires, such as occur in the western United States, have not been a problem in Cooper County in recent history. However, smaller wildfires/natural cover fires occur every year. In Cooper County, the majority of the fires and the greatest acreage loss occur during the spring fire season (February 15 through May 10).

These fires may take place at any time of the year, but the majority occur during the spring fire season (February 15 through May 10). Spring is the time of the year when rural residents burn garden spots and brush piles. Many landowners also believe it is necessary to burn the woods in the spring to grow more grass, kill ticks, and get rid of brush. These factors, combined with low humidity and high winds, result in higher fire danger at this time of year. The spring fire season abates with the growth of the new season's grasses and other green vegetation.

Numerous fires also occur in October and November due to the dryness associated with fall in Missouri. Many rural residents use this time of year to burn leaves and debris, thus raising the possibility of a fire that might burn out of control.

The major causes of wildfires in Missouri are various human activities, according to statistics from the Missouri Department of Conservation (Figure 4.61).

Figure 4.61



**Location**

The rural areas of Cooper County and the rural/urban interfaces are most at risk from wildfires. Debris burning is consistently the number one cause of wildfires in Missouri. Fires caused by lightning are rare despite 50 to 70 thunderstorm days per year.

Representatives of the Cooper County Fire Department reported that the annual burning of agricultural fields is also a major contributor to wildfires.

The Wildland Urban Interface (WUI) is defined as "the area where structures and other human development meet or intermingle with undeveloped wildland" in a 2001 Federal Register report. There is a higher risk scenario for wildfire in these areas where high fuel loads and structures meet or overlap.

A Wildland Urban Interface (WUI) map (Figure 4.62) does not depict any high risk areas due to the lack of heavy forested areas and intense farming practices. A map of agricultural land throughout the county will be used to highlight those areas that have been classified as being the highest risk areas (see Figure 4.63).

**Figure 4.62**

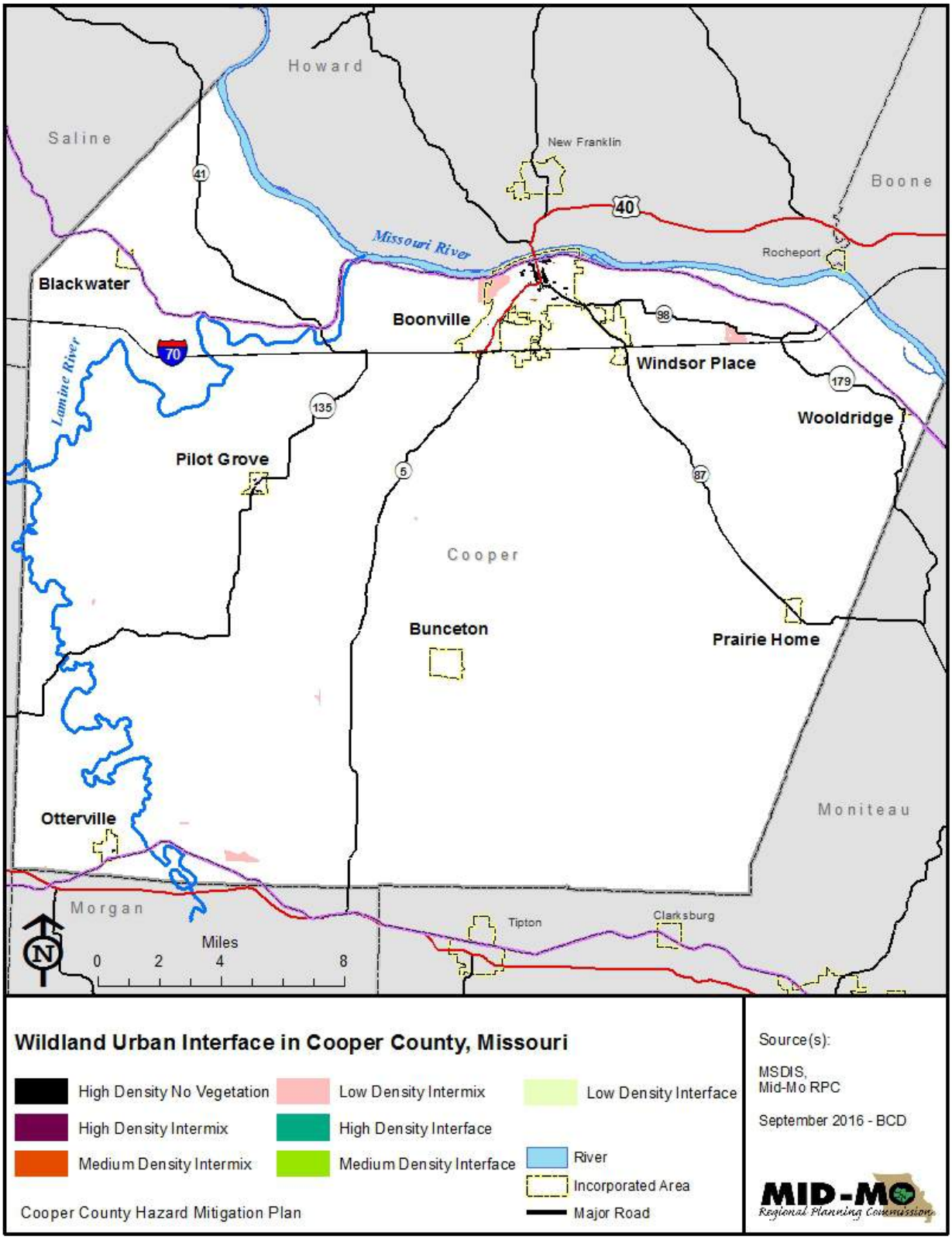
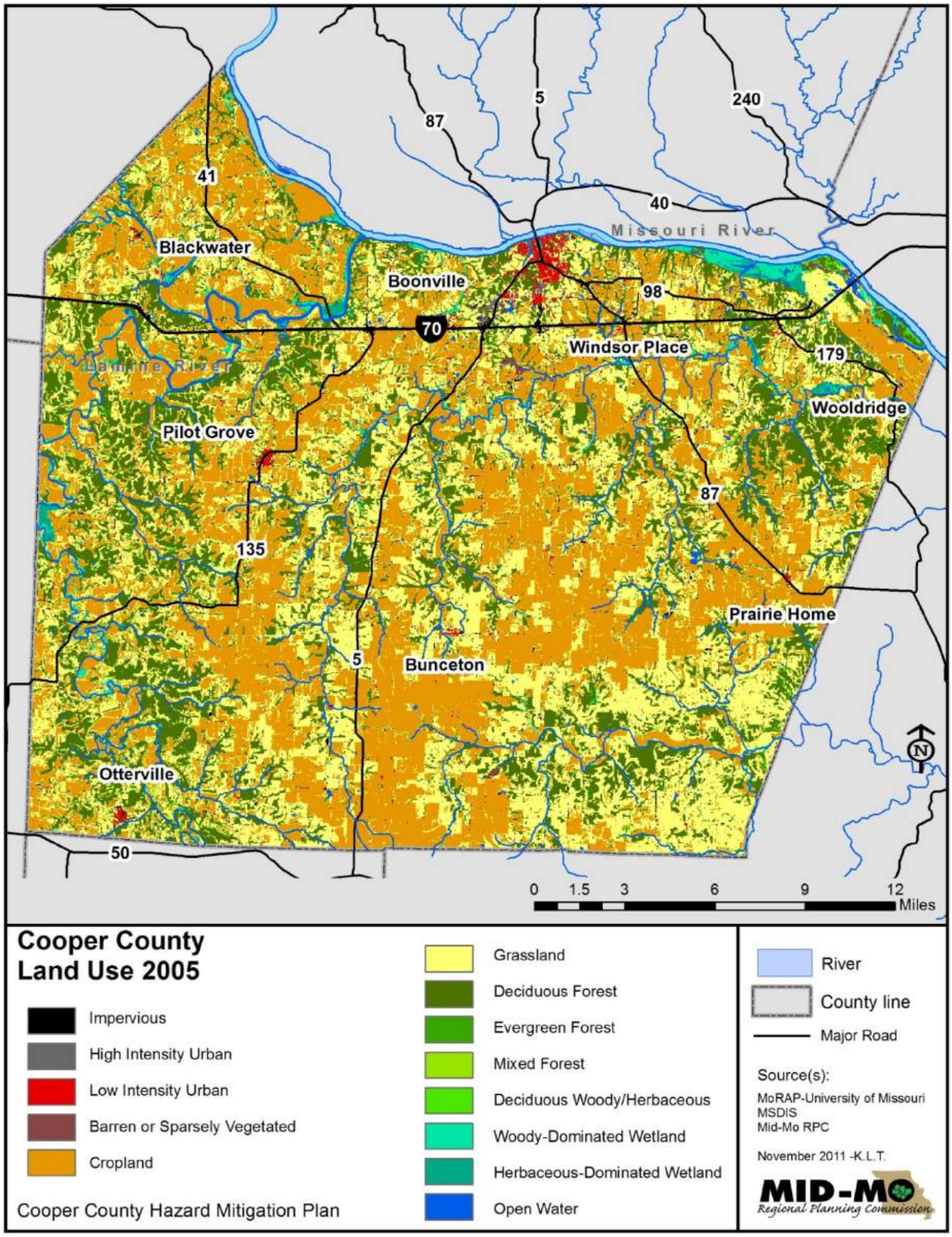

Howard
Saline
New Franklin
Boone
Missouri River
Rocheport
Blackwater
Boonville
Windsor Place
Wooldridge
Lamine River
Pilot Grove
Cooper
Bunceton
Prairie Home
Otterville
Moniteau
Morgan
Tipton
Clarksburg
Miles
0 2 4 8
Wildland Urban Interface in Cooper County, Missouri
High Density No Vegetation
High Density Intermix
Medium Density Intermix
Low Density Intermix
High Density Interface
Medium Density Interface
Low Density Interface
River
Incorporated Area
Major Road
Cooper County Hazard Mitigation Plan
Source(s):
MSDIS,
Mid-Mo RPC
September 2016 - BCD
MID-MO
Regional Planning Commission

**Figure 4.63 (reviewed by Beau Derque, September 2016)**



### Extent

Most fires in the planning area are brush fires, which are usually dealt with in less than a few hours.

### Previous Occurrences

Large and widespread wildfires, such as occur in the western United States, have not been a problem in Cooper County in recent history. Most fires have stemmed from open debris burning and agricultural burning. Several small fires occur in the early spring and fall in mostly agricultural areas in the county.

### Probability and Severity of Future Events

Probability: low
Severity: low

The probability of wildfires increases during conditions of excessive heat, dryness, and drought. The probability is also higher in spring and late fall. The Missouri State Hazard Mitigation Plan points out that the probability of wildfires may increase to high during conditions of excessive heat, dryness, and drought. The probability is also higher in spring and late fall.

## ANALYSIS OF RISK

### Potential Impact - Existing Structures

While wildfires in the central Missouri area have the potential to destroy buildings, data from the entire Mid-Missouri RPC region indicates that this is more the exception than the rule. Wildfires are usually quickly suppressed, and the damage to the built environment is minimal.

The Missouri State Hazard Mitigation Plan 2010 estimates that Cooper County has a low potential for wildfire occurrence (4-year average of 23.4 occurrences a year) and a medium potential for the amount of acres that could burn (4-year average of 213 acres burned a year).

### Potential Impact - Future Development

Potential impacts of this hazard on future development are not quantifiable with the resources available.

### Existing Mitigation Activities

State of Missouri Statutes: Missouri Revised Statute 49.266, adopted in August 2013, confers the right of county commissions to adopt an order or ordinance issuing a burn ban upon a determination made by the state fire marshal:

> Upon a determination by the state fire marshal that a burn ban order is appropriate for a county because:
>
> (1) An actual or impending occurrence of a natural disaster of major proportions within the county jeopardizes the safety and welfare of the inhabitants of such county; and

(2) The U.S. Drought Monitor has designated the county as an area of severe, extreme, or exceptional drought, the county commission may adopt an order or ordinance issuing a burn ban, which may carry a penalty of up to a class A misdemeanor. State agencies responsible for fire management or suppression activities and persons conducting agricultural burning using best management practices shall not be subject to the provisions of this subsection. The ability of an individual, organization, or corporation to sell fireworks shall not be affected by the issuance of a burn ban. The county burn ban may prohibit the explosion or ignition of any missile or skyrocket as the terms "missile" and "skyrocket" are defined by the 2012 edition of the American Fireworks Standards Laboratory, but shall not ban the explosion or ignition of any other consumer fireworks as the term "consumer fireworks" is defined under section 320.106.

The use of Red Flag Days by fire and public works departments notifies the public of heightened fire risk. Emergency response systems**,** well-trained fire departments, and numerous county roads improve response times to fire events, thus decreasing the chances of fire spread.

The Missouri Department of Conservation and the State Fire Marshal have published an informational booklet entitled “Living with Wildfire”, which educates homeowners on assessing a property’s vulnerability to wildfire and making changes to decrease the risk.

## SUMMARY OF VULNERABILITY

Wildfires in Cooper County tend to be limited in their spatial extent, thus minimizing their impact. According to the Missouri Department of Conservation, 49 percent of all wildfires in Missouri result from debris burning that gets out of hand and starts a wildfire. People and structures in the path of a wildfire are all at risk of minimum to extensive damage. Wildfire is defined as an uncontrolled fire that destroys forests and many other types of vegetation, as well as animal species.

While wildfires occur on a regular basis, they are usually easily suppressed by a quick response from the fire districts and thus limited in their spread and destruction.

## 4.10 EARTHQUAKE

## DESCRIPTION OF HAZARD

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

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

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

### Location

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

### Extent

The magnitude of an earthquake is a measurement of the actual energy released by the quake at its epicenter. In the U.S., it is commonly measured by the Richter Scale denoted with an Arabic numeral (e.g. 4.0).

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

### Previous Occurrences

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

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

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

**Probability of Future Events - Moderate**

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

> The active faults in the NMSZ are poorly understood because they are not expressed at the ground surface where they can be easily studied. The faults are hidden beneath 100- to 200-foot thick layers of soft river deposited soils called alluvium.
>
> Microseismic earthquakes (magnitude less than 1.0 to about 2.0), measured by seismographs but not felt by humans, occur on average every other day in the NMSZ (more than 200 per year).
>
> Active faults that have generated dangerous earthquakes in historic times or the recent geologic past (the last 10,000 years) are not always microseismically active. In fact, in some settings, these quiet faults are considered the most dangerous ones because high built-up stress has locked the two sides of the fault together, thereby preventing the microseismic earthquakes. This is thought to happen as a prelude to a major rupture of the fault. It is not known if faults of this type exist in the NMSZ. If they do exist, there is no easy way to locate them.

If one looks strictly at the historical record for earthquakes of 6.5 magnitude or greater, there have been 2 years (1811 and 1812) out of the last 204 years in which such earthquakes have occurred. This equals less than 1% probability in any given year (Probability= 2/204*100= 0.98%). However, there were many serious quakes in just the two years of 1811 and 1812, according to Missouri DNR.

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

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

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

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

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

## ANALYSIS OF RISK

### Severity: High

### Potential Impact - Existing Structures

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

Intensity is measured by the Modified Mercalli Intensity Scale (MMI) and expressed by a Roman numeral (Figure 4.64).

**Figure 4.64**

**Modified Mercalli Intensity Scale**

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

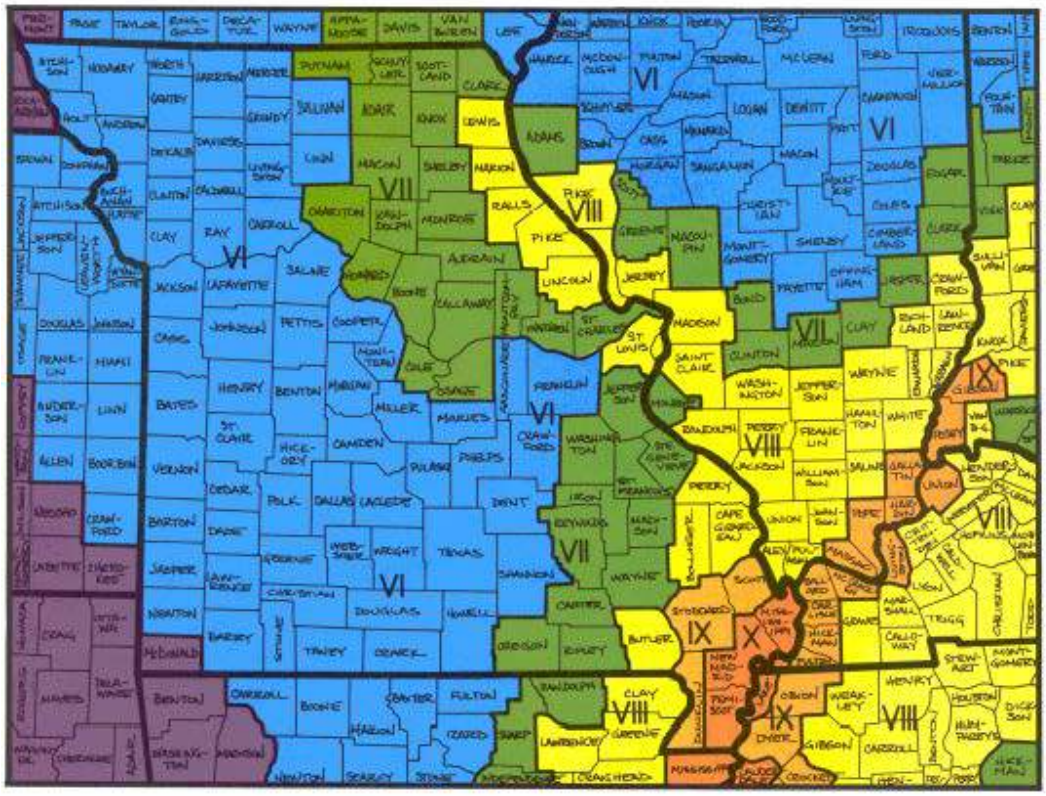
Source: http://en.wikipedia.org/wiki/Mercalli_intensity_scale

According to the USGS, Cooper County is one of the many counties in Missouri in which a 7.6-magnitude earthquake with an epicenter on or near the New Madrid Seismic Zone would have a strong impact.

The State Emergency Management Agency (SEMA) has made projections of the highest earthquake intensities which would be experienced throughout the state of Missouri should various magnitude quakes occur along the New Madrid Seismic Zone (Figure 4.65).

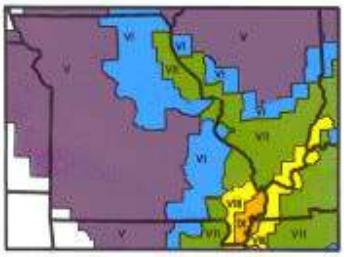
**Figure 4.65**

**Highest Projected Modified Mercalli Intensities by County**



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

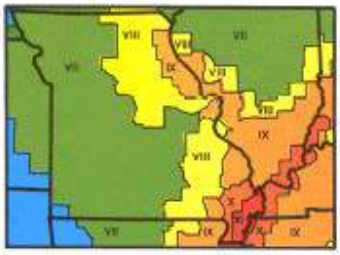
6.7



7.6

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.

8.6



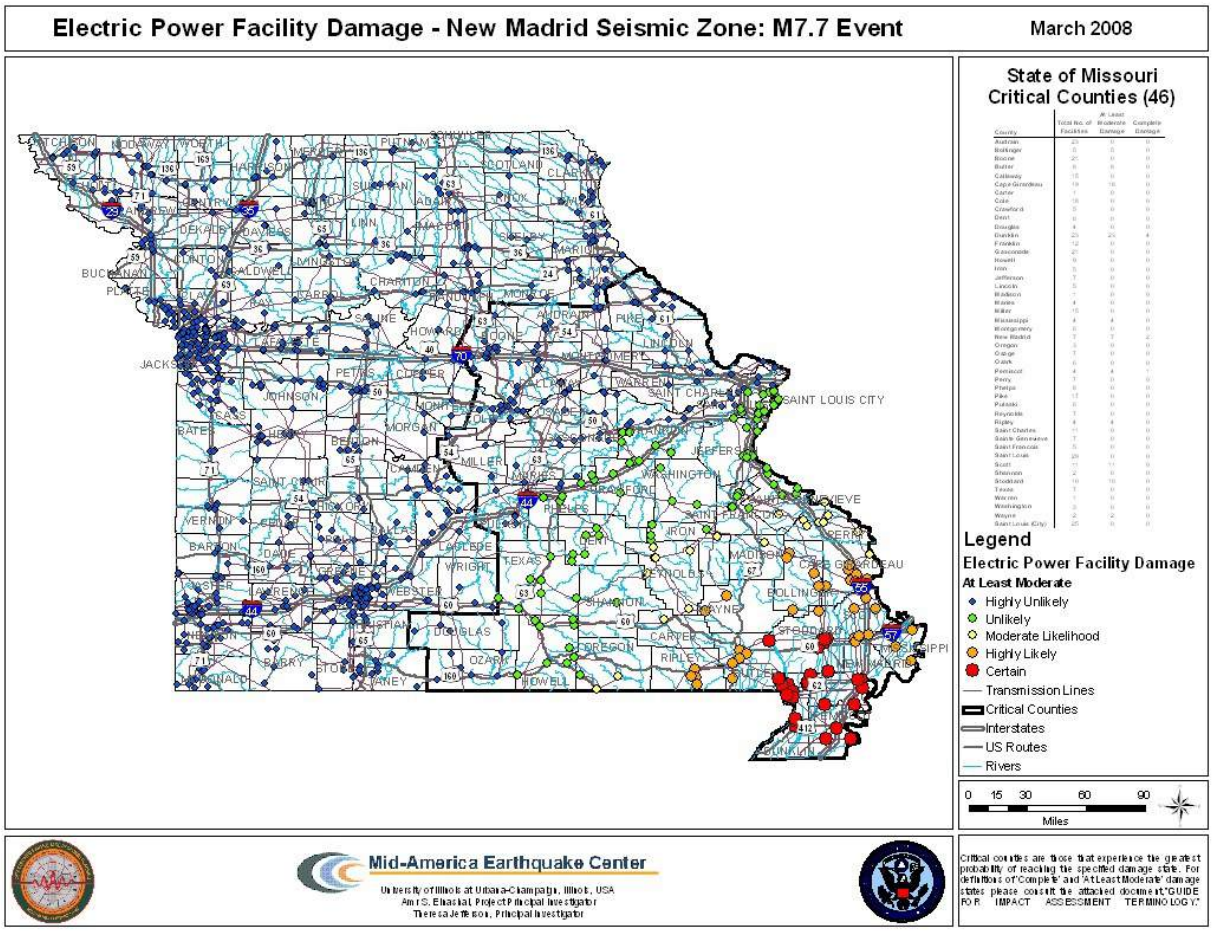
This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 8.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

The pertinent information for Cooper County is summarized in Figure 4.66.

| **Figure 4.66** **Projected Earthquake Hazard for Cooper County** | | | |
|---|---|---|---|
| **Magnitude at NMSZ** | **Probability of Occurrence (2002 -2052)** | **Intensity (MMI)** | **Expected Damage** |
| 6.7 | 25-40% | V | Minimal to none |
| 7.6 | 7-10% | VI | Slight |

In 2008, the Mid-America Earthquake Center mapped the expected probability of at least moderate damage to electric power facilities from a 7.7-magnitude earthquake in the NMSZ; such damage was considered "highly unlikely" in the planning area (Figure 4.67). This correlates well with the projected damage to *poorly* built structures from a 7.6-magnitude quake.

**Figure 4.67**



*Missouri State Hazard Mitigation Plan (2013)* Analysis: Specific modeling of damage and loss from earthquake scenarios has been conducted for the state using HAZUS 2.1 software; the findings are included in the *Missouri State Hazard Mitigation Plan (2013)*. (HAZUS software is used by FEMA to compare relative risk from earthquakes and other natural hazards.)

The following analyses were done:

1. Annualized Loss Scenario based on eight earthquake return periods (100, 200, 500, 750, 1000, 1500, 2000, and 2500 years)

2. 2% Probability of Exceedance in 50 Years Scenario – a "worst case scenario"

The analyses used demographic data based on the 2010 Census; site-specific essential facility data was based on the 2011 HSIP inventory data.
The analyses for Cooper County are discussed in the following pages.

Annualized Loss Scenario

The *MO State Hazard Mitigation Plan (2013)* explains the annualized loss scenario as follows:

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

The results of the modeling for Cooper County are shown in Figure 4.68.

**Figure 4.68**

**HAZUS-MH Earthquake Loss Estimation**
**Annualized Loss Scenario for Cooper County**

| Building Loss Total | Loss Ratio %* | Income Loss Total | Economic Loss to Buildings Total ** | Loss Ratio Rank*** |
|---|---|---|---|---|
| $43,000 | 0 | $13,000 | $56,000 | 93 |

*Loss ratio equals the sum of structural and nonstructural damage divided by the entire building inventory value within the county.

**Total economic loss includes inventory loss, relocation loss, capital-related loss, wages loss, and rental income loss

***Out of 115 (114 counties and the City of St. Louis)

Source: Missouri State Hazard Mitigation Plan (2013)

Cooper County has among the lowest loss ratios in the state, and the county's estimated building damage in actual dollars ranks 70th. For comparison, the modeling estimates the annualized total economic loss to buildings in St. Louis County (ranked number 1) at $29,748,000 and in the City of St. Louis (ranked number 2) at $9,613,000.

In Cooper County, there is the potential for building damage even at a considerable distance from the New Madrid Fault. However, the percentage of buildings sustaining damage and/or the level of damage sustained would be much lower than in a county adjacent to the fault. The loss ratio reflects this and gives an indication of both the potential economic impact of an earthquake and the difficulty of recovery in the county.

2% Probability of Exceedance in 50 Years Scenario

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

The methodology is based on probabilistic seismic hazard shaking grids developed by the U.S. Geological Survey (USGS) for the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of peak ground acceleration and spectral

acceleration at periods of 0.3 second and 1.0 second, respectively that have a 2% probability of exceedances in the next 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas. This scenario used a 7.7 driving magnitude in HAZUS-MH, which is the magnitude used for typical New Madrid fault planning scenarios in Missouri. While the 2% probability of exceedances in the next 50 years ground motion maps incorporate the shaking potential from all faults with earthquake potential in and around Missouri, the most severe shaking is predominately generated by the New Madrid Fault.

The results of the modeling for Cooper County are shown in Figure 4.69.

**Figure 4.69**

**HAZUS-MH Earthquake Loss Estimation**

**2% Probability of Exceedances in 50 Years Scenario for Cooper County**

| Structural Damage | Non-Structural Damage | Contents Damage and Inventory Loss | Loss Ratio %* | Income Loss | Total Economic Loss to Buildings** | Loss Ratio Rank*** |
|---|---|---|---|---|---|---|
| $6,754,000 | $19,413,000 | $6,782,000 | 1.54 | $8,889,000 | $41,838,000 | 65 |

*Loss ratio equals the sum of structural and nonstructural damage divided by the entire building inventory value within the county.

**Total economic loss includes inventory loss, relocation loss, capital-related loss, wages loss, and rental income loss.

***Out of 115 (114 counties and the City of St. Louis)

Source: Missouri State Hazard Mitigation Plan (2013)

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

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

### Potential Impact - Life

Social impacts have also been modeled through HAZUS-MH for this 2% Probability of Exceedance in 50 Years (Worst Case) Scenario. The modeling was done for displacement of households, sheltering needs, and the following four levels of casualty severity:

Level 1 – Injuries will require medical attention but hospitalization is not needed
Level 2 – Injuries will require hospitalization but are not considered life-threatening
Level 3 – Injuries will require hospitalization and can become life threatening if not promptly treated.
Level 4 – Victims are killed by the earthquake.

The data in Figure 4.70 shows the estimated social impact in Cooper County of an earthquake occurring at 2 a.m., a time when most people would be in their homes.

**Figure 4.70**

**Social Impact Estimates (HAZUS-MH Modeling)**
**2% Probability of Exceedance in 50 Years Scenario for Cooper County**
**2 a.m. Time of Occurrence**

| Level 1 | Level 2 | Level 3 | Level 4 | Displaced Households | Short-Term Shelter Needs |
|---|---|---|---|---|---|
| 9 | 1 | 0 | 0 | 13 | 9 |

Source: Missouri State Hazard Mitigation Plan (2013)

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

### Potential Impact - Future Development

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

### Existing Mitigation Activities

Personnel of the Cooper County Emergency Management Agency are well-trained and well-equipped to respond to disasters of all types.

School Districts The Revised Statutes of Missouri, Section 160.451, require that, "The governing body of each school district which can be expected to experience an intensity of ground shaking equivalent to a Modified Mercalli of VII or above from an earthquake occurring along the New Madrid Fault with a potential magnitude of 7.6 on the Richter Scale shall

establish an earthquake emergency procedure system in every school building under its jurisdiction."

The educational institutions in Cooper County are not subject to these statutory requirements because the county is categorized as a VI in the Modified Mercalli Intensity Scale.

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

SAVE Coalition This is a program of the Missouri State Emergency Management Agency. According to the SEMA website:

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

## SUMMARY OF VULNERABILITY

The entire planning area is vulnerable to the risk of damage from an earthquake in the New Madrid Seismic Zone (NMSZ) located in southeastern Missouri. But Cooper County is not one of the 46 "critical counties" where school districts are required by state law to establish earthquake emergency procedure systems in every school.

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

## 4.11 LAND SUBSIDENCE/SINKHOLE

### DESCRIPTION OF HAZARD

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

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

- Depression sinkholes which have a defined drainage area and are generally shown as closed contours on a topographic map; best management practices are required to protect groundwater when runoff from development drains into these areas

- Collapse sinkholes are areas of "karst-related subsidence with no defined drainage area when occurring outside of a depression sinkhole. Collapse sinkholes can occur in the bottom of a depression sinkhole and are commonly referred to as the 'eye' of the sinkhole"

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

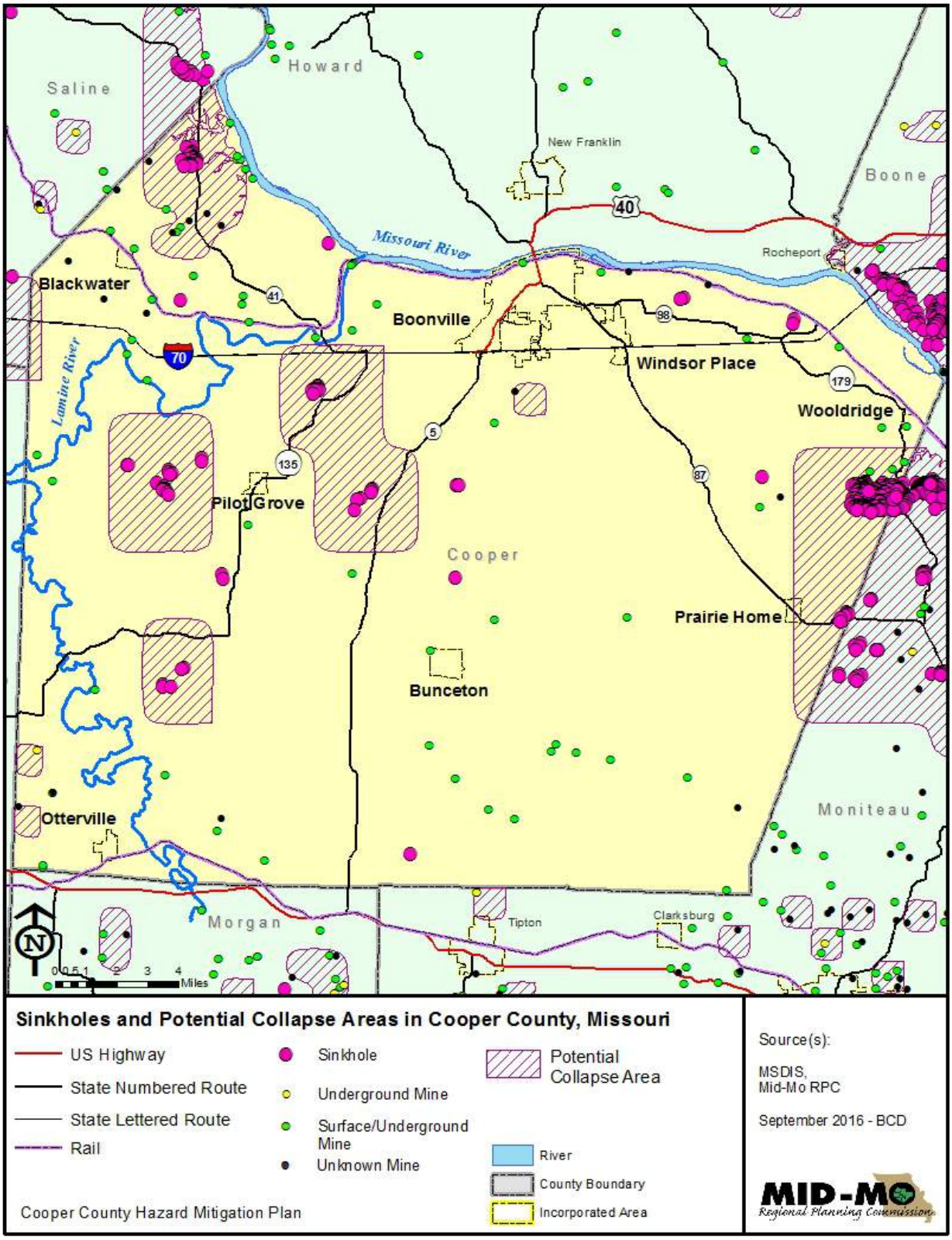
In addition to being at risk for land subsidence and sinkhole collapse associated with karst topography, the planning area is at risk from land subsidence/collapse associated with underground mining and exploratory drilling for petroleum.

**Location**

The only known sinkhole areas in the planning area are in unincorporated Cooper County (see Figure 4.71). It is important to note that future sinkhole development has the potential to occur near these areas and also in other areas that have no developed sinkholes. Gradual or sudden land subsidence is a key sign of sinkhole formation.

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

**Figure 4.71**


Saline
Howard
New Franklin
Boone
Missouri River
Rocheport
Blackwater
Boonville
Windsor Place
Wooldridge
Lamine River
Pilot Grove
Cooper
Prairie Home
Bunceton
Otterville
Moniteau
Morgan
Tipton
Clarksburg
Miles
Sinkholes and Potential Collapse Areas in Cooper County, Missouri
US Highway
State Numbered Route
State Lettered Route
Rail
Sinkhole
Underground Mine
Surface/Underground Mine
Unknown Mine
Potential Collapse Area
River
County Boundary
Incorporated Area
Source(s):
MSDIS,
Mid-Mo RPC
September 2016 - BCD
Cooper County Hazard Mitigation Plan
MID-MO
Regional Planning Commission

**Extent**

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

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

**Previous Occurrences**

There have been no *recorded* recent occurrences of sinkhole collapse in Cooper County. Just because no occurrences have been recorded does not mean that they have not happened. Previous occurrences of sinkhole development in other parts of Missouri with similar geologic features are a source of concern.

According to the Missouri DNR, sewage lagoons in West Plains and Republic in southern Missouri were drained of their contents due to the development of sinkholes. Sinkholes drain directly into underground water sources and can impact or pollute area water sources.

In West Plains, sinkholes had drained the lagoon twice before the final collapse; local officials had tried to patch the collapses with cement and other materials. The final collapse in 1978 resulted in sewage draining directly into underground water sources. Mammoth Spring in Arkansas was contaminated, and more than 800 local residents reported illness, according to the Missouri DNR. While this occurred in southern Missouri, the potential exists for a similar situation to occur in the planning area.

**Probability and Severity of Future Events**

Probability - low
Severity - low

## ANALYSIS OF RISK

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

**Potential Impact – Life**

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

Sinkhole collapse potentially poses a threat to public health via contamination of the water supply. According to information from the Missouri DNR, a 1978 sinkhole collapse in southern Missouri drained the West Plains lagoon, resulting in sewage draining directly into underground

water sources. More than 800 local residents reported illness, and Mammoth Spring in Arkansas was contaminated.

According to the *Boone County Stormwater Design Manual*, groundwater in karst systems can move as much as a mile per day; this is contrasted to non-karst areas where groundwater may only move a few feet per year. Obviously, the potential for quick and widespread contamination of groundwater is a major concern in karst areas; "a contaminant may reach some springs or wells within a few hours after entering the groundwater system." It is important to note that due to the nature of karst topography, some of the karst sinkhole areas may drain into watersheds other than the ones in which they are located. This makes the impact of pollutants in these areas harder to quantify.

**Potential Impact - Existing Structure**

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

> There is a lack of data on historic damages caused by land subsidence and sinkhole collapse in Missouri.
>
> Even with the mapping of known and possible sinkhole locations, it is difficult to predict where a sinkhole will collapse and if the collapse will be significant enough to damage any structures in the vicinity.

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

**Potential Impact - Future Development**

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

## SUMMARY OF VULNERABILITY

Land subsidence and sinkhole collapse are not of great concern in the planning area. There are no known sinkholes in any areas that would impact a school district structure. The only known sinkhole areas in the planning area are in unincorporated Cooper County. It is important to note the potential for future sinkhole development near these areas and in other areas that presently do not have developed sinkholes. Gradual or sudden land subsidence is a key sign of sinkhole formation.

# Section 5: Mitigation Strategy

## 5.1 Hazard Mitigation Goals

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

The hazard mitigation goals first developed during the 2005 were updated in 2017.

The five county hazard mitigation goals for the Cooper County Hazard Mitigation Plan (2017) are:

- Goal 1: Mitigation Planning - Mitigate effects of future natural hazards throughout the County through public and private cooperation.

- Goal 2: Mitigation Policy - Develop policies that limit the impact of natural hazards on lives and property.

- Goal 3: Mitigation Programs - Implement cost effective and feasible mitigation programs to protect lives and property of Cooper County jurisdictions.

- Goal 4: Public Awareness - Increase public awareness of natural hazards in order to make the public a greater partner in hazard mitigation planning.

- Goal 5: Future Development - Promote hazard-proof development in the jurisdictions of Cooper County.

## 5.2 Update of Mitigation Actions

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

The original Project Steering Committee (2005) was charged with developing a comprehensive range of mitigation actions to promote the agreed upon mitigation goals. Objectives were defined under each goal and the mitigation actions were then developed to promote each objective. The following six categories of mitigation were considered in developing the mitigation actions:

- **Prevention tools -** regulatory methods such as planning and zoning, building regulations, open space planning, land development regulations, and storm water management.
- **Property protection measures -** acquisition of land, relocation of buildings, modifying at-risk structures, and flood proofing at-risk structures.
- **Natural resource protection** - erosion and sediment control or wetlands protection.
- **Emergency services measures** – warning systems, response capacity, critical facilities protection, and health and safety maintenance.
- **Structural mitigation** - reservoirs, levees, diversions, channel modifications and storm sewers.
- **Public information** - providing hazard maps and information, outreach programs, real estate disclosure, technical assistance and education.

**Update of Mitigation Actions**

The Planning Committee for the 2017 update reviewed and evaluated the status of the mitigation actions from the 2012 plan. In order to ensure that there was a comprehensive mitigation approach to each hazard, there was a discussion of each hazard and the existing actions focused on its mitigation. Many actions were retained for the 2017 update; two were deleted as unrealistic or inappropriate and one new action was added.

For the 2017 update, the actions in the plan were reviewed by the planning committee and categorized as follows:

- Some uncompleted actions were removed from the strategy action plan for various reasons (Figure 5.1).

- Many of the 2012 actions were kept in the 2017 strategy action plan (Figure 5.2) either because they have not yet been completed or because they are ongoing actions which the committee wants to highlight in the plan. Changes were made to the language of some of these actions.

- One new mitigation action was added for the 2017 update (Figure 5.3).

PLEASE NOTE: The hazard mitigation meetings are an excellent opportunity for new staff and elected officials to become familiar with the extensive mitigation program in the planning area. It is an especially good opportunity for personnel from the smaller communities and educational institutions to have ongoing connections, over a period of months, with County personnel. This fosters good discussion and sometimes new issues or approaches emerge through the discussion of these ongoing actions.

**Figure 5.1**

**2012 Plan Mitigation Actions Removed from 2017 Plan**

| 2012 # | Mitigation Action | Jurisdiction | Description of Implementation |
|---|---|---|---|
| 4.2 | Encourage purchase of drought insurance in agricultural communities. | County and all participating communities | At least 90% of agricultural communities are already insured. |
| 5.7 | Build a retainment levee to control seep water and rain water | Overton-Wooldridge Levee District | The action was deemed as cost prohibitive. |

**Figure 5.2**

**2017 Plan Mitigation Actions Retained from 2012 Plan**

| 2012 # | Mitigation Action | Jurisdiction | Description of Implementation |
|---|---|---|---|
| 1.1 | Continue to enforce floodplain management ordinances in compliance with NFIP requirements | County and all participating communities | The participating jurisdictions will continue to enforce compliance with NFIP. |
| 1.2 | Develop agreements with local shelters. | County and all participating communities | Boonville, Bunceton, Otterville, and Pilot Grove have existing local shelter agreements. New shelter agreement will be added for Windsor Place and Prairie Home. |
| 1.3 | Encourage Utility Companies to maintain right of ways | County and all participating communities | Little to no control over this but will still encourage as much as possible. |
| 1.4 | Encourage cooperative agreements with utility providers to activate energy between utility districts | County and all participating communities | Little to no control over this but will still encourage as much as possible. |
| 2.1 | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. | County and all participating communities | The participating jurisdictions are working toward installing transfer switches and generators, especially in shelters. |
| 2.2 | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. | County and all participating communities | One example of this action is utilizing hazard mitigation meetings for collaboration. |

| Figure 5.2 (continued)<br>**2017 Plan Mitigation Actions<br>Retained from 2012 Plan** | | | |
|---|---|---|---|
| **2012 #** | **Mitigation Action** | **Jurisdiction** | **Description of Implementation** |
| 2.3 | Identify low water crossings and/or flood prone areas | County and all participating communities | The low water crossing map has been updated in the 2017 update. |
| 2.4 | Have alternate fueling sites/sources for emergency vehicles | County and all participating communities | MFA Oil has recently been added as a backup fuel source. Currently there is not a reserve tank for the hospital. Cooper County does have back up fuel storage. |
| 3.1 | Evaluate access problems to critical infrastructure | County and all participating communities | MODOT and Cooper County are working together on reviewing culverts and bridges. |
| 3.2 | Provide back-up power to all critical infrastructure | County and all participating communities | Boonville, Consolidated PWSD #1, Pilot Grove, and Bunceton have back up power. |
| 3.3 | Remove obstructive vegetation and/or combustible material from critical infrastructure | County and all participating communities | Clean up is ongoing in all areas. |
| 3.4 | Recommend camping facilities, fairgrounds, and mobile home parks to have safe shelters on premises | County and all participating communities | Changed wording of this action to include fairgrounds and listed as safe shelters instead of safe rooms to differentiate among the definitions. |
| 3.5 | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. | County and all participating communities | Cooper County EMA staff is currently working with nursing homes on implementing emergency plans for evacuations. The school district have individual school district evacuation plans in existing school district emergency plans. |
| 3.6 | Encourage school buses to be equipped with a multi-channel VHF High Band Devices on board and in schools | County and participating school districts | Prairie Home, Bunceton, and Boonville School Districts currently have VHF devices on school buses. Pilot Grove School District does not have VHF devices on the school buses. |
| 3.7 | Encourage shelters to have alternative heating sources | County and all participating communities | Continuously working on ways to incorporate generators into established shelters for an alternate heat source. |
| 3.8 | Build a tornado safe room | County and all participating communities and school districts | Hannah Cole Elementary in Boonville completed a safe room within the gymnasium in 2016. Boonville School District is also looking to add more safe rooms within another elementary school and vocational technology building. Prairie Home School District is waiting for FEMA funding for a safe room within the school district and NOI's have been completed and submitted to SEMA. Blackwater School District is interested in obtaining safe room funding after adopting the updated hazard mitigation plan. |

**Figure 5.2 (continued)**

**2017 Plan Mitigation Actions**
**Retained from 2012 Plan**

| 2012 # | Mitigation Action | Jurisdiction | Description of Implementation |
|---|---|---|---|
| 4.1 | Distribute public education hazard awareness information to the public. | County and all participating communities | Cooper County EMA staff distributes Nixle alerts through the public awareness system. The County is currently looking at options to update this system. |
| 5.1 | Develop a plan for upgrading and/or prioritizing low water crossings | County and all participating communities | Cooper County is working on a 5 year plan for low water crossings. |
| 5.2 | Discourage development in known sinkhole areas | County and all participating communities | Continuously monitor known sinkhole areas, especially when working on development projects. |
| 5.3 | Install dry hydrants and/or standard hydrants as needed | County and all participating communities | Fire district will be installing dry hydrants in Pilot Grove in the near future and will replace and add units whenever a need arises. |
| 5.4 | Create secondary water supply sources through interconnections or agreements | County and all participating communities | Boonville and Consolidated PWSD #1 have an interconnection agreement. |
| 5.5 | Install additional pumping stations as needed | Levee Districts | Overton-Wooldridge and Linneman-Weekley Levee Districts both installed new pumps in the recent past and will continue to update the current pumps and add additional pumps as needed. |
| 5.6 | Thicken and/or maintain levee as needed to improve capabilities | Linneman-Weekley Levee District | The levee district will continue to maintain and make improvements as needed. |
| 5.8 changed to 5.7 due to a removal | Acquire destroyed or damaged properties and relocate people voluntarily | County and participating school districts | Pilot Grove completed a CDBG demolition project in 2016. Prairie Home is starting a demolition project on 2017. Bunceton and Boonville have completed ongoing demolition projects. Wooldridge is interested in a future demolition project. |

**Figure 5.3**

**New Actions for 2017 Mitigation Strategy**

| 2017 # | Mitigation Action |
|---|---|
| 1.5 | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. |
| 1.6 | Encourage community participation in the annual Earthquake Awareness Day. |
| 1.7 | Develop a Continuity of Operations Plan (COOP). |
| 3.9 | Maintain a system of temporary alternative placement sites (“safe houses”) for temporary emergency evacuation and shelter of school populations. |
| 4.2 | Continue to maintain and upgrade early warning weather warning systems. |

## 5.3 Integration of Hazard Mitigation into Other Planning Mechanisms

| | |
|---|---|
| ***Requirement §201.6(c)(4)(ii):*** | ***[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*** |

Successful mitigation depends on the actual implementation of the mitigation actions arrived at through the planning process. The composition of the Technical Steering Committee for the update of the Cooper County Natural Hazard Mitigation Plan bodes well for the successful incorporation of the hazard mitigation strategy into other planning processes throughout the Planning Area.

In addition to the core members of the Technical Steering Committee, the representatives from Cooper County were resourceful in bringing other knowledgeable staff to meetings on subjects in their particular areas of expertise. The entire process thus drew on experience and knowledge from: elected officials/staff from the incorporated communities; senior department members from Cooper County in key areas such as Emergency Management, Road and Bridge, Public Health and Fire; and representatives from the educational institutions, levee districts, and fire districts.

This diverse group worked to produce a thoughtful and useful document. The sheer number of different people involved in the update process has raised the level of awareness of hazard mitigation planning within the Planning Area; this will also be helpful when integrating the *Hazard Mitigation Plan* into other planning processes.

<u>Cooper County</u>

The primary planning document for the unincorporated area of the county is ***The Cooper County Emergency Operations Plan***. An update of this plan was approved in 2017. During the next update process, the requirements of the *Hazard Mitigation Plan* will be integrated with this document.

In the meantime, the Cooper County Commission and the Cooper County EMA will adopt the Hazard Mitigation Plan as an additional planning document for the County.

The Cooper County Emergency Management Director, Assistant Director, and County Commissioners were key members of the Technical Steering Committee for the update of the *Hazard Mitigation Plan*; they are also involved in developing the plan for implementing and administering those County mitigation actions which fall under their scope of duties. They will ensure that the mitigation actions are included in the EMA work program and other county planning documents or work programs according to the prioritizations in the plan.

Incorporated Communities of Boonville, Bunceton, Otterville, Pilot Grove, Prairie Home, Windsor Place, and Wooldridge

The smaller incorporated communities in the Planning Area do not have Master or Comprehensive Plans. They are, however, part of the *Cooper County EOP*; the integration of the *Hazard Mitigation Plan* with the *EOP* will serve to integrate the actions under the lead of the EMD for these jurisdictions also.

In all of these communities, the City Council or the Board of Aldermen/Trustees serves as the main planning body. These bodies were informed of the hazard mitigation update planning process as it was taking place. The councils/boards approved the specific mitigation actions for their jurisdictions, in addition to the plans for implementation and administration. In most of these communities, the Council/Mayor is responsible for implementing most of the specific mitigation actions.

Levee Districts

Neither the Linneman-Weekly Levee District nor the Overton-Wooldridge Levee District have work programs. They do have annual budgets that they submit to the Cooper County Commission. The levee districts may use this plan to help develop a budget to include actions they have laid out in this plan. Both levee districts attended Steering Committee Meetings and provided great input.

School Districts

The mitigation actions in the *Hazard Mitigation Plan* will be integrated into the district ***emergency plans*** for Blackwater School District, Boonville School District, Otterville School District, and Prairie Home R-V School District. These actions will be maintained as goals in the schools plans and will be updated on a regular basis.

All Participating Jurisdictions

In addition to the specific incorporation/integration methods described for each participating jurisdiction, it should be emphasized that the yearly maintenance of the *Hazard Mitigation Plan*, as discussed in Section 5.1, will serve to help incorporate and integrate its requirements into the planning in the jurisdictions.

## 5.4 Mitigation Goals, Objectives, and Actions

A comprehensive list of the goals, objectives, and mitigation actions for the Cooper County Hazard Mitigation Plan (2017) are listed below. The mitigation actions listed are for the entire planning area; participating jurisdictions will differ in the specific actions undertaken in their jurisdictions. The mitigation actions for each participating jurisdiction are included in Section 6.3: Implementation, Administration, and Integration in Participating Jurisdictions.

Actions which address reducing the effects of hazards on new and/or existing buildings and infrastructure are indicated as such in parentheses following the actions (i.e. New, Existing, Both).

1. **Mitigation Planning - Mitigate effects of future natural hazards through public and private cooperation.**

1.1 Continue to enforce floodplain management ordinances in compliance with NFIP requirements. (Both)
1.2 Develop agreements with local shelters.
1.3 Encourage Utility Companies to maintain right of ways. (New)
1.4 Encourage cooperative agreements with utility providers to activate energy between utility districts. (New)
1.5 Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards.
1.6 Encourage community participation in the annual Earthquake Awareness Day. (Both)
1.7 Develop a Continuity of Operations Plan (COOP).

2. **Mitigation Policy - Develop policies that limit the impact of natural hazards on lives and property.**

2.1 Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. (Both)
2.2 Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts.
2.3 Identify low water crossings and/or flood prone areas. (Both)
2.4 Have alternate fueling sites/sources for emergency vehicles.

3. **Mitigation Programs - Implement cost effective and feasible mitigation programs to protect lives and property.**

3.1 Evaluate access problems to critical infrastructure. (Both)
3.2 Provide back-up power to all critical infrastructure. (Both)
3.3 Remove obstructive vegetation and/or combustible material from critical infrastructure. (Both)
3.4 Recommend camping facilities, fairgrounds, and mobile home parks to have safe shelters on premises.
3.5 Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas.

3.6 Encourage school buses to be equipped with a multi-channel VHF High Band Devices on board and in schools.
3.7 Encourage shelters to have alternative heating sources. (Both)
3.8 Build a tornado safe room. (Both)
3.9 Maintain a system of temporary alternative placement sites ("safe houses") for temporary emergency evacuation and shelter of school populations.

**4. Public Awareness - Increase public awareness of natural hazards.**

4.1 Distribute public education hazard awareness information to the public.
4.2 Continue to maintain and upgrade early warning weather warning systems.

**5. Future Development - Promote hazard-proof development**

5.1 Develop a plan for upgrading and/or prioritizing low water crossings. (Both)
5.2 Discourage development in known sinkhole areas. (Both)
5.3 Install dry hydrants and/or standard hydrants as needed.
5.4 Create secondary water supply sources through interconnections or agreements. (Both)
5.5 Install additional pumping stations as needed.
5.6 Thicken and/or maintain levee as needed to improve capabilities.
5.7 Acquire destroyed or damaged properties and relocate people voluntarily. (Both)

**Overview of Mitigation Actions by Hazards Addressed and Participating Jurisdictions**

An overview of the mitigation actions for the 2017 update is shown by the hazards addressed (Figure 5.1-5.3). An overview by the participating jurisdictions to which each action applies and the lead jurisdiction on each action is shown in Figure 5.4.

## MITIGATION ACTIONS BY HAZARD AND JURISDICTION

**Figure 5.4 OVERVIEW OF MITIGATION GOALS AND ACTIONS INCLUDING HAZARDS AND JURISDICTIONS**

| Action # | Goals and Actions | Cooper County | Blackwater | Boonville | Bunceton | Otterville | Pilot Grove | Prairie Home | Windsor Place | Wooldridge | Overton-Wooldridge Levee | Linneman-Weekley Levee | Blackwater School District | Boonville School District | Otterville School District | Prairie Home School District | Dam Failure | Drought | Earthquake | Extreme Heat | Flood | Land Subsidence/ Sinkholes | Levee Failure | Severe Winter Weather | Wildfire | Windstorm | Hailstorm | Tornado |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Mitigation Planning - Mitigate effects of future natural hazards through public and private cooperation.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **1.1** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements | x | x | x | x | x | x | | | x | | | | | | | | | | | X | | X | | | | | |
| **1.2** | Develop agreements with local shelters | x | x | x | x | x | x | x | x | x | | | | x | | x | | | X | | X | | | X | X | X | | X |
| **1.3** | Encourage Utility Companies to maintain right of ways | x | x | x | x | x | x | x | x | x | | | | | | | | | X | | | | | X | X | X | | X |
| **1.4** | Encourage cooperative agreements with utility providers to activate energy between utility districts | x | x | x | x | x | x | x | x | x | | | | | | | X | | X | X | | | | X | X | X | X | X |
| **1.5** | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. | x | | | | | | | | | | | x | x | x | x | | | | | | | | | | | | |
| **1.6** | Encourage community participation in the annual Earthquake Awareness Day. | x | | | | | | | | | | | | x | | x | | | X | | | | | | | | | |
| **1.7** | Develop a Continuity of Operations Plan (COOP). | x | | | | | | | | | | | | x | | | | | | | | | | | | | | |
| **2. Mitigation Policy - Develop policies that limit the impact of natural hazards on lives and property.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **2.1** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. | x | x | | x | x | x | x | x | x | x | x | | | | x | X | | X | | X | | | X | X | X | | X |
| **2.2** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | X | X | X | X | X | X | X | X | X | X | X | X |
| **2.3** | Identify low water crossings and/or flood prone areas | x | | | | x | | | | | | | | | | | | | | | X | | | | | | | |
| **2.4** | Have alternate fueling sites/sources for emergency vehicles | x | x | x | x | x | x | x | x | | | | | | | | | | X | | X | | | X | X | X | | X |

**Figure 5.4 (continued) Overview of Mitigation Goals and Actions including Hazards and Jurisdictions**

| Action # | Goals and Actions | Cooper County | Blackwater | Boonville | Bunceton | Otterville | Pilot Grove | Prairie Home | Windsor Place | Wooldridge | Overton-Wooldridge Levee District | Linneman-Weekley Levee District | Blackwater School District | Boonville School District | Otterville Public School District | Prairie Home R-V Schools | Dam Failure | Drought | Earthquake | Extreme Heat | Flood | Land Subsidence/ Sinkholes | Levee Failure | Severe Winter Weather | Wildfire | Windstorm | Hailstorm | Tornado |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3. Mitigation Programs - Implement cost effective and feasible mitigation programs to protect lives and property** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **3.1** | Evaluate access problems to critical infrastructure | x | x | x | x | x | x | x | x | | | | | | | | | | X | | X | | X | X | X | | | |
| **3.2** | Provide back-up power to all critical infrastructure | x | x | x | x | x | x | x | x | | | | | | | | | | X | X | | | | X | | X | | X |
| **3.3** | Remove obstructive vegetation and/or combustible material from critical infrastructure | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | | | X | X | X | | X |
| **3.4** | Recommend camping facilities, fairgrounds, and mobile home parks to have safe shelters on premises | x | | | | | | | | | | | | | | | | | | | | | | | X | | | X |
| **3.5** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. | x | | | | | | | | | | | x | x | x | x | | | X | | X | | | | X | X | | X |
| **3.6** | Encourage school buses to be equipped with a multi-channel VHF High Band Devices on board and in schools | x | | | | | | | | | | | | | | | | X | X | X | X | | X | X | X | X | X | X |
| **3.7** | Encourage shelters to have alternative heating sources | x | x | x | x | x | x | x | x | x | | | | | | | | | X | | | | | X | | | | |
| **3.8** | Build a tornado safe room | x | x | x | x | x | x | x | x | x | | | x | x | x | x | | | | | | | | | | | | X |
| **3.9** | Maintain a system of temporary alternative placement sites (“safe houses”) for temporary emergency evacuation and shelter of school populations. | x | | | | | | | | | | | x | x | x | x | | | | | | | | | | X | X | X |

**Figure 5.4 (continued) Overview of Mitigation Goals and Actions including Hazards and Jurisdictions**

| Action # | Goals and Actions | Cooper County | Blackwater | Boonville | Bunceton | Otterville | Pilot Grove | Prairie Home | Windsor Place | Wooldridge | Overton-Wooldridge Levee District | Linneman-Weekley Levee District | Blackwater School District | Boonville School District | Otterville School District | Prairie Home R-V Schools | Dam Failure | Drought | Earthquake | Extreme Heat | Flood | Land Subsidence/ Sinkholes | Levee Failure | Severe Winter Weather | Wildfire | Windstorm | Hailstorm | Tornado |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4. Public Awareness - Increase public awareness of natural hazards in order to make the public a greater partner in hazard mitigation planning.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **4.1** | Distribute public education hazard awareness information to the public | x | x | x | x | x | x | x | x | x | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X |
| **4.2** | Continue to maintain and upgrade early warning weather warning systems. | x | x | x | x | x | x | x | x | | | | | | | | | X | | | | | | | | | | |
| **5. Future Development - Promote hazard-proof development** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **5.1** | Develop a plan for upgrading and/or prioritizing low water crossings | x | | | | | | | | | | | | | | | | | | | X | | | | | | | |
| **5.2** | Discourage development in known sinkhole areas | x | | | | | | | | | | | | | | | | | | | | X | | | | | | |
| **5.3** | Install dry hydrants and/or standard hydrants as needed | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | | | | X | | | |
| **5.4** | Create secondary water supply sources through interconnections or agreements | x | x | x | x | x | x | x | x | | | | | | | | | X | X | X | | | | | X | | | |
| **5.5** | Install additional pumping stations as needed | x | | | | | | | | | | x | | | | | | | | | X | | X | | | | | |
| **5.6** | Thicken and/or maintain levee as needed to improve capabilities | x | | | | | | | | | x | x | | | | | | | | | X | | X | | | | | |
| **5.7** | Acquire destroyed or damaged properties and relocate people voluntarily | x | x | x | x | x | x | x | | x | | | | | | | | | | | X | | | | | | | |

Mitigation Actions Addressing Compliance with NFIP Requirements

| | |
|---|---|
| ***Requirement §201.6(c)(3)(ii):*** | ***[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance program (NFIP), and continued compliance with NFIP requirements, as appropriate.*** |

Details of NFIP participation and flood mapping have been included in the Flood Profile in Section 3.5. The NFIP participation statuses of jurisdictions are shown again in Figure 5.5, along with jurisdictions that are not participating.

**Figure 5.5**

| **Jurisdictions Participating in NFIP** |
|---|
| Cooper County |
| Blackwater |
| Boonville |
| Bunceton |
| Otterville |
| Pilot Grove |
| Wooldridge |
| **Jurisdictions Not Participating in NFIP** |
| Prairie Home |
| Windsor Place |

Source: Community Surveys

The jurisdictions of Cooper County, Blackwater, Boonville, Bunceton, Otterville, Pilot Grove, and Wooldridge participate in the NFIP. The following mitigation actions pertain to continued compliance with the NFIP; the participating jurisdiction to which each action applies is listed after the action. While Prairie Home and Windsor Place are not participants in NFIP, they do list Flood as a hazard in their communities and are also included in the figure.

| Figure 5.6<br><br>**Mitigation Actions Addressing Compliance with NFIP Requirements** | | Cooper County | Blackwater | Boonville | Bunceton | Otterville | Pilot Grove | Wooldridge |
|---|---|---|---|---|---|---|---|---|
| 1.1 | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. | x | x | x | x | x | x | x |
| 2.1 | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. | x | x | x | x | x | x | x |
| 2.2 | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. | x | x | x | x | x | x | x |
| 2.3 | Identify low water crossings and/or flood prone areas. | x | | | | x | | x |
| 4.1 | Distribute public education hazard awareness information to the public. | x | x | x | x | x | x | x |
| 5.1 | Develop a plan for upgrading and/or prioritizing low water crossings. | x | | | | | | |
| 5.5 | Install additional pumping stations as needed. | x | | | | | | |
| 5.6 | Thicken and/or maintain levee as needed to improve capabilities. | x | | | | | | |
| 5.7 | Acquire destroyed or damaged properties and relocate people voluntarily. | x | x | x | x | x | x | x |

## 5.5 Prioritization, Implementation, and Administration

| | |
|---|---|
| ***Requirement §201.6(c)(3)(iii):*** | ***[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c) (3) (ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*** |
| ***Requirement §201.6(c)(3)(iv):*** | ***For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*** |

### STAPLEE AND BENEFIT/COST REVIEWS

After the comprehensive list of mitigation actions for the entire planning area had been developed for the 2017 update, the Planning Committee carried out a STAPLEE review and Benefit/Cost review on the actions. The 2017 Planning Committee reviewed this prior evaluation and carried out a review of the new actions. The following guidelines were used during both updates:

### STAPLEE Review

The questions below were used as starting points for evaluating each action according to the STAPLEE criteria. Scoring:

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

- **Social**: Is the action socially acceptable to the community?
- **Technical**: Will the proposed strategy work? Will the action independently solve the problem?
- **Administrative**: Is there someone to coordinate and lead the effort?
- **Political**: Is the action politically acceptable? Is there public support both to implement and to maintain the project?
- **Legal**: Is there legal authority to implement the action?
- **Economic**: Will the action benefit the area economically? Does the cost seem reasonable for the size of the problem and the likely benefits?
- **Environmental**: Is the action consistent with local, state, and federal environmental laws and regulations? Will the project have a positive impact on the environment? Will historic structures be saved or protected?

**Benefit/Cost Review**

Benefit

Two (2) points were added for each of the following *avoided* damages (8 points maximum = highest benefit)

- Injuries and/or casualties
- Property damages
- Loss-of-function/displacement impacts
- Emergency management costs/community costs

Cost

Points were subtracted according to the following cost scale (-5 points maximum = highest cost)

(-1) = Minimal – little cost to the jurisdiction involved
(-3) = Moderate – definite cost involved but could likely be worked into operating budget
(-5) = Significant – cost above and beyond most operating budgets; would require extra appropriations to finance or to meet matching funds for a grant

**Total Score**

The scores for the STAPLEE Review and Benefit/Cost Review were added to determine a Total Score for each action.

**Priority Scale**

To achieve an understanding of how a Total Score might be translated into a Priority Rating, a sample matrix was filled out for the possible range of ratings an action might receive on both the STAPLEE and Benefit/Cost Review (see Figure 4.4.2). The possible ratings tested ranged between:

- A hypothetical action with "Half probably NO and half maybe YES" answers on STAPLEE (i.e. poor STAPLEE score) and Low Benefit/High Cost: Total Score = 7

- A hypothetical action with "All definitely YES" on STAPLEE and High Benefit/Little Cost: Total Score = 28

An inspection of the possible scores within this range led to the development of the following Priority Scale based on the Total Score in the STAPLEE-Benefit/Cost Review process:

20-28 points = High Priority
14-19 points = Medium Priority
13 points and below = Low Priority

The results of the STAPLEE Review, Benefit/Cost Review, and Final Priority for each of the mitigation actions are shown in Figure 5.7. It should be noted that most of the actions attained a high priority rating; this is reflective of the fact that many actions which would have scored poorly on the STAPLEE review were deleted for the 2017 update process. Also, some of the actions are already in place and ongoing, but remain high priorities in the work plans of the jurisdictions; these are included in the overall mitigation strategy for the reasons discussed in Section 5.1.

| Figure 5.7<br>**Overview of Prioritization of Actions** | | S | T | A | P | L | E | E | STAPLEE Total | Benefit | Cost | B/C Total | Total | Priority |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.1** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 19 | 8 | -1 | 7 | 26 | H |
| **1.2** | Develop agreements with local shelters | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **1.3** | Encourage Utility Companies to maintain right of ways | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 20 | 8 | -1 | 7 | 27 | H |
| **1.4** | Encourage cooperative agreements with utility providers to activate energy between utility districts | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **1.5** | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **1.6** | Encourage community participation in the annual Earthquake Awareness Day. | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **1.7** | Develop a Continuity of Operations Plan (COOP). | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **2.1** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 19 | 8 | -1 | 7 | 26 | H |
| **2.2** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **2.3** | Identify low water crossings and/or flood prone areas | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **2.4** | Have alternate fueling sites/sources for emergency vehicles | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -3 | 5 | 26 | H |
| **3.1** | Evaluate access problems to critical infrastructure | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **3.2** | Provide back-up power to all critical infrastructure | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -5 | 3 | 24 | H |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3.3** | Remove obstructive vegetation and/or combustible material from critical infrastructure | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 6 | -1 | 5 | 26 | H |
| **3.4** | Recommend camping facilities, fairgrounds, and mobile home parks to have safe shelters on premises | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 17 | 4 | -5 | -1 | 16 | M |
| **3.5** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 20 | 6 | -1 | 5 | 25 | H |
| **3.6** | Encourage school buses to be equipped with a multi-channel VHF High Band Devices on board and in schools | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 6 | -3 | 3 | 24 | H |
| **3.7** | Encourage shelters to have alternative heating sources | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -3 | 5 | 26 | H |
| **3.8** | Build a tornado safe room | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 4 | -5 | -1 | 20 | H |
| **3.9** | Maintain a system of temporary alternative placement sites (“safe houses”) for temporary emergency evacuation and shelter of school populations. | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |

| **Figure 5.7 (Continued)** **Overview of Prioritization of Actions** | | **S** | **T** | **A** | **P** | **L** | **E** | **E** | **STAPLEE Total** | **Benefit** | **Cost** | **B/C Total** | **Total** | **Priority** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4.1** | Distribute public education hazard awareness information to the public | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **4.2** | Continue to maintain and upgrade early warning weather warning systems. | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -5 | 3 | 24 | H |
| **5.1** | Develop a plan for upgrading and/or prioritizing low water crossings | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 19 | 8 | -1 | 7 | 26 | H |
| **5.2** | Discourage development in known sinkhole areas | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -1 | 7 | 28 | H |
| **5.3** | Install dry hydrants and/or standard hydrants as needed | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -5 | 3 | 24 | H |
| **5.4** | Create secondary water supply sources through interconnections or agreements | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 8 | -5 | 3 | 24 | H |
| **5.5** | Install additional pumping stations as needed | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 4 | -1 | 3 | 24 | H |
| **5.6** | Thicken and/or maintain levee as needed to improve capabilities | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 21 | 4 | -3 | 1 | 22 | H |
| **5.7** | Acquire destroyed or damaged properties and relocate people voluntarily | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 19 | 8 | -5 | 3 | 22 | H |

## 5.6 Implementation and Administration In Participating Jurisdictions

| | |
|---|---|
| **Requirement §201.6(c)(3)(iii):** | ***[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c) (3) (ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*** |
| **Requirement §201.6(c)(3)(iv):** | ***For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*** |

After the Planning Committee had finished the STAPLEE and Benefit/Cost Reviews and prioritization of the mitigation actions, the mitigation actions suggested for the specific participating jurisdictions were handed over to the representatives or governing bodies of those jurisdictions for implementation and administration decisions.

It was recognized that participating jurisdictions might choose to either change the prioritization of or exclude some suggested mitigation actions based on current specifics of time, resources, and capabilities. In addition, new mitigation actions might be added based on specific issues.

The implementation of mitigation actions are shown in the following pages; they are organized by the participating jurisdiction serving as lead for the action. Keys for the charts are shown below:

<u>Benefit (Losses Avoided)</u>

I/C - Injuries and/or casualties
PD - Property damages
LF - Loss-of-function/displacement impacts
EMCC - Emergency management costs/community costs

<u>Projected Cost</u>

Minimal – little cost to the jurisdiction involved
Moderate – definite cost involved but could likely be worked into operating budget
Significant – cost above and beyond most operating budgets; would require extra appropriations to finance or to meet matching funds for a grant

The Cooper County Emergency Management Agency is the lead on many actions mitigating hazards for the entire planning area.

## COOPER COUNTY

| | |
|---|---|
| **Action #** | 1.1.1 |
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA |
| Plan for Implementation and Administration | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |

| | |
|---|---|
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

| | |
|---|---|
| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

| | |
|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |
| Action # | 1.1.5 |
| Mitigation Action | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School District administration staff will update school plans as needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed school safety plans. |
| Action # | 1.1.6 |
| Mitigation Action | Encourage community participation in the annual Earthquake Awareness Day. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School Districts will observe and plan an annual Earthquake Awareness Day activity. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed earthquake awareness activity. |

| | |
|---|---|
| **Action #** | 1.1.7 |
| **Mitigation Action** | Develop a Continuity of Operations Plan (COOP). |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School Districts will develop a emergency plan to ensure regular activities resume after an emergency as quickly as possible. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed Continuity of Operation Plan (COOP). |
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

| | |
|---|---|
| **Action #** | 2.1.3 |
| **Mitigation Action** | Identify low water crossings and/or flood prone areas |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Otterville City Council |
| Partners, if any | Mid Missouri Regional Planning Commission |
| Plan for Implementation and Administration | Both Cooper County and Otterville have identified flood prone areas, which can be found in Section 3 under "Flood". Cooper County is currently in the process of identifying all low water crossing locations and mapping those locations in a GIS. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | 2012 |
| Criterion for Completion | All flooding locations and low water crossings are identified. |

| | |
|---|---|
| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |

| | |
|---|---|
| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

| | |
|---|---|
| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Generators are installed, as needed |

| | |
|---|---|
| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |

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| **Action #** | 3.1.4 |
| **Mitigation Action** | Recommend camping facilities and mobile home parks to have safe rooms on premises. |
| Priority | M |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Mobile home park owners, campsite owners |
| Plan for Implementation and Administration | Cooper County will encourage all mobile home parks and camping facilities to have a safe room on their premises. This can be achieved through new construction or designation of hardened facilities that may already exist nearby. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Facilities will be educated on the importance of a safe room. |

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| **Action #** | 3.1.5 |
| **Mitigation Action** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | School Districts, Nursing Homes, other special districts |
| Plan for Implementation and Administration | Cooper County EMA, with the cooperation of school districts and nursing homes, will review evacuation procedures on an annual basis to ensure public safety in response to natural and manmade hazards. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Evacuation procedures are in place and reviewed in accordance with emergency management protocols. |

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| **Action #** | 3.1.6 |
| **Mitigation Action** | Encourage school buses to be equipped with a multi-channel VHF High Band Device on board and in schools |
| Priority | H |
| Lead Department or Agency | Cooper County EMA and Prairie Home R-V School District |
| Partners, if any | SEMA, FEMA |
| Plan for Implementation and Administration | Both Cooper County EMA and Prairie Home R-V Schools will work together to secure funding to equip busses with these radios. This is needed due to poor cell phone reception in certain areas, and a need for a consistent and efficient form of communication between the school district main office and busses en route. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2014 |
| Criterion for Completion | Radios are installed. |

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| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

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|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |
| | |
| **Action #** | 3.1.9 |
| **Mitigation Action** | Maintain a system of temporary alternative placement sites ("safe houses") for temporary emergency evacuation and shelter of school populations. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | The participating School Districts are working on establishing emergency evacuations sites. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2017) |
| Criterion for Completion | Sites for safe rooms have been identified. |

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| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |
| | |
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | PD |
| Projected Cost | Minimal |
| Potential Funding Sources | Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Farmers are aware of drought insurance availability. |

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| **Action #** | 5.1.1 |
| **Mitigation Action** | Develop a plan for upgrading and/or prioritizing low water crossings. |
| Priority | H |
| Lead Department or Agency | Cooper County Road and Bridge Department |
| Partners, if any | Mid-Missouri Regional Planning Commission |
| Plan for Implementation and Administration | The Cooper County and Commission and the Road and Bridge Department would like to have all low water crossings identified in the county (Action 2.3). This would enable better planning for installing signs, constructing new crossings, and would help with general public safety. This action is currently underway through mapping by the Mid-Missouri Regional Planning Commission. In addition to identifying the County will start prioritizing crossings that need to be replaced or upgraded. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | 2012 |
| Criterion for Completion | All low water crossings are identified and mapped. |

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| **Action #** | 5.1.2 |
| **Mitigation Action** | Discourage development in known sinkhole areas. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Private land owners |
| Plan for Implementation and Administration | Cooper County departments will give advice and recommendations concerning construction and/or land use in known sinkhole areas when necessary. It should be noted that Cooper County does not have zoning ordinances. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Land owners are aware of sinkhole areas. |
| | |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |

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|---|---|
| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

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|---|---|
| **Action #** | 5.1.5 |
| **Mitigation Action** | Install additional pumping stations as needed. |
| Priority | H |
| Lead Department or Agency | Linneman-Weekley Levee District |
| Partners, if any | Cooper County Commission, USACE, SEMA, FEMA |
| Plan for Implementation and Administration | The levee district would identify areas that are in need of extra pumping stations and identify a funding source. |
| Benefits (Losses Avoided) | PD |
| Projected Cost | Minimal |
| Potential Funding Sources | Private, Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Two pumping stations installed. |

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| **Action #** | 5.1.6 |
| **Mitigation Action** | Thicken and/or maintain levee as needed to improve capabilities. |
| Priority | H |
| Lead Department or Agency | Levee Districts, USACE |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | Both levee districts will continue current maintenance practices consistent with US Army Corps of Engineers guidelines. Thickening of the levee "toe" or base would increase from a slope of 1 to 2 to a slope of 1 to 3 where needed (for every 1 foot of rise there would be 3 feet of run). In some areas a slope of 1 to 5 may be necessary. |
| Benefits (Losses Avoided) | PD, LF |
| Projected Cost | Moderate |
| Potential Funding Sources | Private, State, and Federal |
| Projected Completion Date | Ongoing - project is continuous depending on conditions |
| Criterion for Completion | Slope is increases to a minimum of 1 to 3. |

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|---|---|
| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## BLACKWATER

| **Action #** | 1.1.1 |
|---|---|
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA |
| Plan for Implementation and Administration | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |

| **Action #** | 1.1.2 |
|---|---|
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

| **Action #** | 1.1.3 |
|---|---|
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

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|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |
| | |
| Action # | 2.1.1 |
| Mitigation Action | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |
| | |
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

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| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |

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| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

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| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2021 |
| Criterion for Completion | Generators are installed, as needed |

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| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |
| | |
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sites for safe rooms have been identified. |

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|---|---|
| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |
| | |
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | PD |
| Projected Cost | Minimal |
| Potential Funding Sources | Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Farmers are aware of drought insurance availability. |

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|---|---|
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |
| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |
| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## BOONVILLE

| | |
|---|---|
| **Action #** | 1.1.1 |
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA |
| Plan for Implementation and Administration | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |

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|---|---|
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

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|---|---|
| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

| | |
|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

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|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

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| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

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| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |

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|---|---|
| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

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| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Generators are installed, as needed |

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| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2021 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

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| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |

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| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |

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| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2021 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |
| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## BUNCETON

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|---|---|
| **Action #** | 1.1.1 |
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA |
| Plan for Implementation and Administration | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

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| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

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|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

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|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

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|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

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|---|---|
| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |

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|---|---|
| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

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| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Generators are installed, as needed |

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|---|---|
| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

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|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

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| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |

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|---|---|
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |
| Action # | 5.1.4 |
| Mitigation Action | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2021 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

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| Action # | 5.1.7 |
| Mitigation Action | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## OTTERVILLE

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|---|---|
| **Action #** | 1.1.1 |
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA |
| Plan for Implementation and Administration | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

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| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

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|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

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|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

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|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

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| **Action #** | 2.1.3 |
| **Mitigation Action** | Identify low water crossings and/or flood prone areas |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Otterville City Council |
| Partners, if any | Mid Missouri Regional Planning Commission |
| Plan for Implementation and Administration | Both Cooper County and Otterville have identified flood prone areas, which can be found in Section 3 under "Flood". Cooper County is currently in the process of identifying all low water crossing locations and mapping those locations in a GIS. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | 2012 |
| Criterion for Completion | All flooding locations and low water crossings are identified. |
| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |
| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

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| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Generators are installed, as needed |

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| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

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| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

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| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |

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| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |

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| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

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| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## PILOT GROVE

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| **Action #** | 1.1.1 |
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| **Priority** | H |
| **Lead Department or Agency** | Cooper County Commission, Cooper County EMA |
| **Partners, if any** | SEMA, FEMA |
| **Plan for Implementation and Administration** | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| **Benefits (Losses Avoided)** | I/C, PD,LF, EMCC |
| **Projected Cost** | Minimal |
| **Potential Funding Sources** | Federal and State |
| **Projected Completion Date** | Ongoing |
| **Criterion for Completion** | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |
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| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |
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| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

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| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

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| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

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| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

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| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |

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|---|---|
| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

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| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2021 |

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| Criterion for Completion | Generators are installed, as needed |
| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

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| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

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| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |

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|---|---|
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |

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|---|---|
| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

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|---|---|
| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## PRAIRIE HOME

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|---|---|
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

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| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

| | |
|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

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|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

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|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

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|---|---|
| **Action #** | 2.1.4 |
| **Mitigation Action** | Have alternate fueling sites/sources for emergency vehicles. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Local Council |
| Partners, if any | Privately owned gas stations and automotive shops |
| Plan for Implementation and Administration | All jurisdictions have identified a need for additional fueling sites for emergency vehicles, especially when flooding or other events occur that may block roadways and cause lengthy detours. Otterville, Pilot Grove, and Bunceton have only one gas station in each respective community. These communities are in the process of identifying additional sources and creating agreements with private establishments to ensure access in case of an emergency. Cooper County and the City of Boonville have identified that there are portions of their jurisdictions that may become cut off from other areas and will need alternative fueling sites if this occurs. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, Private |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Additional sources are identified and staff are made aware. |

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|---|---|
| **Action #** | 3.1.1 |
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

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|---|---|
| **Action #** | 3.1.2 |
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2021 |
| Criterion for Completion | Generators are installed, as needed |
| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

| | |
|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

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|---|---|
| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |

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|---|---|
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |

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|---|---|
| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

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| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## WINDSOR PLACE

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|---|---|
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

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| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

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|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

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|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

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|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

| **Action #** | 3.1.1 |
|---|---|
| **Mitigation Action** | Evaluate access problems to critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Local Agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will evaluate, on an annual basis, their ability to access all critical facilities during times of hazardous weather, and/or flooding. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Access routes are evaluated on a consistent basis and changes in procedure are made as needed |

| **Action #** | 3.1.2 |
|---|---|
| **Mitigation Action** | Provide back-up power to all critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA, Local jurisdiction |
| Partners, if any | Private business owners, Local Agency, SEMA, FEMA |
| Plan for Implementation and Administration | All Jurisdictions seek to have available back-up power for all critical infrastructures, including but not limited to; law enforcement, fire, EMS, medical facilities. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | 2021 |
| Criterion for Completion | Generators are installed, as needed |

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|---|---|
| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

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|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

| | |
|---|---|
| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |

| | |
|---|---|
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |

| | |
|---|---|
| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2016 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

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|---|---|
| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## WOOLDRIDGE

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|---|---|
| **Action #** | 1.1.1 |
| **Mitigation Action** | Continue to enforce floodplain management ordinances in compliance with NFIP requirements. |
| **Priority** | H |
| **Lead Department or Agency** | Cooper County Commission, Cooper County EMA |
| **Partners, if any** | SEMA, FEMA |
| **Plan for Implementation and Administration** | Jurisdictions will continue to enforce floodplain management ordinances in accordance with NFIP participation. This will also include the supplying updated information to FEMA when Flood Insurance Rate Maps are being edited and revised. |
| **Benefits (Losses Avoided)** | I/C, PD,LF, EMCC |
| **Projected Cost** | Minimal |
| **Potential Funding Sources** | Federal and State |
| **Projected Completion Date** | Ongoing |
| **Criterion for Completion** | Compliance with floodplain ordinances. Sharing of data and approval of new FIRM when revised or updated |
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |

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|---|---|
| **Action #** | 1.1.3 |
| **Mitigation Action** | Encourage utility companies to maintain right of ways. |
| Priority | H |
| Lead Department or Agency | Cooper County, Communities |
| Partners, if any | Utility providers, Ameren UE, Co-Mo Electric |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain right of ways through consistent communication. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Right of ways are clear of problem vegetation and debris. |

| | |
|---|---|
| **Action #** | 1.1.4 |
| **Mitigation Action** | Encourage cooperative agreements with utility providers to activate energy between utility districts. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | Ameren UE, Co-Mo Electric, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue to encourage utility providers to maintain agreements for restoring power as needed during interruptions in service. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed MOU/MOA in place between utilities. |

| | |
|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

| | |
|---|---|
| **Action #** | 3.1.3 |
| **Mitigation Action** | Remove obstructive vegetation and/or combustible material from critical infrastructure. |
| Priority | H |
| Lead Department or Agency | Local Jurisdiction |
| Partners, if any | Utility providers |
| Plan for Implementation and Administration | All jurisdictions currently have plans in place for maintenance of vegetation in their jurisdiction. This action will be used to reinforce this effort. |
| Benefits (Losses Avoided) | PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Vegetation is removed or maintained properly. |
| | |
| **Action #** | 3.1.7 |
| **Mitigation Action** | Encourage shelters to have alternative heating sources. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | American Red Cross, SEMA, FEMA |
| Plan for Implementation and Administration | Cooper County EMA will work with designated shelters to ensure there are alternative methods for heat, namely backup generators to run gas or electric units or propane access. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Moderate |
| Potential Funding Sources | Local, Federal, State |
| Projected Completion Date | 2016 |
| Criterion for Completion | Alternative sources have been identified and cost estimates for installation have been gathered. |

| | |
|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |

| | |
|---|---|
| **Action #** | 4.1.1 |
| **Mitigation Action** | Distribute public education hazard awareness information to the public. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Public and Private Agencies |
| Plan for Implementation and Administration | The Cooper County Emergency Management Agency (EMA) currently has several educational programs in place. The Cooper County EMA is very involved with public education and awareness of natural hazards and other hazards. The following actions are taken by the Cooper County EMA on a regular basis:<br>• Promote educational materials for staff and the public regarding best practices for earthquake preparedness.<br>• Encourage safe driving through public education campaigns, websites, community events.<br>• Provide public education materials concerning the dangers of icy roads.<br>• Provide educational materials for outdoor workers and school athletic organizations on the dangers of excessive heat exposure.<br>• Promote education materials for homeowners near large fuel sources.<br>• Encourage developers to build earthquake resistant structures. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Cooper County EMA will continue its roll in public safety education |

| | |
|---|---|
| **Action #** | 4.1.2 |
| **Mitigation Action** | Continue to maintain and upgrade early warning weather warning systems. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local insurance agencies, USDA |
| Plan for Implementation and Administration | Communities supplied as needed with educational materials as needed about funding and warning siren options to upgrade existing sirens or purchase new sirens while maintaining current operational sirens. Cooper County in process of updating county warning system to better serve communities with emergency warnings. |
| Benefits (Losses Avoided) | I/C |
| Projected Cost | Moderate |
| Potential Funding Sources | USDA, FEMA |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Communities aware of warning system options. |
| **Action #** | 5.1.3 |
| **Mitigation Action** | Install dry hydrants and/or standard hydrants as needed. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA, Rural and City Fire Departments |
| Partners, if any | Private/Public land owners, Developers, Water providers |
| Plan for Implementation and Administration | All of the participating jurisdictions currently have standard fire hydrants within their boundaries. The rural fire districts stated that there is a need for dry hydrants to be installed in various areas where standard hydrants cannot be placed. All jurisdictions would implement this action by identifying and evaluating areas of concern across the county. In some places the use of community and/or private water sources may be needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Private, Local, Federal, and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Hydrants are installed and/or agreements are in place for future installation and use. |
| **Action #** | 5.1.4 |
| **Mitigation Action** | Create secondary water supply sources through interconnections or agreements. |
| Priority | H |
| Lead Department or Agency | Water Districts and Incorporated Communities |
| Partners, if any | All water districts and incorporated communities |
| Plan for Implementation and Administration | All jurisdictions will continue to work towards agreements between water providers and will investigate available funding for constructing connections. Currently community water providers and water districts are separated by several miles and interconnection, while very beneficial, would be very expensive. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Local, State, and Federal |
| Projected Completion Date | 2021 |
| Criterion for Completion | Interconnections constructed to connect all water utilities |

| | |
|---|---|
| **Action #** | 5.1.7 |
| **Mitigation Action** | Acquire destroyed or damaged properties and relocate people voluntarily. |
| Priority | H |
| Lead Department or Agency | Local jurisdiction |
| Partners, if any | Cooper County, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions would like the opportunity to be eligible to buyout properties in the floodplain if needed. Currently, only on jurisdiction has identified any properties for this activity. The Village of Wooldridge has identified several properties within the 100 year floodplain for this activity. The community is currently trying to reinstate themselves in the National Flood Insurance Program, but until they are officially active any buyouts are not able to go forward. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | State and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Buyout locations are identified and enrollment in NFIP. |

## LINNEMAN-WEEKLY LEVEE DISTRICT

| | |
|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |

| | |
|---|---|
| **Action #** | 5.1.5 |
| **Mitigation Action** | Install additional pumping stations as needed. |
| Priority | H |
| Lead Department or Agency | Linneman-Weekley Levee District |
| Partners, if any | Cooper County Commission, USACE, SEMA, FEMA |
| Plan for Implementation and Administration | The levee district would identify areas that are in need of extra pumping stations and identify a funding source. |
| Benefits (Losses Avoided) | PD |
| Projected Cost | Minimal |
| Potential Funding Sources | Private, Local, State, and Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Two pumping stations installed. |

| | |
|---|---|
| **Action #** | 5.1.6 |
| **Mitigation Action** | Thicken and/or maintain levee as needed to improve capabilities. |
| **Priority** | H |
| **Lead Department or Agency** | Levee Districts, USACE |
| **Partners, if any** | Cooper County, SEMA, FEMA |
| **Plan for Implementation and Administration** | Both levee districts will continue current maintenance practices consistent with US Army Corps of Engineers guidelines. Thickening of the levee "toe" or base would increase from a slope of 1 to 2 to a slope of 1 to 3 where needed (for every 1 foot of rise there would be 3 feet of run). In some areas a slope of 1 to 5 may be necessary. |
| **Benefits (Losses Avoided)** | PD, LF |
| **Projected Cost** | Moderate |
| **Potential Funding Sources** | Private, State, and Federal |
| **Projected Completion Date** | Ongoing - project is continuous depending on conditions |
| **Criterion for Completion** | Slope is increases to a minimum of 1 to 3. |

## OVERTON-WOOLDRIDGE LEVEE DISTRICT

| | |
|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |
| | |
| **Action #** | 5.1.6 |
| **Mitigation Action** | Thicken and/or maintain levee as needed to improve capabilities. |
| **Priority** | H |
| **Lead Department or Agency** | Levee Districts, USACE |
| **Partners, if any** | Cooper County, SEMA, FEMA |
| **Plan for Implementation and Administration** | Both levee districts will continue current maintenance practices consistent with US Army Corps of Engineers guidelines. Thickening of the levee "toe" or base would increase from a slope of 1 to 2 to a slope of 1 to 3 where needed (for every 1 foot of rise there would be 3 feet of run). In some areas a slope of 1 to 5 may be necessary. |
| **Benefits (Losses Avoided)** | PD, LF |
| **Projected Cost** | Moderate |
| **Potential Funding Sources** | Private, State, and Federal |
| **Projected Completion Date** | Ongoing - project is continuous depending on conditions |
| **Criterion for Completion** | Slope is increases to a minimum of 1 to 3. |

## BLACKWATER SCHOOL DISTRICT

| | |
|---|---|
| **Action #** | 1.1.2 |
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |
| | |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |
| | |

| | |
|---|---|
| **Action #** | 3.1.5 |
| **Mitigation Action** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | School Districts, Nursing Homes, other special districts |
| Plan for Implementation and Administration | Cooper County EMA, with the cooperation of school districts and nursing homes, will review evacuation procedures on an annual basis to ensure public safety in response to natural and manmade hazards. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |

| | |
|---|---|
| Criterion for Completion | Evacuation procedures are in place and reviewed in accordance with emergency management protocols. |

| **Action #** | 3.1.8 |
|---|---|
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |
| | |

| **Action #** | 3.1.9 |
|---|---|
| **Mitigation Action** | Maintain a system of temporary alternative placement sites (“safe houses”) for temporary emergency evacuation and shelter of school populations. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | The participating School Districts are working on establishing emergency evacuations sites. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2017) |
| Criterion for Completion | Sites for safe rooms have been identified. |

## BOONVILLE SCHOOL DISTRICT

| **Action #** | 1.1.2 |
|---|---|
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |
| | |
| Action # | 1.1.5 |
| Mitigation Action | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School District administration staff will update school plans as needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed school safety plans. |
| | |
| Action # | 1.1.6 |
| Mitigation Action | Encourage community participation in the annual Earthquake Awareness Day. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School Districts will observe and plan an annual Earthquake Awareness Day activity. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed earthquake awareness activity. |

| | |
|---|---|
| Action # | 1.1.7 |
| Mitigation Action | Develop a Continuity of Operations Plan (COOP). |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School Districts will develop a emergency plan to ensure regular activities resume after an emergency as quickly as possible. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed Continuity of Operation Plan (COOP). |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |
| | |
| **Action #** | 3.1.5 |
| **Mitigation Action** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | School Districts, Nursing Homes, other special districts |
| Plan for Implementation and Administration | Cooper County EMA, with the cooperation of school districts and nursing homes, will review evacuation procedures on an annual basis to ensure public safety in response to natural and manmade hazards. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Evacuation procedures are in place and reviewed in accordance with emergency management protocols. |

| **Action #** | 3.1.5 |
|---|---|
| **Mitigation Action** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | School Districts, Nursing Homes, other special districts |
| Plan for Implementation and Administration | Cooper County EMA, with the cooperation of school districts and nursing homes, will review evacuation procedures on an annual basis to ensure public safety in response to natural and manmade hazards. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Evacuation procedures are in place and reviewed in accordance with emergency management protocols. |

## OTTERVILLE SCHOOL DISTRICT

| | |
|---|---|
| Action # | 1.1.5 |
| Mitigation Action | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School District administration staff will update school plans as needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed school safety plans. |
| | |
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |
| | |
| **Action #** | 3.1.5 |
| **Mitigation Action** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | School Districts, Nursing Homes, other special districts |
| Plan for Implementation and Administration | Cooper County EMA, with the cooperation of school districts and nursing homes, will review evacuation procedures on an annual basis to ensure public safety in response to natural and manmade hazards. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Evacuation procedures are in place and reviewed in accordance with emergency management protocols. |

| | |
|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |
| | |
| **Action #** | 3.1.9 |
| **Mitigation Action** | Maintain a system of temporary alternative placement sites ("safe houses") for temporary emergency evacuation and shelter of school populations. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | The participating School Districts are working on establishing emergency evacuations sites. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2017) |
| Criterion for Completion | Sites for safe rooms have been identified. |

## PRAIRIE HOME SCHOOL DISTRICT

| **Action #** | 1.1.2 |
|---|---|
| **Mitigation Action** | Develop agreements with local shelters. |
| Priority | H |
| Lead Department or Agency | Cooper County Commission, Cooper County EMA |
| Partners, if any | SEMA, FEMA, American Red Cross, local non-profits |
| Plan for Implementation and Administration | All jurisdictions actively participate with the county and the American Red Cross in ensuring that shelter locations are identified and agreements for use are in place. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Sheltering agreements are in place and maintained as needed. |
| | |
| Action # | 1.1.5 |
| Mitigation Action | Continue to review and update school plans on an annual basis to ensure that they adequately address all potential threats from identified hazards. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School District administration staff will update school plans as needed. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed school safety plans. |
| | |
| Action # | 1.1.6 |
| Mitigation Action | Encourage community participation in the annual Earthquake Awareness Day. |
| Priority | H |
| Lead Department or Agency | Cooper County |
| Partners, if any | Local Agencies |
| Plan for Implementation and Administration | The participating School Districts will observe and plan an annual Earthquake Awareness Day activity. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Internal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Completed earthquake awareness activity. |

| | |
|---|---|
| **Action #** | 2.1.1 |
| **Mitigation Action** | Review, prioritize, evaluate and monitor needed upgrades or retrofits for critical buildings and/or infrastructures. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions will continue their current practice of inspecting critical infrastructure and making repairs and upgrades as needed. Prioritization of upgrades and retrofitting is dependent on funding need. |
| Benefits (Losses Avoided) | I/C, PD,LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Upgrades and/or retrofits are identified. |

| | |
|---|---|
| **Action #** | 2.1.2 |
| **Mitigation Action** | Identify, review, and implement mechanisms to foster collaboration among jurisdictions, agencies and special districts. |
| Priority | H |
| Lead Department or Agency | Cooper County, Local Jurisdictions |
| Partners, if any | Local agencies, SEMA, FEMA, USACE, USFW, etc. |
| Plan for Implementation and Administration | All jurisdictions will continue to participate in various mutual aid agreements. All participating jurisdictions participate with Cooper County EMA in the maintenance of the county Emergency Operations Plan. Mutual aid agreements exist between utility districts, fire districts, and law enforcement. Collaboration also exists between local agencies and state and federal agencies. Sheltering agreements with local non-profits, businesses, and houses of worship are also maintained. |
| Benefits (Losses Avoided) | I/C, PD, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local, State, Federal |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Mutual aid agreements are in place and regularly maintained. |
| | |
| **Action #** | 3.1.5 |
| **Mitigation Action** | Review evacuation routes with special consideration for schools and nursing homes and mitigate any problem areas. |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | School Districts, Nursing Homes, other special districts |
| Plan for Implementation and Administration | Cooper County EMA, with the cooperation of school districts and nursing homes, will review evacuation procedures on an annual basis to ensure public safety in response to natural and manmade hazards. |
| Benefits (Losses Avoided) | I/C, LF, EMCC |
| Projected Cost | Minimal |
| Potential Funding Sources | Local |
| Projected Completion Date | Ongoing |
| Criterion for Completion | Evacuation procedures are in place and reviewed in accordance with emergency management protocols. |

| | |
|---|---|
| **Action #** | 3.1.8 |
| **Mitigation Action** | Build a tornado safe room |
| Priority | H |
| Lead Department or Agency | Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | All jurisdictions are currently reviewing their need for a tornado safe room. Boonville, Bunceton, Otterville, Pilot Grove do not currently have specific sites identified, but will review their need in the next five years. Prairie Home R-V Schools are in the process of identifying a site location for such a building, there is great need in this school district, because all staff and students do not fit into the interior rooms used for tornados. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2016) |
| Criterion for Completion | Sites for safe rooms have been identified. |
| | |
| **Action #** | 3.1.9 |
| **Mitigation Action** | Maintain a system of temporary alternative placement sites ("safe houses") for temporary emergency evacuation and shelter of school populations. |
| Priority | H |
| Lead Department or Agency | School Districts, Cooper County EMA |
| Partners, if any | Local Communities, SEMA, FEMA |
| Plan for Implementation and Administration | The participating School Districts are working on establishing emergency evacuations sites. |
| Benefits (Losses Avoided) | I/C, EMCC |
| Projected Cost | Significant |
| Potential Funding Sources | Federal and State |
| Projected Completion Date | Ongoing (Needs identified by 2017) |
| Criterion for Completion | Sites for safe rooms have been identified. |

## 5.6 Funding Sources

Funding of many public activities has become increasingly difficult in recent years. In the past, large mitigation projects have relied heavily on federal funding from FEMA; the local government was then responsible for a 25% match for the federal funds. With a few exceptions, these FEMA mitigation funds are increasingly difficult to obtain.

The increase in natural disasters across the county in recent years, coupled with already tight budgets, mean that a large part of the federal mitigation money follows the largest disasters. This poses an increased challenge for local governments to come up with creative ideas for finding funding to move ahead with needed mitigation projects.

This section will review the federal programs, when they may come into play and then discuss other possible avenues and approaches to mitigation funding.

### Federal Funds

The bulk of federal funding for mitigation is available through three FEMA grant programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

Jurisdictions which have adopted a FEMA approved Hazard Mitigation Plan are eligible for funding through these programs.

Another possible funding source is Community Development Block Grants (CDBG), which may be a possibility after a Presidential Disaster Declaration.

The **Hazard Mitigation Grant Program (HMPG)** assists states and local communities in implementing long-term mitigation measures following a Presidential Disaster Declaration. HMGP funding is allocated using a “sliding scale” formula based on the percentage of the funds spent on Public and Individual Assistance programs for each Presidential Disaster Declaration. Missouri is one of 12 states, as of March 2015, which has a FEMA-approved Enhanced State Hazard Mitigation Plan; this enhanced plan demonstrates a comprehensive mitigation program in the state and qualifies Missouri for increased HMPG funding (20%) after a disaster declaration.

HMGP funds can be used for projects protecting either public or private property; the proposed projects must fit within the state and local government's overall mitigation strategy for the disaster area and comply with program guidelines.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. Applicants work through SEMA which is responsible for setting funding priorities and administering the program.

The **Pre-Disaster Mitigation (PDM)** program provides funding for cost-effective hazard mitigation activities that complement a comprehensive mitigation program, and reduce injuries,

loss of life, and damage and destruction of property. The PDM grant funds are provided to the state which then provides sub-grants to local governments for eligible mitigation activities.

The **Flood Mitigation Assistance (FMA)** program was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. Applicants must be participants in good standing in NFIP and properties to be mitigated must have flood insurance.

States administer the FMA program and are responsible for selecting projects for funding from the applicants submitted by all communities within the state. The state forwards selected applications to FEMA for eligibility determinations. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Both the Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) are funded through a yearly appropriation from Congress. These are nationally competitive grants for which MO SEMA submits a statewide application of projects selected from jurisdictions around the state.

Funding Priorities: Mitigation projects within the counties in the disaster declaration are prioritized for HMGP funds; however, if all funds are not used within these counties, they will eventually be made available statewide.

In recent years, PDM funds have severely tightened up; with less money to disperse planning projects appear to be FEMA's top priority for the program. In Missouri, PDM is primarily used for the planning grants which allow updates of the state and county hazard mitigation plans.

FEMA's highest priority for FMA funds in recent years has been flood planning projects. The next priority has been the buyout of Severe Repetitive Loss (SRL) flooded properties. A jurisdiction which needs help with flood planning or SRL buyouts is a potential candidate for FMA funding.

Eligible Activities: For any of the FEMA programs, potential projects must match the stated goals and objectives of the Cole County/Jefferson City Hazard Mitigation Plan and the State of Missouri Hazard Mitigation Plan.

A jurisdiction which has a mitigation project for which federal funding is sought should submit a Notice of Interest (NOI) to SEMA. This does not obligate the jurisdiction to proceed with the project but helps SEMA to have a sense of where mitigation funding is needed in the state.

Mitigation activities eligible for funding vary between the programs (Figure 6.9).

| Figure 5.8<br>**Eligible Activities for FEMA Mitigation Grant Programs** | | | |
|---|---|---|---|
| **Activity** | **HMGP** | **PDM** | **FMA** |
| **1. Mitigation Projects** | ✓ | ✓ | ✓ |
| Property Acquisition and Structure Demolition or Relocation | ✓ | ✓ | ✓ |
| Structure Elevation | ✓ | ✓ | ✓ |
| Dry Floodproofing of Historic Residential Structures | ✓ | ✓ | ✓ |
| Dry Floodproofing of Non-residential Structures | ✓ | ✓ | ✓ |
| Minor Localized Flood Reduction Projects | ✓ | ✓ | ✓ |
| Structural Retrofitting of Existing Buildings | ✓ | ✓ | |
| Non-structural Retrofitting of Existing Buildings and Facilities | ✓ | ✓ | |
| Safe Room Construction | ✓ | ✓ | |
| Infrastructure Retrofit | ✓ | ✓ | |
| Soil Stabilization | ✓ | ✓ | |
| Wildfire Mitigation | ✓ | ✓ | |
| Post-disaster Code Enforcement | ✓ | | |
| 5% Initiative Projects | ✓ | | |
| **2. Hazard Mitigation Planning** | ✓ | ✓ | ✓ |
| **3. Management Costs** | ✓ | ✓ | ✓ |
| Source: www.fema.gov/library/viewRecord.do?id=3648 | | | |

## Application and Cost Share Requirements:

The application process for the FEMA Mitigation Grant Programs includes a Benefit Cost Analysis (BCA). A potential project must have a Benefit Cost Ratio of at least 1.0 to be considered for funding; a ratio of 1.0 indicates at least $1 benefit for each $1 spent on the project.

A BCA is the first step in assessing if a project has the potential to be funded. The BCA for a potential project is run on FEMA's BCA Software; planners at the Mid-MO RPC are trained to assist member jurisdictions with this software.

Cost share requirements and the application format for these programs are shown in Figure 5.9. Contributions of cash, in-kind services or materials, or any combination thereof, may be accepted as part of the non-Federal cost share. For FMA, not more than one half of the non-Federal contribution may be provided from in-kind contributions.

| Figure 5.9<br>**FEMA Mitigation Grant Programs** | | | |
|---|---|---|---|
| **Program** | **Federal/Local Match** | **Notes** | **Application Process** |
| **HMGP** | 75/25 | | paper |
| **PDM** | 75/25 | | e-grants |
| **PDM** (Small Impoverished Community) | 90/10 | Qualification Requirements for "small impoverished":<br>• A community of 3,000 or fewer individuals identified by the State as a rural community that is not a remote area within the corporate boundaries of a larger city<br>• An average per capita annual income not exceeding 80 percent of the national per capita income, based on best available data. (For current information: http://www.bea.gov)<br>• A local unemployment rate exceeding by 1 percentage point or more the most recently reported, average yearly national unemployment rate. (For current information: http://www.bls.gov/eag/eag.us.htm)<br>• Meet other criteria required by the State/Tribe/Territory in which the community is located | e-grants |
| **FMA** | 75/25 | | e-grants |
| **FMA** (Severe Repetitive Loss Property) | 90/10 | In Missouri, this cost share is less than the usual 75/25 because the State has an approved “Enhanced” State Mitigation Plan. | e-grants |

**Community Development Block Grant (CDBG)** The objective of the CDBG program is to assist communities in rehabilitating substandard dwelling structures and to expand economic opportunities, primarily for low-to-moderate-income families. After a Presidential Disaster Declaration, CDBG funds may be used for long-term needs such as acquisition, reconstruction, and redevelopment of disaster-affected areas. There is no low-to-moderate income requirement after a Presidential Disaster Declaration.

## Local Funds

Local funding sources for mitigation projects is becoming increasingly important due to the frequency and high cost of recent disasters in the U.S. At the same time, local government funds, which have traditionally come from property and sales tax revenues, have been shrinking due to the effects of depressed property values and online commerce.

At the same time that both federal and local funds are shrinking, the need for mitigation funding is increasing due to the increased frequency and severity of the hazards.

It is important that jurisdictions consider how mitigation can be incorporated and funded through other essential functions. For example, money allocated for a new school could include funds to harden part of that structure to FEMA 361 standards for a tornado safe room.

**Non-Governmental Funds**

Another potential source of revenue for local mitigation efforts are contributions of non-governmental organizations such as churches, charities, community relief funds, the Red Cross, hospitals, businesses, and nonprofit organizations. A variety of these local organizations can be tapped to help carry out local hazard mitigation initiatives.

# Section 6: Plan Maintenance Process

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

## 6.1 Plan Monitoring and Evaluation

The Cooper County Natural Hazard Mitigation Plan will be monitored and evaluated on a yearly basis following its approval and adoption. These evaluations will begin approximately one year after the final approval of the plan and continue until the next 5-year update begins.

The monitoring and evaluation with be facilitated through the Mid-MO Regional Planning Commission. It will consist of the following:

1. A meeting of the Hazard Mitigation Planning Committee convened by planners at the Mid-MO Regional Planning Commission to discuss any general hazard mitigation issues.

2. A survey emailed to all participating jurisdictions on such topics as changes/developments in the jurisdictions and implementation of mitigation actions.

3. A yearly addendum to the plan summarizing information from the planning meeting and the surveys.

4. Entry of any direct changes to the plan in the "Log of Changes Made to the Plan following Approval" (which follows the Executive Summary).

## 6.2 Plan Updating

FEMA requirements state a hazard mitigation plan must be updated and reapproved by FEMA every five years; the five years is counted from when the first participating jurisdiction adopts the approved plan. A proposed schedule for the update is shown in Figure 7.1.

**Figure 6.1**

**Proposed Schedule for 5-year Update of Hazard Mitigation Plan**

| **KEY: PED = Plan Expiration Date** | | |
|---|---|---|
| **Activity** | **Timeline to Begin** | **Responsible Party** |
| Preliminary update of data | Yearly during maintenance/ review of plan | Mid-MO RPC |
| Prepare cost estimates for update of plan and submit to SEMA | PED - 13 months | Mid-MO RPC |
| Contact participating jurisdictions re: representation on update Planning Committee | PED - 12 months | Mid-MO RPC |
| Receive Memorandum of Agreement from SEMA for update | PED - 11 months | SEMA |
| Preliminary data review | PED - 11 months | Mid-MO RPC |
| Review and update plan | PED - 10 months | Hazard Mitigation Planning Committee |
| Public Meeting #1 for comment and input on draft of update | PED - 6.5 months | Mid-MO RPC/HM Planning Committee |
| Draft of update due at SEMA | PED - 6 months | Mid-MO RPC |
| Public Meeting #2 for comment and input on final update | PED - 5 months | Mid-MO RPC/HM Planning Committee |
| Participating jurisdictions adopt plan | PED - 5 months | Participating Jurisdictions |
| Final plan due at SEMA | PED - 3 months | Mid-MO RPC |
| Plan reviewed by SEMA | PED - 3 months | SEMA |
| Required changes/additions made to plan | PED - 2.5 months | Mid-MO RPC |
| Plan submitted to FEMA | PED - 2 months | SEMA |
| Plan approved by FEMA | before PED | FEMA |

The ongoing yearly maintenance and evaluation of the plan, as described previously, will be of great value when undertaking the five year update. Continuity of personnel on the Hazard Mitigation Planning Committee throughout the five year process would be highly beneficial in taking mitigation planning to the next level.

## 6.3 Public Participation in Plan Maintenance

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

The Cooper County Hazard Mitigation Plan will be remain continually available on the website of the Mid-Missouri Regional Planning Commission (www.mmrpc.org) for public review and comment. Either the plan itself or links to the plan will also be posted on as many websites of participating jurisdictions as possible.

The Cooper County Emergency Management Coordinator will facilitate presenting the plan at the annual Local Emergency Operation Plan (LEOP) Review. This review is attended by representatives of the following groups:

- Cooper County Commission
- Local Elected Officials/Administrators
- Educational Districts and Institutions
- County Health Department
- County and Local Public Works
- Fire Protection Districts/Departments
- Sheriff/Police Departments
- Emergency Medical Services (EMS)
- Local Emergency Planning Committee (LEPC)

Notice of any public meetings concerning the maintenance of the plan will be given in accordance with Missouri's "Sunshine Law" (Revised Statutes of Missouri 610.010, 610.020, 610.023, and 610.024.)

# Appendix A

# Adoption Resolutions

**The following resolution was adopted by the (City of Blackwater), Cooper County, Missouri on** _April 11, 2017_.

Resolution No. 272

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the (City of Blackwater) participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the (City of Blackwater) have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the (City of Blackwater) has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the (City of Blackwater) adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this _11th_ day of __April_____, 2017 at the meeting of the (enter meeting name here).

| | | |
|---|---|---|
| (Shelby D Hendrix) | (Mayor) | (April 11, 2017) |
| (Richard Wilson) | (Councilman) | (April 11, 2017) |
| (Wayne Gerard, Jr) | (Councilman) | (April 11, 2017) |
| (Marc Miller) | (Councilman) | (April 11, 2017) |
| (Tanner Fahrendorf) | (Councilman) | (April 11, 2017) |

**RESOLUTION NO. R2017-03**

**A RESOLUTION OF THE CITY OF BOONVILLE, MISSOURI, AUTHORIZING AND APPROVING PARTICIPATION IN THE COOPER COUNTY NATURAL HAZARD MITIGATION PLAN; AND PROVIDING AN EFFECTIVE DATE THEREFOR**

**WHEREAS**, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R.201.6; and

**WHEREAS**, the City of Boonville, Missouri participated in the preparation of the Cooper County Hazard Mitigation Plan; and

**WHEREAS**, the citizens of the City of Boonville, Missouri have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

**WHEREAS**, the City of Boonville, Missouri has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

**THEREFORE**, be it resolved by the City Council that the City of Boonville, Missouri, adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

Passed this 3rd day of April 2017, by the City Council of Boonville, Missouri

Julie Thacher, Mayor

ATTEST:

Teresa Studley, City Clerk

**The following resolution was adopted by the (~~enter jurisdiction name here~~ City of Bunceton), Cooper County, Missouri on** __May 2, 2017_____.

Resolution No. ___2017-04_____

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the City of Bunceton participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the City of Bunceton have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the City of Bunceton has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the City of Bunceton adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this __2nd__ day of _____May_____, 2017 at the meeting of the Bunceton City Council.

| (enter name) | (enter title) | (enter date) |
|---|---|---|
| Teresa Bell | Alderman | 5/2/17 |
| John E Breshea | Alderman | 5/2/17 |
| KATHRYN SWEARENGEN | ALDERMAN | 5/2/17 |
| Mamie Vollmer | Alderman | 5-2-17 |
| | | |

**The following resolution was adopted by the (enter jurisdiction name here), Cooper County, Missouri on** May 1, 2017.

Resolution No. 2

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the (enter jurisdiction name here) participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the (enter name of jurisdiction here) have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the (enter jurisdiction name here) has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the (enter jurisdiction name here) adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 1 day of May, 2017 at the meeting of the (enter meeting name here). Cooper County Commission

| (enter name) | (enter title) | (enter date) |
|---|---|---|
| Don Baragary | Presiding Commissioner | 5/1/17 |
| David Booker | Assoc. Commissioner | 5/1/17 |
| Charlie Melkersman | Assoc. Commissioner | 5/1/17 |
| | | |
| | | |

**The following resolution was adopted by the City of Otterville, Cooper County, Missouri on** May 3, 2017.

Resolution No. 442

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the participated in the **City of Otterville** preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the **City of Otterville** have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the **City of Otterville** has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the **City of Otterville** adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 3rd day of May, 2017 at the meeting of the Board of Alderman.

| | | |
|---|---|---|
| (Jon Hibbs) | (Mayor) | (5/3/2017) |
| (Brandy Marcum Turner) | (Alderman) | (5/3/2017) |
| (Richard Mulvey) | (Alderman) | (5/3/2017) |
| (RoseMary Brand) | (Alderman) | (5/3/2017) |
| (Belinda Newgaard) | (Alderman) | (5/3/2017) |

**The following resolution was adopted by the Board of Aldermen of the City of Pilot Grove, Missouri, Cooper County, Missouri on** May 2, 2017.

Resolution No. 2017-2

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the City of Pilot Grove, Missouri participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the City of Pilot Grove, Missouri have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the City of Pilot Grove, Missouri has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the Board of Aldermen of the City of Pilot Grove, Missouri, adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 1st day of May, 2017 at the meeting of the Board of Aldermen of the City of Pilot Grove, Missouri.

Robert Kraus

| | | |
|---|---|---|
| Robert Kraus | Alderman | May 1, 2017 |
| (enter name) | (enter title) | (enter date) |

Sandy Meisenheimer

| | | |
|---|---|---|
| Sandy Meisenheimer | Alderman | May 1, 2017 |
| (enter name) | (enter title) | (enter date) |

Donna Bader

| | | |
|---|---|---|
| Donna Bader | Alderman | May 1, 2017 |
| (enter name) | (enter title) | (enter date) |

| | | |
|---|---|---|
| Karen Wolfe | Alderman | May 1, 2017 |
| (enter name) | (enter title) | (enter date) |

| | | |
|---|---|---|
| | | |
| (enter name) | (enter title) | (enter date) |

**The following resolution was adopted by the CITY OF PRAIRIE HOME, Cooper County, Missouri on** April 20, 2017.

Resolution No. 2017-002

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the City of Prairie Home, MO participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the City of Prairie Home, MO have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the City of Prairie Home, MO has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the City of Prairie Home, MO adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 20th day of April, 2017 at the meeting of the Regular Monthly City Council Meeting

| (enter name) | (enter title) | (enter date) |
|---|---|---|
| Donald Lohse | Mayor | 4-20-17 |
| Tammel Simmons | ALDERMAN | 4/20/17 |
| David D[illegible] | " | 4.20.17 |
| [illegible] Hopley | ALDERMAN | 4/20/17 |
| Cindy Zenger | Alderman | 04/20/2017 |

**The following resolution was adopted by the Village of Windsor Place, Cooper County, Missouri on April 11, 2017.**

Resolution No. 2017-001

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the Village of Windsor Place participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the Village of Windsor Place have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the Village of Windsor Place has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the Village of Windsor Place adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 11th day of April, 17 at the meeting of the Village of Windsor Place Board of Trustees.

| | | |
|---|---|---|
| Randon Leathers | Chairman | April 11, 2017 |
| Karen Myers | Secretary | April 11, 2017 |
| Maeola Rowles | Trustee | April 11, 2017 |
| Steve Gilson | Trustee | April 11, 2017 |
| Jenny Alpers | Trustee | April 11, 2017 |

VILLAGE OF WOODRIDGE

**The following resolution was adopted by the (enter jurisdiction name here), Cooper County, Missouri on** MAY 16 2017.

Resolution No. 202

WHEREAS, the Cooper County Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 CFR 201.6; and,

WHEREAS, the (enter jurisdiction name here) participated in the preparation of the Cooper County Hazard Mitigation Plan; and,

WHEREAS, the citizens of the (enter name of jurisdiction here) have been afforded the opportunity to comment and provide input on the Plan and the mitigation actions therein; and,

WHEREAS, the (enter jurisdiction name here) has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

NOW THEREFORE, BE IT RESOLVED by the (enter jurisdiction name here) adopts the Cooper County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 16 day of MAY, 2017 at the meeting of the (enter meeting name here).

| | | |
|---|---|---|
| Colleen Boorn | Chairperson | 5-16-17 |
| (enter name) | (enter title) | (enter date) |
| [illegible] | Chairperson | 5-16-17 |
| (enter name) | (enter title) | (enter date) |
| Kelly L. Murphy | 1st Chairman | 5/16/2017 |
| (enter name) | (enter title) | (enter date) |
| | | |
| (enter name) | (enter title) | (enter date) |
| | | |
| (enter name) | (enter title) | (enter date) |

PO Box 117
300 Doddridge
Blackwater MO 65322

Phone: 660-846-2461
Fax: 660-846-2431
E-mail brownt@blackwater.k12.mo.us
Principal: Tanya Brown

# Blackwater R-II Elementary School

*PAW PRIDE!*

March 21, 2017

To Whom It May Concern:

The Cooper County Natural Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6.

Blackwater R-II School District has participated in the preparation of, and reviewed, the Cooper County Natural Hazard Mitigation Plan.

Blackwater R-II adopts the Cooper County Natural Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan and resolves to execute the actions in the Plan.

Sincerely,

Tanya Brown

Tanya Brown
Superintendent

# Boonville R-I School District

**736 Main Street**
**Boonville, MO 65233**
**www.boonville.k12.mo.us**

Dr. Mark Ficken
Superintendent

Dr. Sarah Marriott
Assistant Superintendent of Student Services

Phone: 660-882-7474
Fax: 660-882-5721


May 9, 2017

To Whom It May Concern:

The Cooper County Natural Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6.

The Boonville R-I School District has participated in the preparation of, and reviewed, the Cooper County Natural Hazard Mitigation Plan.

The Boonville R-I School District **adopts the Cooper County Natural Hazard Mitigation Plan** as this jurisdiction's Hazard Mitigation Plan and resolves to execute the actions in the Plan.

Sincerely,

Mark D. Ficken

Dr. Mark Ficken
Supt. of Boonville R-I
School District

# Otterville R-VI School District

101 W. Georgetown Street Otterville, MO 65348 Fax: 660-366-4293

**Kim Oelrichs**
Superintendent
660-366-4391

**Scott Gemes**
Principal
660-366-4621

May 17, 2017

To Whom It May Concern:

The Cooper County Natural Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6.

The Otterville R-VI School District has participated in the preparation of, and reviewed, the Cooper County Natural Hazard Mitigation Plan.

The Otterville R-VI School District adopts the Cooper County Natural Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan and resolves to execute the actions in the Plan.

Sincerely,

Kim Oelrichs

Kim Oelrichs
Superintendent

*"Where Eagles Soar"*

To Whom It May Concern:

The Cooper County Natural Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan prepared in accordance with FEMA requirements at 44 C.F.R. 201.6.

(Enter name of school district here) School District has participated in the preparation of, and reviewed, the Cooper County Natural Hazard Mitigation Plan.

Prairie Home R-5 School District **adopts the Cooper County Natural Hazard Mitigation Plan** as this jurisdiction's Hazard Mitigation Plan and resolves to execute the actions in the Plan.

Sincerely,

PLEASE NOTE: Language in bold must be included in the letter. Thanks.

# Appendix B

# Planning Process Documentation

# Kickoff Meeting

# Update of Cooper County Hazard Mitigation Plan

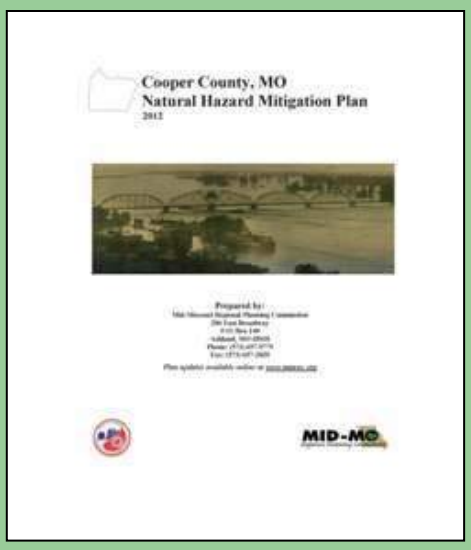
*PRELIMINARY AGENDA*

**Wednesday, Oct 12, 2016**

**6:30 p.m.**

**Cooper County Emergency Operation Center**

**200 Main Street Boonville, MO**




- Welcome and Introductions
- General Overview
  - Hazard mitigation planning
  - Cooper County Plan
  - Update process/requirements
  - Planning meeting schedule
- Begin review of 2012 mitigation strategy
  - Severe winter weather events
  - Tornado, windstorm, hailstorm events
- Next meeting date and adjournment

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 12/30/2015.

# COOPER COUNTY HAZARD MITIGATION PLAN UPDATE

**Meeting 1**

**October 12, 2016**

| | Name | Organization | Contact Info. | Mileage |
|---|---|---|---|---|
| 1. | Ed Siegmund | Mid-MO RPC | edwardsiegmund@midmorpc.org 573657-9779 | 76 |
| 2. | MARK BLANKENSHIP | Otterville R-VI School / Otterville Fire Prot. Dist | markb904@yahoo.com | 40 |
| 3. | Don Baragary | Commissioner | don.baragary@coopercountymo.gov | N/A |
| 4. | Tim Carmichael | Boonville F.D. | TJC101@boonville-mo.org | |
| 5. | Larry Oerly | Cooper Co E/MA | Larry.Oerly@coopercountymo.Gov | N/A |
| 6. | DAVID BOOKER | COMMISSIONER | DAVID.BOOKER@COOPERCOUNTYMO.GOV | N/A |
| 7. | Tanya Brown | Blackwater R-II | brownt@blackwater.K12.mo.us | N/A |
| 8. | DAVID GEHM | COOPER COUNTY FPD | dgehm@gehm.com | N/A |
| 9. | ROBERT ALPERS | OVERTON-WOODRIDGE LEVEE DIST | rkalpers@centurytel.net | |
| 10. | Kevin Swartz | Cooper Co. EMS | Cooper_EMS@yahoo.com | — |

# Meeting #2 -

# Update of Cooper County Hazard Mitigation Plan

*PRELIMINARY AGENDA*

**Wednesday, Oct. 26th**

**6:30 pm.**

**Cooper County Emergency Operation Center**

**200 Main Street**
**Boonville, MO**

- Welcome and Introductions
- Recap Meeting #1.
- Jurisdictional Info
- Planning Area Overview
- Review of Planning Area Assets and Capabilities.
- Next Meeting Date and Adjournment

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 10/19/2016.

**COOPER COUNTY HAZARD MITIGATION PLAN UPDATE**

**Meeting 2**

**October 26, 2016**

| | Name | Organization | Contact Info. | Mileage |
|---|---|---|---|---|
| 1. | Ed Siegmund | Mid-MO RPC | edwardsiegmund@midmorpc.org 573657-9779 | 76 |
| 2. | Melanie Hutton | Public Health | Melanie.Hutton@coopercopublichealth.com | |
| 3. | Judy Bailey | City of Otterville | cityotf@gmail.com | 30 |
| 4. | David Gehm | Cooper County FPD | dgehm@gehm.com | 20 |
| 5. | Darrell Harris | Boonville Fire | | |
| 6. | Randon Leathers, | Windsor Place | windsorplace@outlook.com | 5 |
| 7. | Robert Alpers | | | |
| 8. | Chris Howard | Cooper EMA | | 5 |
| 9. | Jay Kelley | Cooper EMA | | 8 |
| 10. | ~~Karen Wolfe~~ | ~~City of Pilot Grove~~ | karenwolfeaew@outlook.com 6606210471 | |

# COOPER COUNTY HAZARD MITIGATION PLAN UPDATE

**Meeting 2**

**October 26, 2016**

| | Name | Organization | Contact Info. | Mileage |
|---|---|---|---|---|
| 1. | Ed Siegmund | Mid-MO RPC | edwardsiegmund@midmorpc.org 573657-9779 | 76 |
| 2. | DAVID BOOKER | COOPER COUNTY | DAVID.BOOKER@COOPERCOUNTYMO.GOV | 16 |
| 3. | Tanya Brown | Blackwater R-II | brownt@blackwater.k12.mo.us | Ø |
| 4. | Kevin Swartz | CC Amb | KRS64@yahoo.com | Ø |
| 5. | Tony Babbitt | CC Amb | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

# Meeting #3 –

# Update of Cooper County Hazard Mitigation Plan

*PRELIMINARY AGENDA*

**Wednesday, Nov. 30th**

**6:30 pm.**

**Cooper County Emergency Operation Center**

**200 Main Street**
**Boonville, MO**

- Welcome and Introductions
- Recap Meetings #1-#2
- Risk Assessment - Methodology
- Review of 2012 Mitigation Strategy
  - Severe winter weather
  - Tornado, windstorm, hailstorm
  - Flood
  - Levee Failure
  - Dam Failure
  - Earthquake
  - Extreme Heat
- Next meeting date and adjournment

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 11/28/2016.

**COOPER COUNTY HAZARD MITIGATION PLAN UPDATE**

**Meeting 3**

**November 30, 2016**

| | Name | Organization | Contact Info. | Mileage |
|---|---|---|---|---|
| 1. | Ed Siegmund | Mid-MO RPC | edwardsiegmund@midmorpc.org 573657-9779 | 76 |
| 2. | Stuart Clark | Boonville R1 Schools | sclark@boonville.k12.mo.us | |
| 3. | Chris Howard | Cooper EMA | Chris.howard@CooperCountyMO.Gov | |
| 4. | Larry Oerly | Cooper EMA | Larry.Oerly@CooperCountyMO.Gov | |
| 5. | Mark Blankenship | Otterville Fire<br>Otterville R VI School<br>City of Otterville | markb904@yahoo.com | |
| 6. | Tim Carmichael | Boonville Fire | TJC101@boonville-mo.org | |
| 7. | David Gehm | Cooper Co. Fire | dgehm@gehm.com | |
| 8. | Ryan Reuter | Cooper Co. Fire | chiefreuter@gmail.com | |
| 9. | Don Baragary | Cooper Co. Commission | don.baragary@coopercountymo.gov | |
| 10. | Karen Wolfe | City of Pilot Grove | karenwolfeaew@outlook.com | |

# COOPER COUNTY HAZARD MITIGATION PLAN UPDATE

**Meeting 3**

**November 30, 2016**

| | Name | Organization | Contact Info. | Mileage |
|---|---|---|---|---|
| 1. | Ed Siegmund | Mid-MO RPC | edwardsiegmund@midmorpc.org 573657-9779 | 76 |
| 2. | DAVID BOOKER | COOPER COUNTY | DAVID.BOOKER@COOPERCOUNTYMO.GOV | 16 |
| 3. | Randon Leathers | Windsor Place/Water Dst. | rcleathers@hotmail.com 573-619-3950 | 12 |
| 4. | Tanya Brown | Blackwater R-II | brownt@blackwater.k12.mo.us | — |
| 5. | | | | |
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| 9. | | | | |
| 10. | | | | |

Meeting #4 –

# Update of Cooper County Hazard Mitigation Plan

*PRELIMINARY AGENDA*

**Wednesday,**

**January 4, 2017**

**6:30 p.m.**

**Cooper County Emergency Operation Center**

**200 Main Street Boonville, MO**

- Welcome and Introductions
- Recap Meetings #1-#2-#3
- Risk Assessment - Methodology
- Review of Mitigation Strategy for Natural Hazards:
  - Severe Winter Weather
  - Tornado
  - Windstorm
  - Hailstorm
- Overview of Funding
  - Safe Rooms
- Next meeting date and adjournment

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 11/28/2016.

MID-MO Regional Planning Commission

Cooper County Natural Hazard Mitigation Plan
Technical Steering Committee Meeting #4

Location: Cooper County EOC, 200 Main Street, Boonville, Missouri
Date: 01/04/2017 Time: 6:30 pm – ~~8:30 pm~~ 9:00 pm

| NAME | POSITION/REPRESENTING | PHONE | EMAIL |
|---|---|---|---|
| Larry Oerly | Ops Director - EMA | 660-621-5737 | larry.oerly@coopercountymo.gov |
| Don Baragary | Presiding Commissioner | 660-888-0169 | don.baragary@coopercountymo.gov |
| Ed Siegmund | Mid-Mo RPC | 573.657.9775 | edwardsiegmund@midmorpc.org |
| Danielle Gearhart | CED/CCMH | (660) 882-4100 | gearhartd@ccmh-mo.org |
| Tim Carmichael | Boonville F.D. | 660-621-0279 | TJC101@boonville-mo.org |
| Kevin Swartz | CC EMS | 660.888-3596 | KRS64@yahoo.com |
| Paul Langlotz | Cooper County EMS | 573-424-0999 | plang22@yahoo.com |
| Jim Gann | Boonville R-I Schools | 660-537-3221 | GannJ@Missouri.edu |
| Chris Howard | EMA Director | 660-621-0230 | Chris.howard@CooperCountymo.gov |
| Randi Luscombe | City Clerk / Blackwater | 660-846-4411 | blkwtrch@iland.net |
| Karen Wolfe | City of Pilot Grove | 660-621-0471 | karenwolfeaew@outlook.com |
| David Booker | Cooper County Commissioner | 660-882-2228 | David.Booker@coopercountymo.gov |
| Tanya Brown | Blackwater R-II Supt | 660-846-2461 | brownt@blackwater.k12.mo.us |
| Stuart Clark | Boonville R1 Schools | 660-621-3846 | sclark@boonville.k12.mo.us |
| Kim Oelrichs | Otterville R-VI, Superintendent | 660-366-4391 | koelrichs@otterviller vi.k12.mo.us |
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# Meeting #5 – Update of Cooper County Hazard Mitigation Plan

**PRELIMINARY AGENDA**

**Wednesday,**

**February 1, 2017**

**6:30 p.m.**

**Cooper County Emergency Operation Center**

**200 Main Street**
**Boonville, MO**

- ☐ **Welcome and Introductions**
- ☐ **Recap Meetings #1-#2-#3 - #4**
- ☐ **Mitigation Strategy - Methodology**
- ☐ **Review of Hazard Mitigation Strategies for Cooper County & Communities:**
  - **Blackwater**
  - **Boonville**
  - **Bunceton**
  - **Otterville**
  - **Pilot Grove**
  - **Prairie Home**
  - **Windsor Place**
  - **Wooldridge**
- ☐ **Next meeting date and adjournment**

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 1/9/2017.

MID-MO Regional Planning Commission

Cooper County Natural Hazard Mitigation Plan
Location: Cooper County EOC, 200 Main Street, Boonville, Missouri
Technical Steering Committee Meeting #5
Date: 02/01/2017 Time: 6:30 pm – 8:00 pm 9:10 pm

| NAME | POSITION/REPRESENTING | TOTAL MILES | PHONE | EMAIL |
|---|---|---|---|---|
| Larry Oerly | Cooper County EMA | 5 | 660-621-5737 | |
| Rebecca Riley | Mid-MO | 41 | 573.651.9779 | rebeccariley@midmorpc.org |
| Tony Madlex | City of Bunceton - Public Works | 15 | 660 693 147 | Tony.City of Pilot Grove@gmail |
| Stuart Clark | Boonville R1 School | 3 | 660-621-3846 | sclark@boonville.k12.mo.us |
| Tim Carmichael | Boonville Fire Dept. | 3 | 660-621-0229 | tcarmi@boonville-mo.org |
| DAVID GEHM | COOPER COUNTY FIRE | 20 | 660-537-1332 | dgehm@gehm.com |
| Dennis Rupp | Mayor. Pilot Grove | 26 | 660834 3551 | city of pilotgrove@gmail |
| Melanie Hutton | Cooper Co Public Health | 15 | 660-882-2626 | Melanie.Hutton@cooperco.publichealth.com |
| Randon Leathers | Windsor Place / Cooper Co. CPWSD #1 | 10 | 573-619-3950 | windsorplace@outlook.com |
| David Heeb | Superintendent / Prairie Home R-5 | 15 | 660.841.5946 | dheeb@prairiehome.k12.mo.us |
| CHARLIE MELKERSMAN | EASTERN DISTRICT COMMISSIONER | 10 | 660-537-2082 | CHARLIE.MELKERSMAN@COOPERCOUNTYGOV.com |
| Don Baragary | Cooper County Commission | 10 | 660-888-0169 | don.baragary@coopercountymo.gov |
| Lydia Martin | City Clerk, City of Prairie Home | 16 | 660-841-5524 | cityclerk@cityprairiehome.com |
| [illegible] | CCPD | 3 | 660 5325346 | ldsickmann@hotmail.com |
| DAVID BOOKER | COOPER COUNTY COMMISSIONER | 26 | 660-882-2228 | |
| Paul Langlotz | Cooper County Ambulance | 20 | 573-424-0999 | plang22@yahoo.com |
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# Meeting #6 – Update of Cooper County Hazard Mitigation Plan

## PRELIMINARY AGENDA

**Wednesday,**

**February 15, 2017**

**6:30 p.m.**

**Cooper County Emergency Operation Center**

**200 Main Street**
**Boonville, MO**

- ☐ **Welcome and Introductions**
- ☐ **Recap Meeting #5**
- ☐ **Mitigation Strategy Updates**
- ☐ **Warning Sirens:**
  - **USDA Funding**
  - **Bidding Specifications**
- ☐ **Next meeting date**
- ☐ **Adjournment**

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 1/9/2017.

MID-MO Regional Planning Commission

Cooper County Natural Hazard Mitigation Plan
Location: Cooper County EOC, 200 Main Street, Boonville, Missouri
Technical Steering Committee Meeting #6
Date: 02/15/2017 Time: 6:30 pm – ~~8:00 pm~~ 9:00pm

| Name | Position/Representing | Total Miles | Take-Home Mitigation Strategy In-Kind Hours | Phone | Email |
|---|---|---|---|---|---|
| Rebecca Riley | Regional Planner / Mid Mo | 41 | | 573-657-9779 | rebeccariley@midmocpcog |
| Kurt Heisi | Town Councilman / Woodridge | 27 | | 573 673 1601 | Kheisi.pb.1@gmail.com |
| Larry Oerly | Cooper County Flood Plain Mgr | 8 | | 660-621-5737 | Larry.Oerly@cooperco unty mo.gov |
| Don Baragary | Cooper County Road + Bridge | 8 | 3 hrs | 660-888-0169 | don.baragary@cooperco unty.mo.gov |
| Stuart Clark | Boonville R1 School District | 3 | 6 | 660-621-3846 | sclark@Boonville.K12.mo.us |
| David Gehm | Cooper County FPD | 22 | 5 | 660 882-6111 | dgehm@gehm.com |
| Linda Martin | Prairie Home, City Clerk | 12 | 2 | 660-841-5524 | cityclerk@cityprairiehome.com |
| Brenda Gerlach | SEMA-Region F | | | 573-644-3728 | brenda.gerlach@sema.dps.mo.gov |
| Colleen Born | Town Councilman / Woodridge | 27 | | 660 886 0476 | flossygirl33@yahoo.com |
| Pete E. Busalacki | Pilot Grove PD - EMA | 26 | | 660-834-4300 | streetac@iland.net |
| Rayden Leathers | Windsor Place + Cooper Co. CPWSD#1 | 12 | 4 | 573-619-3950 | windorplace@outlook.com |
| Paul Langlotz | Cooper County Ambulance | 10 | | 573-424-0959 | plang22@yahoo.com |
| Anthony Maddox | City of Bunceton | 15 | | 660 619 3147 | tony.cityofpilotgrove@gmail |
| Travis Zimmerman | USDA - Rural Development | | | 660-826-3339 | travis.zimmerman@mo.usda.gov |
| David Booker | St. Joseph School | 26 | | 660-882-2228 | DAVID.BOOKER@CooperCounty.mo.gov |
| Dennis Knipp | City of Pilot Grove, Mo | 26 | 4 | 660-834-3551 | mayor.cityofpilotgrove@gmail.com |
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MID-MO Regional Planning Commission

Cooper County Natural Hazard Mitigation Plan
Location: Cooper County EOC, 200 Main Street, Boonville, Missouri
Technical Steering Committee Meeting #6 –
Continued Warning Siren Supplier Presentation Meeting
Date: 02/23/2017 Time: 6:00 pm – ~~8:00 pm~~ 8:30pm

| Name | Position/Representing | Total Miles | Phone | Email |
|---|---|---|---|---|
| Don Baragary | Cooper County Road + Bridge | 8 | 660-888-0169 | don.baragary@coopercountymo.gov |
| Rebecca Riley | Regional Planner / Mid MO | 41 | 573.657.9779 | rebecca.riley@midmorpc.org |
| Brandon Bell | Cooper County EMA | 0 | 660-882-5355 ext 7 | Brandon.Bell@coopercountymo.gov |
| Jim Williams | L & B Electronics | 55 | 573-480-4512 | aflyer@hotmail.com |
| Kurt Heise | Wooldridge Council | 23 | 573 673 1601 | Kheisspk1@gmail.com |
| Pete E. Busalacki | Pilot Grove P.D. - EMA | 26 | 660-834-4300 | streetca@land.net |
| Dennis Knipp | City Hall, Pilot Grove MO | 26 | 660-834-3551 | cityofpilotgrove@gmail.com. |
| Larry Oerly | Cooper County EMA | 8 | 660-621-5737 | larryoerly@coopercountymo.com |
| Randen Leathers | Windsor Place & Cooper Co. CPUSD#1 | 12 | 573-619-3950 | windsorplace@outlook.com |
| Steve Clearlock | Outdoor Warning Consulting LLC | 64 | 573-635-0166 | owcllc@embarqmail.com |
| Bruce Fisher | Sales / BVPS | 162 | 8168074101 | bruce@bvpsonline.com |

# Meeting #7 Update of Cooper County Hazard Mitigation Plan

## PRELIMINARY AGENDA

**Wednesday,**

**March 15, 2017**

**6:30 p.m.**

**Cooper County Emergency Operation Center**

**200 Main Street**
**Boonville, MO**

- ☐ **Welcome and Introductions**
- ☐ **Recap Meeting #6**
- ☐ **Draft Plan Review**
  - **Questions & Answers Session**
- ☐ **Adjournment**

MID-MO Regional Planning Commission

This announcement is in accordance with Sec. 610.011 of the Missouri Sunshine Law. Posted 1/9/2017.

MID-MO Regional Planning Commission

Cooper County Natural Hazard Mitigation Plan
Location: Cooper County EOC, 200 Main Street, Boonville, Missouri
Technical Steering Committee Meeting #7
Date: 03/15/2017 Time: 6:30 pm – ~~8:00 pm~~ 9:00 pm

| Name | Position/Representing | Total Miles | Phone | Email |
|---|---|---|---|---|
| Rebecca Riley | Regional Planner / Mid Mo | 41 | 657-9779 | rebecca.riley@midmorpc.org |
| Brendan Bell | Cooper EMA | Ø | 886-6395 | Brendan.Bell@cooperco.mo.gov |
| Larry Oerly | Cooper Flood Plain Mng | 8 | 621-5737 | Larry.Oerly@cooperco.mo.gov |
| Stuart Clark | Boonville R1 School D.ST. | 2 | 621-3846 | sclark@boonville.k12.mo.us |
| KELLY L MURPHY | WOODRIDGE MO. | 10 | 573 999-1631 | MURphyKelly1957@gmail.com |
| Linda Martin | City Clerk | 6 | 660-841-5524 | citycleark@cityprairiehome.com |
| Brenda Gerlach | Region F Coord, SEMA | | 573-644-3728 | brenda.gerlach@sema.dps.mo.gov |
| DAVID GEHM | COOPER COUNTY FIRE | 22 | (660)882-3485 | dgehm@gehm.com |
| Tanya Brown | Blackwater R-II | Ø | 573-694-3726 | brownt@blackwater.K12.mo.us |
| Don Baragary | Cooper County Road + Bridge | 8 | 660-882-2228 | don.baragary@cooperco.mo.gov |
| Kurt Heiss | Wooldridge Council | 15 | 573-673-1601 | Kheiss.pb.1@gmail.com |
| PAUL LANGLOTZ | COOPER COUNTY AMBULANCE | 20 | 573-424-0999 | plang22@yahoo.com |
| KAREN WOLFE | CITY OF PILOT GROVE | 20 | 6606210471 | karenwolfeaew@outlook.com |
| Randon Leathers | Windsor Place + Cooper Co. CPWSD#1 | 12 | 573 619-3950 | windsorplace@outlook.com |
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