

Table of Contents

Prerequisites	3
Section 1 – Introduction and Planning Process	4
1.1 Purpose and Background	4
1.2 History of Hickory County Hazard Mitigation Plan	5
1.3 Participating Jurisdictions	6
1.4 The update process	8
Section 2 – Planning Area Profile and Capabilities	13
2.1 History	13
2.2 Natural Hazard History	13
2.3 Geography and Ecology	16
2.4 Form of Government	18
2.5 Community Partnerships	18
2.6 Demographic Information	18
2.7 Economy, Industry, Employment	20
2.8 Transportation and Commuting Patterns	22
2.9 Education	23
2.10 Major Employers	24
2.11 Capabilities Assessment	25
2.11.1 staff/organizational capabilities and community profiles	25
2.11.2 technical capabilities	38
Section 3 – Risk Assessment	42
3.1 Identifying Hazards	42
3.2 Profiling Hazards	42
3.2.1 dam failure	44
3.2.2 drought	50
3.2.3 earthquake	58
3.2.4 extreme heat	69
3.2.5 flood	73
3.2.6 land subsidence sinkhole	83
3.2.7 levee failure	86
3.2.8 severe winter weather	87
3.2.9 tornado	91
3.2.10 thunderstorms, (Damaging Winds, Lightning, Hail)	94
3.2.11 wildfire	100
3.3 Vulnerability assessment overview	104
3.3.1 Hickory County inventory	104

3.3.2 school districts	109
3.3.3 community jurisdictions	110
3.4 Vulnerability summary and impact	112
3.4.1 dam failure vulnerability	112
3.4.2 drought vulnerability	122
3.4.3 earthquake vulnerability	127
3.4.4 extreme heat vulnerability	131
3.4.5 flood vulnerability	133
3.4.6 land and subsidence/sinkhole vulnerability	139
3.4.7 levee failure vulnerability	141
3.4.8 severe winter weather vulnerability	143
3.4.9 tornado vulnerability	148
3.4.10 thunderstorm (high wind, lightning, hale)	153
3.4.10 wildfire vulnerability	160
3.5 Jurisdictional Vulnerability Variations	164
Section 4 Mitigation Strategies	179
4.1 Hazard Mitigation Goals	179
4.2 Update of Mitigation Actions	149
4.3 Prioritization, Implementation, and Administration	181
4.4 Mitigation Goals, Objectives, and Actions	183
4.5 NFIP Participation	197
4.6 Funding Sources	198
Section 5: Plan Maintenance Process	203
5.1 Plan Monitoring and Evaluation	203
5.2 Plan Updating	206
5.3 Integration of Hazard Mitigation into Other Planning Mechanisms	208
5.4 Public Participation in Plan Maintenance	209
Section 6: Maps	210
Education Facilities	211
Population Density	212
Land Cover	213
Sinkhole	214
Transportation	215
Healthcare Facilities	216
Floodplain Maps	217
Dams	219
Soils	221
Topographic	222
Appendices	223

Appendix A Adoption Resolutions	223
Appendix B Sign-In Sheets from Meetings	234
Appendix C Press Releases/Meeting Announcements	247

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.

Examples of adoption resolutions for the participating jurisdictions are included in Appendix A.

(NOTE: ADOPTION WILL COME AT THE END OF THE PROCESS AFTER FEMA HAS APPROVED THE PLAN.)

Section 1: Introduction and Planning Process

1.1 Purpose and Background

Following the severe weather, tornado, and flood disaster that was declared in the spring of 2002 (DR-1412), Missouri's State Emergency Management Agency (SEMA) received flood buyout project proposals from 23 communities across the state. Fortunately, they were able to help some of these communities with federal mitigation grant funding provided through the Federal Emergency Management Agency (FEMA). After November 1, 2010, communities like these will still be eligible for federal disaster assistance and individual assistance, but will not be eligible for mitigation assistance unless they have an approved hazard mitigation plan on file. For the nearly 1,000 cities and 114 counties in Missouri, mitigation plans will be required for all federally declared disasters such as flood, earthquake, ice storm, tornado, and fire. Under the rules for federal mitigation funding, local governments will be required to have FEMA-approved hazard mitigation plans in place as a condition to receiving federal mitigation grant funding as of the 2010 deadline.

Under the initiative set forth by SEMA, the Missouri Association of Councils of Government (MACOG) agreed to meet the challenge of developing county and municipal plans throughout the state. The 19 regional planning commissions of MACOG provide an effective way for local governments to work together to share technical staff and address common problems in need of an area-wide approach. They also can effectively deliver programs that might be beyond the resources of an individual county or municipal government.

The intent of the regional planning commissions in Missouri is to be of service to their member counties and municipalities and to bring an organized approach to addressing a broad cross-section of area-wide issues. They also are available to assist their member entities in coordinating the needs of the area with state and federal agencies or with private companies or other public bodies. SEMA's initiative further states that, due to time and funding limitations, the plans developed by Missouri's regional planning commissions should cover natural hazards only. Manmade and/or technological hazards are not addressed in this plan, except in the context of cascading damages.

Citizens and public organizations have participated in the process. This effort will be sustainable over the long term because it enjoys grassroots support that stems from a sense of local and individual ownership.

Through SEMA's Scope of Work, Hickory County contracted with Kaysinger Basin Regional Planning Commission and participated fully in the preparation of the plan. Once this plan is approved, Hickory County and cities within the county will be eligible for future mitigation assistance from FEMA and will be able to more effectively carry out mitigation activities to lessen the adverse impact of future disasters within the county.

Most of the rural regional planning commissions in Missouri were formed under Chapter 251 of the Revised Statutes of the State of Missouri. All regional councils in Missouri operate as "quasi-governmental" entities. In Missouri, regional planning commissions are advisory in nature, county, and municipal governments hold memberships on a voluntary basis.

The Hickory County hazard mitigation Plan was prepared by the staff of the Kaysinger Basin Regional Planning Commission (KBRPC). KBRPC, a member of MACOG, was created October 14, 1968 by Governor Warren E. Hearnes. The commission serves the seven county areas of Bates, Hickory, Cedar, Henry, Hickory, St. Clair, and Vernon counties.

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

1.2 History of the Hickory County Hazard Mitigation Plan

In November 2004, 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. Hickory County, a member of the Kaysinger Basin Regional Planning Commission (KBRPC), contracted with the KBRPC to facilitate the development of a hazard mitigation plan for the county. The plan was approved by FEMA and adopted by the participating jurisdictions in the spring of 2005.

Maintenance of Hazard Mitigation Plan 2005-2012

The Hickory County Hazard Mitigation Plan 2005 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 will be publicly available on the website of the Kaysinger Basin Regional Planning Commission.

During the ensuing years, the Kaysinger Basin RPC has kept the jurisdictions informed of mitigation grant opportunities through letters and announcements at meetings of the RPC.

The maintenance plan in the original document called for an annual review of the plan by the Hickory County Hazard Mitigation Steering Committee, facilitated by the Kaysinger Basin RPC. These annual reviews did not take place; lack of a defined time table for the reviews, shortage of time and personnel and personnel changes all played a role in this omission.

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.

1.3 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 Hickory County Hazard Mitigation Plan is a multi-jurisdictional plan. Planners from the Kaysinger Basin RPC adopted the following criteria from Mid-MO RPC for a jurisdiction to qualify as a participating jurisdiction:

1. Completion of a survey regarding capabilities, vulnerable assets, and future development
2. Review of a draft of the plan and provision of feedback, if warranted
3. Review of mitigation actions suggested for the jurisdiction; prioritization of actions deemed feasible for the jurisdiction based on benefit/cost and time/resources available for implementation and administration
4. Formal adoption of the plan by resolution
5. Attendance to at least one Hazard Mitigation Plan public informational meeting.

The participating jurisdictions in the original plan (2005) and those participating to any degree in the updated plan (2010) are the same. 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.

Figure 1.3-1 **Participating Jurisdictions**

Participating Jurisdictions	2005	2012
Hickory County	X	X
City of Cross Timbers	X	X
City of Hermitage	X	X
Village of Preston	X	X
City of Weaubleau	X	X
City of Wheatland	X	X
Hermitage R-IV School District		X
Hickory County R-I School District		X
Weaubleau R-III School District		X
Wheatland R-II School District		X

The chart in Figure 1.3-1 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 (“2012 Participating Jurisdictions”) indicates those jurisdictions which have completed the above requirements and are requesting approval of the plan prior to formal adoption.

The primary representatives for each jurisdiction participating to any degree in the update process are shown in Figure 1.3-2. The representative indicated had the primary contact with the Plan Author for purposes of participation in the plan. It should be noted, however, that there was wider participation in the planning process within each jurisdiction. Further information on the planning in each participating jurisdiction is given in Section 4.4.

Figure 1.3-2 **Representatives for each Jurisdiction who participated in the plan.**

Jurisdiction	Representative
Hickory County	Mrs. Jeanne Lindsey, County Clerk
Cross Timbers	Mr. Bill Arnold, City Clerk
Hermitage	Mrs. Karen Darby, City Clerk
Preston	Mrs. Elsie Snyder, City Clerk
Weaubleau	Mrs. Sheila Chaney, City Clerk
Wheatland	Mr. Byron Hines, Mayor
Hermitage R-IV School District	Ms. Shelly Aubuchon, Superintendent
Hickory Co. R-I School District	Mr. Mark Beem, Superintendent
Weaubleau R-III School District	Mr. Eric Wilken, Superintendent
Wheatland R-II School District	Mr. Robert McQuarter, Superintendent

All jurisdictions listed above have participated in the planning process and have been in further communication with the Plan Author and have completed all of the preliminary requirements for consideration as participating jurisdictions. ***There are no nonparticipating jurisdictions.***

1.4 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 Hickory County Hazard Mitigation Plan was directed by a planner from Kaysinger Basin RPC as specified in a Memorandum of Agreement (MOA) with the Missouri State Emergency Management Agency (SEMA).

The general planning process along with significant dates was as follows:

1. Preliminary update of technical data in charts and graphs (e.g. storm history events, population statistics, etc.) by Kaysinger Basin RPC staff in expectation of an MOA from SEMA for the update (Dec. 2010-February 2012)
2. Preliminary discussions with new regional planner from Kaysinger Basin and SEMA regarding the update of the Hickory County Hazard Mitigation Plan (July 2010)
3. MOA for Update of Hickory County Hazard Mitigation Plan received from SEMA (May 2010)
4. Formation of a Technical Steering Committee to prepare preliminary draft of the update and provide input throughout the update process (May. 2012)
5. Draft of update due at SEMA for review (May, 2012)
6. Survey to officials of participating jurisdictions on capabilities, vulnerable assets, and future development (August-October. 2010)
7. Presentation of update draft to officials of participating jurisdictions, neighboring jurisdictions, the public, interested agencies, businesses, and non-profits (July, 2012)
8. Feedback from participating jurisdictions on mitigation actions and their prioritization decisions for their jurisdictions (July, 2012)
9. Incorporation of survey information and mitigation actions feedback from participating jurisdictions into update draft (July, 2012)
10. Presentation of final draft for public comment before submission for SEMA/FEMA final approval (August, 2012)
11. Final plan due at SEMA for submission to FEMA (February, 2012)
12. Presentation of the approved plan for participating jurisdictions' approvals (after approval by FEMA) (Six months from submission date; March, 2012)

Technical Steering Committee

The Technical Steering Committee was formed with the intention of having a diversity of members who would represent the interests of all participating jurisdictions. Planners from the Kaysinger Basin RPC, which works with communities throughout Hickory County, initiated the formation of the committee and participated in the committee meetings.

The Technical Steering Committee consisted of the following individuals: Samantha Dingfelder, Regional Planner, Kaysinger Basin Regional Planning Commission J.C. Owsley, (Eastern Commissioner), City of Hermitage, Karen Darby, (City Clerk), and Elsie Snyder, (Preston City Clerk), City of Weaubleau, Sheila Chaney (City Clerk).

Summary of Update of the Plan

The Technical Steering Committee decided that each section of the plan needed to be updated. The original plan was written early in FEMA's decision making cycle regarding requirements for Hazard Mitigation Plans. It contained useful but vague information so as the goal for this update was to be as specific as possible. The goal was to produce a plan which is relevant, useful, and readable.

The plan was also restructured from its original organization to promote readability and flow. A general description of changes and updates made to the plan are shown in Table 1.4-1.

A public comment period was held from August 16 through August 31, 2012 in which none of the participating jurisdictions gave suggestions and critiques of the plan. There were no errors found within the plan during this process are listed below.

Table 1.4-1 **Plan Changes**

Hickory County Changes from 2005 to Present Plan		
Description	Revised	Pages of Original Plan
Section 1 was reworded, rearranged, and had more detailed information per section. Basic format stayed the same.	Yes	#1-7
Section 2 Community profile removed and updated. Updated all charts and graphs to reflect more recent data. Historic properties and the NFIP information were moved to Section 3. Subsection titles were changed and some were merged and/or eliminated.	Yes	#11--44
Section 3 Reviewed all charts and graphs and updated; edited text to reflect new information; changed rating system of each hazard to "Measure of Probability and Severity" using the same rating system as in the Missouri State HMP 2007. Reorganized hazard profiles and made specific changes. Removed all vulnerability assessment charts to update data and reformat per FEMA guidelines.	Yes	#45-94
Section 4 Hazard identification is moved to Section 3 and has been updated with the most recent community concerns.	Yes	#95-113
Section 5 Updated the Mitigation Goals, Objectives, and Actions to reflect decisions made by the participating jurisdictions, added documentation of changes to Mitigation Actions; added mitigation action matrix for each participating jurisdiction. This section is Section 4 in the update.	Yes	#115-118
Section 6 Goals and Strategies changed very little but were moved to another section.	Yes	#120-127
Section 7 Removed and replaced in Section 6	Yes	#128-145
Replaced Appendices with update maps and figures, the current outline is now in the following order; Section 1 Introduction and Planning Section 2 Planning Area Profile and Capabilities Section 3 Risk Assessment Section 4 Mitigation Strategy Section 5 Plan Maintenance Process Section 6 Maps Appendices with other maps	Yes	#141-151

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; (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 Officials and Community Leaders Meeting

Eleven meetings were held for city, county, and school district officials. An introductory and informing presentation about the county's Hazard Mitigation Plan and services offered by Kaysinger Basin Regional Planning Commission in the paragraphs listed below. A sign-in sheet for these meetings is included in Appendix B. Kaysinger staff did attend a county-wide Local Emergency Preparedness Committee (LEPC) meeting on May 2, 2012 and a local economic development group meeting on May 5, 2012.

Public Meetings for Comment and Input

Nine meetings were held for public comment and input on the update of this plan. The first meeting was held on October 5, 2010 at Preston City Hall. The second meeting was held at Hermitage City Hall on October 14, 2010. The third meeting was held on October 19, 2010 at Weaubleau City Hall. The fourth meeting was held on October 25, 2010 at Wheatland City Hall and the last city meeting was held at Cross Timbers City Hall on November 3, 2010. All meetings were held during the drafting stage and the rest prior to the plan being submitted for approval by FEMA. All schools were invited to attend but no representatives were ever present. Information collected from them was gained by visiting the school during a regular monthly school board meeting hours. School board meetings attended included Hickory County R-I (May 18, 2012), Hermitage IV (May 18, 2012), Weaubleau R-III (May 18, 2012), and Wheatland (May 19, 2012). Two community-served entities on separate occasions were also part of the "public outreach". One meeting was held for the local LEPC group (May 2) and the other was a county coalition group (May 5). 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 Meeting for Public Comment and Input

A first meeting for public comment and input on the plan update was held on October 5, 2010 in the Preston City Hall. An overview of the previous plan and informational PowerPoint was presented with an opportunity for feedback, comments, and questions. It was emphasized at the meeting that the previous draft (and eventually updated plan) will be available online at: www.kaysinger.com (Hazard Mitigation Plan Section). A sign-in sheet for this meeting is included in Appendix B.

- Press release went to The Index print edition: A meeting announcement was in the calendar for upcoming events on October 4th, 2010 for both Preston and Cross Timbers.

Second Meeting for Public Comment

A second meeting for public comment and input on the plan was held on October 14, 2010 during the Hermitage City Hall meeting. An overview of the previous plan and informational speech was presented with an opportunity for feedback, comments, and questions. It was emphasized at the meeting that the previous plan (and eventually updated plan) will be available online at www.kaysinger.com (Hazard Mitigation Plan Section). A sign-in sheet for this meeting is included in Appendix B.

Third Meeting for Public Comment

The third meeting was held at Weaubleau City Hall meeting on October 19, 2010. An overview of the purpose of a hazard plan and informational handouts were given with the opportunity for feedback, comments, and questions. A sign-in sheet for this meeting is included in Appendix B.

Fourth Meeting for Public Comment

The fourth meeting was held at Wheatland City Hall meeting on October 25, 2010. An overview of the purpose of a hazard plan and informational handouts were given with the opportunity for feedback, comments, and questions. A sign-in sheet for this meeting is included in Appendix B.

Fifth Meeting for Public Comment

The fifth meeting was held at Cross Timbers City Hall meeting on November 3, 2010. An overview of the purpose of a hazard plan and informational handouts were given with the opportunity for feedback, comments, and questions. A sign-in sheet for this meeting is included in Appendix B.

School Board Meetings

Four school board meetings were attended by staff in the month of May. Newspaper representatives were present at each meeting along with school staff and local citizens. 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.) A sign-in sheet for this meeting is included in Appendix B.

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 (2010), State Emergency Management Agency (SEMA)
- Hickory County Emergency Operations Plan (2004 edition)
- SEMA Situation Reports (<http://sema.dps.mo.gov/SitReps/Situation%20Reports.htm>)
- Long Range Transportation Plan (LRTP), Missouri Department of Transportation
- Regional Transportation Plan (2009), Kaysinger Basin Regional Planning Commission
- Atlas of Missouri Ecoregions, Missouri Department of Conservation
- Missouri Drought Plan (2002), Missouri Department of Natural Resources

Section 2: Planning Area Profile and Capabilities

2.1 History

In 1845, Hickory County was named after former U.S. President Andrew Jackson, who was known as “Old Hickory.” “Hickory County lies within the Osage land cession of 1808. Its early settlers were French trappers, Kickapoo Indians and pioneers from Tennessee and Kentucky. Hermitage was established in 1846 as the county seat and was named for Andrew Jackson's home in Tennessee.”----- *Hickory County Courthouse*

2.2 Natural Hazard History

Hickory County has been impacted by numerous natural hazards in the past including floods, tornadoes, thunderstorms, severe winter weather, and extreme heat.

Since 2004 Hickory County has experience several varying storms and tornado events costing over a million dollars. In March, 2006 there was a F3 tornado that hit various parts of the county costing an estimated \$1 million. In late July of 1998 the Missouri Governor declared a state of emergency for several counties including Hickory. There was an estimated \$8.5 million loss in property and crop damages when flooding occurred severe enough to wash away several vehicles and bridges. Major weather events in Hickory County that were significant enough for the National Weather Service to recognize included;

12 March 2006: A F3 tornado hit close to the town of Hermitage cost \$1 million in property damage. The tornado eventually tore through an intersection known as Carson’s Corner causing significant structural damage along with 19 injuries.

30 November 2006: A major winter storm caused a combination of freezing rain, sleet, and heavy snow to fall over sections of southwest and central Missouri. The frozen precipitation began on the 30th; the precipitation type was freezing rain and sleet, with ice accumulations up to four inches in some areas.

The second wave of precipitation occurred overnight causing large amount of snow to accumulate over the ice. The combination of the ice and snow weighted down all exposed objects. As a matter of fact, some areas experienced disaster as many roofs on businesses, barns, outbuildings, and schools collapsed due to the weight of the accumulated precipitation. On Lake of the Ozarks and Pomme De Terre Lake, numerous docks collapsed destroying a large number of boats and causing many of them to sink. This storm caused an estimated \$40,000 in property damage.

9 Dec. 2007: Major tree and power line damage resulted countywide. EPISODE NARRATIVE: A major ice storm impacted portions of southwest Missouri during the early morning hours of 9 December. A southwest to northeast narrow band of convection developed from northeast Oklahoma into central Missouri, which became the heaviest axis of ice accumulation. This axis of heavy ice accumulation became positioned from Asbury, to Lamar, to Wheatland Missouri. Intermittent periods of light freezing rain occurred through the morning of 10 December, which provided an additional coating of ice on exposed surfaces. This storm caused an estimated \$40,000 in damage.

26 Jan. 2009: Freezing drizzle and light freezing rain developed area wide at the onset of the event causing multiple traffic accidents. Freezing rain persisted for much of the event across far southern Missouri resulting in significant ice accretion of one half to one inch. This ice storm downed tree limbs and power lines causing numerous power outages. As many as 20,000 residences lost power along the Arkansas border from Branson to Alton. Sleet was the predominant precipitation type for much of the area with accumulations of 1 to 3 inches common. As much as 6 inches of sleet fell across far south central Missouri. The weight of freezing rain and sleet across far southern Missouri caused the roofs of several buildings and a boat dock to collapse. The sleet transitioned to snow toward the end of the event with 2 to 4 inches of snow common on top of the freezing rain and sleet. This storm caused an estimated \$40,000 in damages.

24 Nov. 2010: Two tornados occurred in separate parts of the county on the same day totaling \$100,000 in damages. An EF-0 tornado produced 80 mph winds causing moderate damage to a roof and destroyed one shed. EPISODE NARRATIVE: A vigorous storm system moved out across the central plains and an Arctic front moved south across the area. A fairly deep trough setup across the mid section of the U.S. as Gulf of Mexico moisture and warm air surged northward across southern Missouri. A line of severe storms developed along the front with a few embedded supercells and caused large hail, high winds, flash flooding, and several tornadoes.

Missouri Department of Conservation employees attempt to clear roads after the 2009 storm.



Source: Missouri Department of Conservation online www.mdc.mo.gov.

Figure 2.2-2 Tornado damage produced from the Joplin, 2012 tornado.



Source: GEV.com world news

2.3 Geography and Ecology

Hickory County is located in central Missouri with an area covering 410 square miles. It is located three counties east of the Kansas line and four counties south of the Missouri River.

The county is bordered on the north by Benton, on the west by St. Clair and Cedar Counties, on the south by Polk and Dallas, on the east by Camden. The City of Hermitage is the county seat and most populated community.

Hickory County consists of one main ecological land type according to the *Atlas of Missouri Ecoregions*, published by the Missouri Department of Conservation:

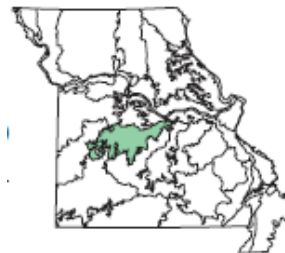
Ozark Highlands (Osage River Hills)

It includes lands associated with the Sac, Pomme de Terre, and Niangua Rivers, all of them major tributaries of the Osage, and also the Lake of the Ozarks, Pomme De Terre Lake, and Pomme de Terre Lake. Its proximity to prairie-dominated Ecoregions to the west and north and the presence of extensive areas of shallow to moderately deep and droughty soils make the influence of prairie and open woodlands stronger here than in hill subsections in the Ozarks to the east.

It lies along the Osage River and its tributaries and comprises major portions of St. Clair, Hickory, Morgan, Camden, and Miller Counties, and portions of Cole, Osage, Maries, Laclede, Dallas, Hickory, Polk, Henry, and Cedar Counties.



Osage River Hills Subsection



Source: MDC Atlas of Ecoregions

Public Land

Hickory County has several state owned land areas (see Appendix A). These public lands are important to consider when working on mitigation efforts, especially when they contain hazards such as sinkholes and high fuel loads that could cause wildfires.

Incorporated Communities

Hickory County consists of the following five incorporated communities:

- Cross Timbers
- Hermitage
- Preston
- Weaubleau
- Wheatland

Climate

Mean annual precipitation for Hickory County is 40.9 inches. The wettest months are June-August; 63 percent of the annual precipitation occurs during the six warmer months of the year. Annual snowfall averages 18 inches. Mean January minimum daily temperature is 20°. Mean July maximum daily temperature is 90°.

Hickory County lies in a Humid Temperate climate and is vulnerable to northern pressure systems in the winter and strong pressure and storm systems from the Gulf of Mexico and the Great Plains region of the central United States. While Hickory County does have extreme variations in weather at times, there is a seasonal pattern, as demonstrated in table 2.3-1

Table 2.3-1 **Hermitage Normal and Record Temperatures**

History & Almanac

April 14, 2012 Max Temp Min Temp

Normal (KSGF) 67 °F 43 °F

Record (KSGF) 88 °F (1936) 26 °F (1950)

Yesterday 75 °F 45 °F

Yesterday's Heating Degree Days: 5

Choose a date

Source; Weather Underground www.wunderground.com

2.4 Form of Government

Hickory County is considered a Class 3 county, with an assessed value of \$6,259,726. According to the US Census Bureau, the estimated population in 2009 was 18,461. The county government consists of the County Commission which oversees the following offices: Assessor, Auditor, Collector, Clerk, Public Administrator, Public Attorney, Recorder, Sheriff, and Treasurer.

The Hickory County Commission has authority to administer county structures, infrastructures, and finances as well as a master plan, zoning codes, subdivision regulations, floodplain regulations and storm water regulations. The three-member County Commission generally is the final authority on county issues; the remaining bodies provide the information used by the County Commissioners to create policy.

2.5 Community Partnerships

Hickory County has some working relationships with its towns and cities as well as neighboring counties. This is particularly evident in regard to the mutual aid agreements that exist between fire and police jurisdictions. A significant partnership exists between Hickory County and the City of Hermitage.

Hickory County jurisdictions have partnered successfully with Kaysinger Basin Regional Planning Commission (KBRPC) and six surrounding counties on numerous grant applications. Local elected and appointed leaders provide the core board positions and committees established by the Regional Planning Commission.

2.6 Demographic Information

Due to the close proximity of Lake Pomme De Terre, Hickory County is visited frequently by fisherman and other outdoor recreation enthusiast. A low cost of living, the presence of cultural amenities, and quality schools each contribute to the attractiveness of the county.

Figure 2.6.1 and figure 2.6-2 portray some key demographic information about Hickory County.

Social Characteristics	Estimate Percent		Margin of Error	
Average household size	2.17	(X)	+/-0.12	map
Average family size	2.60	(X)	+/-0.19	
Population 25 years and over	6,858		*****	
High school graduate or higher	(X)	78.9	(X)	map
Bachelor's degree or higher	(X)	7.1	(X)	map
Civilian veterans (civilian population 18 years and over)	1,392	18.8	+/-155	map
With a Disability	(X)	(X)	(X)	
Foreign born	39	0.4	+/-40	map
Male, Now married, except separated (population 15 years and over)	2,298	61.7	+/-196	
Female, Now married, except separated (population 15 years and over)	2,428	60.2	+/-253	
Speak a language other than English at home (population 5 years and over)	166	1.9	+/-91	map
Household population	8,948		+/-123	
Group quarters population	(X)	(X)	(X)	
Economic Characteristics	Estimate Percent		Margin of Error	
In labor force (population 16 years and over)	3,594	47.2	+/-224	map
Mean travel time to work in minutes (workers 16 years and over)	32.6	(X)	+/-4.2	map
Median household income (in 2009 inflation-adjusted dollars)	28,685	(X)	+/-2,995	map
Median family income (in 2009 inflation-adjusted dollars)	34,961	(X)	+/-2,166	map
Per capita income (in 2009 inflation-adjusted dollars)	17,567	(X)	+/-1,551	
Families below poverty level	(X)	10.7	+/-4.2	
Individuals below poverty level	(X)	15.5	+/-3.3	map
Housing Characteristics	Estimate Percent		Margin of Error	
Total housing units	6,519		+/-62	
Occupied housing units	4,120	63.2	+/-235	
Owner-occupied housing units	3,403	82.6	+/-187	
Renter-occupied housing units	717	17.4	+/-166	
Vacant housing units	2,399	36.8	+/-221	

Owner-occupied homes	3,403		+/-187	map
Median value (dollars)	83,900	(X)	+/-6,520	map
Median of selected monthly owner costs				
With a mortgage (dollars)	758	(X)	+/-48	map
Not mortgaged (dollars)	251	(X)	+/-14	

ACS Demographic Estimates	Estimate Percent		Margin of Error	
Total population	9,022		*****	
Male	4,357	48.3	*****	
Female	4,665	51.7	*****	
Median age (years)	51.2	(X)	+/-0.3	map
Under 5 years	387	4.3	*****	
18 years and over	7,410	82.1	*****	
65 years and over	2,466	27.3	*****	
One race	8,042	89.1	+/-233	
White	7,738	85.8	+/-260	map
Black or African American	26	0.3	+/-33	map
American Indian and Alaska Native	246	2.7	+/-143	map
Asian	26	0.3	+/-37	map
Native Hawaiian and Other Pacific Islander	6	0.1	+/-9	map
Some other race	0	0.0	+/-114	map
Two or more races	980	10.9	+/-233	map
Hispanic or Latino (of any race)	28	0.3	+/-27	

Source: U.S. Census Bureau American FactFinder

2.7 Economy, Industry, Employment

Hickory County is considered a rural community with the largest town, Hermitage, reaching a population of 647. Hermitage is also the county seat.

Table 2.7-1 depicts the principle types of employment found in Hickory County.

Table 2.7-1 Employment by Occupation				
	Estimate	ME	%	ME
INDUSTRY				
Civilian employed population 16 years and over	3,282	+/-260	3,282	(X)
Agriculture, forestry, fishing and hunting, and mining	192	+/-72	5.9%	+/-2.2
Construction	318	+/-112	9.7%	+/-3.3
Manufacturing	249	+/-104	7.6%	+/-3.1
Wholesale trade	66	+/-49	2.0%	+/-1.4
Retail trade	676	+/-175	20.6%	+/-5.4
Transportation and warehousing, and utilities	283	+/-117	8.6%	+/-3.5
Information	48	+/-50	1.5%	+/-1.5
Finance and insurance, and real estate and rental and leasing	66	+/-44	2.0%	+/-1.4
Professional, scientific, and management, and administrative and waste management services	128	+/-84	3.9%	+/-2.6
Educational services, and health care and social assistance	576	+/-153	17.6%	+/-4.3
Arts, entertainment, and recreation, and accommodation and food services	305	+/-98	9.3%	+/-2.8
Other services, except public administration	162	+/-70	4.9%	+/-2.1
Public administration	213	+/-97	6.5%	+/-2.8

Listed below are business quickfacts from the U.S. Census Bureau that explain employment rates from 1990-2009 in Hickory County.

Source: US Census Bureau

Hickory County, Missouri

S2301. Employment Status

Data Set: 2005-2009 American Community Survey 5-Year Estimates

Survey: American Community Survey

NOTE: For information on confidentiality protection, sampling error, nonsampling error, and definitions, see [Survey Methodology](#).

Subject	Total	Margin of Error	In labor force	Margin of Error	Employed	Margin of Error	Unemployment rate
Population 16 years and over	7,621	+/-51	47.2%	+/-2.9	43.1%	+/-3.4	8.7%
AGE							
16 to 19 years	338	+/-88	50.9%	+/-15.2	47.9%	+/-15.4	5.8%
20 to 24 years	425	+/-68	87.3%	+/-9.6	67.1%	+/-17.4	23.2%
25 to 44 years	1,523	*****	74.4%	+/-7.7	68.3%	+/-7.9	8.2%
45 to 54 years	1,187	*****	79.1%	+/-7.4	73.6%	+/-6.8	6.9%
55 to 64 years	1,682	*****	45.4%	+/-7.4	42.7%	+/-7.2	5.8%
65 to 74 years	1,376	*****	11.4%	+/-4.2	10.4%	+/-4.0	8.9%
75 years and over	1,090	*****	5.4%	+/-3.7	5.4%	+/-3.7	0.0%

Agriculture

Agriculture in Hickory County:

Average size of farms: 292 acres

Average value of agricultural products sold per farm: \$30,106

Average value of crops sold per acre for harvested cropland: \$36.40

The value of livestock, poultry, and their products as a percentage of the total market value of agricultural products sold: 89.97%

Average total farm production expenses per farm: \$25,298

Harvested cropland as a percentage of land in farms: 28.38%

Average market value of all machinery and equipment per farm: \$34,995

The percentage of farms operated by a family or individual: 96.82%

Average age of principal farm operators: 58 years

Average number of cattle and calves per 100 acres of all land in farms: 23.62

Milk cows as a percentage of all cattle and calves: 6.02%

Corn for grain: 1478 harvested acres

All wheat for grain: 391 harvested acres

Soybeans for beans: 1224 harvested acres

Source: http://www.city-data.com/county/Hickory_County-MO.html#ixzz1JcPz3bGn

2.8 Transportation and Commuting Patterns

Roadways

Hickory County serves as a host for one of the state's major highway systems. Running north-south is U.S. Highway 65. This highway serves as a major route for transporting goods, providing access to work for many residents, and bringing many visitors to Lake of the Ozarks, Pomme De Terre Lake, and Branson. Highway 54 runs east-west which connects Highway 13 to Highway 65 (two major transportation routes for tourism and semi-trucks). The highway also provides access to Lake Pomme De Terre. This lake is an excellent host to outdoor recreation created by the U.S. Army Corps and managed by the Missouri Department of Conservation.

Air

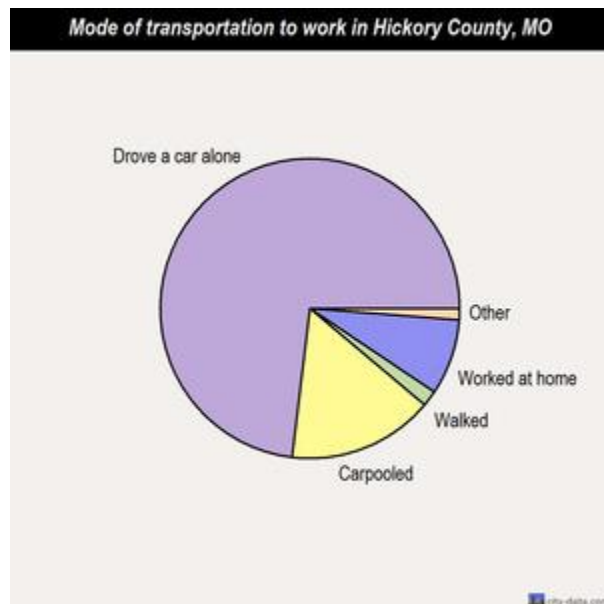
Hickory County does not have any form of aviation transportation. Surrounding counties have a couple of municipal airports, the closest one being in Benton County to the north.

Commuting

Table 2.8-1 elaborates on the moderate population of county residents that commute outside the county with less than 30 minutes of travel time.

Means of transportation to work:

- Drove a car alone: 2,094 (73%)
- Carpooled: 454 (16%)
- Bus or trolley bus: 6 (0%)
- Walked: 48 (2%)
- Other means: 29 (1%)
- Worked at home: 235 (8%)



Source: http://www.city-data.com/county/Hickory_County-MO.html#ixzz1JcZ4dXB9

2.9 Education

Pre K-12

As of 2010, there are approximately 1,658 students and 225 teachers in four public schools districts. There are no private schools in Hickory County. (See Figure 2.10-1).

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 can also act as safe rooms and shelters during a natural disaster.

Table 2.9-1 Hickory County Public Schools

Hickory County Public Schools			
School District	# of Schools	# of Teachers	# of Students
Hermitage R-IV	3	58	293
Hickory County R-I	3	83	818
Weaubleau R-III	2	50	403
Wheatland R-II	2	39	288

2.10 Major Employers

City of Cross Timbers

There are no major employers in Cross Timbers as stated by the city clerk.

City of Hermitage

Prominent Employers	Service	Total Employed	Union
County Courthouse	Public Service	20+	No
Hermitage R-IV Schools	Educational	15+	No

Village of Preston

There are no major employers in Preston as stated by the city clerk.

City of Weaubleau

The local school (Weaubleau R-III) is the largest employer for the city employing over 10 + people as stated by the city clerk.

City of Wheatland

Prominent Employers	Service	Total Employed	Union?
Snyder Equipment	Manufacturing	20+	No
Lucas Oil Speedway	Recreational	20 +	No
Wheatland R-II School	Educational	15 +	No

2.11 Capabilities Assessment

Many of the structures of County and municipal government are potentially involved in the mitigation of natural hazards. Private organizations also play an important role. Discussion of the capabilities present in Hickory County are organized in the following manner:

- Staff /Organizational Capabilities and Community Profiles
- Technical Capability
- Political Willpower

2.11.1 Staff/Organizational Capabilities and Community Profiles

Each jurisdiction in the Planning Area has an administrative body composed of elected and/or paid staff. These public offices are directly involved with decision making in those jurisdictions and are integral to hazard mitigation planning. Jurisdictions and their administrative offices are listed in this section.

NOTE: Water, Sewer, and Road Districts are not participating jurisdictions in this plan.

Hickory County

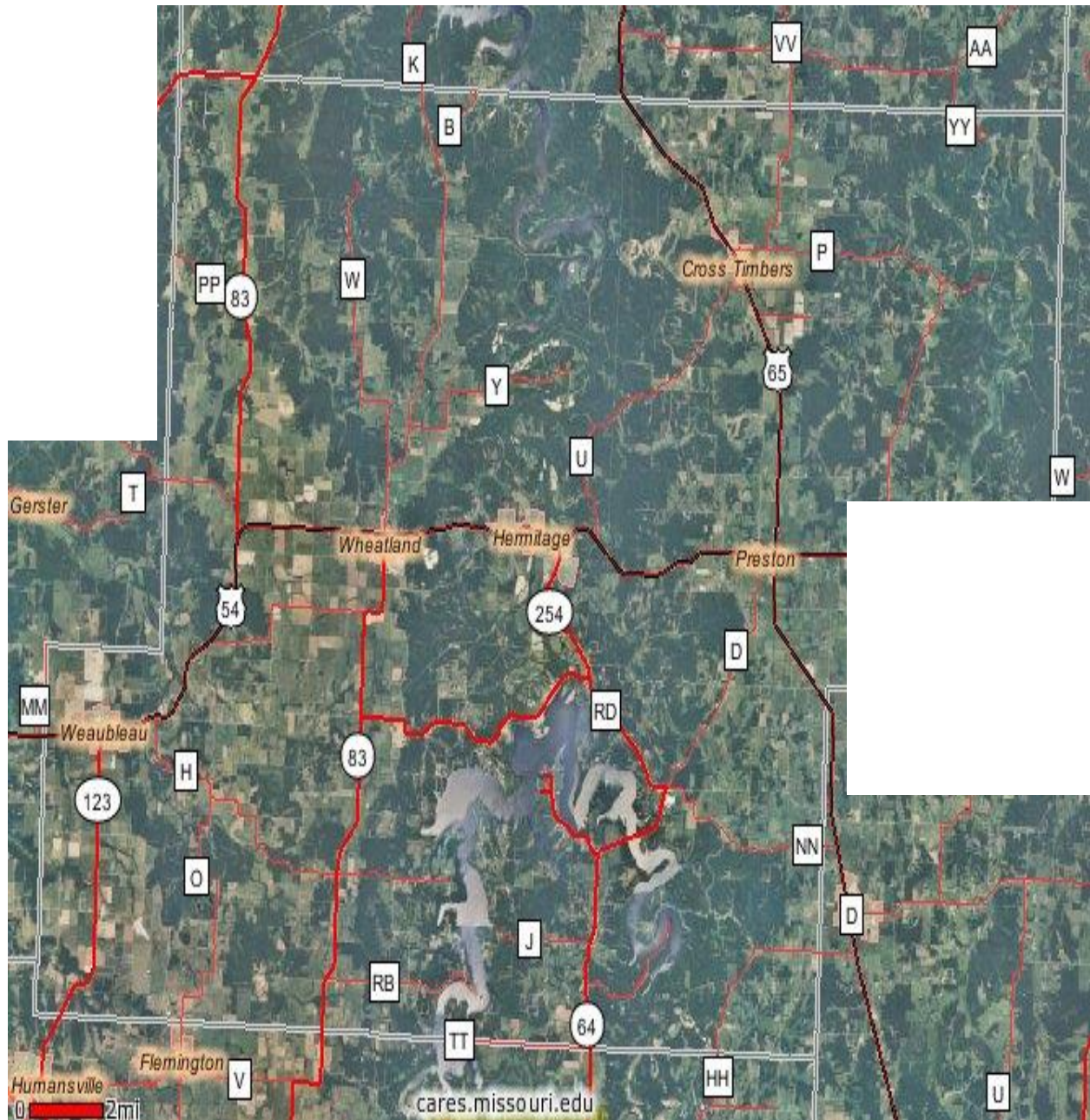
The County Commission is the administrative authority. It is an elected three-member governing body with an Eastern Commissioner, a Western Commissioner, and a Presiding Commissioner. The Commission establishes County policy; approves and adopts the annual budget for all County operations; approves actual expenditures for each department; supervises the operations of Public Works, Planning and Zoning, Building Codes, Human Resources, Purchasing, Facilities and Grounds Maintenance; ensures County-wide compliance with numerous statutory requirements; and acts as liaison with County boards, commissions, and other governmental entities.

Hickory County also has the following staff positions:

- Assessor
- Circuit Clerk
- Collector
- Coroner
- County Clerk
- Emergency Management Director
- Public Administrator
- Prosecuting Attorney
- Sheriff
- Treasurer

Source; County website: www.hickorycountymo.net

County-Wide Area Map



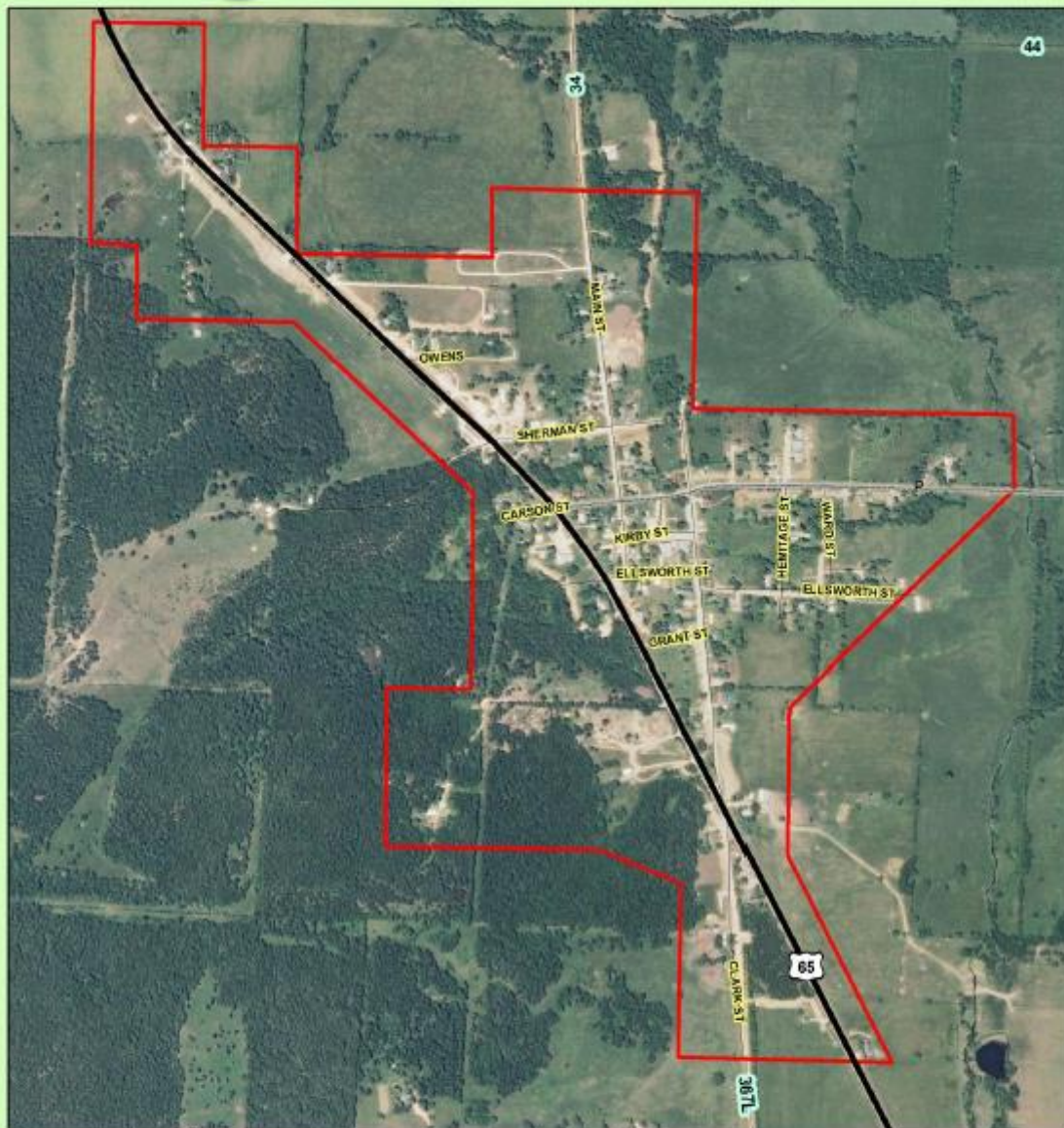
Cross Timbers

The Mayor and the Board of Aldermen are the policy making bodies in the city government. Cross Timbers also have the following staff positions:

- City Clerk
- Sewer/Water Superintendent
- Attorney

Cross Timbers	
Classification	4 th
Population	185
Median Household Income	\$16,875
Median owner-occupied housing value	\$37,900
Total housing units	119
Water Service	\$12.00 base rate
Electric Service	Empire-primary; Southwest Elect. Coop
Ambulance Service	Cox Memorial Hospital
Sewer Service	\$14.75 + 3.72/1,000 gal usage fee
Fire Service	Local volunteer Fire Dept.
Master Plan	No
Emergency Operations Plan	No
Building Regulations	No
Zoning Regulations	No
Subdivision Regulations	No
Storm water Regulations	No
NFIP participation	No
Floodplain Regulations	No
Flash flooding issues?	No

Village of Cross Timbers



Legend	
transportation	— MO
<all other values>	— OR
RTE_DESG	
— CRD	— RP
— CST	— RT
— IS	— US
	□ County Boundary

Miles
0 0.05 0.1 0.2

This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011.



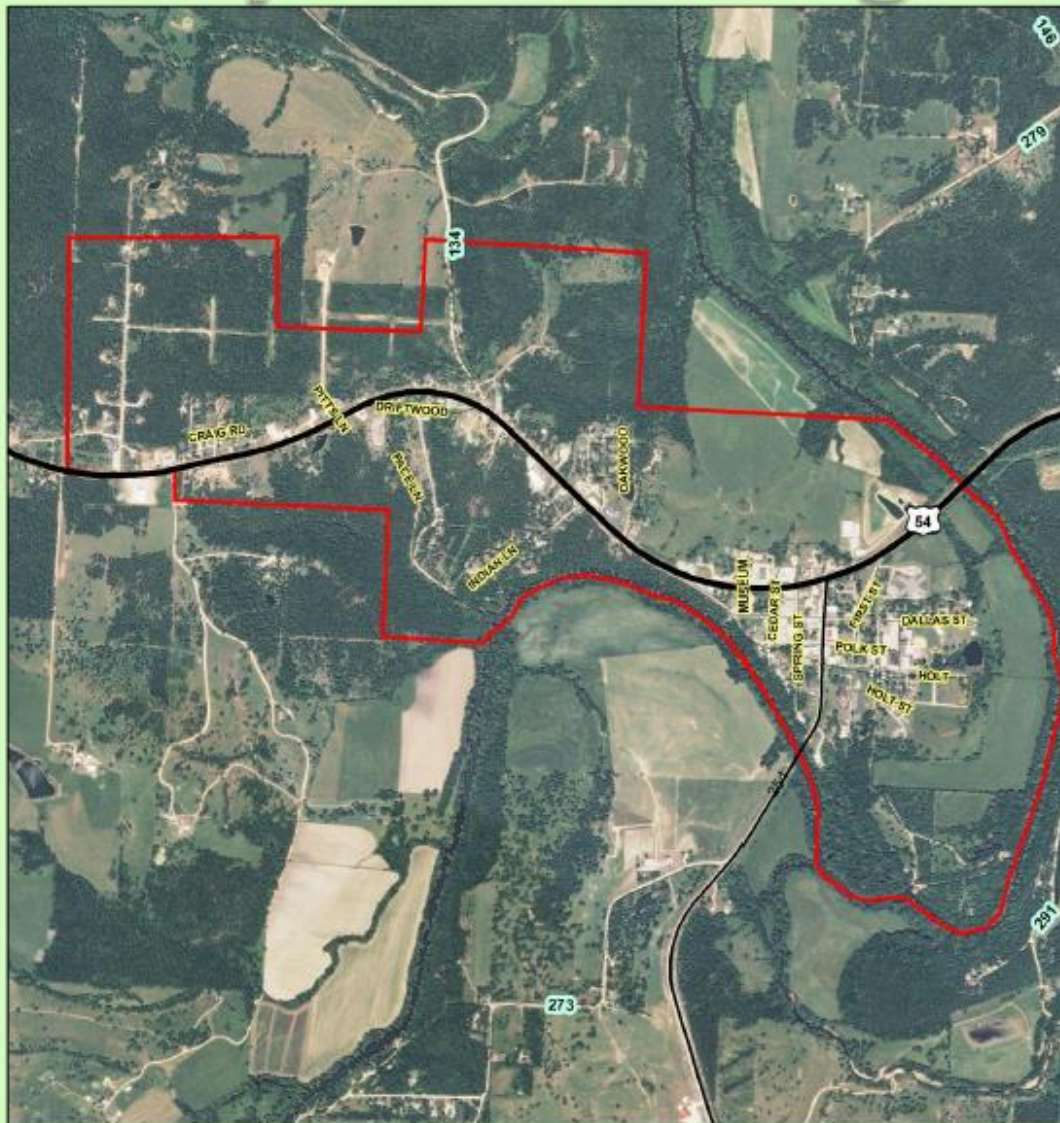
Hermitage

The Mayor and the four member council are the policy making bodies in the city government. Hermitage has the following offices and staff positions;

- City Clerk
- Collector
- Attorney
- City Marshall
- Street/Sewer/Water Superintendent
- Fire Chief
- Treasurer

Hermitage	
Classification	4 th
Population	647
Median Household Income	\$27,083
Median owner-occupied housing value	\$82,700
Total housing units	256
Water Service	\$10/per 1st thousand;\$1.30 after
Electric Service	Empire Dist. Electric- Bolivar
Ambulance Service	Citizens Memorial Hospital-Bolivar
Sewer Service	\$10/per 1 st thousand; \$2.00 after
Fire Service	Hermitage Fire Dept.
Master Plan	No
Emergency Operations Plan	Yes;2008
Building Regulations	No
Zoning Regulations	No
Subdivision Regulations	No
Storm water Regulations	No
NFIP participation	No
Floodplain Regulations	No
Flash flooding issues?	No

City of Hermitage



Legend	
transportation	MO
<all other values>	OR
RTE_DESG	
CRD	RR
CST	RT
IS	US
	County Boundary

Miles
0 0.125 0.25 0.5

This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Preston

The Mayor and the three member Board of Alderman are the policy making bodies in the city government. Preston has the following offices and staff positions;

- City Clerk
- Attorney
- Fire Chief
- Street, Sewer, and Water Superintendent

Preston	
Classification	Village
Population	161
Median Household Income	19,821
Median owner-occupied housing value	45,000
Total housing units	111
Water Service	\$6.00 base rate
Electric Service	Empire District Electric
Ambulance Service	Citizens Memorial Hospital
Sewer Service	\$4.00 base rate
Fire Service	Preston Volunteer Fire Dept./mutual aid agreements with surrounding dept.
Master Plan	No
Emergency Operations Plan	No
Building Regulations	No
Zoning Regulations	No
Subdivision Regulations	No
Storm water Regulations	No
NFIP participation	No
Floodplain Regulations	No
Flash flooding issues?	No

City of Preston



Legend	
transportation	MO
<all other values>	OR
RTE_DESG	
CRD	RP
CST	RR
IS	RT
	US
	County Boundary

Miles
0 0.05 0.1 0.2

This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Weaubleau

The Mayor and the four member council are the policy making bodies in the city government. Weaubleau has the following offices and staff positions;

- City Clerk
- Attorney
- Sewer/Water Superintendent

Weaubleau	
Classification	4 th class
Population	560
Median Household Income	\$33,173
Median owner-occupied housing value	\$54,600
Total housing units	293
Water Service	\$8.83/1,000gal
Electric Service	Empire Dist. Electric
Ambulance Service	CMH-Citizens Memorial Hospital
Sewer Service	\$20.10/1,000gal
Fire Service	Volunteer
Master Plan	No
Emergency Operations Plan	Yes;2009
Building Regulations	No
Zoning Regulations	No
Subdivision Regulations	No
Storm water Regulations	No
NFIP participation	No
Floodplain Regulations	No
Flash flooding issues?	No

City of Weaubleau



Legend	
transportation	MO
<all other values>	OR
RTE_DESG	
CRD	RP
CST	RT
IS	US
	County Boundary

Miles
0 0.05 0.1 0.2



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Wheatland

The Mayor and the three member council are the policy making bodies in the city government. Wheatland has the following offices and staff positions;

- City Clerk
- Attorney
- Sewer/Water Superintendent

Wheatland	
Classification	4 th
Population	319
Median Household Income	\$20,417
Median owner-occupied housing value	\$60,000
Total housing units	232
Water Service	\$9.00/1500gal
Electric Service	Empire District Electric
Ambulance Service	Citizens Memorial Hospital
Sewer Service	\$6.10/1500 gal
Fire Service	Local Volunteer
Master Plan	No
Emergency Operations Plan	Yes;2004
Building Regulations	No
Zoning Regulations	No
Subdivision Regulations	No
Storm water Regulations	No
NFIP participation	No
Floodplain Regulations	No
Flash flooding issues?	No

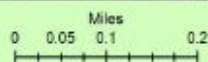
The following table represents the average median owner-occupied housing value of Hickory County. This figure will be used in the projected hazard events damage estimates used latter in this plan.

Table 2.12.1-1 Average Median Owner-Occupied Housing Values		
Jurisdiction	Median Value	Totals
Cross Timbers	\$37,900	\$37,900
Hermitage	\$82,700	\$117,600
Preston	\$45,000	\$162,600
Weaubleau	\$54,600	\$217,200
Wheatland	\$60,000	\$277,200
Total Average Median owner-occupied housing Value = \$277,200 / 5 jurisdictions =		\$67,400

City of Wheatland



Legend	
transportation	— MO
<all other values>	— OR
RTE_DESG	— RP
— CRD	— RR
— CST	— RT
— IS	— US
	□ County Boundary



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Districts

School Districts

Hickory County has four school districts. Combined, the district schools hold more than 2,684 students and employ more than 195 teachers. Each district has an elected Superintendent and School Board along with several administrative staff. The four districts are:

- Hermitage R-IV
- Hickory County R-I
- Weaubleau R-III
- Wheatland R-II

Hickory County Water/Sewer Districts

There is only one Water District within the County that is responsible for distributing water throughout a small community located in Galmey; Hickory County Sewer District #1. Each of the municipalities within the county is responsible for developing new water and sewer supply infrastructure and maintaining existing infrastructure. Each Village and City mentioned within this plan has a sewer/drinking water system.

Road District

The Missouri Department of Transportation Central District assesses and corrects all county problems with the exception of municipal roads. Hickory County is part of MoDOT District 8 which also covers Springfield.

Fire Protection Districts

Several fire departments serve in the Hickory County Fire Protection District; the Cross Timbers Rural FD, Hermitage FD, Pittsburg Volunteer FD, Preston Volunteer FD, Wheatland Volunteer FD, and Galmey FPD.

While the municipal fire departments are run through the oversight of the city, the county fire districts are administered by an elected Board of Directors and the appointed Fire Chief. The capabilities of these districts will be expanded under Technical Capability.

Fire Departments in Hickory County Missouri (6 Fire Stations)



Source: www.firedepartmentdirectory.com

2.11.2 Technical Capabilities

This section includes the technical capabilities of Hickory County, Fire Protection, and Law Enforcement agencies and other organizations.

A note on cooperation and coordination: Intergovernmental and interagency coordination exists as needed. The agencies and offices listed below cooperate with one another as specific projects warrant cooperation. For instance, the Hickory County Sheriff and the Hickory County Fire Protection District both have mutual aid agreements in place with local police departments.

Hickory County

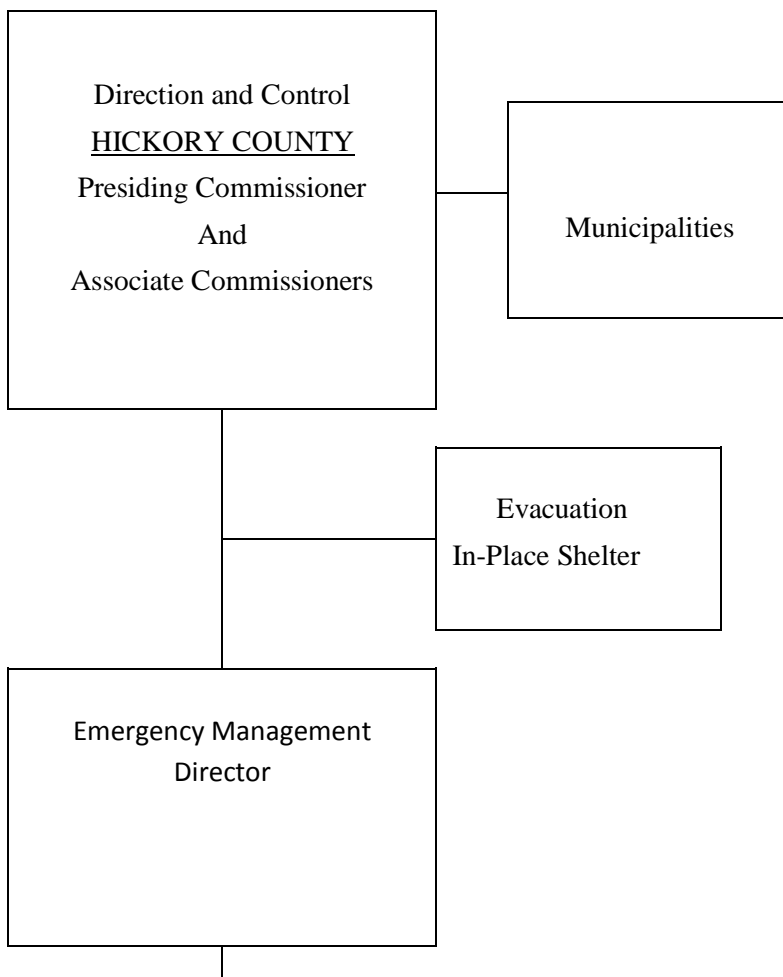
Hickory County has limited full time emergency response staff that can help identify and guide hazard mitigation strategies. The staff is backed by some limited communication system and exchange of information from local cities, little to none GIS capabilities, and other associated tasks. Email, online databases, and user friendly websites provide a wide range of information both for citizens and county employees. There is also an inventory of trucks, earthmovers, and other vehicles. Solid coordination exists between agencies and local jurisdictions.

Emergency Management

- Hickory County and the City of Hermitage share oversight of emergency management.
- There is a director of emergency management for Hickory County who works closely with city officials to write and update the Emergency Operations Plan, conduct ongoing public education related to emergency information, and identify and fix gaps in emergency response, preparedness, and mitigation.
- Staff has had training from SEMA, FEMA, and other bodies in emergency response, preparedness, recovery, mitigation, and overall emergency management.

Emergency Management Diagram by Emergency Function

HICKORY COUNTY EMERGENCY MANAGEMENT DIAGRAM BY EMERGENCY FUNCTION



<p>Law Enforcement</p> <p><u>Communications and Warning</u></p> <p>County Sheriff</p>		<p><u>Resource and Supply</u></p> <p>County Clerk</p>
<p><u>Fire Rescue</u></p> <p>Municipal/Rural Fire departments</p>		<p><u>Damage Assessment</u></p> <p>County Assessor</p>
<p><u>Health and Medical</u></p> <p>Hickory County Health Department</p>		<p><u>Reception and Care</u></p> <p>Hickory County Health Department</p>
<p><u>Public Works</u></p> <p>County Road and Bridge Supervisor</p>		<p><u>Hazardous Materials</u></p> <p>Hickory County LEPC</p>

Emergency Operations Plan

Hickory County has updated their Emergency Operations Plan (EOP) in January, 2012. The EOP consists of specific directions for local government to undertake in the event of an emergency.

While this is not considered mitigation, an EOP is an essential tool in helping reduce the threat of a natural hazard (or any other hazard). Furthermore, the EOP directs local authorities in cleaning up after a natural hazard. When this happens, these local authorities can use that as an opportunity to learn from the event and see what did and did not work in regard to effectiveness.

Copies of the EOP can be found with the County Clerk's Office on West Dallas Street, Hermitage, Missouri 65668, 417-745-6450 or e-mail the clerk at hickory@sos.mo.gov.

The **Hickory County Central E-911 Dispatch Center** consists of calling 911 which will connect the caller to the Hickory County Sheriff's Department in Hermitage. They do not have the ability to trace the caller's location.

Media

Local and regional media outlets provide regular weather information including forecasts for potentially destructive weather. Broadcast media stations originating in or reaching Hickory County are shown in Figure 2.29.

TV Station	Base City	Radio Station	Base City
KY3-Channel 10	Springfield	94.1	Springfield
KDEB-Channel 27	Springfield	KWTO	Springfield

Newspaper	Base City
The Index	Hermitage

Law Enforcement Agencies

Hickory County Sheriff's Office..... (417) 745-6415

State Agencies (Missouri)

Missouri State Highway Patrol, Troop D, Springfield... (417) 895-6868

Missouri State Highway Patrol, General Headquarters, Jefferson City..... (573) 751-3313

Missouri State Water Patrol, Headquarters, Jefferson City..... (573) 751-3333

Missouri Department of Conservation Agents (Springfield)..... (417) 895-6880

Department of Natural Resources, Park Rangers..... (573) 751-1000

State Fire Marshal's Office (arson, bombing), Jefferson City..... (573) 751-2930

Federal Agencies

U.S. Marshal, Federal Court Building, Jefferson City..... (573) 635-9708

Federal Bureau of Investigation, Hawthorne Building, Jefferson City..... (573) 636-8814

U.S. Corps of Engineers-Pomme De Terre Lake (Hermitage)..... (417) 745-6411

Section 3 Risk Assessment

3.1 Identifying Hazards

Requirement

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

The following natural hazards have been identified as posing potential risk in Hickory County:

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

The Missouri State Hazard Mitigation Plan (2010) 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 Hickory County Plan.

Avalanches and volcanoes have not been included in this plan as they do not pose a threat due to Hickory 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.

3.2 Profiling Hazards

Requirement

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

Each of the natural hazards being profiled in this plan has been studied, analyzed, and assessed for its potential impact on the Planning Area. Each hazard profile is organized in the following manner:

- General description
- Geographic location
- Previous occurrences
- Measures of Probability and Severity
- Existing mitigation strategies

Measures of Probability and Severity

The assessments of probability and severity included in each profile were based on the following definitions from the Missouri State Hazard Mitigation Plan (2010):

Measure of Probability – The likelihood that the hazard will occur.

- 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).

Measure of Severity – The deaths, injuries, or damage (property or environmental) that could result from the hazard.

- Low: Few or minor damage or injuries are likely.
- Moderate: Injuries to personnel and damage to property and the environment is expected.
- High: Deaths and major injuries and damage will likely occur.

Existing Mitigation Strategies

There are few mitigation strategies already in place in the Planning Area. Most have been in place for several years prior to 2005.

Some of the current mitigation strategies are aimed at mitigating the effects of a specific hazard and are described under the specific hazard profile. The following mitigation strategies are applicable to many or all hazards:

- Health care facilities in the county like the Health Department, City wells, County jail in Hermitage, Bank of Urbana, Hermitage Nursing Home, and the Wheatland Senior Center have a transfer switch for a generator. The City of Weaubleau has a backup generator for their water wells.
- Agreements are in place with local “shelters” in the county.
- General evacuation procedures are included in the county’s Emergency Operation Plan.
- Alternative routes in case of severe weather are in place in all school districts in the county.
- Buses in all school districts have cell phones on board.
- Some businesses and municipalities (1,000) have a weather radio in place.
- The county is continuously maintaining tree limb lines.
- Publicize county or city-wide drills.

3.2.1 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: (1) is more than 6 feet high and stores 50 acre feet or more, or (2) is 25 feet or more high and stores more than 15 acre feet.

Based on this definition, there are over 80,000 dams in the United States. Over 95% are non-federal, with most being owned by state governments, municipalities, watershed districts, industries, lake associations, land developers, and private citizens. Dam owners have primary responsibility for the safe design, operation and maintenance of their dams. They also have responsibility for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials. The State has ultimate responsibility for public safety, and many states regulate construction, modification, maintenance, and operation of dams, and also ensure a dam safety program.

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

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

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

Dam 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.

Dam Hazard Classification

Dams pose a hazard to human life and property through faulty operation and outright failure. Dams in Missouri have been classified according to both a federal and state system with regards to potential hazard posed.

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

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

Dam Regulation in Missouri

According to the Association of State Dam Safety Officials, 5206 dams in Missouri have been classified and only 653 are regulated by the state. 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.

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.

One must use caution in assuming the classifications of unregulated dams is currently accurate; however. It is very probable that, for most of the unregulated dams, the classification does not take into account almost 30 years of development and change in Hickory County.

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

A summary of the federal systems hazard classification is listed below.

1. Low Hazard Potential

Dams assigned the low hazard potential classification are those where failure or miss operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

2. Significant Hazard Potential

Dams assigned the significant hazard potential classification are those dams where failure or miss-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

3. High Hazard Potential

Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

There are currently seven dams in Hickory County according to the Missouri Department of Natural Resources. This number has increased by three new dams since the last plan in 2005. None of the dams are regulated. See Table 3.2-2.

Missouri Department of Natural Resources' criterion for dam classification includes the following;

Hazard Classification

The hazard classification criteria are defined in the rules as the "downstream environmental zone." Three environmental classes are defined:

Class I -- Contains 10 or more permanent dwellings or any public building

Class II -- Contains 1 to 9 permanent dwellings or 1 or more campgrounds with permanent water, sewer, and electrical services or 1 or more industrial buildings

Class III -- Everything else

Frequency of Inspections

Hazard Classification	Inspection Cycle
Class 1	2 years
Class 2	3 years
Class 3	5 years

Listed below is the combination of the federal and state classification systems and how they compare in ranking.

Fig. 3.1.1 Dam Hazard Classification Systems				
Federal Classification	Federal Criterion	State 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

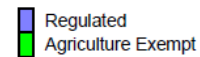
Two dams are considered 'high hazard' within this county according to FEMA; Pomme De Terre Dam and Talbot Dam.

Talbot dam is in a very rural northern part of the county and would have the least environmental impact if it breaks. Pomme De Terre is rather large and is a seasonal ‘hot spot’ for fisherman and other tourists.

Table 3.2-2 **Vernon County Dams**



Missouri Dam Report by County



HICKORY

ID Number	Location	Year Complete	Height (ft)	Length (ft)	Drainage Area (acre)	Lake Area (acre)	Hazard Class	Permit Number
ALLEY LAKE DAM								
MO20057	S36 T36N R24W	1972	25.00	Unknown	640.00	51.00	3	
KUGLER LAKE DAM								
MO31667	S15 T38N R21W	1974	19.00	Unknown	55.00	10.00	3	
POMME DE TERRE DAM								
MO30201	S02 T36N R22W	1961	155.00	Unknown	391,040.00	7,800.00	1	
TALBOT DAM								
MO31666	S08 T38N R20W	1971	30.00	Unknown	130.00	8.00	2	
VANDERFORD NUMBER ONE DAM								
MO20270	S06 T35N R23W	1969	21.00	Unknown	330.00	12.00	3	
VANDERFORD NUMBER THREE DAM								
MO20710	S32 T36N R23W	1971	30.00	Unknown	160.00	10.00	3	
VANDERFORD NUMBER TWO DAM								
MO20325	S32 T36N R23W	1971	20.00	Unknown	260.00	8.00	3	

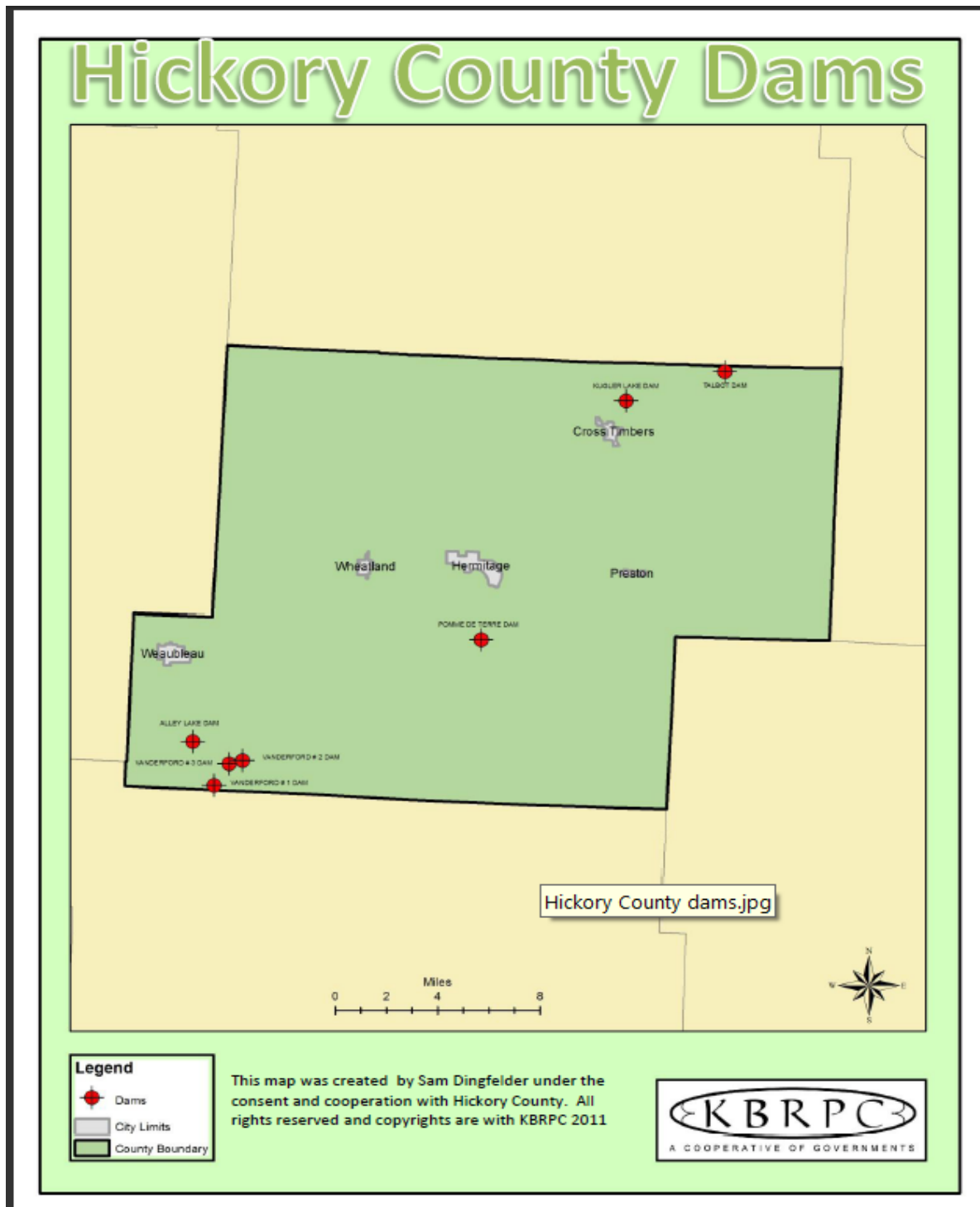
SUMMARY

Regulated Dams: 0	Total:	392,615.00	7,899.00
Total Dams: 7	Average:	42.86	1,128.43

The locations of the dams is available in Figure 3.2-1

As of June, 2013 there have been no dam failures reported for Hickory County according to Missouri Department of Natural Resources.

Figure 3.2-1 Locations of dams are colored in red.



Historical Statistics

“According to the Missouri Department of Natural Resources Dam and Reservoir Safety Program, Missouri had some 5,239 recorded dams in October 2009. This includes all recorded dams for all types of dam owners (federal, state, local, or private) and is the largest number of manmade dams of any state in the United States. The topography of the State allows lakes to be built easily and inexpensively, which accounts for the high number. Despite such a large number, only about 679 Missouri dams (about 13 percent) fall under state regulations, while another 64 dams are federally controlled. Dams that fall under state-regulation are those dams that are non-federal dams that are more than 35 feet in height and can be anything from a large farm pond (e.g., MFA Research Farm Lake Dam in Saline County, which is 20 feet high and holds back 60 acre feet of water) to Bagnell Dam, which created the Lake of the Ozarks. Most nonfederal dams are privately owned structures built either for agricultural or recreational use. Missouri also has some 600 dams that were built as small watershed projects under Public Law 83-566 (Watershed Protection and Flood Prevention Act of 1954). These dams serve many functions, including flood control, erosion control, recreation, fish and wildlife habitat, water supply, and water quality improvement. Many of these PL 83-566 dams need ongoing maintenance to safely provide these functions. Another group of older dams in the State were originally built by railroad companies as holding ponds for water to be used in steam locomotives. Many of these are now used as drinking water reservoirs by nearby towns and cities.” (Missouri HMP)

Existing Mitigation Strategies

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

Measure of Probability and Severity

Probability: High – Hermitage, Hermitage R-IV School
Low – Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I

Severity: Moderate – Hermitage, Hermitage R-IV, and Carson’s Corner (unincorporated)
Low - Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I

3.2.2 Drought

Description of Hazard

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

Droughts occur either through a lack of precipitation (supply droughts) or overuse of water (water use droughts). Supply droughts are natural phenomenon associated with lower than normal precipitation. Water use droughts are when the uses of water by humans outpace what the surrounding environment can naturally support. 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 (see Table 3.2.2-1).

The most common type of drought in Mid-Missouri is the agricultural drought which happens on average every five years. Widespread crop damage, particularly to corn, is associated with agricultural drought in Missouri. The socioeconomic consequences of a drought can reach far beyond those immediately damaged.

Table 3.2.2-1

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

Source: "Missouri Drought Plan," Missouri Department of Natural Resources – Geological Survey and Resource Assessment, Water Resources Report No. 69, 2002

Table 3.2.2-2

Palmer Drought Severity Index (PDSI)

Score Characteristics

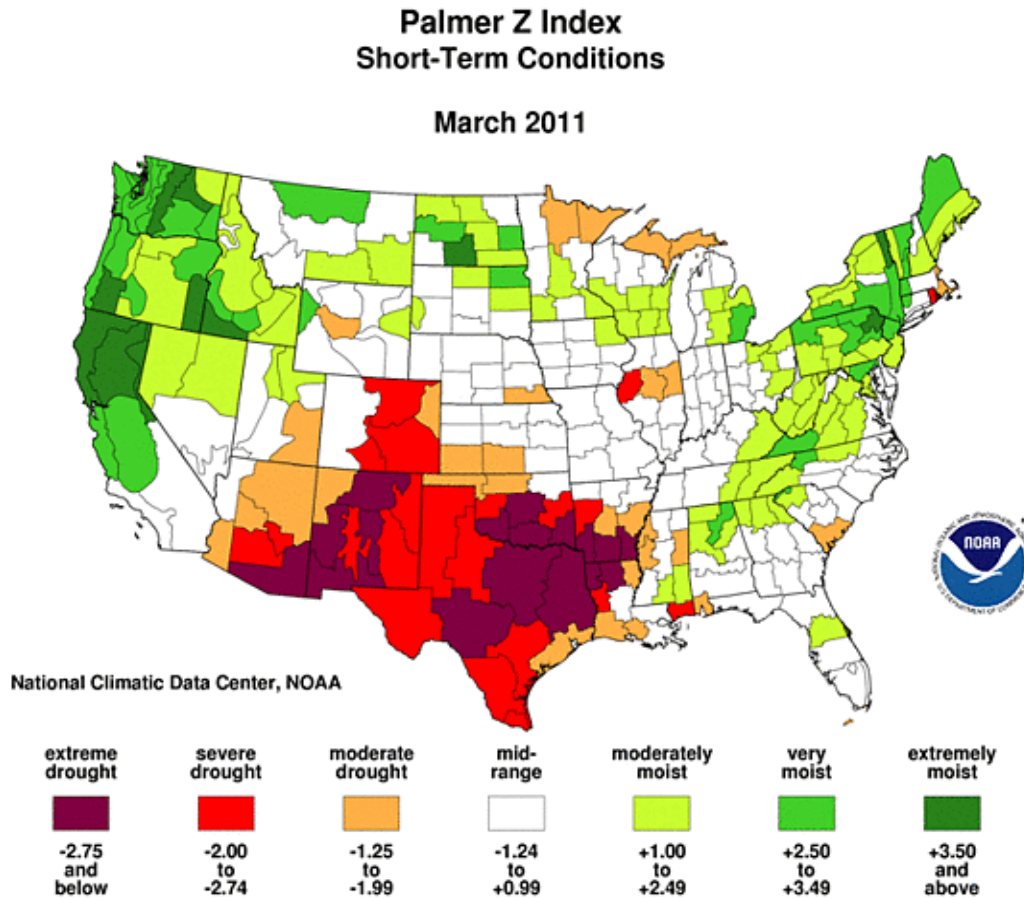
Greater than 4	Extreme moist spell
3.0 to 3.9	Very moist spell
2.0 to 2.9	Unusual moist spell
1.0 to 1.9	Moist spell
.5 to .9	Incipient moist spell
.4 to -.4	Near normal conditions
-.5 to -.9	Incipient drought
-1 to -1.9	Mild drought
-2 to -2.9	Moderate drought
-3 to -3.9	Severe drought
Below -4	Extreme drought

Measuring Drought

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

One of the oldest and most widely used indices is the Palmer Drought Severity Index (PDSI, see Table 3.2.2-2), which is published jointly by NOAA and the U.S. Department of Agriculture (USDA). The PDSI measures the difference between water supply (precipitation and soil moisture) and water demand (amount needed to replenish soil moisture and keep larger bodies of water at normal levels.) The map below shows the present drought severity of the U.S. This map differs greatly from previous years. This exact time five years ago with the original hazard plan, Missouri was considered "near normal". In 2000, Missouri was unusually dry.

Figure 3.2.2-1 **Palmer Z Index**



Palmer Drought Severity Index

Missouri is divided into six regions of similar climactic conditions for PDSI reporting; Hickory County is located in the West Central Plains Region 3 shown in Figure 3.2.2-1

Figure 3.2.2-1 Six regions of climatic conditions.



The Missouri Department of Natural Resource's drought response system is based on the PDSI and has four phases of increasing severity:

- Phase 1: Advisory Phase - Water monitoring analysis indicates anticipated drought.
- Phase 2: Drought Alert - PDSI reads -10 to -20; and stream flow, reservoir levels and groundwater levels are below normal over a period of several months.
- Phase 3: Conservation Phase - PDSI reads between -2 to -4; stream flow, reservoir levels and groundwater levels continue to decline; and forecasts indicate an extended period of below-normal precipitation.
- Phase 4: Drought Emergency - PSDI reads lower than -4.

A newer index which is 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.

Geographic Location

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

Previous Occurrences

Even though Hickory County averages about 40" of precipitation per year, it has been subject to droughts in the past.

Historical information concerning droughts prior to the 20th Century is difficult to find. According to the Missouri State Hazard Mitigation Plan (2007), research on tree-ring patterns at the University of Missouri indicates that Missouri experienced a severe drought in the years 1548 to 1558. The tree-ring patterns indicate a regular 18.6 year cycle of drought for the Midwest. More information is available for droughts in the 20th and current centuries. According to the Missouri Climate Center at the University of Missouri.

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 1953-1957 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%, leading to negative impacts on the agricultural and regional economies of the region. The last major nationwide drought was in the late 1980's. The 1980's 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 and Mississippi Rivers. 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 (2007). 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 Missouri in the years 2002 to 2004. Many crop and livestock producers suffered great financial hardship during this time. The droughts of 2005 and 2006 again caused great hardship for many crop and livestock producers in the state. 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. Conditions began to improve with a large snowstorm in late November/early December.

Though the threat is very real and often overlooked and can occur every season due to lack of rain, due to the new NOAA National Climatic Data Center, data from 2006-2012 reveals there have not been no reported drought events.

Data Limitations

There are some limitations to using NOAA's National Climatic Data Center (NCDC) data. The NCDC data is derived from National Weather Service (NWS) Storm Data. The NWS receives their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, "SKYWARN" spotters, NWS damage surveys, newspaper clipping services, the insurance industry, and the general public.

The data documents only those storms and other significant weather phenomena that are serious enough to cause loss of life, injuries, significant property damage, and/or disruption to commerce. The reliability of the data is highly dependent on the data sources. In addition, it represents only the information that was reported, as opposed to what actually happened. The decision whether or not to report is made subjectively, based on the opinion of the reporter rather than parameters defined by the NWS. Finally, the damages, deaths, and injuries are often reported on a multi-county basis and cannot be attributed to the planning area.

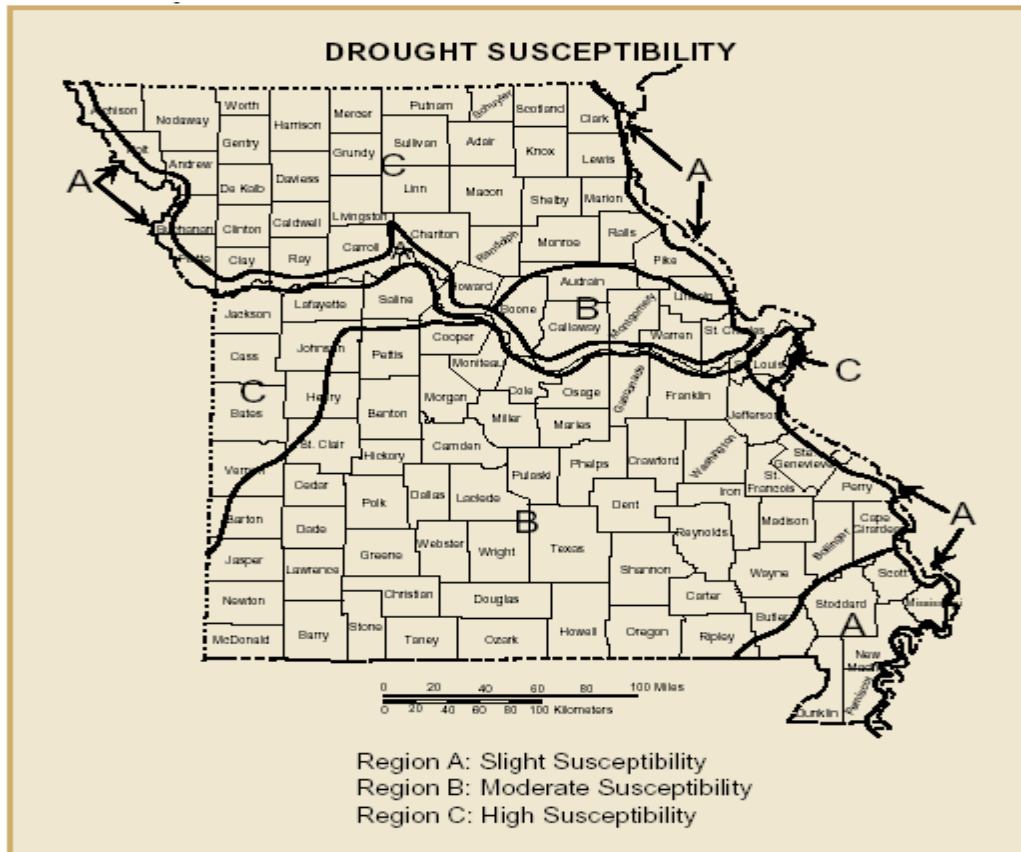
Measure of Probability and Severity

Probability: Moderate – All of Hickory County; Cross Timbers, Preston, Hermitage, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hermitage R-IV, Hickory Co. R-I
Moderate – Unincorporated Hickory County

Severity: Moderate – All of Hickory County
Low –

The Missouri Department of Natural Resources has defined different regions of drought susceptibility in the Missouri Drought Plan (2002). A map of the different regions is shown in Figure 3.2.2-2.

Figure 3.2.2-2 Missouri Drought Susceptibility



Hickory County lies in Region B which is defined as “...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.”

Existing Mitigation Strategies

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.

The University of Missouri Extension has a number of publications for both farmers and homeowners to help mitigate the effects of drought. They 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.”

3.2.3 Earthquake

Background

The State of Missouri established the Missouri Seismic Safety Commission (MSSC) through the authority of the Seismic Safety Commission Act also known as (RSMo) Sections 44.225 through 44.237, the main office being within SEMA. The purpose of MSSC is to review Missouri’s current preparedness for major earthquakes and to make recommendations to mitigate their impact. MSSC developed a 1997 plan titled *A Strategic Plan for Earthquake Safety* that documented successes, opportunities and concerns including recommendations: 1) that educational efforts continue to be developed and expanded and that the MSSC take the lead; 2) that continued and increased cooperation of State agencies with nationally funded programs (National Science Foundation funding the Mid-America Earthquake Center); 3) that stable State funding be provided for the Missouri earthquake mitigation and preparedness program; 4) that SEMA review and recommend hiring a person to train and tract the Community Emergency Response Teams [CERT]; and 5) to assess the impact of National Hazard Earthquake Reduction Program maps on the state and that scientific investigations be conducted to evaluate assumptions upon which maps are based.

The MSSC prepared the *A Strategic Plan for Earthquake Safety* as the result of a legislative mandate, Senate Bill No. 142 in 1993. The MSSC is similar to Utah's Seismic Safety Commission. This plan will aid in projecting goals, initiatives and priorities. The MSSC notes that preparation following the Strategic Plan will yield significant reduction in fatalities, casualties, damaged structures, business failures and state infrastructure losses from earthquakes and will reduce the impact from other hazards. Key issues identified by MSSC are: 1) Earthquake threat is real. Addressing the problem now will yield significant long-term benefits; 2) Reduction of earthquake risk required combined efforts of individuals, businesses, industry, professional and volunteer organizations and all levels of government [promote adoption and enforcement of appropriate building codes]; 3) Strategies identified in the report for reducing earthquake risk can be implemented through proactive, voluntary community participation; others will require legislation or funding, [promote community emergency response teams-CERTs, 4) MSSC accepts responsibilities to advance earthquake planning and mitigation in state at outlined in plan. Objectives include: 1) increase earthquake awareness and education, 2) reduce earthquake hazard through mitigation, 3) create response efforts that are well-coordinated, fast, efficient to reduce injury, loss of life and property destruction, 4) improve recovery from seismic event [identify earthquake resistant shelters], 5) assess earthquake hazard [develop response team to evaluate post-earthquake effects].

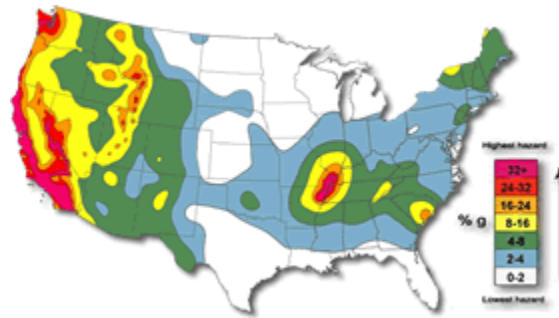
Description

Earthquake is a term used to describe both sudden slip on a fault and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. The Earth's crust is made up of large plates, also known as tectonic plates. These plates are the large, thin, relatively rigid plates that move relative to one another on the outer surface of the Earth.

Plate tectonics involves the formation, lateral movement, interaction, and destruction of the lithosphere plates (The lithosphere is the outer solid part of the earth, including the crust and uppermost mantle. The lithosphere is about 100 km thick; although its thickness is age dependent (older lithosphere is thicker). The lithosphere below the crust is brittle enough at some locations to produce earthquakes by faulting, such as within a subducted oceanic plate). Much of Earth's internal heat is relieved through this process and many of Earth's large structural and topographic features are consequently formed. Continental rift valleys (the nearby New Madrid Fault Zone is considered a buried rift valley) and vast plateaus of basalt are created at plate break up when magma ascends from the mantle to the ocean floor, forming new crust and separating mid-ocean ridges. Plates collide and are destroyed as they descend at subduction zones to produce deep ocean trenches, strings of volcanoes, extensive transform faults, broad linear rises, and folded mountain belts. Earth's lithosphere presently is divided into eight large plates with about two dozen smaller ones that are drifting above the mantle at the rate of 5 to 10 centimeters (2 to 4 inches) per year. There are eight large plates; the New Madrid Fault Zone is located in the North American Plate.

Earthquake induced landslides and dam failure/levee failure are secondary earthquake hazards that occur from ground shaking. Damage resulting from dam failure/levee failure is similar to that with flash flooding. Figure 3.2.3-1 shows the locations of likely earthquakes.

Figure 3.2.3-1 Locations of likely earthquakes and highest hazard



Source: USGS: http://earthquake.usgs.gov/learn/topics/megaqk_facts_fantasy.php

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors:

- erosion by rivers, glaciers, or ocean waves create over steepened slopes
- rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- earthquakes create stresses that make weak slopes fail
- earthquakes of magnitude 4.0 and greater have been known to trigger landslides
- volcanic eruptions produce loose ash deposits, heavy rain, and debris flows
- excess weight from accumulation of rain or snow, stockpiling of rock or ore, waste piles, or from man-made structures may stress weak slopes to failure and other structures

Slope materials that become saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries causing flooding along its path. Features that might be noticed prior to major land sliding.

- Springs, seeps, or saturated ground in areas that have not typically been wet before.
- New cracks or unusual bulges in the ground, street pavements or sidewalks.
- Soil moving away from foundations.
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house.
- Tilting or cracking of concrete floors and foundations.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines.

- Sunken or down-dropped road beds.
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content).
- Sudden decrease in creek water levels though rain is still falling or just recently stopped.
- Sticking doors and windows, and visible open spaces indicating jams and frames out of plumb.

Characteristics

The characteristics of earthquakes include the rolling or shaking of the surface of the ground, landslides, liquefaction and amplification. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude and type of earthquake.

Likely Locations

Earthquakes occur all the time all over the world, both along plate edges and along faults. Most earthquakes occur along the edge of the oceanic and continental plates. It is unlikely that an earthquake will affect Hickory County. Likely locations of earthquakes in Missouri are located near the New Madrid Fault Zone, the Wabash Valley Fault and the fault zones in the vicinity of Farmington (including Big River Fault and the St. Genevieve Fault Zone).

Type of Damage

Buildings on poorly consolidated and thick soils will typically have more damage than buildings located on consolidated soils and bedrock. Soils and soft sedimentary rocks near the earth's surface and landfills can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Damage on buildings can range from minor foundation cracks to complete leveling of the structure. (See Figure 3.2.3-1 below). Building contents can be broken from being knocked onto the floor or being crushed by the ceiling, walls and floor failing. Dams and levees have the potential to fail, resulting in the flooding of downstream regions including residentially populated areas.

Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these structures. Damage from liquefaction can destroy the buildings and the foundations the buildings rest on. Liquefaction has been documented from the New Madrid Fault Zone earthquake activity.

Earthquakes have the potential to destroy roads, bridges, buildings (especially older buildings constructed of masonry or those buildings that are not designed to seismic standards), utilities (including those that are not designed to seismic standards) and other critical facilities (including those that are not designed to seismic standards). Earthquake induced landslides are secondary earthquake hazards that occur from ground shaking.

Historical Statistics

Historic and recent earthquake activity in central United States, discussed in the Hazard Identification Section of this chapter, indicate that throughout this century, the region has not experienced a major earthquake that caused widespread damage or injuries. According to the magnitude-recurrence relation, the rate of earthquake activity for any particular seismic source usually remains stable for long periods of time (possibly thousands of years).

Many Midwestern communities are located near the New Madrid fault, an area with high seismic risk. Estimates of the recurrence intervals of the large 1811-1812 earthquakes are about 500 to 1000 years. Most residents are not aware of this risk because the last significant earthquake occurred in the early 19th century. However, small quakes along this fault continue to occur in Missouri about every 8 days.

Frequency of Occurrence

There has been no significant earthquakes in Hickory County.

Intensity or Strength

Earthquakes can be measured by intensity or by magnitude. The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value. The Richter Scale is not used to express damage. An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that does nothing more than frighten the wildlife. Large-magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

The Mercalli Scale is based on observable earthquake damage. From a scientific standpoint, the Richter scale is based on seismic records while the Mercalli is based on observable data that can be subjective. Thus, the Richter scale is considered scientifically more objective and therefore more accurate. For example a level I-V on the Mercalli scale would represent a small amount of observable damage. At this level doors would rattle, dishes break and weak or poor plaster would crack. As the level rises toward the larger numbers, the amount of damage increases considerably. The higher number represents total damage. Refer to Table 3.2.3-1

Table 3.2.3-1 Modified Mercalli Scale

II. Weak	Felt only by a few people at best, especially on the upper floors of buildings. Delicately suspended objects may swing.
III. Slight	Felt quite noticeably by people indoors, especially on the upper floors of buildings. Many do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV. Moderate	Felt indoors by many people, outdoors by few people during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rock noticeably. Dishes and windows rattle alarmingly.
V. Rather Strong	Felt outside by most, may not be felt by some outside in non-favourable conditions. Dishes and windows may break and large bells will ring. Vibrations like large train passing close to house.
VI. Strong	Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight.
VII. Very Strong	Difficult to stand; furniture broken; damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars.
VIII. Destructive	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved.
IX. Violent	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. Intense	Some well built wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent.
XI. Extreme	Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Cataclysmic	Total damage - Everything is destroyed. Total destruction. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. In some cases, even the route of rivers is changed.

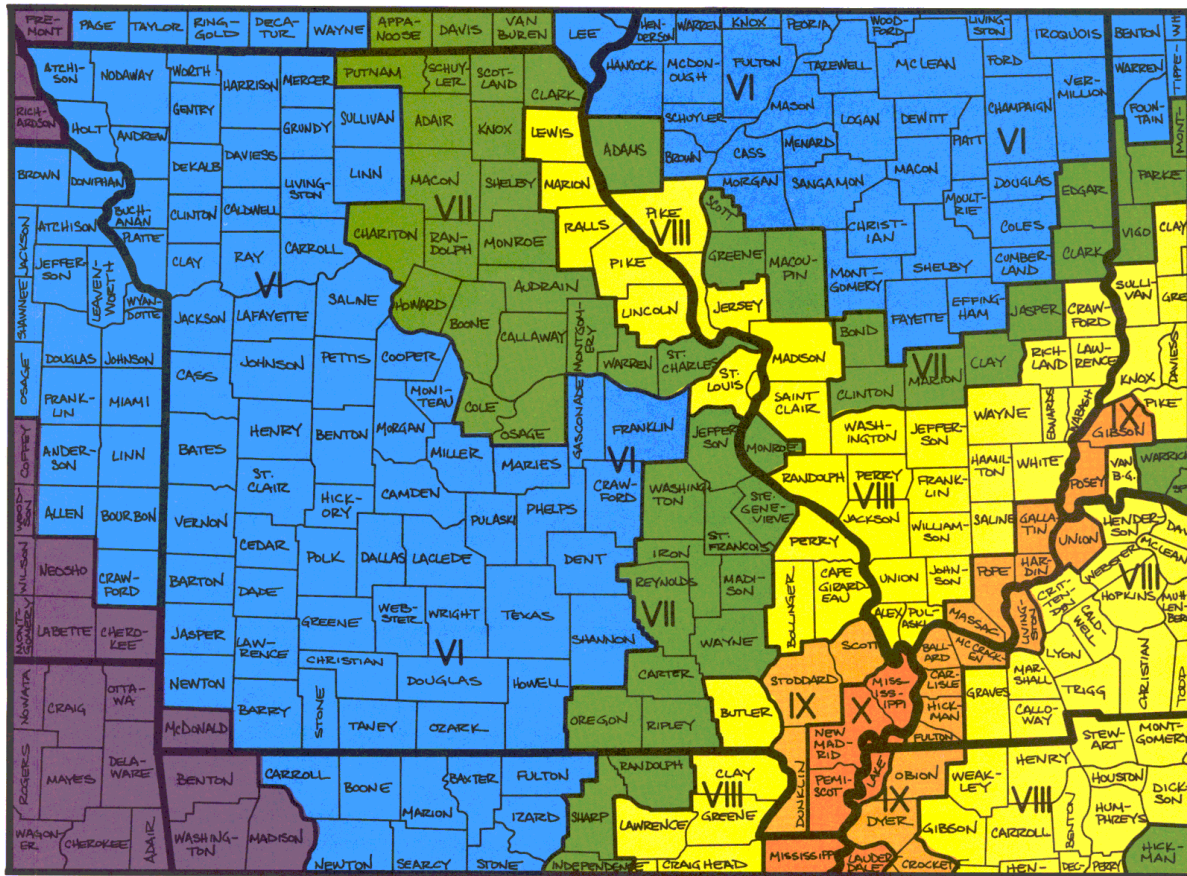
Source: USGS

Intensity scales, like the Modified Mercalli Scale measure the amount of shaking at a particular location. So the intensity of an earthquake will vary depending on where you are. Sometimes earthquakes are referred to by the maximum intensity they produce. Magnitude scales, like the Richter magnitude, measure the size of the earthquake at its source. They do not depend on where the measurement was made.

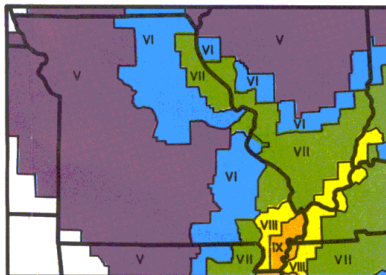
Earthquake Losses

Another earthquake as powerful as the great quakes of 1811-12 may not occur for many years. Because of differences in the geology east and west of the Rocky Mountains, the effects of a magnitude 7 quake in the mid-continent United States could be far worse than those of the 1989 magnitude 7 Loma Prieta, California, earthquake. That quake, which struck the San Francisco Bay region during the World Series, killed 63 people and caused \$6 billion of property damage. Property damage could range from minor cracks in structures to complete destruction. Infrastructure including roads, bridges, water and gas lines may rupture, resulting in an abrupt halt to electricity, heat/cooling source, communication, transportation, rescue and emergency response services. Ruptured gas lines and power lines could potentially cause explosions and fires. Cascading emergencies such as these will compound the initial disaster. Lives lost, injuries, property damage and economic losses could potentially be in the same range as the earthquake that struck San Francisco.

PROJECTED EARTHQUAKE INTENSITIES

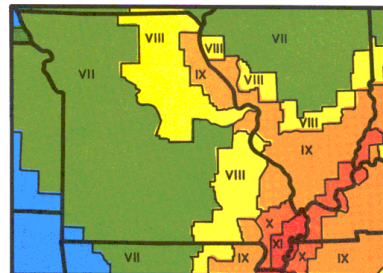


This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude - 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.



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

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

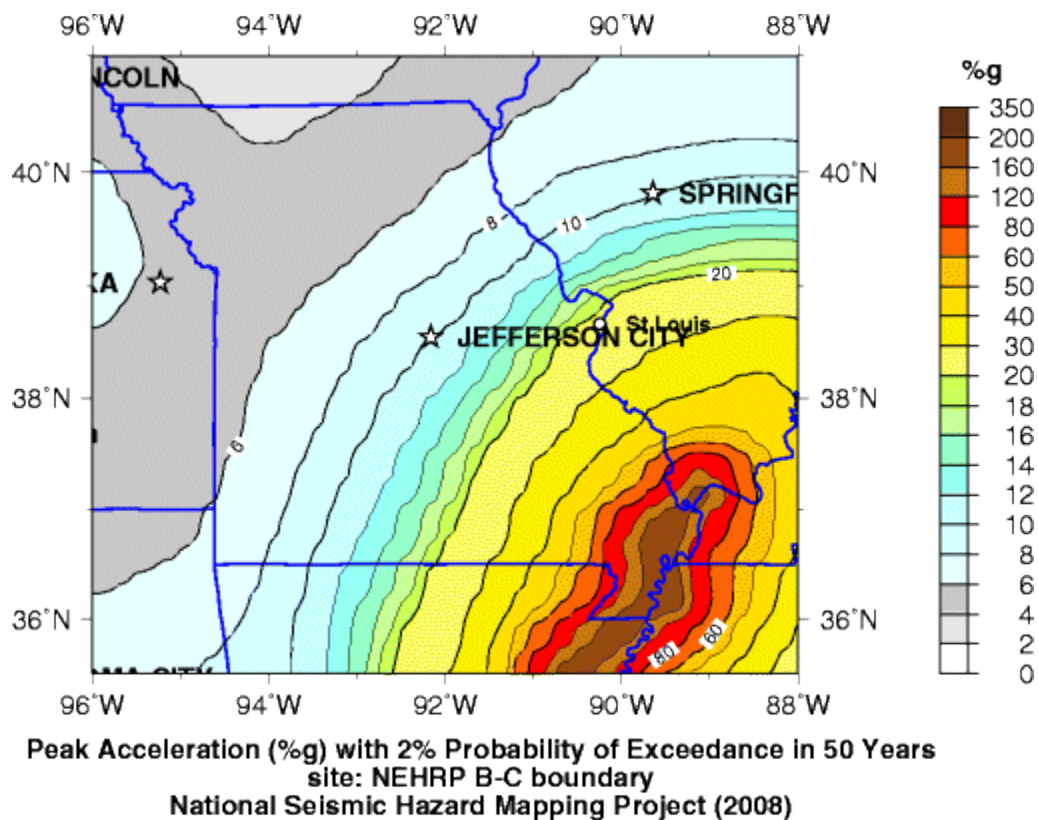


Source: Missouri SEMA

Locations/Areas Affected

Refer to Figure 3.2.2-3 below that depicts the Peak Acceleration (%g) with a 10% probability of exceedance within 50 years. As can be seen, Hickory County lies in four peak acceleration zones running northeast to southwest ranging from a low of 7 in the northwestern corner to almost 15%g of severity in the southeastern corner of Hickory County.

Figure 3.2.2-3 Probability of intensity of New Madrid Earthquake.



Seasonal Pattern

There is no data that supports the relationship between the occurrence of earthquakes and seasonal weather patterns.

There is data that supports the relationship between the occurrence of landslides, sinkhole and mineshaft collapse and seasonal weather patterns. Rainfall events would introduce moisture into the earth and geologic strata, thus creating the potential for earth movement.

Speed of Onset and / Or Existing Warning Systems

Earthquake prediction is a future possibility. Just as the Weather Bureau now predicts hurricanes, tornadoes, and other severe storms, the National Earthquake Information Center (NEIC) may one day issue forecasts on earthquakes. Earthquake research was stepped up after the Alaska shock in 1964.

Today, the U.S. Geological Survey (USGS) and other federal and state agencies, as well as universities and private institutions are conducting research. Earthquake prediction may someday become a reality, but only after much more is learned about earthquake mechanisms. The speed of onset is immediate. See Table 3.2.3-2 below.

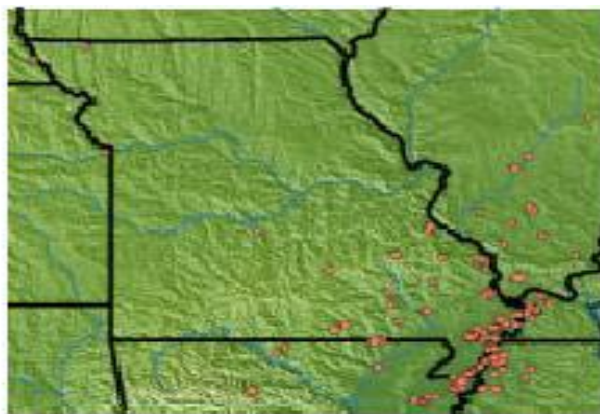
Table 3.2.3-2 **Measurement of Earthquake**

Descriptor	Magnitude	Annual Average
Great	8 and higher	1
Major	7 -7.9	17
Strong	6 – 6.9	134
Moderate	5 – 5.9	1,319
Light (estimated)	4 – 4.9	13,000
Minor (estimated)	3 – 3.9	130,000
Very Minor (estimated)	2 – 2.9	1,333,00

The USGS estimates that several million earthquakes occur in the world each year. Many go undetected because they hit remote areas or have very small magnitudes. The NEIC now locates about 50 earthquakes each day, or about 20,000 a year.

Map of Hazards

Figure 3.2.3-4 **Earthquakes that have occurred in the southern half of the state.**



Source: United States Geological Survey

Statement of Probable Future Severity

According to the SEMA map above, Hickory County is at a risk for a Level VI impact on the Modified Mercalli Intensity Scale from a 7.6 earthquake. According to the Mercalli Scale, all in Hickory County would feel a Level VI impact. People could have difficulty walking due to motion. Objects could fall from shelves and dishes, glassware and ceramics may be broken. Pictures could fall off walls. Furniture could move or be overturned. Weak plaster and masonry could crack. Slight damage could occur in poorly constructed buildings. Trees and bushes could shake visibly or be heard rustling. (See Table 3.2.3-3)

Probable Risk of Modified Mercalli Levels:

Table 3.2.3-3 Mercalli Levels

Modified Mercalli Levels I-V	Possible
Modified Mercalli Levels VI	Unlikely
Modified Mercalli Levels VII	Unlikely
Modified Mercalli Levels VII-XIII	Unlikely

Statement of Probable Risk/Likelihood of Future Occurrence

Many Midwestern communities are located near the New Madrid fault, an area with a high seismic risk. Estimates of the recurrence intervals of the large 1811-1812 earthquakes are about 500 to 100 years. Most residents are not aware of this risk because the last significant earthquake occurred in the early 19th century. However, small quakes along this fault continue to occur in Missouri about every 8 days.

Based on the history of the New Madrid Fault and the January 2003 estimates, Hickory County stands a 25-40% chance of experiencing an earthquake of magnitude 6.0 or greater within the next 50 years. Since Hickory County lies a good distance from the New Madrid Fault, small earthquakes usually are not noticeable. The more severe threat stems from an earthquake producing Modified Mercalli impact levels of VII-XIII.

Measure of Probability and Severity

Probability: Low – All of Hickory County; Cross Timbers, Preston, Hermitage, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hermitage R-IV, Hickory Co. R-I, and unincorporated Hickory County

Severity: Low-Moderate – All of Hickory County; Cross Timbers, Preston, Hermitage, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hermitage R-IV, Hickory Co. R-I
Low – Unincorporated jurisdictions in Hickory County

Existing Mitigation Strategies

Multiple Jurisdictions

By law all schools in Hickory County must provide training and exercises to students in preparation for a large earthquake. This is implemented in all the school districts in the county.

The Office of Emergency Management (OEM) maintains materials which address earthquake preparedness.

3.2.4 Extreme Heat

Description of Hazard

Extreme heat should be taken equally as serious as any other natural disaster such as floods, hurricanes, and tornadoes. According to NOAA, heat is the second killer among natural hazards following extreme cold temperatures.

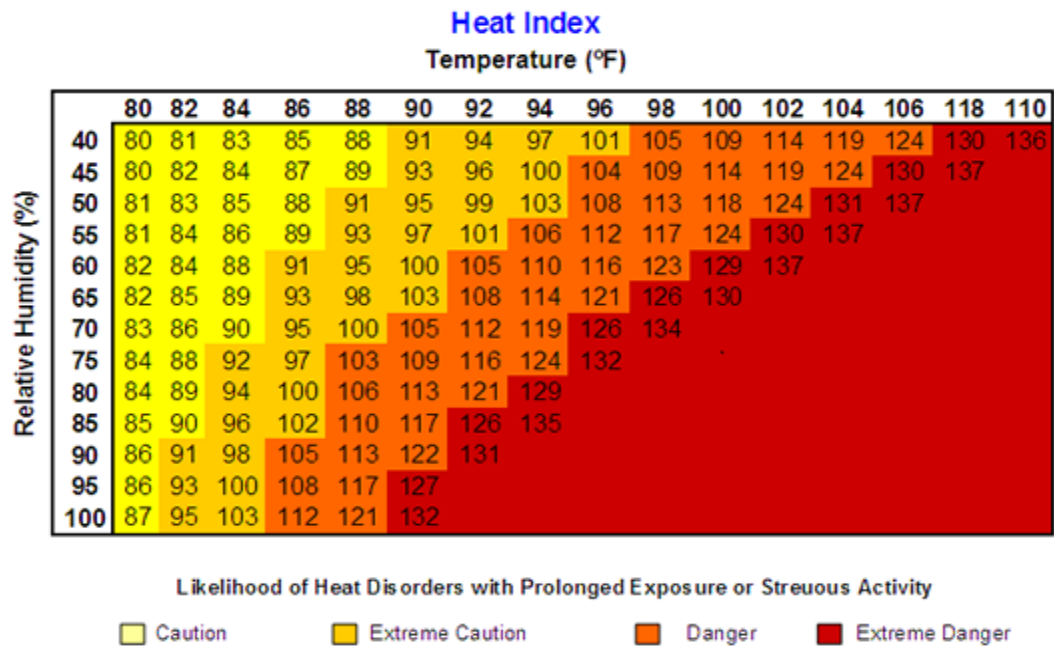
The National Oceanic and Atmospheric Administration defines life threatening conditions when heat overloads the human body's capacity to cool itself. In the disastrous heat wave of 1980, more than 1,200 people died nationwide. In a normal year, about 175 Americans succumb to the bodily stress of summer heat.

Air temperature is not the only factor to consider when assessing the likely effects of a heat wave. High humidity often accompanies heat in Missouri and increases the danger. The human body cools itself by perspiring; the evaporation of perspiration carries excess heat from the body. High humidity makes it difficult for perspiration to evaporate and thus interferes with this natural cooling mechanism.

The Heat Index, devised by the National Weather Service, takes into account both air temperature and relative humidity (See Table 3.2.4-1). The Heat Index, also known as the apparent temperature, and is a measure of how hot it really feels.

Table 3.2.4-1 Heat Index Chart

NOAA's National Weather Service



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

Geographic Location

The entire Planning Area is at risk from heat events.

Previous Occurrences

Of the eight heat waves to hit Hickory County from 1994 and 2002, six produced heat indices within the “Danger” range. The most intense heat waves causing death occurred in 1994, 1999-2001 totaling 16 deaths. (See Table 3.2.4-2)

10 TEMPERATURE EXTREMES event(s) were reported in **Hickory County, Missouri** between **01/01/1950** and **01/31/2011**.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Click on **Location or County** to display Details.

Missouri

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 MOZ001>115	06/12/1994	0000	Heat	N/A	4	55	0	50K
2 MOZ055>058 - 068>070	07/12/1995	0600	Excessive Heat	N/A	0	0	0	0
3 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	07/23/1999	06:00 AM	Excessive Heat	N/A	6	0	0	0
4 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	08/01/1999	12:00 AM	Excessive Heat	N/A	2	0	0	0
5 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	08/27/2000	04:00 AM	Excessive Heat	N/A	1	0	0	0
6 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	09/01/2000	12:00 AM	Excessive Heat	N/A	0	0	0	0
7 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	12/12/2000	12:00 AM	Extreme Cold	N/A	0	0	125K	105K
8 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	01/01/2001	12:00 AM	Extreme Cold	N/A	0	0	0K	0K
9 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	07/17/2001	12:00 PM	Excessive Heat	N/A	1	0	0	0
10 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	08/01/2001	12:00 AM	Excessive Heat	N/A	2	0	0	0
TOTALS:					16	55	125K	155K

Source: <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

Temperature extremes were only available for this county from 1994 until the present. Please note the two extreme cold events within the timeline. NOAA does not separate extreme temperature's based off of seasonal fluctuation.

Measures of Probability and Severity

Probability: Moderate – All of Hickory County

Severity: Moderate – All of Hickory County; Cross Timbers, Preston, Hermitage, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hermitage R-IV, Hickory Co. R-I, and unincorporated Hickory County areas

Existing Mitigation Activities

The following departments, agencies, and organizations all 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:

The Hickory County Health Department alerts the public on the dangers of extreme heat.

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

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.

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.

3.2.5 Flood

Description of Hazard

A flood is defined as a very large amount of water that has overflowed from a source such as a river or a broken pipe onto a previously dry area according to Encarta Dictionary.

Most floods are caused by heavy rainfall from storms or thunderstorms that generate excessive runoff.

A river flood is a flood caused by precipitation, runoff or snowmelt over a relatively large watershed causing flooding over wide areas and cresting in over eight hours.

A flash flood is a flood caused by heavy precipitation or snowmelt over a limited watershed (typically less than 50 square miles), crests in eight hours or less, and generally occurs in hilly terrain.

River floods have relatively low velocity, cover a large area of land, and take longer to recede, whereas flash floods have a higher velocity and may recede quickly. A flash flood can also occur when extreme amounts of precipitation fall on any terrain if the precipitation accumulates more rapidly than the terrain can allow runoff.

Floods are extremely dangerous because they destroy through inundation and soaking as well as the force of moving water. Flood damage is proportional to the volume and the velocity of the water. High volumes of water can move heavy objects and undermine roads and bridges.

Floods may occur without local precipitation as a result of precipitation accumulated upstream. Although rural flooding is dangerous to fewer people and may be less costly than urban flooding, it can cause great damage to agricultural operations and the environment. Flooding can also facilitate other hazards such as landslides.

The areas adjacent to rivers and stream banks that serve to carry excess floodwater during rapid runoffs are called floodplains. A floodplain is defined as the lowland and relatively flat areas adjoining rivers and streams.

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.

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.

As indicated by Table 3.2.5-1, most flooding occurred in early spring (May and June).

Table 3.2.5-1 Hickory County Flood Events by Month 2005-2012

Month	Day	Year
January	5	2005
January	5	2005
January	12	2005
January	12	2005
February	21	2010
March	18	2008
March	19	2008
March	31	2008
April	3	2008
April	10	2008
April	13	2007
May	2	2007
May	8	2009
May	10	2007
May	11	2010
May	12	2010
May	13	2010
June	16	2009
July	8	2010

*Most flood events occur in the spring in the month of May

Geographic Location

The entire Planning Area is at risk from some type of flooding. Hermitage and the unincorporated areas near Pomme De Terre Lake are at higher risk of river flooding than the rest of the county. If levees break or flash flooding occurs on either side of the dam, Hermitage will most likely be a direct hit.

There are no Flood Insurance Rate Maps (FIRM) for Hickory County due to the county not previously being mapped. The county is looking into become members of the NFIP as of the spring of 2012.

Figure 3.2.5-1 Cross Timbers FIRM

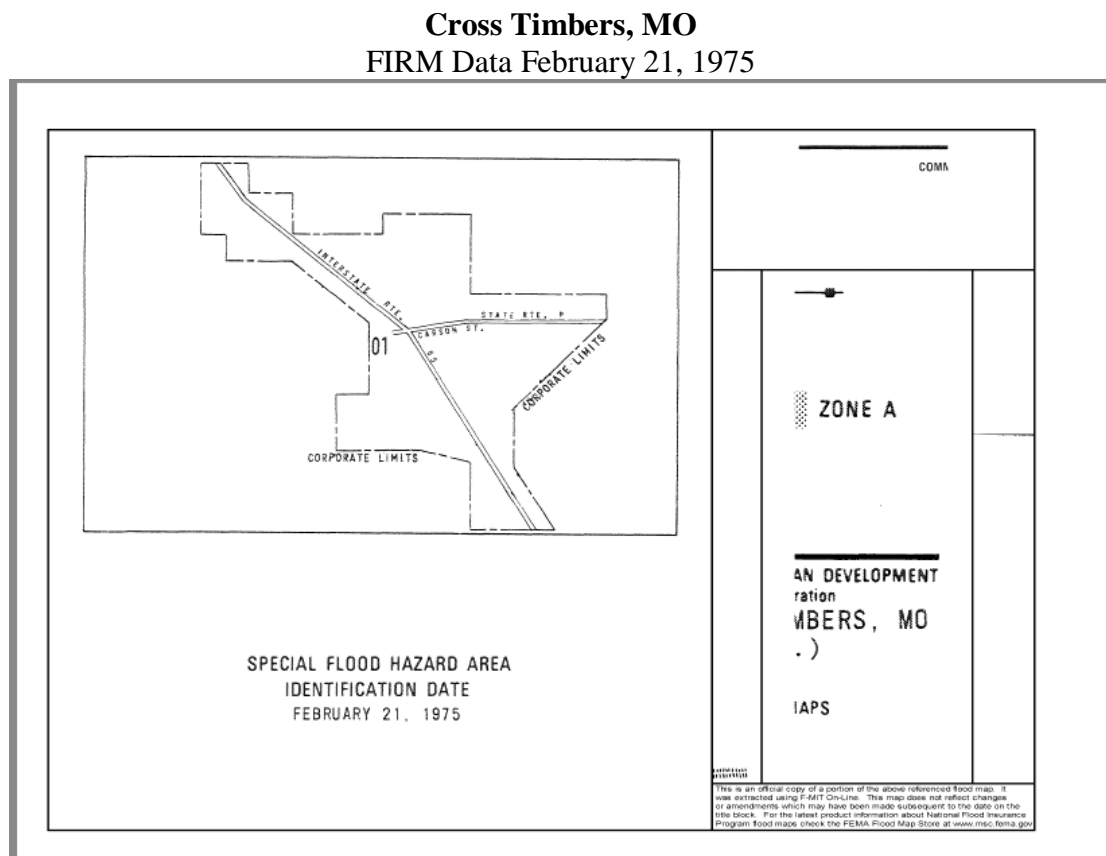


Figure 3.2.5-2

Hermitage, MO
Google Earth Image April 27, 2012

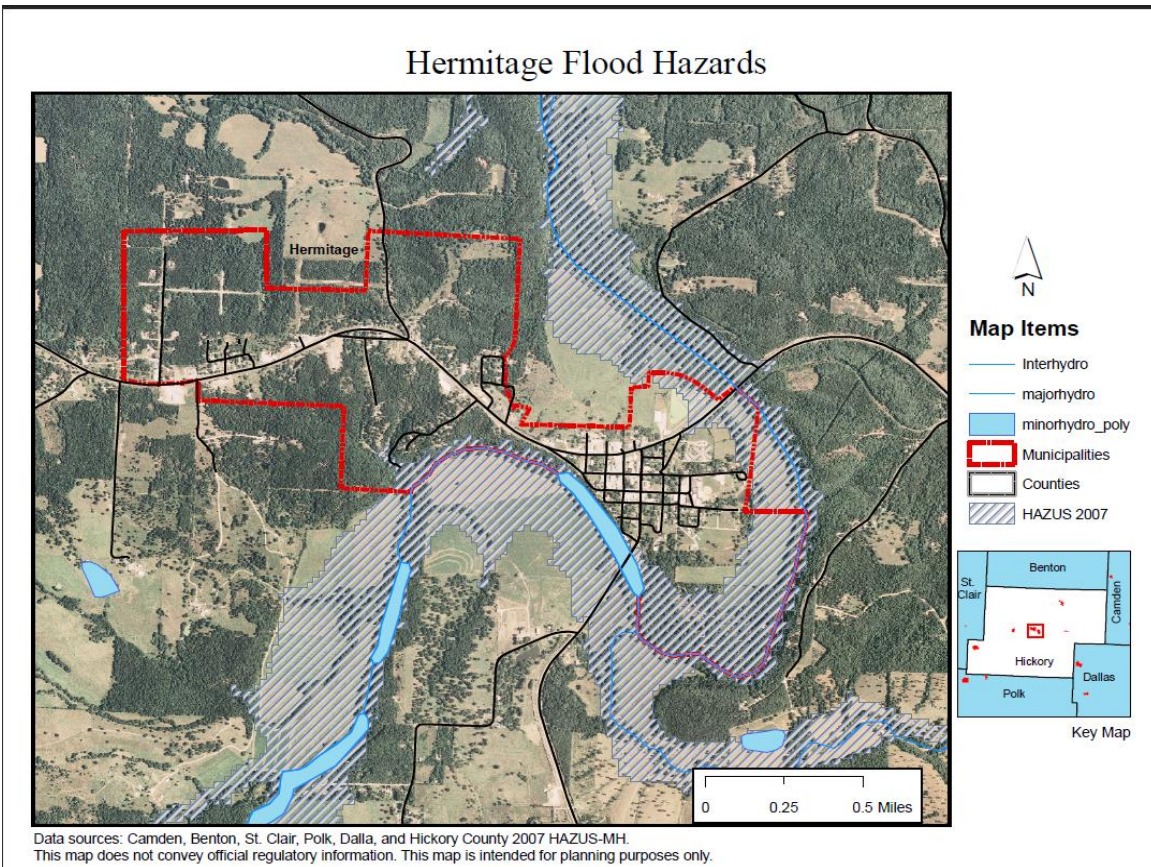


Figure 3.2.5-3 Preston Map

Preston, MO
Google Earth Image, April 27, 2012

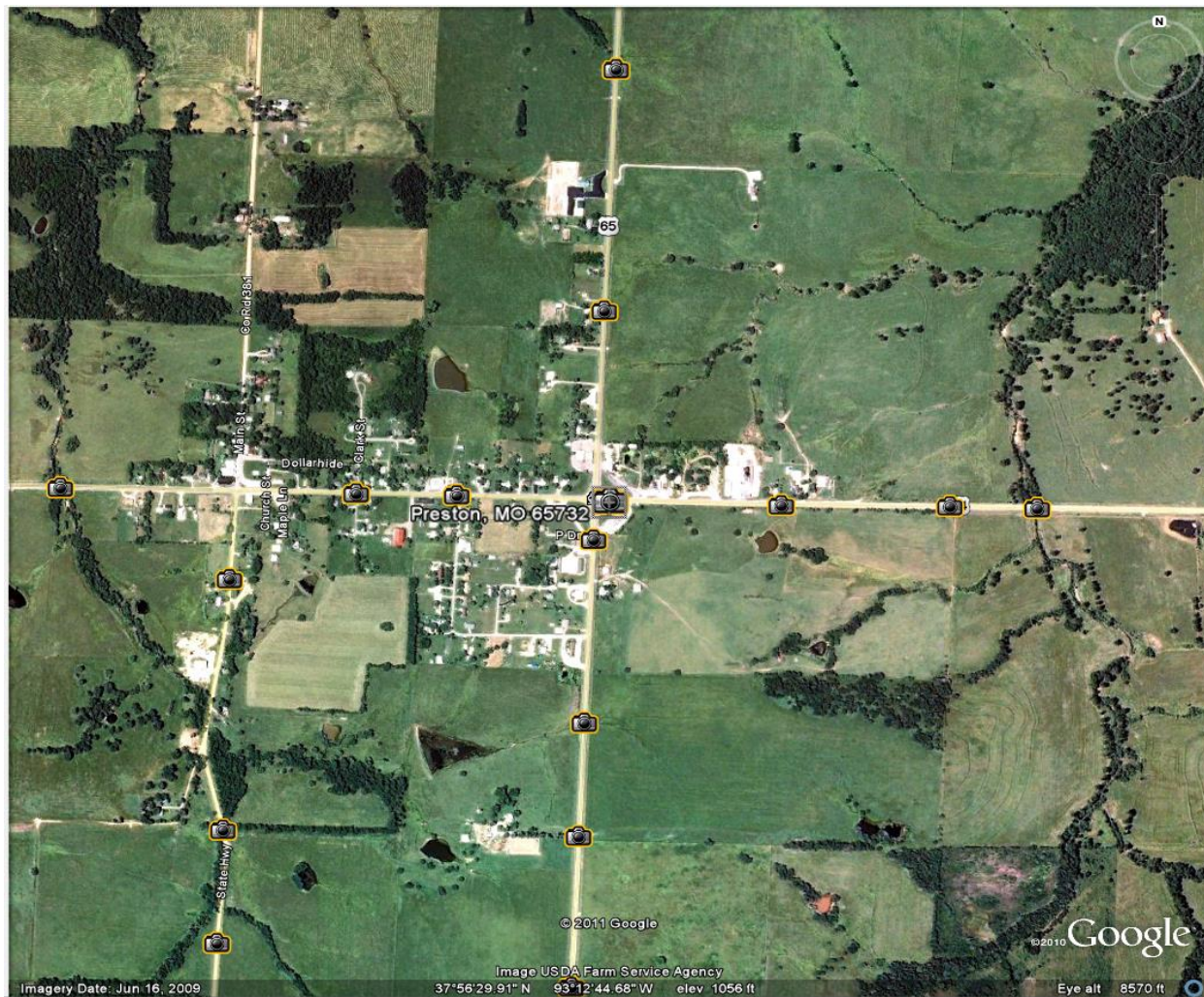


Figure 3.2.5-4

Weaubleau, MO

Google Earth Image, April 27, 2012



Figure 3.2.5-4

Wheatland, MO
Google Earth Image, April 27, 2012



Previous Occurrences

FEMA Repetitive Losses in Hickory County

SEMA checked the listing and none were found within the county.

There were two Presidential Declarations declared in this county in regards to flood events. Presidential Declaration 1631 of March 16, 2006 and 1676 of January 15, 2007.

Existing Mitigation Activities

National Flood Insurance Program

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.

Participation in the National Flood Insurance Program is a critical aspect of hazard mitigation planning for 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 following Hickory County jurisdictions participate in the NFIP: Cross Timbers and Weaubleau. Detailed information on NFIP participation is shown in Table 3.2.5-2; (as of 02/28/2012) there are zero NFIP policies in effect in Hickory County: <http://bsa.nfipstat.com/reports/1011.htm>

Table 3.2.5-2 Listing of communities registered with the NFIP						
CID #	Community	Initial FHBM	Initial FIRM	Curr EFF Map Date	Sanction Date	Tribal?
290634	Weaubleau	1/31/75	-----	NSFHA		No
290610	Cross Timbers	2/21/75	-----	2/21/75	2/21/76	No

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

39 FLOOD event(s) were reported in **Hickory County, Missouri** between **01/01/1950** and **03/31/2012**.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Missouri								
Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Central And	04/11/1994	0000	River Flood	N/A	0	0	5.0M	5.0M
2 HICKORY	04/11/1994	0300	Flash Flood	N/A	0	0	0	0
3 HICKORY	05/01/1995	0730	Urban/small Stream Flood	N/A	0	0	0	0
4 Pittsburg	09/23/1996	05:00 PM	Flash Flood	N/A	0	0	OK	OK
5 Wheatland	11/06/1996	06:20 PM	Flash Flood	N/A	0	0	0	0
6 Preston	08/19/1997	11:00 AM	Flash Flood	N/A	0	0	OK	0
7 Countywide	03/19/1998	05:00 PM	Flash Flood	N/A	0	0	OK	0
8 MOZ055>058 - 068>071 - 083 - 098	07/26/1998	03:00 AM	Flood	N/A	0	0	2.3M	6.2M
9 Countywide	10/05/1998	12:00 AM	Flood	N/A	0	0	0	0
10 Countywide	05/04/1999	03:00 PM	Flash Flood	N/A	0	0	0	0
11 West Portion	07/12/2000	04:07 AM	Flash Flood	N/A	0	0	OK	0
12 West Portion	06/14/2001	01:55 PM	Flash Flood	N/A	0	0	OK	0
13 Countywide	06/14/2001	08:10 PM	Flash Flood	N/A	0	0	OK	0
14 Northeast Portion	07/10/2001	06:35 AM	Flash Flood	N/A	0	0	OK	0
15 North Portion	07/12/2001	05:22 AM	Flash Flood	N/A	0	0	OK	0
16 West Portion	07/26/2001	02:15 AM	Flash Flood	N/A	0	0	OK	0
17 Hermitage	05/07/2002	04:30 PM	Flash Flood	N/A	0	0	OK	0
18 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	05/07/2002	07:30 PM	Flood	N/A	2	0	14.3M	200K
19 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	05/12/2002	04:00 PM	Flood	N/A	0	0	700K	0
20 Cross Timbers	05/12/2002	06:00 PM	Flash Flood	N/A	0	0	OK	0
21 Preston	01/05/2005	04:53 AM	Flash Flood	N/A	0	0	0	0

22	MOZ068	01/05/2005	12:15 PM	Flood	N/A	0	0	0	0
23	Hermitage	01/12/2005	10:00 PM	Flash Flood	N/A	0	0	0	0
24	MOZ068	01/12/2005	10:55 PM	Flood	N/A	0	0	0	0
25	Wheatland	04/13/2007	23:20 PM	Flood	N/A	0	0	OK	OK
26	Preston	05/02/2007	18:28 PM	Flash Flood	N/A	0	0	OK	OK
27	Weaubleau	05/10/2007	17:20 PM	Flash Flood	N/A	0	0	OK	OK
28	Weaubleau	03/18/2008	03:00 AM	Flash Flood	N/A	0	0	OK	OK
29	Weaubleau	03/19/2008	06:00 AM	Flood	N/A	0	0	OK	OK
30	Wheatland	03/31/2008	12:45 PM	Flash Flood	N/A	0	0	OK	OK
31	Cross Timbers	04/03/2008	07:30 AM	Flash Flood	N/A	0	0	OK	OK
32	Weaubleau	04/10/2008	01:00 AM	Flash Flood	N/A	0	0	OK	OK
33	Cross Timbers	05/08/2009	07:40 AM	Flash Flood	N/A	0	0	OK	OK
34	Elkton	06/16/2009	03:00 AM	Flash Flood	N/A	0	0	OK	OK
35	Cross Timbers	02/21/2010	15:08 PM	Flash Flood	N/A	0	0	OK	OK
36	Galmay	05/11/2010	23:20 PM	Flash Flood	N/A	0	0	OK	OK
37	Nemo	05/12/2010	02:00 AM	Flash Flood	N/A	0	0	OK	OK
38	Wheatland	05/13/2010	06:55 AM	Flash Flood	N/A	0	0	OK	OK
39	Galmay	07/08/2010	19:30 PM	Flash Flood	N/A	0	0	OK	OK
TOTALS:						2	0	22.260M	11.410

Riverine Flooding

Probability: Moderate – Hermitage, Hermitage R-IV
Moderate-Low - Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

Severity: Low-Moderate – Hermitage, Cross Timbers, unincorporated Hickory County
Low - All other participating jurisdictions

Flash Flooding

Probability: Moderate – Hermitage, Hermitage R-IV
Moderate-Low - Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

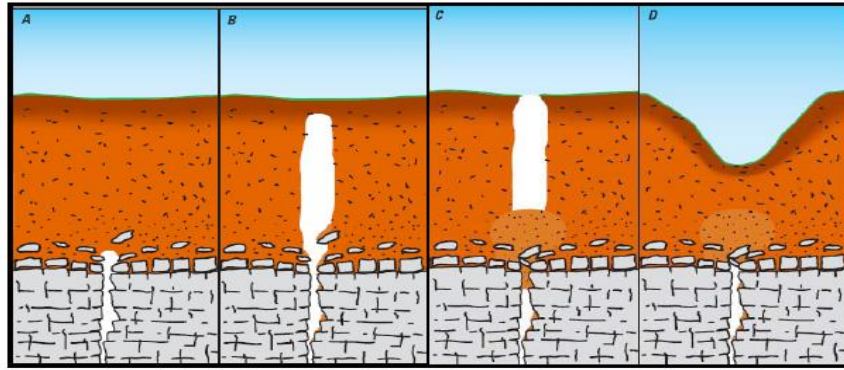
Severity: Low-Moderate – Hermitage, Cross Timbers, unincorporated Hickory County
Low - Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

3.2.6 Land subsidence/Sinkhole

Description of Hazard

Missouri State Hazard Mitigation Plan (2010) gives the following definition for land subsidence and sinkholes: “Land subsidence is sinking of the earth’s surface due to the movement of earth materials below the surface. In the case of sinkholes, the rock below the surface is limestone, carbonate rock, salt beds, or some other rock that can be naturally dissolved by circulating groundwater.” Figure 3.2.6-1 shows how a sinkhole can develop. According to the Missouri Department of Natural Resources (DNR), sinkholes can occur due to human activities such as construction excavation, well drilling, or mining operations. These activities can cause shifts in buoyancy and/or disturb subsurface voids. Sinkholes vary in size and can potentially cause damage to roads, water/sewer lines, buildings, and lagoons.

Figure 3.2.6-1 **Sinkhole Formation**

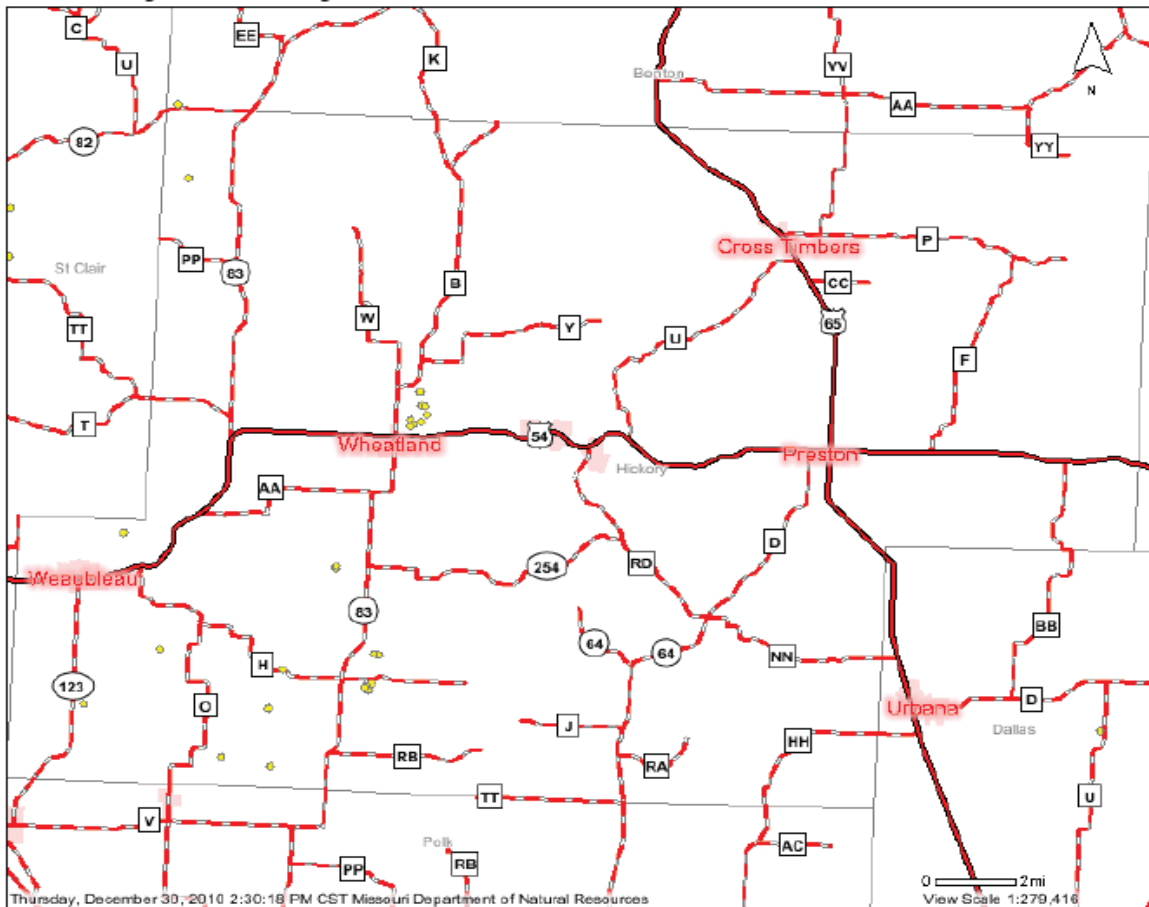


Formation of collapse—Soil bridges gap where sediment has been washing into a solution enlarged fracture, A. Over time, the void migrates upward through the soil, B. After the bridge thins, a sudden collapse, C, often plugs the drain and erosion will, after many years, transform the collapse into a more bowl-shaped sinkhole, D.

-By James E. Kaufmann
Source: US Geological Survey

Figure 3.2.6-2 Sinkhole Map

Hickory County Sinkholes



Geographic Location

Sinkhole concerns are highlighted by the Missouri DNR mapping website in Figure 3.2.6-2. The map shows a concentrated number immediately north of Wheatland, and a smaller number of randomly patterned of sinkholes over the western third of the county.

Previous Occurrences

There have been no *recorded* recent occurrences of sinkhole collapse in the Planning Area. Just because no occurrences have been recorded does not mean that they are not happening. Most of the karst and bedrock in Hickory County are either part of publicly owned land or in less developed areas.

Previous occurrences of sinkhole development in other parts of Missouri that have similar geologic features have proved to be 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. Sinkhole drainage goes directly into underground water sources and can impact or pollute area water sources. In the case of West Plains, sinkholes had drained the lagoon twice before and local officials tried to patch the collapses with cement and other materials.

According to the Missouri DNR, the final 1978 collapse resulted in sewage draining straight into underground water sources which resulted in the contamination of Mammoth Spring in Arkansas and more than 800 local residents reporting illness. While this occurred in Southern Missouri, the potential risk for a similar situation occurring in unincorporated Hickory County is high.

Measure of Probability and Severity

Probability: There is some probability over the western third of the county, and a moderate probability over the entire unincorporated county.

Severity: Moderate – Wheatland, unincorporated Hickory County areas.

Existing Mitigation Strategies

There are no mitigation strategies in place throughout the county to plan for sinkhole incidences. This will be something the county addresses later in the next plan and should be added to the mitigation actions.

3.2.7 Levee Failure

Description

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

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

There is no single agency with responsibility for levee oversight. The US Army Corps of Engineers (USACE) has specific and limited responsibilities for approximately 2,000 levees nationwide. According to the Army Corps of Engineer National Levee Database, there are no levees in Hickory County.

Federally authorized levees are typically designed and built by the Corps 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.

Geographic Location

There are no Hickory County levees in the National Levee Database (NLD) maintained by the USACE. There is one levee that is known to planning committee members which is along county Highway 254 which runs east to west between Hermitage and Pomme De Terre. The levee/road is often used to connect tourists and weekend vacationers interested in camping and fishing to their favorite sites on the lake. The breach of this levee would impact the highway but no incorporated areas. The planning committee will obtain more information about levees for the next plan update.

Previous Occurrences

There is not record of levee breaches of any kind in the planning area.

Measures of Probability and Severity

Probability: Low – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

Severity: Low – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

Existing Mitigation Strategies

None. The USACE regulates and inspects dams and all other activities associated with Pomme De Terre Lake. According to the NID and the National Levee Database, there are no recognized levees in Hickory County.

3.2.8 Severe Winter Weather

Description of Hazard

Hickory County seems to have some relatively random yet mild winter weather due to Pomme De Terre Lake and River. Winter storms in Hickory County are variable between ice, severe cold, sleet, snow, and wind. Because of the high bluffs and uneven ground throughout the county, severe winter weather can disable towns, transportation, power lines, community infrastructure, and homes. All of Hickory County can be considered rural and as such the citizens must deal with unplowed roads at certain times, facility, and home damages due to ice or snow.

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.

Geographic Location

The entire Planning Area is at risk from severe winter weather.

Previous Occurrences

Hickory County experienced 9 officially recorded winter storms that included snow and ice with in the period Jan. 1, 2005 – January 31, 2012, according to data from NOAA. Table 3.2.8-1,

summarizes available data for these storms including additional information from SEMA Situation Reports.

A SEMA situation report was submitted on December 9, 2007 regarding freezing rain. Hickory County had 2,000 customers without power and an emergency shelter was opened at the community center in Hermitage.

Since 2006, there have been six Presidential Disaster Declarations for severe winter weather that included Hickory County (1676, 1736, 3317, 1961, 3281, and 3303). In all of these disasters, Public Assistance (PA) was made available to Hickory 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, limited to direct Federal Assistance was made available during these Emergencies.

Since Hickory County is so rural, minor damages are reported compared to a larger area like Columbia or Kansas City. No deaths were reported for winter weather within the given time period.

Source: State Hazard Mitigation Plan;

<http://sema.dps.mo.gov/Mitigation%20Files/MO%20State%20HMP.pdf>

25 SNOW & ICE event(s) were reported in **Hickory County, Missouri** between **04/30/1950** and **11/30/2012**.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Missouri								
Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Central And Eastern M	04/05/1994	1500	Winter Storm	N/A	0	0	500K	0
2 MOZ055>058 - 068>070	02/14/1995	0900	Glaze	N/A	0	0	50K	0
3 MOZ068	11/24/1996	11:00 AM	Ice Storm	N/A	0	0	25K	0
4 MOZ055>058 - 066>071 - 077>083 - 088>096 - 101>104	01/08/1997	12:00 PM	Heavy Snow	N/A	0	0	670K	0
5 MOZ055>058 - 066>071 - 077>083 - 088>098 - 101>106	12/20/1998	02:00 AM	Winter Storm	N/A	0	0	0	0
6 MOZ055>058 - 066>071 - 077>083 - 088>098 - 102>106	01/01/1999	05:00 AM	Winter Storm	N/A	0	0	2.8M	0
7 MOZ055>058 - 066>071	12/12/2000	09:00	Heavy	N/A	0	0	450K	0

<u>- 077>083 - 088>098 - 101>106</u>		PM	Snow						
8 <u>MOZ055>058 - 066>071 - 077>083 - 088>098 - 101 - 105>106</u>	02/21/2001	03:30 PM	Ice Storm	N/A	0	0	25K	0	
9 <u>MOZ055>058 - 066>071 - 077>081 - 088>091 - 093>094 - 101>103</u>	03/02/2002	02:00 AM	Winter Storm	N/A	0	0	0K	0	
10 <u>MOZ058 - 066>071 - 077>083 - 088>098 - 101>106</u>	12/24/2002	04:00 AM	Winter Storm	N/A	0	0	0	0	
11 <u>MOZ055>057 - 066>069 - 077>079 - 089</u>	01/02/2003	01:00 AM	Winter Storm	N/A	0	0	0	0	
12 <u>MOZ055>058 - 067>071 - 077>083 - 088>098 - 101>106</u>	02/23/2003	01:30 PM	Winter Storm	N/A	0	0	0	0	
13 <u>MOZ055>058 - 066>069 - 077>081</u>	03/04/2003	11:00 PM	Winter Storm	N/A	0	0	0	0	
14 <u>MOZ055>056 - 066>069 - 077>081 - 088>091 - 093>095 - 101>103</u>	12/10/2003	01:00 AM	Heavy Snow	N/A	0	0	0	0	
15 <u>MOZ055>058 - 067>071 - 079>083 - 091>092 - 098</u>	01/25/2004	02:00 AM	Ice Storm	N/A	0	0	0	0	
16 <u>MOZ055>058 - 066>071 - 077>081 - 088>091 - 093</u>	11/30/2006	12:00 PM	Winter Storm	N/A	0	0	40K	0K	
17 <u>MOZ055>058 - 066>071 - 077>083 - 088>098 - 101</u>	01/20/2007	19:00 PM	Winter Storm	N/A	0	0	0K	0K	
18 <u>MOZ055>058 - 066>069 - 077>080 - 089 - 094</u>	12/09/2007	03:00 AM	Ice Storm	N/A	0	0	2.5M	0K	
19 <u>MOZ068>070 - 082 - 090 - 092 - 095</u>	02/11/2008	07:00 AM	Ice Storm	N/A	0	0	0K	0K	
20 <u>MOZ056 - 066 - 068</u>	02/21/2008	03:00 AM	Ice Storm	N/A	0	0	0K	0K	
21 <u>MOZ055 - 067>069 - 078 - 096</u>	01/26/2009	03:00 PM	Ice Storm	N/A	0	0	40K	0K	
22 <u>MOZ055 - 067>069 - 078 - 096</u>	01/26/2009	03:00 PM	Winter Storm	N/A	0	0	0K	0K	
23 <u>MOZ055 - 068</u>	12/25/2009	12:00	Winter	N/A	0	0	0K	0K	

		AM	Storm						
24	MOZ068 - 078	03/20/2010	02:00 PM	Winter Storm	N/A	0	0	0K	0K
25	MOZ055 - 066>068 - 082 - 096>097 - 103 - 105	02/01/2012	05:00 AM	Winter Storm	N/A	0	0	0K	0K
TOTALS:						0	0	7.070M	0

Measure of Probability and Severity

Probability: High – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

Severity: Moderate – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

Existing Mitigation Activities

The Office of Emergency Management is proactive in alerting the public to the dangers of winter storms. The Emergency Operations Procedures (EOP) includes a snowplowing plan whereby streets critical for emergency procedures and schools are cleared as a first priority.

National Weather Service and Local Media

The St. Louis 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. Should a storm reach 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 Table 3.2.8-2.

Table 3.2.8-2 **National Weather Service Winter Warnings**

Winter Weather Advisory	Winter weather conditions are expected to cause significant inconvenience and may be hazardous. I 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 about to begin in your area.
Blizzard Warning	Blowing 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.

3.2.9 Tornado

Description of Hazard

A tornado is a violently rotating column of air, in contact with the ground, which is generated by a powerful thunderstorm.

The potential destruction posed by a tornado touching ground is well known.

Tornadoes can happen during any season yet in Missouri they tend to strike most in spring and summer. Most tornadoes happen in late afternoon and early evening, but this too is not always the case. The seasonal and spatial uncertainty of tornadoes makes year round preparedness essential.

Tornado winds may reach over 300 mph. Tornadoes can move in any direction, but often move from southwest to northeast. The average forward speed of a tornado is about 30 mph, but may vary from nearly stationary to 70 mph.

Tornadoes 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.

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.

The destructive effects of a tornado depend on the strength of the winds, proximity to people and structures, the strength of structures, and/or how well a person is sheltered. Tornadoes are classified by the most recent Enhanced Fujita scale, which ranks tornadoes according to wind speed and destruction (See Table 3.2.9-1).

Table 3.2.9-1 Enhanced F (EF) Scale

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

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

Enhanced F Scale Damage Indicators

NUMBER	DAMAGE INDICATOR	ABBREVIATION
<u>1</u>	Small barns, farm outbuildings	SBO
<u>2</u>	One- or two-family residences	FR12
<u>3</u>	Single-wide mobile home (MHSW)	MHSW
<u>4</u>	Double-wide mobile home	MHDW
<u>5</u>	Apt, condo, townhouse (3 stories or less)	ACT
<u>6</u>	Motel	M
<u>7</u>	Masonry apt. or motel	MAM
<u>8</u>	Small retail bldg. (fast food)	SRB
<u>9</u>	Small professional (doctor office, branch bank)	SPB
<u>10</u>	Strip mall	SM
<u>11</u>	Large shopping mall	LSM
<u>12</u>	Large, isolated ("big box") retail bldg.	LIRB
<u>13</u>	Automobile showroom	ASR
<u>14</u>	Automotive service building	ASB
<u>15</u>	School - 1-story elementary (interior or exterior halls)	ES
<u>16</u>	School - jr. or sr. high school	JHSH
<u>17</u>	Low-rise (1-4 story) bldg.	LRB
<u>18</u>	Mid-rise (5-20 story) bldg.	MRB
<u>19</u>	High-rise (over 20 stories)	HRB

Thunderstorms, in and of themselves, can do great damage even when a tornado is not involved.

Heavy rain, lightning, hail, and straight-line winds which often accompany thunderstorms each present their own particular concerns.

Geographic Location

The entire Planning Area is at risk from tornadoes and thunderstorms.

Tornadoes can strike anywhere. There is a greater chance of loss of life and destruction of property in population centers, especially with a large tornado path.

Thunderstorms can also develop anywhere in the county. Areas more susceptible to the flooding associated with heavy rain from thunderstorms are discussed under the flooding profile.

Previous Occurrences

Tornado

The county has experienced five tornado events since 2005, as officially recorded by NOAA (see Table 3.2.9-2). There have been nineteen injuries and \$1.125 million in property damages associated with these five tornadoes.

Table 3.2.9-2 **Hickory County Tornado History**

12 TORNADO(s) were reported in **Hickory County, Missouri** between **04/30/1950** and **11/30/2011**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Missouri

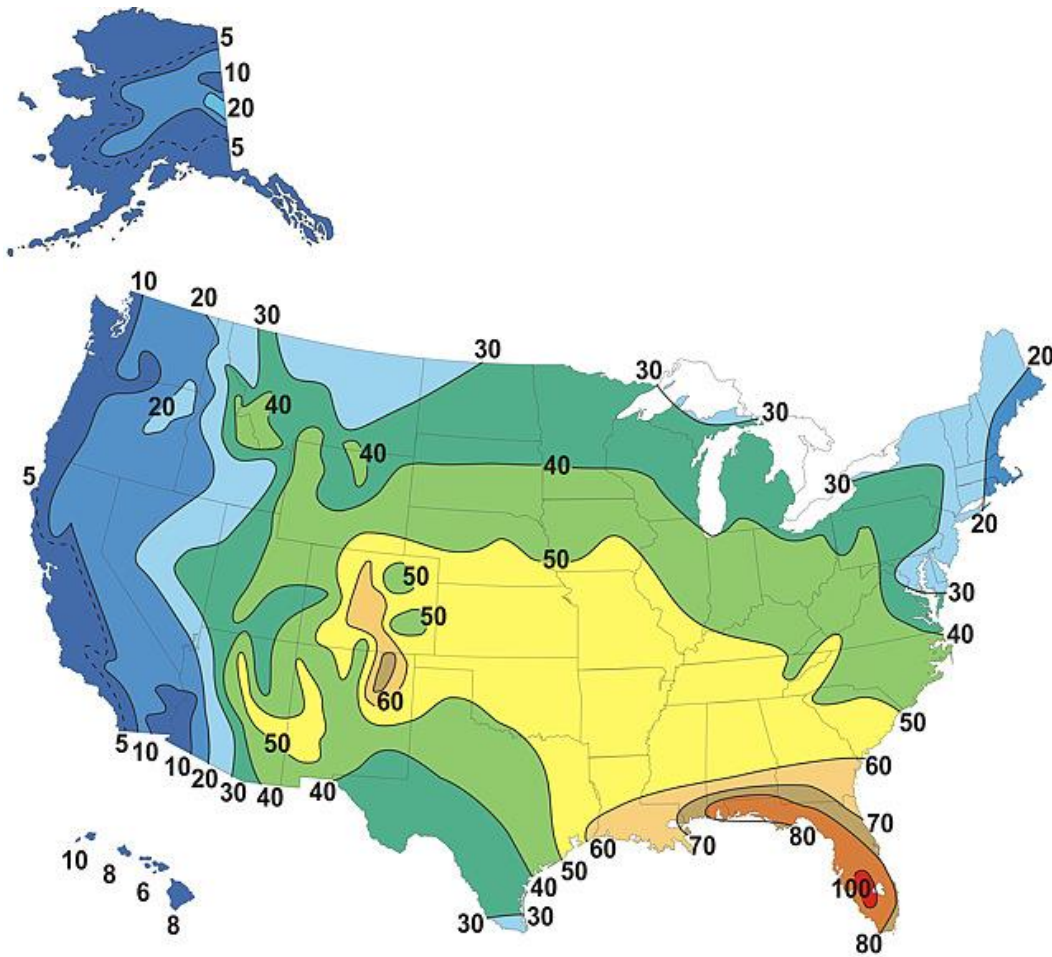
Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 HICKORY	10/24/1967	0705	Tornado	F1	0	0	3K	0
2 HICKORY	04/13/1972	2105	Tornado	F1	0	1	25K	0
3 Weaubleau	05/07/1995	2250	Tornado	F1	0	0	20K	0
4 Preston	02/25/2000	02:20 PM	Tornado	F1	0	0	500K	0
5 Weaubleau	12/18/2002	02:57 AM	Tornado	F1	0	1	43K	0K
6 Pittsburg	05/04/2003	06:18 PM	Tornado	F2	0	0	0K	0K
7 Quincy	05/06/2003	03:35 PM	Tornado	F0	0	0	0K	0K
8 Elkton	03/12/2006	10:15 PM	Tornado	F0	0	0	0	0
9 Hermitage	03/12/2006	10:17 PM	Tornado	F3	0	19	1.0M	0
10 Elkton	03/31/2008	08:48 AM	Tornado	F0	0	0	25K	0K
11 Wheatland	11/24/2010	04:50 PM	Tornado	F0	0	0	25K	0K
12 Cross Timbers	11/24/2010	05:09 PM	Tornado	F1	0	0	75K	0K
TOTALS:					0	21	1.716M	0

Source: <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

3.2.10 Thunderstorm, (Damaging Winds, Lightning, Hail)

A thunderstorm is a rainstorm with thunder and lightning present. The National Weather Service considers a thunderstorm “severe” when it includes one or more of the following: winds gusting in excess of 57.5 mph hail at least 0.75 inch in diameter, a tornado. National Weather Service data indicates that there are on average 50-60 thunderstorm days per year in Missouri (see Figure 3.2.9-1). Many of these thunderstorms are severe.

Figure 3.2.10-1 Average Number of Thunderstorm Days Annually in U.S.



Source: http://www.srh.noaa.gov/jetstream/tstorms/tstorms_intro.htm

Damaging winds:

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

According to NOAA, there have been 23 thunderstorm wind and other high wind events reported in Hickory County since 2005 (see Table 3.2.10-3). These storms resulted in \$25,000 in property damage in Hickory County.

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

Table 3.2.10-1 Damaging Wind Events

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Weaubleau	06/07/2005	02:35 PM	Tstm Wind	55 kts.	0	0	0	0
2 Cross Timbers	06/09/2005	07:02 PM	Tstm Wind	55 kts.	0	0	5K	0K
3 Cross Timbers	06/10/2005	01:00 PM	Tstm Wind	50 kts.	0	0	0	0
4 Weaubleau	06/10/2005	12:44 PM	Tstm Wind	55 kts.	0	0	0	0
5 Weaubleau	08/13/2005	01:40 PM	Tstm Wind	50 kts.	0	0	0	0
6 Weaubleau	11/05/2005	05:30 PM	Tstm Wind	60 kts.	0	0	0	0
7 Elkton	04/02/2006	02:20 AM	Tstm Wind	50 kts.	0	0	0	0
8 Nemo	08/06/2006	03:35 PM	Tstm Wind	50 kts.	0	0	5K	0
9 Weaubleau	03/31/2008	08:48 AM	Thunderstorm Wind	52 kts.	0	0	5K	0K
10 Wheatland	06/03/2008	23:15 PM	Thunderstorm Wind	50 kts.	0	0	0K	0K
11 Hermitage	06/03/2008	23:20 PM	Thunderstorm Wind	50 kts.	0	0	5K	0K
12 Cross Timbers	07/08/2008	15:36 PM	Thunderstorm Wind	50 kts.	0	0	0K	0K
13 Cross Timbers	03/08/2009	07:17 AM	Thunderstorm Wind	59 kts.	0	0	0K	0K
14 Quincy	06/09/2009	14:40 PM	Thunderstorm Wind	52 kts.	0	0	0K	0K
15 Pomme De Terre Res	06/10/2009	18:05 PM	Thunderstorm Wind	60 kts.	0	0	0K	0K
16 Hermitage	06/15/2009	23:14 PM	Thunderstorm Wind	52 kts.	0	0	0K	0K
17 Wheatland	06/16/2009	04:28 AM	Thunderstorm Wind	52 kts.	0	0	0K	0K
18 Cross Timbers	06/16/2009	04:30 AM	Thunderstorm Wind	61 kts.	0	0	0K	0K
19 Nemo	06/16/2009	04:30 AM	Thunderstorm Wind	52 kts.	0	0	0K	0K
20 Preston	06/16/2009	05:30 AM	Thunderstorm Wind	65 kts.	0	0	0K	0K
21 Cross Timbers	04/23/2010	17:12 PM	Thunderstorm Wind	58 kts.	0	0	2K	0K
22 Weaubleau	05/12/2010	00:50 AM	Thunderstorm Wind	52 kts.	0	0	1K	0K
23 Hermitage	10/25/2010	23:55 PM	Thunderstorm Wind	52 kts.	0	0	2K	0K
TOTALS:					0	0	25K	0

Lightning

From January 1993 to July 31, 2009, 181 damaging lightning events were reported in Missouri however no statistics were available for Hickory County specifically. The statistics available from the National Climatic Data Center only include reported lightning events from 1993 to the present. There are likely thousands of lightning events that occur annually that go unreported either because damages did not occur or because the damages were not reported to be captured in NCDC statistics.

Hail

Table 2.3.10-3 Hail Damage

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.

NOAA lists 21 reported hailstorm events (with hail of at least 0.75 inch in diameter) in Hickory County since 2005 (See Table 3.2.10-3).

While the NOAA data only indicates \$10,000 of hail damage from these events in the county, the damage caused by hail is undoubtedly much higher. The NOAA data before 1993 is very general; the location is listed generally as Hickory County and no damages are reported in that time period.

While hailstorms of the magnitude that caused such damage in 2006, 2008, and 2010 do not occur every year in Hickory County, hail is a costly hazard for the Planning Area.

The National Weather Service uses hail as an indicator of a severe storm. If the hail measures 3/4" or larger, then the storm has enough energy to be very dangerous. In a storm, warm and cold air currents collide.

Raindrops are created and fall until they hit a strong updraft, which tosses them up to freezing altitudes. These altitudes are sometimes very high. They fall and are tossed again, getting bigger each time, until they are heavy enough to resist the updraft.

Hail is a good indicator of storm strength, because the faster the updraft, the bigger the hailstone will be. Luckily, most stones are the size of peas. The table below lists a little information about hailstones and damage that the different sizes might cause.

Table 3.2.10-4 Sizes of Hailstones and Potential Damage Caused		
Size in Inches	Common Description	Potential Damage
1/4"	Pea sized hail	Could cause slight damage to trees and shrubs. People and animals in the open might be slightly injured.
1/2 "	Marble sized hail	This size of hail could cause slight damage to trees and shrubs. People and animals in the open might be slightly injured.
3/4"	Dime sized hail	This size of hail could cause moderate damage to trees and shrubs and injury to people and animals caught unprotected. It will also cause slight damage to automobiles and roofs.
1 1/2"	Golf ball sized hail	This size of hail could cause heavy damage to trees and shrubs and severe injury to unprotected people and animals. It will also cause moderate damage to automobiles and roofs. Golf ball sized hail could break glass and penetrate convertible tops.
3"	Baseball sized hail	This size of hail could cause severe damage to trees and shrubs and life threatening injuries to people and animals. This hail can cause extensive damage to automobiles and roofs.
4 "	Softball Sized Hail	This size of hail could cause devastating damage to trees and shrubs, severe injury and possible death to people and animals that are unprotected. It might also cause devastating damage to automobiles and buildings. This is large hail that falls rapidly. It can penetrate roofs and windows, which could cause damage to the interior of buildings and automobiles. Occupants face a risk of injury or death if good protection is not available.

Table 3.2.10-5 NOAA listed Hail Storms from 2005 to present.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Weaubleau	06/30/2005	04:25 PM	Hail	1.00 in.	0	0	0	0
2 Pittsburg	09/13/2005	04:16 PM	Hail	1.00 in.	0	0	0	0
3 Pittsburg	03/30/2006	10:14 PM	Hail	0.88 in.	0	0	0	0
4 Hermitage	04/22/2006	04:58 PM	Hail	0.88 in.	0	0	0	0
5 Hermitage	04/23/2006	09:05 PM	Hail	1.00 in.	0	0	0	0
6 Cross Timbers	04/23/2006	09:15 PM	Hail	1.00 in.	0	0	0	0
7 Wheatland	04/22/2008	05:00 AM	Hail	1.00 in.	0	0	0K	0K
8 Wheatland	04/22/2008	05:06 AM	Hail	0.75 in.	0	0	0K	0K
9 Nemo	04/22/2008	05:20 AM	Hail	0.88 in.	0	0	0K	0K
10 Hermitage	05/10/2008	13:53 PM	Hail	0.88 in.	0	0	0K	0K
11 Hermitage	06/15/2008	14:15 PM	Hail	1.75 in.	0	0	0K	0K
12 Nemo	06/19/2008	12:15 PM	Hail	0.88 in.	0	0	0K	0K
13 Hermitage	06/19/2008	12:16 PM	Hail	0.75 in.	0	0	0K	0K
14 Pittsburg	06/19/2008	12:40 PM	Hail	1.50 in.	0	0	0K	0K
15 Cross Timbers	03/10/2010	19:50 PM	Hail	0.88 in.	0	0	0K	0K
16 Pittsburg	04/23/2010	16:55 PM	Hail	1.00 in.	0	0	0K	0K
17 Pittsburg	04/23/2010	16:58 PM	Hail	1.00 in.	0	0	0K	0K
18 Cross Timbers	04/23/2010	17:12 PM	Hail	1.75 in.	0	0	10K	0K
19 Cross Timbers	04/23/2010	17:19 PM	Hail	1.00 in.	0	0	0K	0K
20 Elkton	07/26/2010	16:35 PM	Hail	0.75 in.	0	0	0K	0K
21 Weaubleau	11/24/2010	16:49 PM	Hail	1.00 in.	0	0	0K	0K
TOTALS:					0	0	10K	0

Measure of Probability and Severity

Probability: High – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau,

Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I,
unincorporated Hickory County

Severity: High – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau,
Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I,
unincorporated Hickory County

Existing Mitigation Strategies

The Office of Emergency Management is proactive in educating the public about the dangers of tornadoes and thunderstorms.

Warning Systems

The following warning systems are used in the county:

Local television weather reports

Local radio weather reports

Sheriff's Department

Tornado Sirens

3.2.11 Wildfire

Description of Hazard

Forest, grassland, and natural cover fires can and have occurred at any time throughout the year in Missouri. In Hickory County, the majority of the fires and the greatest acreage loss occur during the spring fire season (February 15 - May 10). Wildland Urban Interface maps are located in Appendix A.

Spring is the time of the year when rural residents burn garden spots and brush piles. Many landowners also believe it is necessary to burn the woods in the spring to grow more grass, kill ticks, and get rid of brush. These factors, combined with low humidity and high winds, result in higher fire danger at this time of year. The spring fire season abates with the growth of the new season's grasses and other green vegetation.

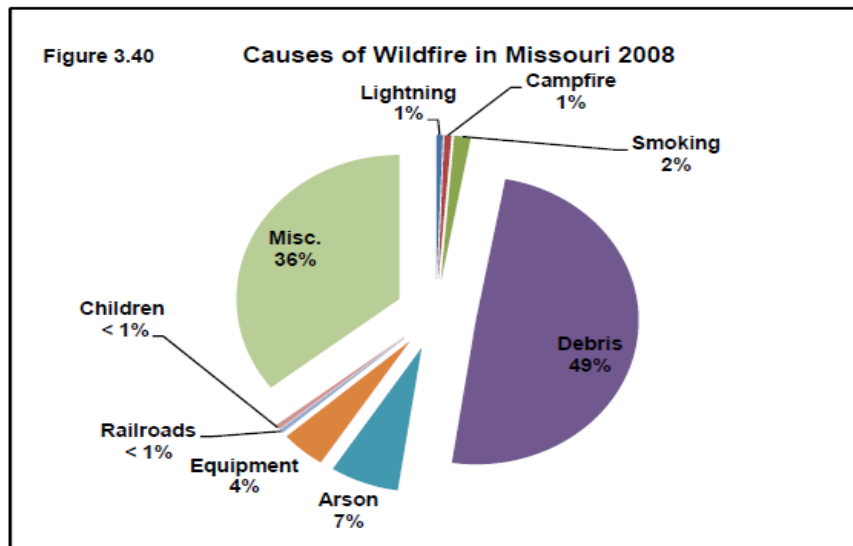
Numerous fires also occur in October and November due to the dryness associated with fall in Missouri. Many rural residents use this time of year to burn leaves and debris thus raising the possibility of a fire which burns out of control.

The major causes of wildfires in Missouri are various human activities, according to statistics from the Missouri Department of Conservation (See Figure 3.2.10-1b). From January, 2005 until the present, there have been 14,598 acres affected by wildfire according to the MDC's Forest Fire Reporting.

3.2.11-1a. The Missouri Department of Conservation groups fires by cause and acreage.

Cause	Number of Fires	Number of Acres
Lightning	10	15.72
Campfire	44	576.35
Smoking	49	191.3145
Debris	1192	7962.67
Arson	197	7054.77
Equipment	121	744.11
Railroads	2	1.5
Children	16	192.75
Misc.	1242	10052.08
TOTAL	2873	26791.2645

Figure 3.2.11-1b Wildfire Causes



Source: Missouri Department of Conservation

2 WILD & FOREST FIRE event(s) were reported in Hickory County, Missouri between 04/30/1950 and 11/30/2011.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Click on **Location or County** to display Details.

Missouri

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Countywide	11/18/1999	12:00 PM	Wild/forest Fire	N/A	0	0	0	0
2 Countywide	03/08/2000	08:00 AM	Wild/forest Fire	N/A	0	0	20K	0
TOTALS:					0	0	20K	0

Source: NOAA

In addition to the risk faced by rural areas, there is an increased risk of Wildfire in areas called the WUI (Wildland Urban Interface). The WUI is defined by the NWCG (National Wildfire Coordinating Group) as, “the line, area, or zone where structures and other human development meet or intermingle with undeveloped Wildland or vegetative fuel.” More information on the WUI can be found at the NWCG website (<http://www.nwcg.gov/>).

Within the WUI there are three defined Community types that are vulnerable to Wildfire:

- **Interface Community**
Structures directly about Wildland fuels. There is a clear line of demarcation between Wildland fuels and residential, business, and public structures. Wildland fuels do not

generally continue into the developed area. The development density for an interface community is usually three or more structures per acre, with shared municipal services.

- **Intermix Community**
Structures are scattered throughout a Wildland area. There is no clear line of demarcation; Wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres.
- **Occluded Community**
Often found within a city, structures abut an island of Wildland fuels (e.g. park or open space). There is a clear line of demarcation between structures and Wildland fuels. The development density is usually similar to those found in the interface community, but the occluded area is usually less than 1,000 acres in size.

The Missouri Department of Conservation website keeps a record of all fire incidences within the state. The search can be narrowed via what kind of incident caused the fire, date, and county. From 2005-to present, there has been 2,832 acres burned. NOAA only lists two wildfires (11/1999 and 3/2000) from 1950-2010.

Despite the fact that Missouri experiences an average of 2,700 wildfires each year, Missouri has only received one fire management assistance declaration. This was for the Camden Fire Complex in 2000. At the time of the declaration, the complex consisted of 70 fires burning on 3,000 acres of grassland that had destroyed 17 homes and forced the evacuation of approximately 300 residents in Camden County communities from Macks Creek to Climax Springs. Additional county-level historical data is available in Section 3.5 to support further vulnerability and loss estimation as it varies across the State.—State HMP

Geographic Location

The rural areas of Hickory 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.

Previous Occurrences

Large and widespread wildfires, such as occur in the western United States, have not been a problem in Hickory County in recent history. However, the Fire Districts in Hickory County fight smaller wildfires/natural cover fires every year.

There have been a record number of wildfires in the spring of the past 4-5 years; these have destroyed crops, hay fields, green space, and woods. Quick response from the Fire District(s) has limited the spread and loss involved with these fires.

Measure of Probability and Severity

Probability: Moderate – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

Severity: Moderate – Hermitage, Hermitage R-IV, Cross Timbers, Preston, Weaubleau, Wheatland, Weaubleau R-III, Wheatland R-II, Hickory Co. R-I, unincorporated Hickory County

The Missouri State Hazard Mitigation Plan (2007) 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

Existing Mitigation Activities

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. The publication is available online at: <http://mdc4.mdc.mo.gov/Documents/322.pdf>

3.3 Vulnerability Assessment Overview

Requirement

§201.6(c) (2) (ii)

(A) The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area....

Requirement

§201.6(c) (2) (ii)

(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (2) (11) (A) of this section and a description of the methodology used to prepare the estimate...

Requirement

§201.6(c) (2) (ii)

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

This section will provide an inventory assessment of vulnerable structures, equipment, and populations within Hickory County. As prescribed by FEMA guidelines, critical structures, building counts and assessed values will be included. All people, structures, and equipment are

Name of Building	Type	Replacement Value	Location
Courthouse	Offices	\$808,000	Polk-Spring St., Hermitage
Jail & Sheriff's	Offices	\$517,000	470 Jackson St., Hermitage
Annex	Offices	\$176,000	Cedar & Polk St., Hermitage
East-side Road & Bridge	Shop	\$84,000	D Hwy, Preston
West-side Road & Bridge	Shop	\$84,000	705 W. Sunshine, Wheatland

hazards in Hickory County. This assessment can be used to identify potential areas where mitigation activities are needed. (See Table 3.3.1-1)

3.3.1 Hickory County Inventory

Hickory County 2010 Assessed Values	Amount \$
Residential	\$55,309,770
Commercial	\$7,357,430
Agricultural	\$5,326,590
Total Real Property	\$76,896,870
Total Personal Property	\$23,240,241
Utilities	\$6,259,726

3.3.1-1 Hickory County-Owned Buildings by the county clerk as of May 1st, 2012

Source: Hickory County Commissioner's Office

Agriculture

Table 3.3.1-2 show value estimates for agricultural land in Hickory County and estimates of crop and livestock sales. Since almost half of the land area of Hickory 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.

Table 3.3.1-2 Excerpt from the USDA agriculture census for Hickory County farms.

Hickory County Missouri

	2007	2002
Number of Farms	492	534
Land in Farms	146,764 acres	156,143 acres
Average Size of Farm	298 acres	292 acres
Market Value of Products Sold	\$15,265,000	\$16,076,000
Crop Sales \$1,948,000 (13 percent)		
Livestock Sales \$13,317,000 (87 percent)		
Average Per Farm	\$31,027	\$30,106

2007 Census of Agriculture, County Profiles; http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/

Critical Facilities

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

Critical facilities commonly include all public and private facilities that a community considers essential for the delivery of vital services and for the protection of the community. The adverse effects of damaged critical facilities can extend far beyond direct physical damage. Disruption of health care, fire, and police services can impair search and rescue, emergency medical care, and even access to damaged areas. Critical Medical Facilities are shown in Table 3.3.1-3.

Table 3.3.1-3 **Hickory County Critical Facilities**

Hickory County Critical Facilities	
Facility	Location
Hermitage Family Medical Center	Hermitage
Lake Area Primary Care Clinic	Weaubleau
Christian Health Care-Nursing Home	Hermitage

Table 3.3.1-4 **Hickory County Water Districts.**

Hickory County Water Districts	Location
Hickory Co. PWSD 1	Preston
PWSD 2 Hickory Co.	Galmey

Table 3.3.1-5 Shows the location of Public Water Supply Towers.

Public Water Supply Towers				
Owner	Facility Name	People Served		# Tanks
Cross Timbers	Cross Timber	285		1
Hermitage	Hermitage	687		2
Weaubleau	Weaubleau	625		1
Wheatland	Wheatland	334		2

Source: Missouri Department of Natural Resources

Water Systems

Water System No.	Water System Name	Type	Status	Principal County Served	Primary Source Water Type
MO5251522	BOHANNA HEIGHTS SUBDIVISION	C	A	HICKORY	GW
MO5010197	CROSS TIMBERS	C	A	HICKORY	GW
MO5238302	FUGATE MOBILE HOME PARK	C	A	HICKORY	GW
MO5010361	HERMITAGE	C	A	HICKORY	GW
MO5024250	HICKORY CO PWSD 1	C	A	HICKORY	GW
MO5036203	LAKE FOREST SUBDIVISION	C	A	HICKORY	GW
MO5252968	POMME DE VILLA SUBDIVISION	C	A	HICKORY	GW
MO5021292	PWSD 2 OF HICKORY CO	C	A	HICKORY	GW
MO5036314	RIVIERA SOUTH WATER CORP	C	A	HICKORY	GW
MO5010843	WEAUBLEAU	C	A	HICKORY	GW
MO5010855	WHEATLAND	C	A	HICKORY	GW
MO5208303	WHITESIDE HIDDEN ACRES	C	A	HICKORY	GW
MO5031388	EAST LAKE HILLS SUBDIVISION	C	I	HICKORY	GW

Total Number of Records Fetched = 13

Source: Missouri DNR-

http://www.dnr.mo.gov/DWW/JSP/SearchDispatch?number=&name=&county=HICKORY&WaterSystemType=C&SourceWaterType=All&PointOfContactType=None&SampleType=null&begin_date=5%2F23%2F2009&end_date=5%2F23%2F2012&action=Search+For+Water+Systems

Population

Table 3.3.1-6 shows an age profile of the Hickory County population. Age can be one factor that

influences vulnerability when a natural hazard occurs as needs and abilities may vary widely between age groups.

ACS Demographic Estimates	Estimate	Percent	Margin of Error
Total population	9,022		*****
Male	4,357	48.3	*****
Female	4,665	51.7	*****
Median age (years)	51.2	(X)	+/-0.3 map
Under 5 years	387	4.3	*****
18 years and over	7,410	82.1	*****
65 years and over	2,466	27.3	*****

Source: US Census Bureau

Table 3.3.1-7 Historic Properties in Hickory County

National Register Historic Property	Community
Quincy Public Hall	Quincy
Williams, John Siddle House	Hermitage

Source: <http://www.dnr.mo.gov/shpo/Hickory.htm>

Development Trends

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county is also likely to continue at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Future development in Hickory County also can and will be impacted by several natural hazards. Development plans can use the Hickory County Hazard Mitigation Plan as a guide to possible problems that could come to light when building in certain areas and when building with certain materials. Since this county has not been mapped by FEMA and does not have any zoning laws, all incorporated cities will hopefully include some zoning/preventative measure for deterring landowners and business owners from building in high hazard areas such as floodplains or densely vegetated areas due to the wildfire risk. For this county, those measures should be addressed in the next update of the natural hazard mitigating plan as mitigation actions.

Village of Cross Timbers

In August 2010, the Village of Cross Timbers created a city sewer system and water treatment plant with pipe lines and meters. They also built an office in the existing Community Building early 2010.

City of Hermitage

The City did a sewer line extension, updated one section of sewer line from clay pipe to PVC, updated three lift stations, updated some water lines, updated to a new water storage standpipe, added a backup generator at both wells, put in a section of sidewalk to school, and did some paving. The City also purchased property with two buildings on it and an adjoining lot with nothing on it yet. The existing buildings will hold a new City Hall/Lab and storage building. Parts of the City (southern half) are in a floodplain according to USACE. The City will plan on discouraging businesses or landowners from building within this obvious floodplain.

City of Preston

Since 2005, the Village of Preston has also created a city sewer system with pipelines and meters. They also added a storm siren. Future developments are not likely to occur unless it is in regards to City maintenance projects on an 'as needed' basis.

City of Weaubleau

The City did terminate 8 of their lift stations and have 1 lift station at their lagoons now. They are in the process of replacing broken clay tile pipes and replacing them with PVC pipe. The City is not located in a floodplain and there is little potential for a highly fueled wildfire.

Little future development is expected from the City though a City Park improvement grant project is a possibility in the near future.

City of Wheatland

The City has just been awarded \$1.4 million in USDA and CDBG funds to improve their sewer system. Future planning is mostly completed by individual private businesses rather than through the City. Lucas Oil Speedway is located within the City and is a high tourist attraction for speed boats and race cars. The speedway is about .25 of a mile long and unpaved. Lucas Oil recently added the speed boat water track. Most economic development will be made through this company. Neither the City nor the speedway is located in a floodplain.

3.3.2 School Districts

Table 3.3.2-1 Hickory County School District populations

Hickory County School District Populations				
School District	School Name	Grades	Staff	Students

Hermitage R-IV	Hermitage High School	(9-12)	19	79
	Hermitage Middle School	(6-8)	17	61
	Hermitage Elementary School	(PK-5)	22	153
Hickory County R-I	Skyline High School	(9-12)	27	303
	Skyline Middle School	(5-8)	30	218
	Skyline Elementary School	(K-4)	26	297
Weaubleau R-III	Weaubleau High School	(7-12)	23	190
	Weaubleau Elementary	(K-6)	27	213
Wheatland R-II	Wheatland High School	(7-12)	19	157
	Wheatland Elementary	(PK-6)	20	131

Table 3.3.2-2 lists the school districts Building Counts and Replacement Costs.

Table 3.3.2-2 School Districts Assessed Values			
Hickory County School Districts Assessed Values			
School District	Building Count	Building Replacement Cost	Assessed Valuation
Hermitage R-IV	12	\$1,413,026	\$10,630,217
Hickory Co. R-I	3	\$13,604,122	\$15,817,429
Weaubleau R-III	4	\$1,315,409	\$9,028,624
Wheatland R-II	2	\$25,000,000	\$32,243,000

Table 3.3.2-3 show a representation of the Hickory County school districts development trends since the first plan was created in 2005.

Table 3.3.2-4 School development trends.

Hermitage
R-IV

None

Hickory Co. R-I	In 2006 the district added a bus barn, repaved, added an agriculture shop along with gym lobby/locker rooms. In 2010 added a new multipurpose room and agricultural greenhouse. In 2012 they bought a truck, kitchen renovation, gym floor replacement, and softball field renovation.
Weaubleau R-III	In 2006-2007 the district reconstructed the high school restrooms and the agricultural building.
Wheatland R-II	In the process of and throughout the year they will be renovating the building and adding onto the gym and vocational-agricultural shop.

3.3.3. Community Jurisdictions

Assessed values for property in Hickory County were calculated using data from the Hickory County Assessor's Office and collected through the county assessor. The "Total Incorporated Building Count" represents all buildings within the community's corporate limits. Preston does not receive taxes and does not have an assessed value. (See Table 3.3.3-1)

Table 3.3.3-1 County/Community Assessed Values

Community	2010 Assessed Values
Cross Timbers	Assessed- \$ 547,880 Residential- \$496,900 Agriculture- \$6,420 Commercial- \$44,560 Total Real- \$678,708 Total Personal- \$119,712 Utilities- \$153,350
Hermitage	Assessed- \$ 3,977,270 Residential- \$2,320,950 Agriculture- \$28,740 Commercial- \$1,627,580 Total Real- \$4,258,975 Total Personal- \$873,035 Utilities- \$345,679

Weaubleau	Assessed- \$ 1,678,090 Residential- \$1,278,940 Agriculture- \$5,200 Commercial- \$393,950 Total Real- \$1,930,192 Total Personal- \$442,773 Utilities- \$283,737
Wheatland	Assessed- \$ 2,677,300 Residential- \$1,016,450 Agriculture- \$1,500 Commercial- \$1,659,350 Total Real- \$2,897,597 Total Personal- \$574,758 Utilities- \$264,949

County Wide Data

Infrastructure Type	Incorporated			Unincorporated		
	Number of People	Number of Buildings	Approximate Value	Number of People	Number of Buildings	Approximate Value
Residential	1787	1179	\$34,924,020	7840	12,628	\$228,262,640
Commercial	430	204	\$10,853,320	517	467	\$15,394,410
Industrial	0	0	\$0	0	0	\$0
Educational	1072	26	\$33,429,052	769	6	\$21,000,000
Religious	36	17	\$2,000,000	32	12	\$1,600,000
Government	80	10	\$2,247,425	22	12	\$1,096,591

The table above shows figures provided by the County Clerk. These numbers are actual representations of the county's infrastructures. Note that these figures do not include counts and valuations for the community of Preston, so actual figures would be higher than what is shown.

3.4 Vulnerability Summary and Impact

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.

This section gives a brief overview of each hazard and provides information about the potential impact that may be incurred on existing and future structures.

Impact on future development is not addressed with every hazard because of the unpredictable nature of some hazards. Methodology used to estimate potential dollar losses was based off of

previous estimates and statistics from the National Oceanic and Atmospheric Administration's NCDC Website.

3.4.1 Dam Failure Vulnerability

Jurisdictions: Unincorporated Hickory County, Hermitage.

Overview

Few incorporated and unincorporated areas of Hickory County are vulnerable to the effects of dam failure. A dam failure in Hickory 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. A dam failure would include the breach of a dam wall or embankment allowing the water and/or debris to flow downstream from the dam.

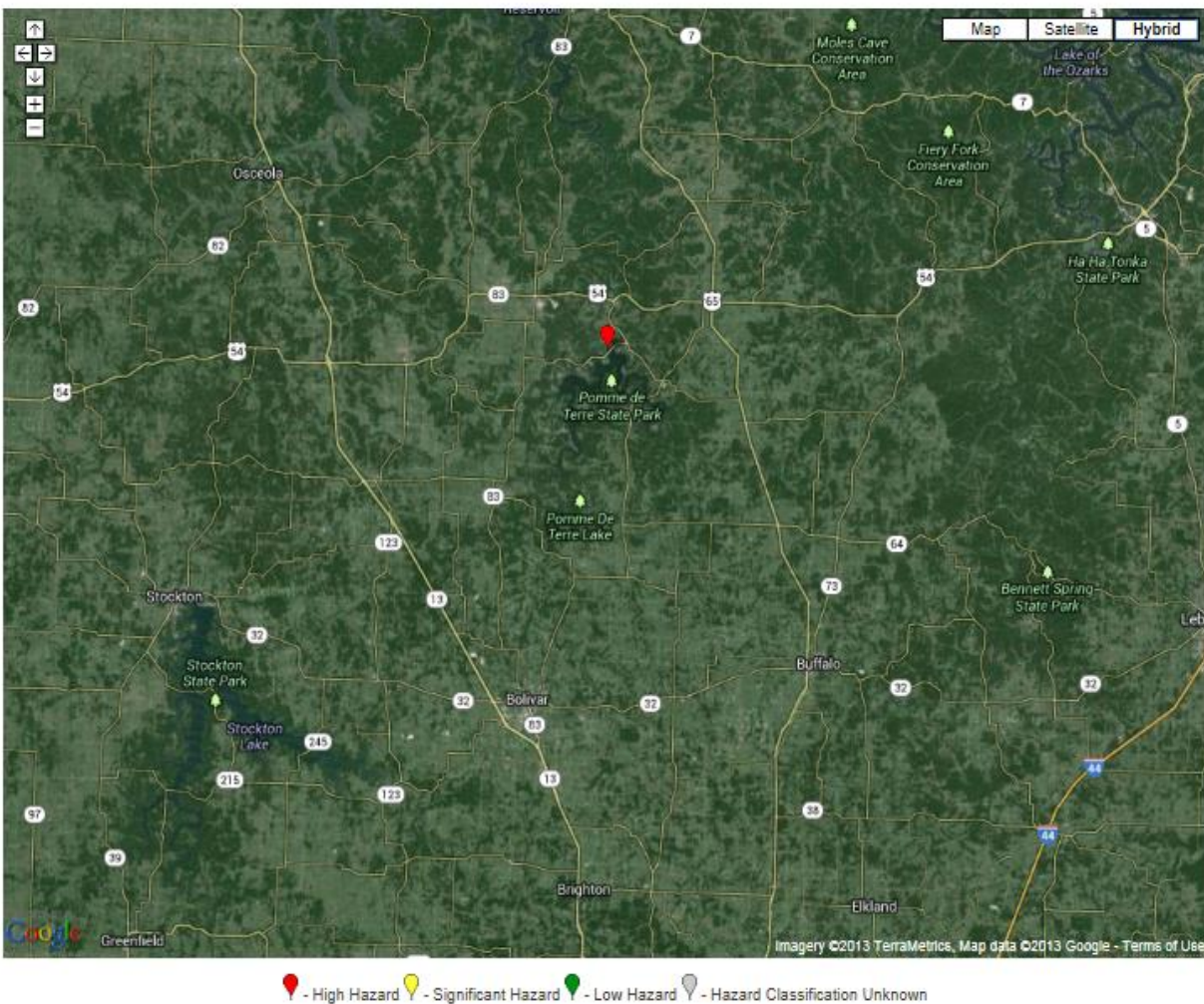
Persons at risk also may include farm workers, hunters, anglers, hikers, campers and other recreationists. Livestock also may be endangered. An EAP also helps emergency managers know who is outside the inundation zone and does not need to be evacuated.

Although none of the dams in Hickory County are regulated by the state, as demonstrated in Figure 3.4.1-1 below, the state collected data about them and other unregulated dams in the Dam Inventory for the state of Missouri.

The data was compiled in the late 1970's to early 1980's, and hazard classifications were assigned based on the data collected. Another source of information about the dams in Hickory County is the U.S. Army Corps of Engineers (USACE) National Inventory of Dams (NID). The State has classified three of Hickory County's dams as "High Hazard." This categorization is given to dams that if breached could cause loss of life. Of the three High Hazard Dams, all are unregulated by the state, but two are regulated by the U.S. Army Corps of Engineers.

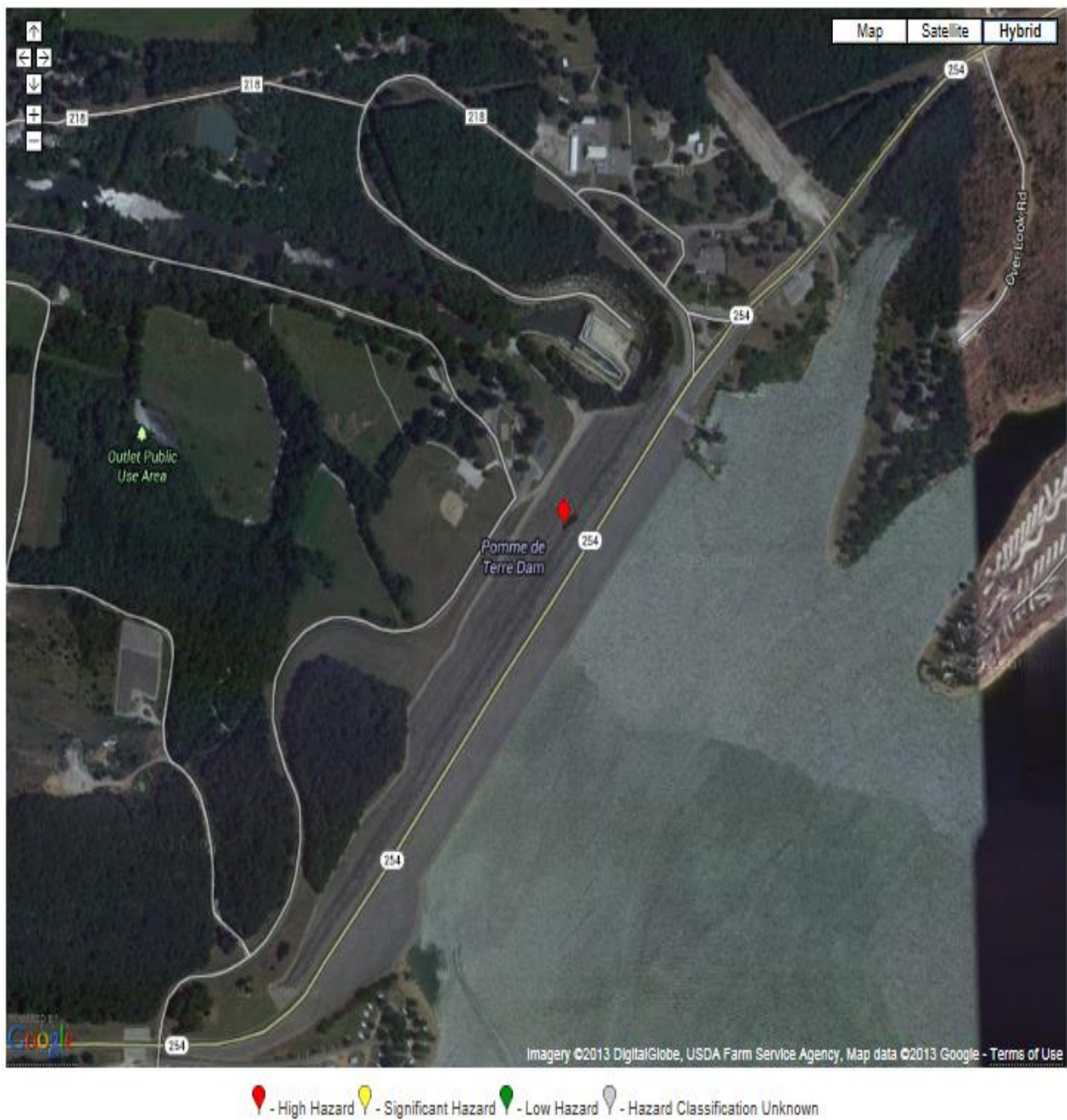
The National Performance of Dams Program (NPDP) of Stanford University list only one high hazard dam in Hickory County. That dam is the Pomme De Terre Dam. This same site states that there is also one "significant" hazard dam in the county. This is the Talbot dam.

Figure 3.4.1-1 High Hazard Dams in Hickory County



Source: http://npdp.stanford.edu/search_dams?dam_name=&state=mo&county=hickory&river=&hazard_f=high

Figure 3.4.1-2 High Hazard Pomme de Terre Dam



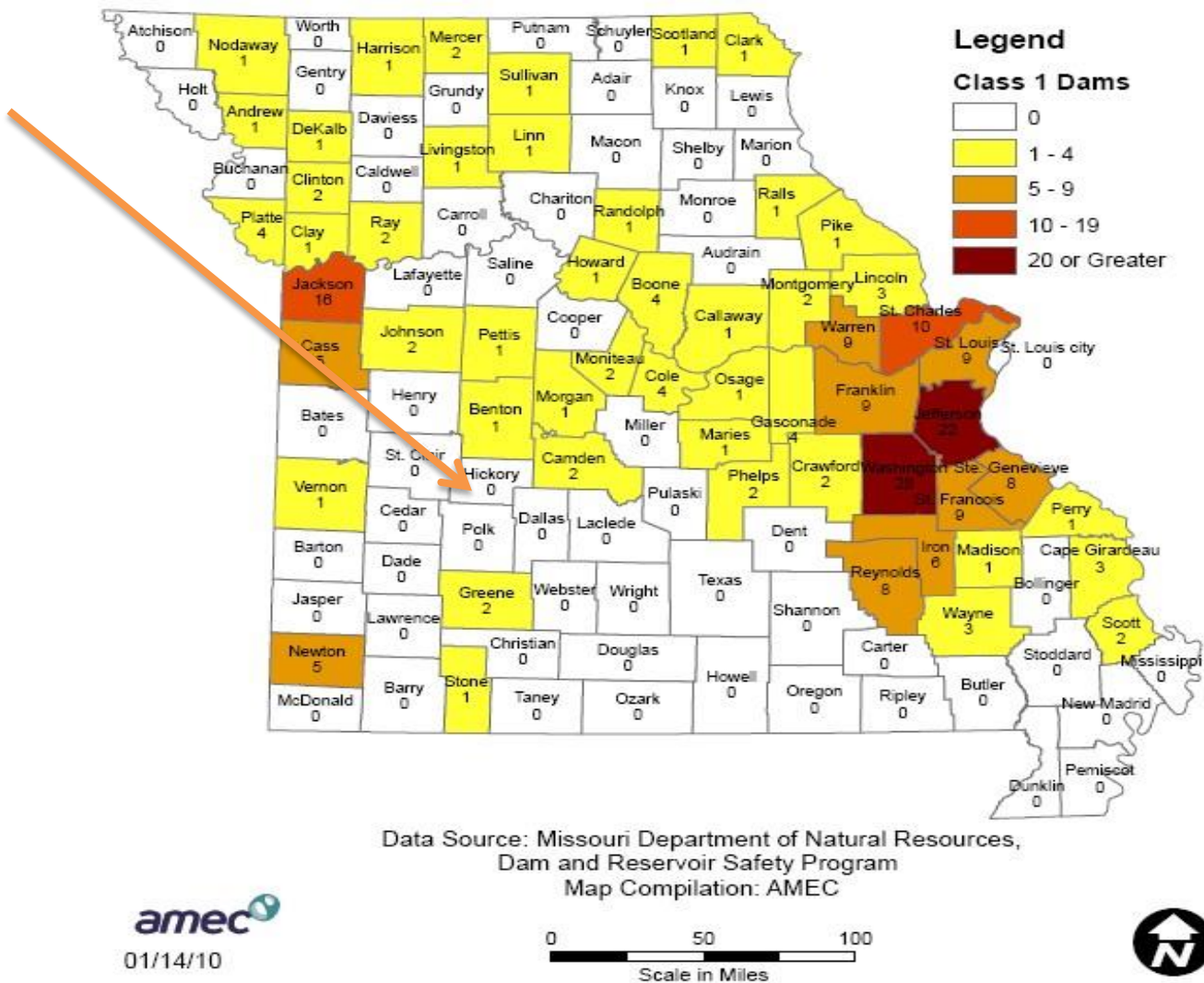
Source: http://npdp.stanford.edu/search_dams?dam_name=&state=mo&county=hickory&river=&hazard_f=high

Figure 3.4.1-3 Significant Hazard Talbot dam



Source: http://npdp.stanford.edu/search_dams?dam_name=&state=mo&county=hickory&river=&hazard_f=high

Figure 3.4.1-3 Missouri State Regulated Class 1 Dams



The 2010 State Hazard Mitigation Plan also states that there are no class 2 or class 3 state regulated dams in Hickory County.

The State dam classification system is based on 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.

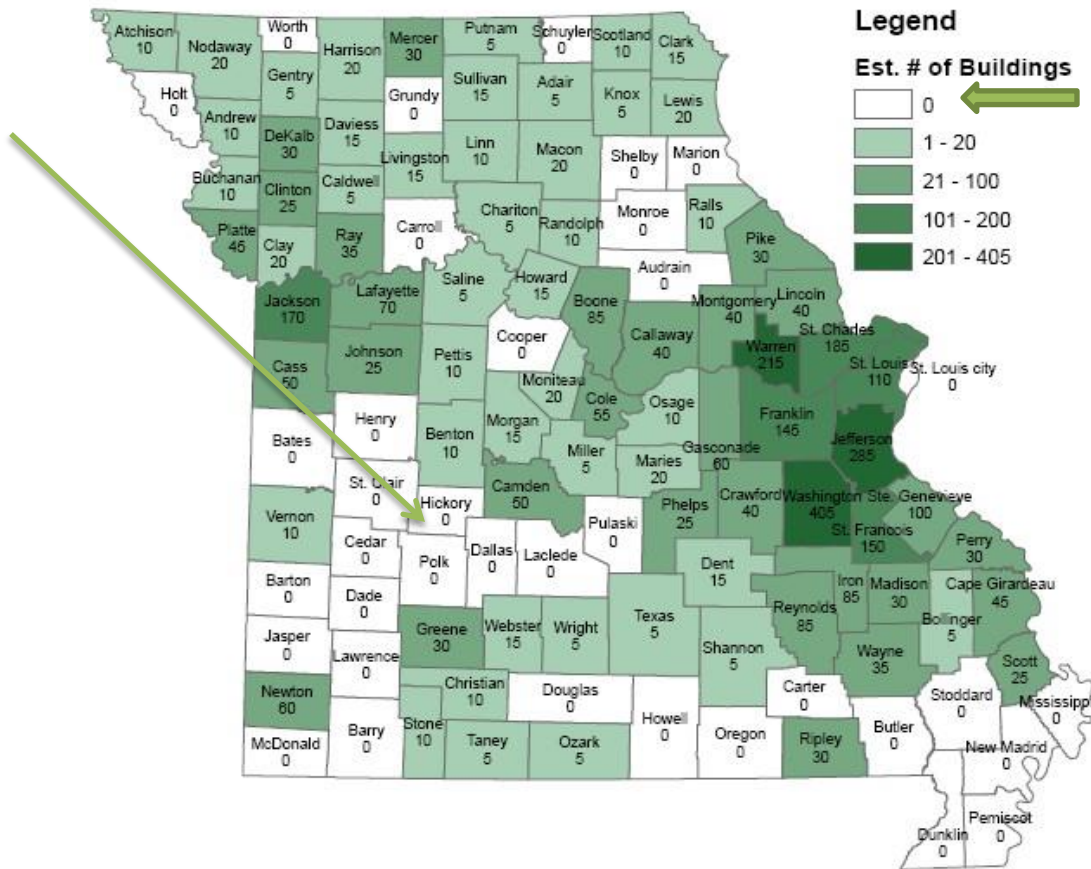
Because there is no entity in charge of unregulated dams, the original classifications for these dams may not be correct. Some dams may not exist anymore while others may pose a greater downstream threat than their classifications indicate.

Potential Impact on Existing Structures

The potential impact on structures and human life downstream from a dam failure directly correlates to the amount of water and/or 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.

As figure 3.4.1-2 from the Missouri State Hazard Mitigation Plan below demonstrates there are no buildings vulnerable to the failure of a state regulated dam in Hickory County. This estimation includes only state regulated dams and does not consider private or non-regulated dams in Hickory County. There is currently no accumulated data on those dams, and therefore they are not included in the vulnerable building estimates.

Figure 3.4.1-4 Estimated Number of Building Vulnerable to State Regulated Dams.



amec
01/14/10

0 50 100
Scale in Miles



Source: State of Missouri 2010 Hazard Mitigation Plan

It should be stated that there are nearly 4,500 unregulated dams in the State of Missouri because they do not meet the 35-foot dam height requirement to fall under state regulation. Although failure potential certainly exists for these non-regulated dams, it is very difficult to attempt to analyze vulnerability due to data limitations.

As stated in the 2010 State of Missouri Hazard Mitigation Plan , keeping in mind the same assumptions that were utilized to determine the approximate number of buildings vulnerable to failure of state-regulated dams, the State Hazard Mitigation Planning Team attempted to quantify potential loss estimates in terms of population and property damages. To complete this analysis, the following additional assumptions were utilized:

Average values for residential structures were obtained for each county from HAZUS-MH MR4. Residential structures were chosen as the most prevalent structure-type downstream of dams. Although certainly other building types are present, the numbers and values are not known. The estimated structure loss was estimated to be at 50 percent of the value of the structure. Actual losses will vary based on the depth of inundation. Average household size was obtained from the U.S. Census Bureau data for residences in each county to determine the approximate population at risk to failure of state-regulated dams.

Because dam breach inundation boundary information is not available at this time it is not possible to know exactly what the severity of a dam failure would be. A dam failure has not occurred in the past in Hickory County. Therefore the following is only an estimate of a possible dam breach of the Pome De Tare dam with the breach affecting the Community of Hermitage.

Table 3.4.1-1 Hickory County Vulnerability Analysis for Failure of State-regulated Dams in Missouri

County	Class 1	Class 2	Class 3	Total	Estimated # of Buildings Vulnerable	Average Exposure Value per Structure (\$)	Estimated Total Potential Building Exposure (\$)	Average Residential Occupancy	Estimated Total Population Exposure	Estimated Building Losses (\$)
Hickory				0	0	59,466	0	2.26	0	0

Table 3.4.1-2 All figures were created using the same scale. Because inundation information is not available at this time it is not possible to know exactly the severity or distance of a dam failure. The table below show figures provided by the County Clerk. These numbers are actual representations of the county's infrastructure. Since dam failure has never occurred in the past, these numbers are zeroed out. For the sake of providing this information, this is table will remain the same.

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

People QuickFacts	Hickory County	Missouri
Population, 2012 estimate	9,391	6,021,986
Population, 2010 (April 1) estimates base	9,627	5,988,921
Population, percent change, April 1, 2010 to July 1, 2012	-2.5%	0.6%
Population, 2010	9,627	5,988,921
Persons under 5 years, percent, 2012	4.2%	6.3%
Persons under 18 years, percent, 2012	17.0%	23.3%
Persons 65 years and over, percent, 2012	30.7%	14.7%
Female persons, percent, 2012	51.0%	51.0%

Dam Failure has the potential to impact future development in the county and its jurisdictions. Because many dams in Hickory 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 knowledge of problem dam that may lie upstream, that development is put in jeopardy. Currently, all the dams located in a high risk area are regulated by the U.S. Army Corps of Engineers.

Future impacts may be addressed by inundation studies being done by the Missouri 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."

The mapping began in Missouri in September 2009; the timeframe for mapping all the regulated high hazards dams in the state is a little over three years. It is expected that the mapping of the high hazard dams in Hickory County will be carried out in 2010-2012, according to inspectors from Dam Safety Program.

After an inundation study on a dam is finished, it will be the responsibility of the dam owner to work with the County Emergency Management Director in developing an Emergency Action Plan for the dam. There are currently no state regulated dams in Hickory County. See Section 3.5.

3.4.2 Drought Vulnerability

Jurisdictions: Unincorporated Hickory County

Overview

The Missouri Drought Plan divides the State into three regions, which are prioritized according to drought susceptibility (see map in Figure 3.2.2-2. section 3.). The regions are identified as having slight, moderate, and severe susceptibility to drought conditions. Descriptions of drought susceptibility for the three regions are as follows:

Region A (mostly southeast Missouri) has very little drought susceptibility. It is a region underlain by sands and gravel (alluvial deposits). Surface and groundwater resources are generally adequate for domestic, municipal, and agricultural needs.

Region B (central, east-central Missouri) has moderate drought susceptibility. Groundwater resources are adequate to meet domestic and municipal water needs, but due to required well depths, irrigation wells are very expensive. The topography is generally unsuitable for row-crop irrigation.

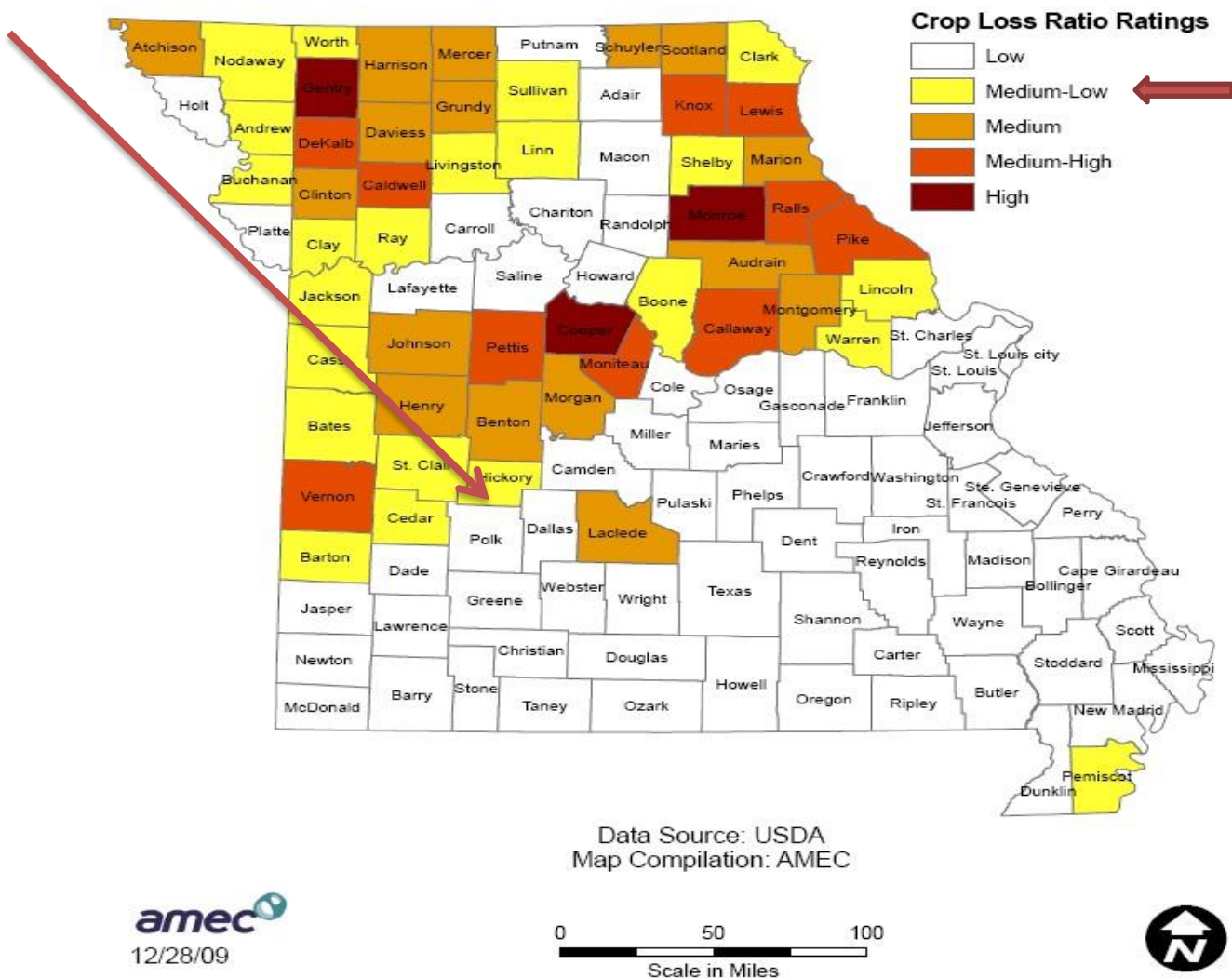
Region C (northern, west-central Missouri; St. Louis County) has severe drought vulnerability. Surface water sources usually become inadequate during extended drought. The groundwater resources are normally poor, and typically supply enough water only for domestic needs. Irrigation is generally not feasible. When irrigation is practical, groundwater withdrawal may affect other uses. Surface water sources are used to supplement irrigation supplied by groundwater sources.

All jurisdictions in the Planning Area are vulnerable to the effects of drought; the unincorporated agricultural areas of Hickory 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.

Statistical data analysis was used to determine potential losses for drought using the USDA Risk Management Agency's insured crop losses as a result of drought in conjunction with the USDA crop exposure by county. According to the USDA's Risk Management Agency 2009 Missouri Crop Insurance Profile, 79.4% of crops were insured that year. This data suggests that the majority of Missouri crops are insured.

The Statistical data of crop insurance paid as a result of drought is from 1998-2008 and the USDA crop exposure by county is from 2007. Figure 3.4.2-1 shows that Hickory County has a Medium to low crop loss ratio.

Figure 3.4.2-1 County Crop Loss Ratio Ratings



Source: 2010 Missouri State Hazard Mitigation Plan

Table 2.4.2-1 Vulnerability of County to Drought

County	Total Crop Insurance Paid for Drought Damage 1998-2008	Crop Claims Ratio Rating	Annualized Crop Insurance Claims/Drought Damage	Crop Exposure (2007 Census of Agriculture)	Annual Crop Claims Ratio	Crop Loss Ratio Rating
Hickory	\$243,219	1	\$22,111	\$1,948,000	1.135%	2

Source: 2010 State of Missouri Hazard Mitigation Plan.

Potential Impact on Existing Structures

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.

Potential Impact on Future Development

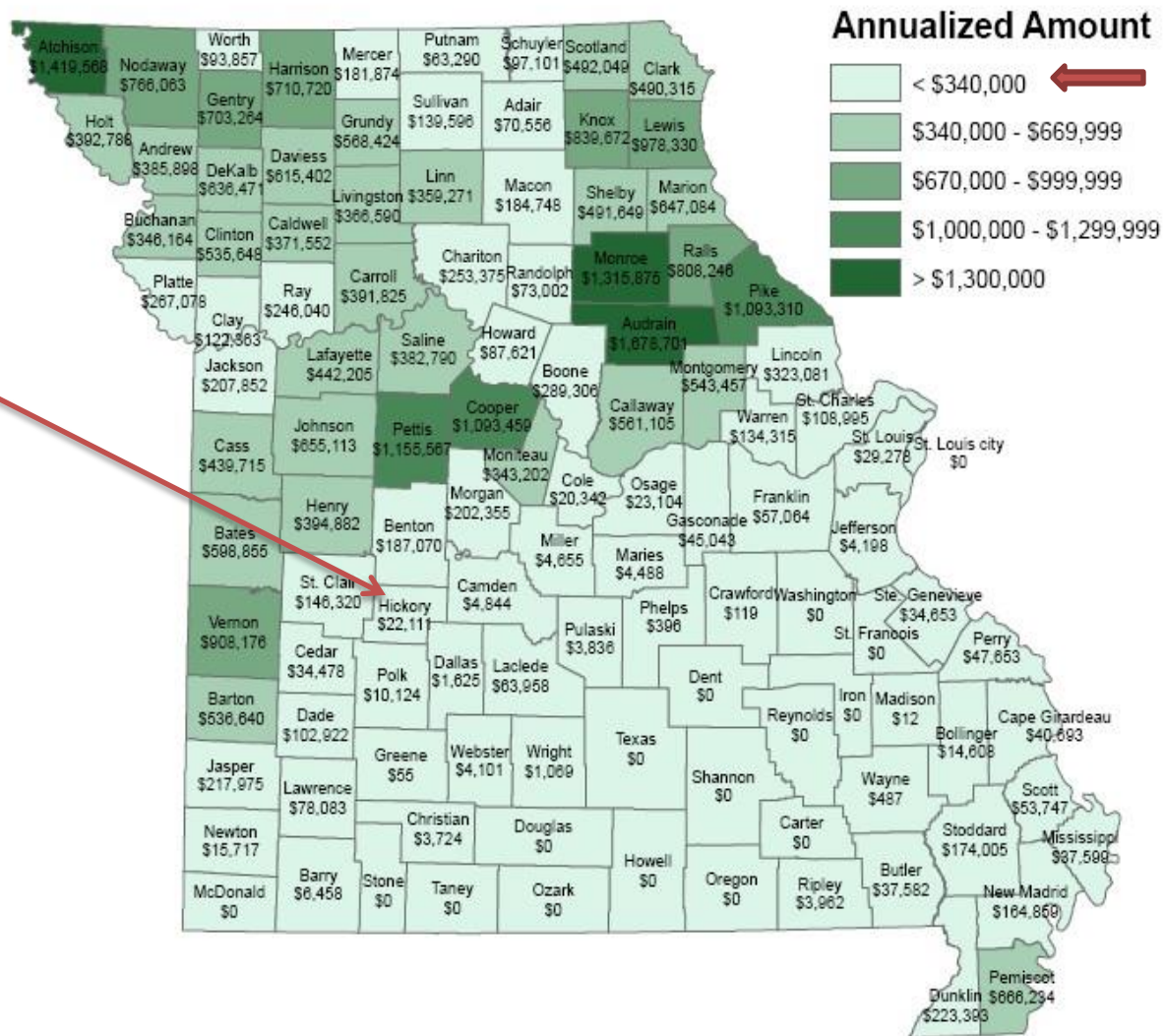
As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Determining the direct and indirect costs associated with drought is difficult because of the broad impacts of drought and the difficulty in establishing when droughts begin and end. This may be more accurately documented in local mitigation plans and direct costs associated with droughts.

The drought loss estimation methodology uses USDA Risk Management Agency's crop insurance claims paid in Missouri from 1998-2008 and the USDA's crop exposure value by county to determine the Annualized Drought Crop Insurance Claims Paid as mapped in Figure 3.4.2-2 below. USDA Risk Management Agency's crop insurance claims paid as a result of drought conditions during this time period to Hickory County totaled \$22,111.

Figure 3.4.2-2 Hickory County Crop Losses



Future development in the county can be at risk from the effects of drought. Good land management techniques are crucial in mitigating future impacts. Also, if Hickory County were to experience significant increases in population that would create greater demands on water resources. Of the counties that were determined to be highly vulnerable or moderately highly

3.4.3 Earthquake Vulnerability

Jurisdictions: All Jurisdictions

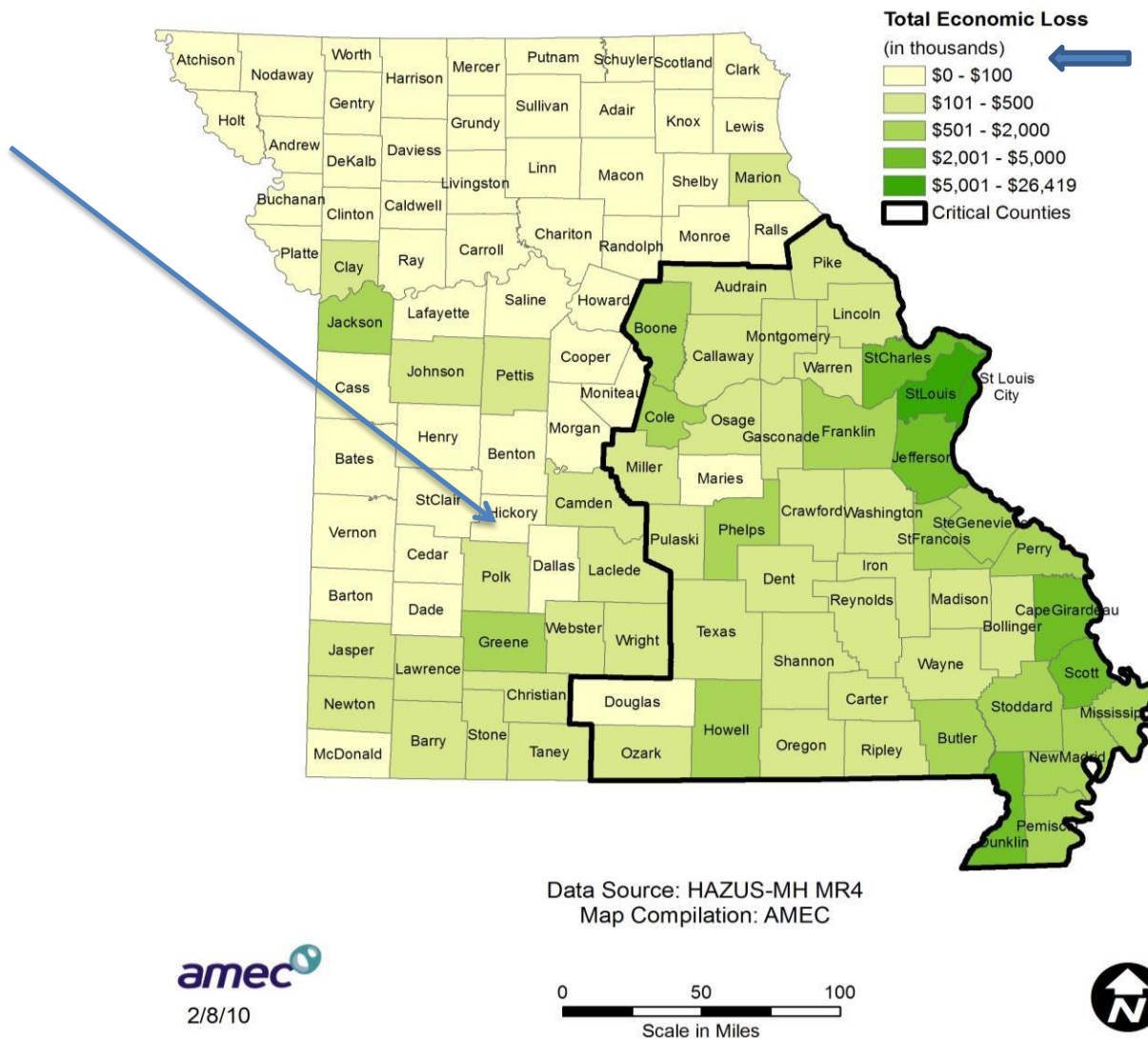
Overview

HAZUS-MH MR4 was used to analyze vulnerability and estimate losses to earthquakes in the 2010 Missouri State Hazard Mitigation Plan. As this analysis included Hickory County it is being incorporated into this county plan.

All HAZUS-MH analyses used the default inventory data associated with the August 2009 release of HAZUS-MH MR4, which includes 2006 building valuations. An annualized loss scenario that enabled a –apples to apples comparison of earthquake risk for each county was run. A second scenario, based on an event with a 2% probability of exceedance in 50 years, was done to model a worst case earthquake using a level of ground shaking recognized in earthquake-resistant design.

The results of the updated annualized loss scenario are shown in Figure 3.4.3-1 and Figure 3.4.3-2. The map in Figure 3.4.2-1 shows direct economic losses to buildings annualized over eight earthquake return periods (100, 200, 500, 750, 1,000, 1,500, 2,000, and 2,500 years). 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). This is the scenario that FEMA uses to compare relative risk from earthquakes and other hazards at the county level nationwide. The trend shows dollar losses to be most significant in the southeastern portion of the State and in the urbanized areas near St. Louis. This is consistent with the southeastern portion of the State’s proximity to the New Madrid Seismic Zone and the fact that the more developed areas in the region are likely to suffer the most building losses, particularly where there are large numbers of unreinforced masonry buildings.

Figure 3.4.1-1 Hickory Earthquake Economic Loss



The map above demonstrates that Hickory might receive from 0 to \$100 thousand in economic loss during based on an event with a 2% probability of exceedance in 50 years
(Source: State of Missouri 2010 Hazard Mitigation Plan)

The total annualized expected losses (including building and income losses) for Hickory County are presented in Table 3.4.1-1. Included in the table are the annualized loss ratio and a ranking based on this loss ratio. The loss-ratio column in Table 3.4.1-1 represents the ratio of the average annualized losses divided by the entire building inventory by county as calculated by HAZUS-MH. The loss ratio is an indication of the economic impacts an earthquake could have, and how difficult it could be for a particular community to recover from an event.

Table 3.4.1-1 **HAZUS-MH Earthquake Loss Estimation: Annualized Loss Scenario**

County	Building Loss Total (\$)*	Loss Ratio %**	Income Loss Total (\$)*	Total Loss (\$)*	Loss Ratio Rank
Hickory	23	0.004	9	32	56

Source: State of Missouri 2010 Hazard Mitigation Plan

Potential Impact on Existing Structures

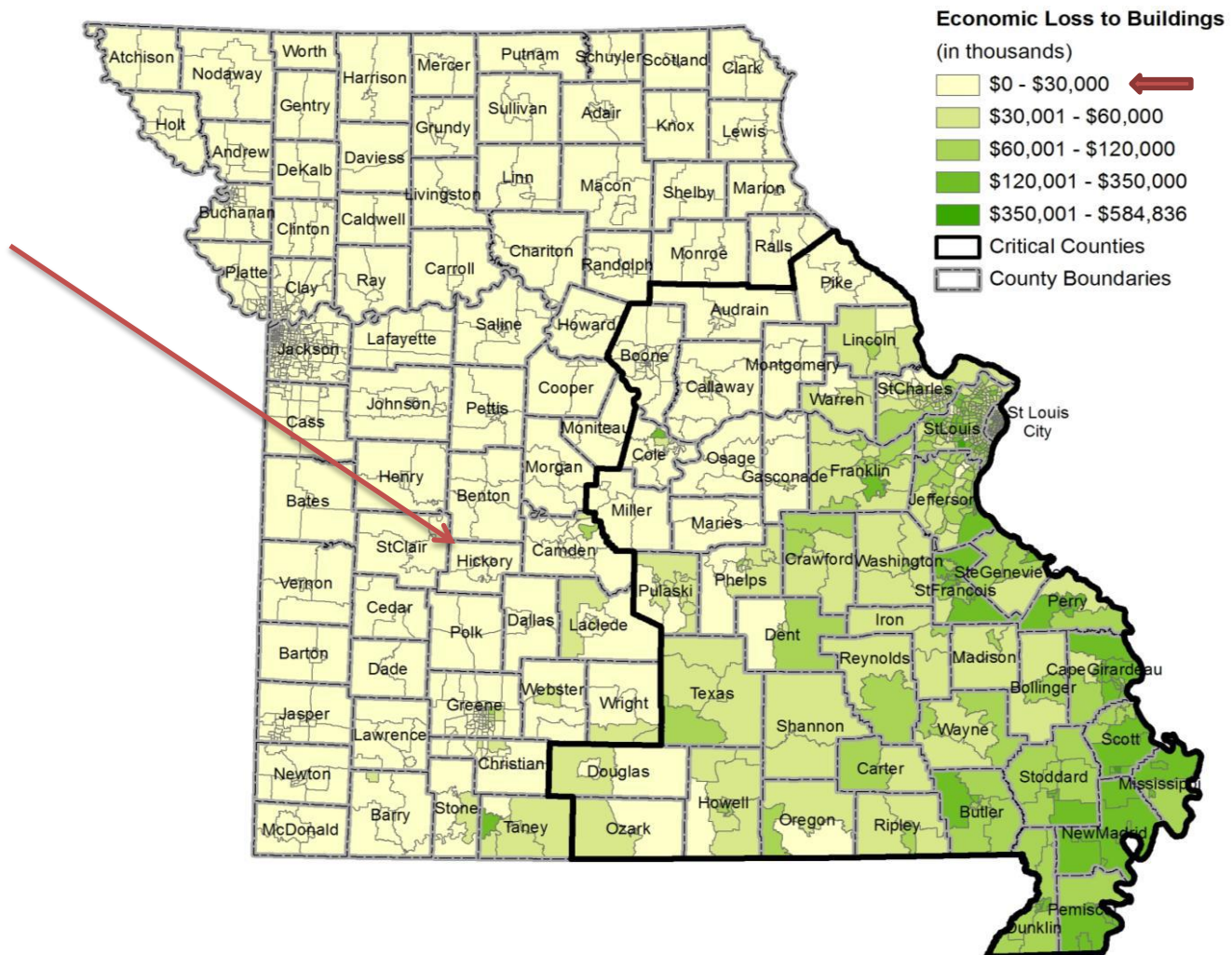
Level VI Intensity quake effects result in minimal damage. A 7.6 Magnitude quake along the New Madrid Seismic Zone would potentially result in Level V Intensity effects in Hickory County. Level V Intensity quake effects are considered “strong” and can result in significant damage to poorly built structures.

HAZUS-MH MR4 was used to analyze vulnerability and estimate losses to earthquakes in the State of Missouri Hazard Mitigation Plan, and as that information included Vernon County it is included in this plan.

All HAZUS-MH analyses used the default inventory data associated with the August 2009 release of HAZUS-MH MR4, which includes 2006 building valuations. An annualized loss scenario that enabled an –apples to apples comparison of earthquake risk for each county was run. A second scenario, based on an event with a 2% probability of exceedance in 50 years, was done to model a worst case earthquake using a level of ground shaking recognized in earthquake-resistant design.

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). This is the scenario that FEMA uses to compare relative risk from earthquakes and other hazards at the county level nationwide.

Figure 3.4.1-2 Economic Losses to Hickory County Buildings



Data Source: HAZUS-MH MR4
Map Compilation: AMEC

amec
2/11/10

0 50 100
Scale in Miles



Source: 2010 State of Missouri Hazard Mitigation plan

This figure suggest that Hickory County may suffer a \$0 to \$30,000 lose from earthquake damage.

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Impacts on future development may be mitigated by following more stringent earthquake resistant building codes. However, this type of mitigation activity may not be cost effective for most communities. The potential impact of earthquakes on future development would be the same as for existing structures.

Recommendation

Increased education, concern and subsequent action can reduce the potential effects of earthquakes can be done in conjunction with preparations for other hazards. A program that recognizes the risk of flooding, landslides and other dangers that incorporate earthquake issues will be of most benefit to citizens. Individuals and government have roles in reducing earthquake hazards. Individuals can reduce their own vulnerability by

3.4.4 Extreme Heat Vulnerability

Jurisdictions: All Jurisdictions

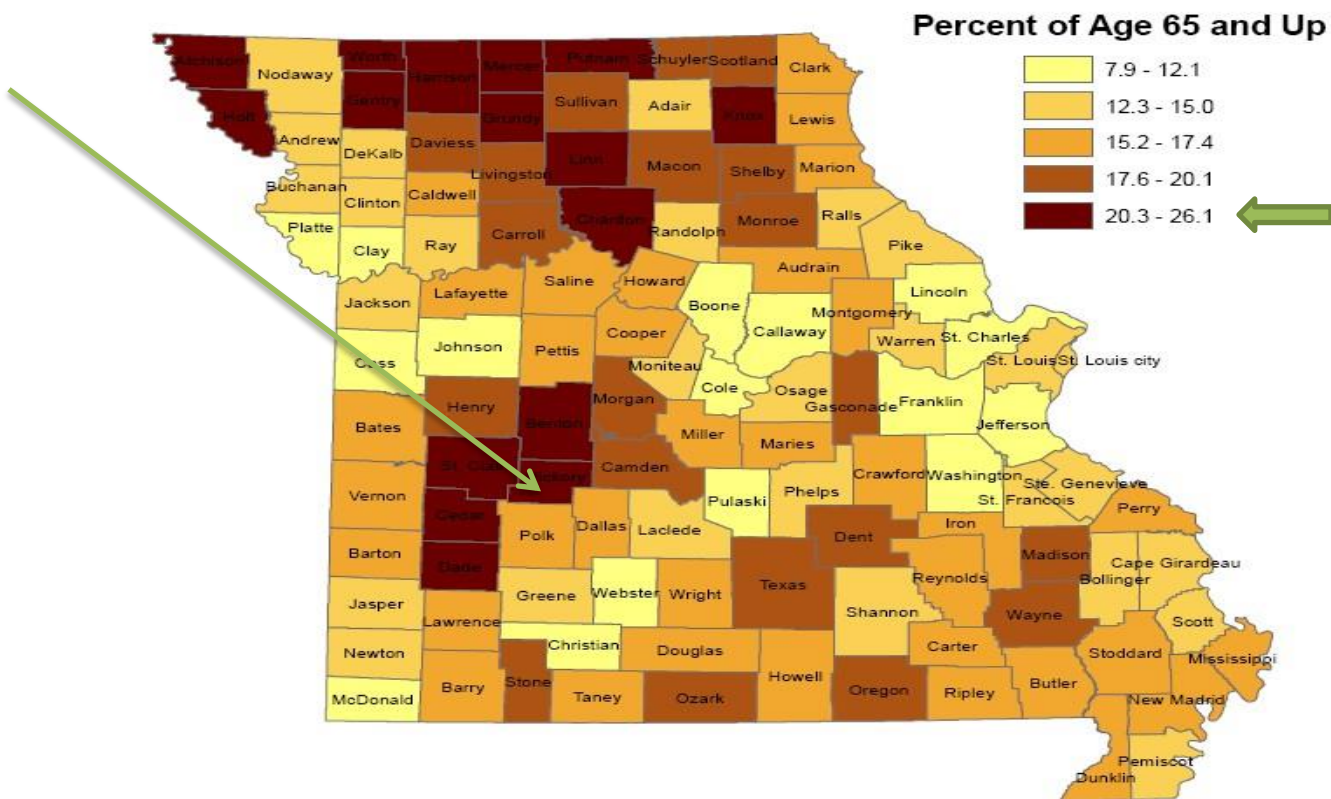
Overview

All jurisdictions are vulnerable to the effects 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. Loss of life is the most significant consequence of extreme heat. The elderly and those active or employed in outdoor settings are most vulnerable. According to the World Health Organization, “elderly” is defined as those over the age of 65. Elderly are the most susceptible to complications from excessive and/or prolonged cold or heat.

Counties with a higher percentage of elderly may be more at risk due to the heightened vulnerability of this segment of the population. As also demonstrated in Figure 3.4.4-1 Hickory County has an elderly population segment of 20.3 to 26.1 percent.

Slightly more than half 109 (54 percent) of the 203 deaths during 2000-2008 were in the 65 year and older age group. Victims in this population often live alone and have other complicating medical conditions. Also, lack of air conditioning or refusal to use it for fear of higher utility expense contributes to the number of deaths in the senior population. There were 84 (41 percent) hyperthermia deaths occurring in the 5 through 64-year-old age group. These deaths often have contributing causes such as physical activity (sports or work), complicating medical conditions, or substance abuse. Circumstances causing hyperthermia deaths in young children often involve a motor vehicle—a child left in or climbing into a parked vehicle during hot weather. From 000-2008, there were 10 (5 percent) deaths of children less than five years of age.

Figure 3.4.4-1 Distribution of Elderly Population



Data Source: US Census 2000
Map Compilation: AMEC

amec
01/19/2010

0 50 100
Scale in Miles



Source: 2010 State of Missouri Hazard Mitigation Plan

In addition to the human toll, the Midwestern Climate Center, in a paper on the 1999 heat wave, points out other possible impacts such as electrical infrastructure damage and failure, highway damage, crop damage, water shortages, livestock deaths, fish kills, and lost productivity among outdoor-oriented businesses. These damages are also connected to **Drought** when there are prolonged and/or recurrent periods of excessive heat.

Potential Impact on Existing Structures

Loss of life is of the most concern with this hazard, structural impacts also exist. While impacts exist they are limited and dependent on how prolonged the heat wave is. Failure of road surfaces, electrical infrastructure, and crop damage may all occur.

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

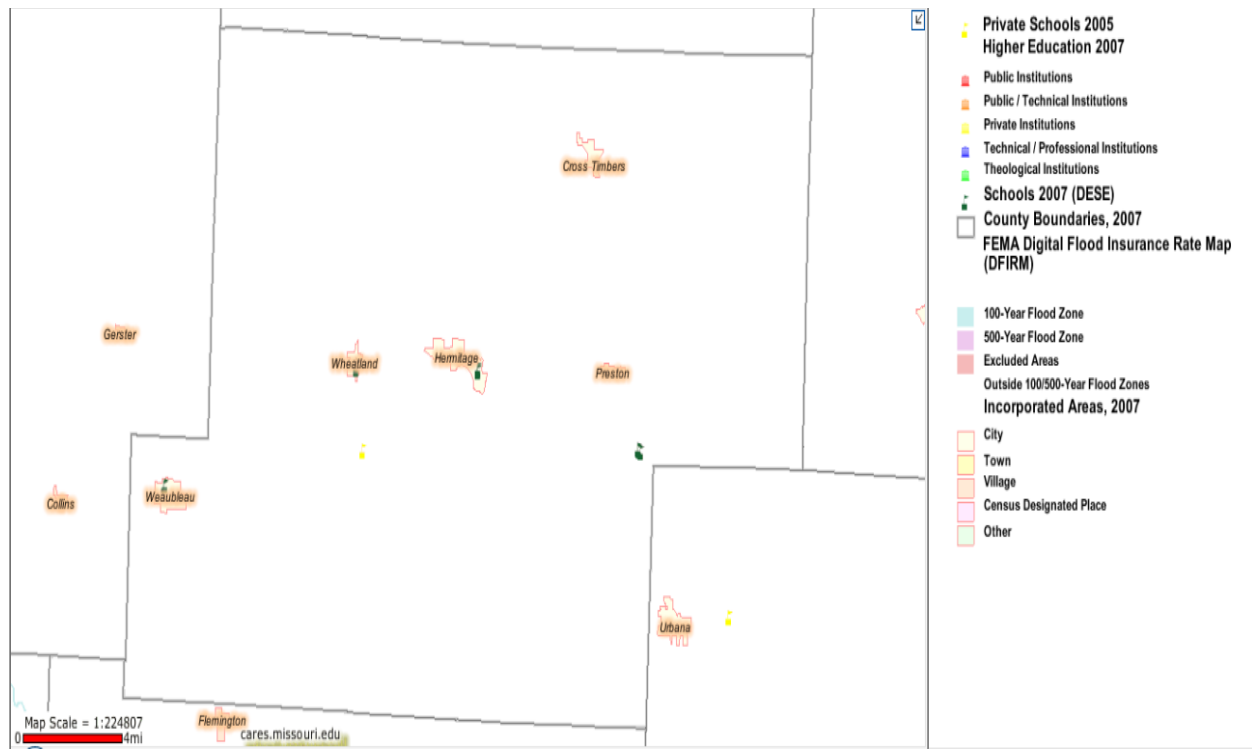
As the population in the above 65 years old category increases, Hickory County will be likely to experience greater hyperthermia deaths in Missouri when heat waves occur.

3.4.5 Flood Vulnerability

Jurisdictions: Unincorporated Hickory County, Hermitage, excluding all school districts.

As the map shown in Figure 3.4.5 indicates there are no school structures located within any FEMA SFHA's (Special Flood Hazard Areas).

Figure 3.4.5-1 Map of Hickory County Schools



Source: CARES Missouri edu.

Overview: Hickory County is not more vulnerable to dam failure than flooding but both are distinct possibilities. Because of Hermitage's close proximity to Pomme De Terre Lake and river, flooding will usually occur in the late spring and fall. Once the river and reservoir are full, locals can expect to see streams and other small tributaries backup.

Storm Flooding

Although there has been no NCDC reported loss of life or major property damage there have been recorded incidents of storm induced flooding in the following jurisdictions in Hickory County.

HERMITAGE				
Flood Type	Date	Injuries	Deaths	Property Damage
Flash Flood	01/12/2005	0	0	0

PRESTON				
Flood Type	Date	Injuries	Deaths	Property Damage
Flash Flood	01/05/2005	0	0	0
Flash Flood	10/08/2009	0	0	0
Flood / Heavy Rain	05/20/2011	0	0	0

WEAUBLEAU				
Flood Type	Date	Injuries	Deaths	Property Damage
Flash Flood	05/10/2007	0	0	0
Flash Flood	03/18/2008	0	0	0
Flood / Heavy Rain	03/19/2008	0	0	0
Flash Flood	03/31/2008	0	0	0
Flash Flood	04/10/2008	0	0	0

WHEATLAND				
Flood Type	Date	Injuries	Deaths	Property Damage
Flood / Heavy Rain	04/13/2007	0	0	0

Source: <http://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=5435725>

Potential Impact on Existing Structures

Hickory County residents, structures, and infrastructure lying in or near the Pomme De Terre River Floodplain and Pomme De Terre Lake are all vulnerable to the effects of a major flood. None of the public school district structures in Hickory County are vulnerable to the effects of this hazard.

While river flooding does not pose a direct threat to educational and other jurisdictions there is a low, indirect threat to access of structures and to populations during times of flash flooding. Other structures not within designated floodplains are also vulnerable to the effects of flash flooding brought on by storm water or sheet flooding.

Hickory County has an estimated 292 residential structures located in the 100-yr flood inundation area (190 would sustain no damages, 90 would sustain 1-10% damage, 12 would sustain 11-20% damage, etc.) This information was derived from inventory data associated with FEMA's loss estimation software HAZUS-MH as provided by the State Emergency Management Agency (SEMA).

Using the above figures and the average Median Owner-Occupied Housing Value of \$67,400 as shown in Figure 2.12.1-1, if a significant flood of the Hickory County 100 year flood inundation area should occur, damage to owner-occupied homes would total approximately \$606,600 dollars. (10 % of \$67,400 = \$6,740.00 x 90 homes = \$606,600)

The following information was added from the 2010 State of Missouri Hazard Mitigation Plan concerning estimated flood losses to the county.

Table 3.4.5-1 Estimated Losses									
Total Estimated Direct Building Loss and Income Loss to Hickory County									
County	Structural Damage	Contents Damage	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct & Income Loss	Calc. Loss Ratio	# Bldgs. Risk	# Substantially Damaged
Hickory	\$338,000	\$906,000	\$5,000	\$2,249,000	\$505,000	\$45,541,000	0.31%	10	0

Source: 2010 Missouri State Hazard Mitigation Plan

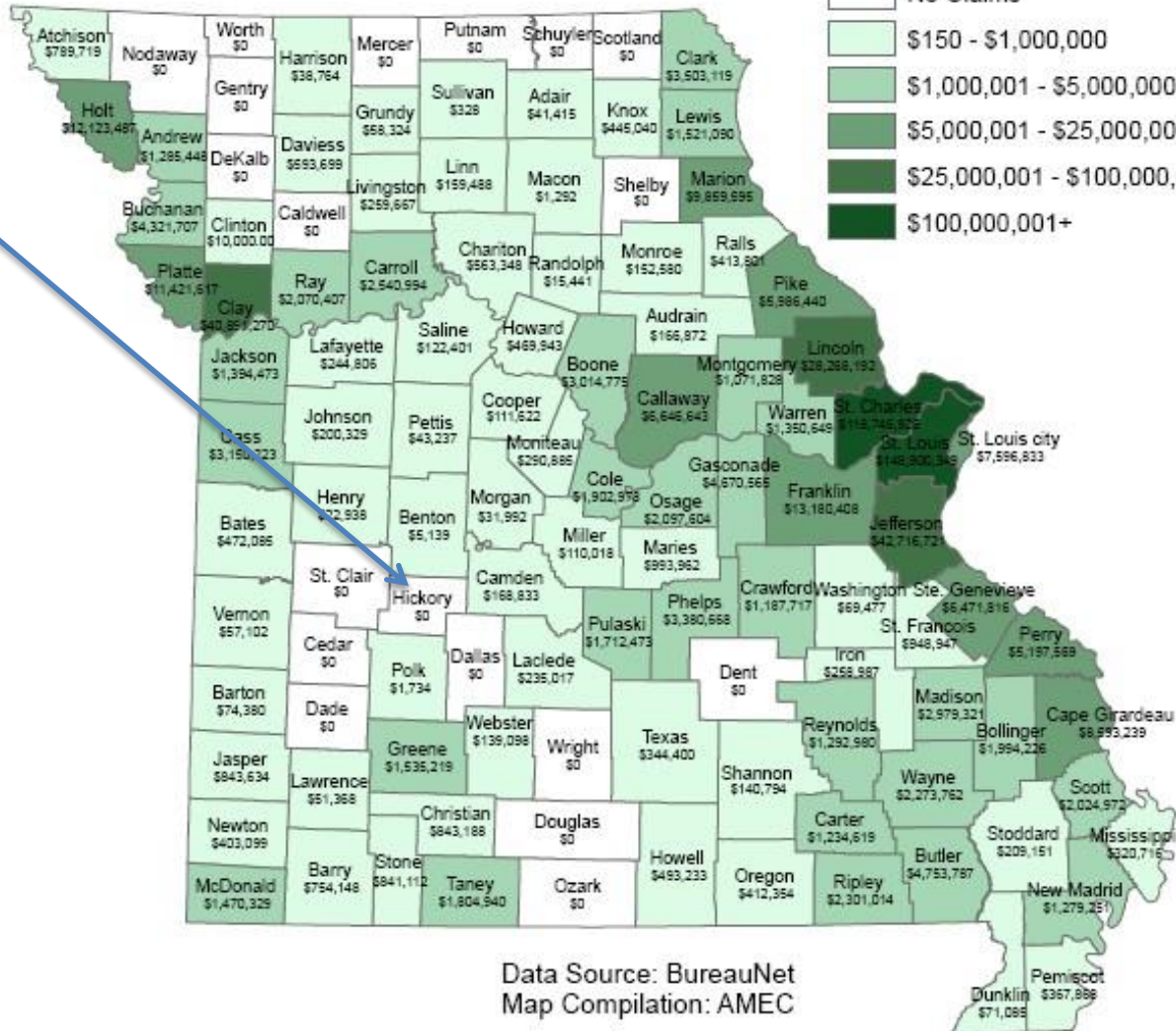
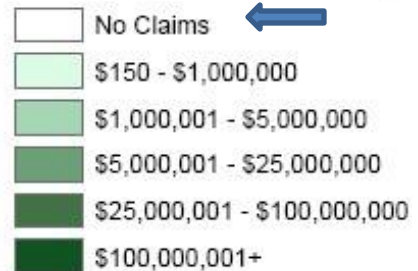
Table 3.4.5-2 Estimated Displaced People and Shelter Needs		
County	Displaced People	Shelter Needs
Hickory	79	31

Source: 2010 Missouri State Hazard Mitigation Plan

As seen in the following figure Hickory County has historically not incurred any flood insurance losses payments from 1978 to 2009.

Dollars Paid Historically for Flood Insurance Losses in Missouri by County, 1978 to Oct. 2009

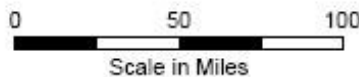
Dollars Paid Historically



Data Source: BureauNet
Map Compilation: AMEC



12/31/09



Source: Missouri 2010 Hazard Mitigation Plan

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Impact on future development is directly related to floodplain management and regulations set forth by the county and individual communities. Currently, there is no knowledge of any future development by any public school district that would be vulnerable to this hazard.

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.

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 ten-year period, and must be greater than 10 days apart.

Hickory County currently does not have any Repetitive loss or Severe Repetitive Losses listed, and there are no listed Repetitive Loss Properties for Hickory County in the 2010 Missouri Hazard Mitigation Plan.

3.4.6 Land Subsidence/Sinkhole Vulnerability

Jurisdictions: Unincorporated Hickory County

Overview

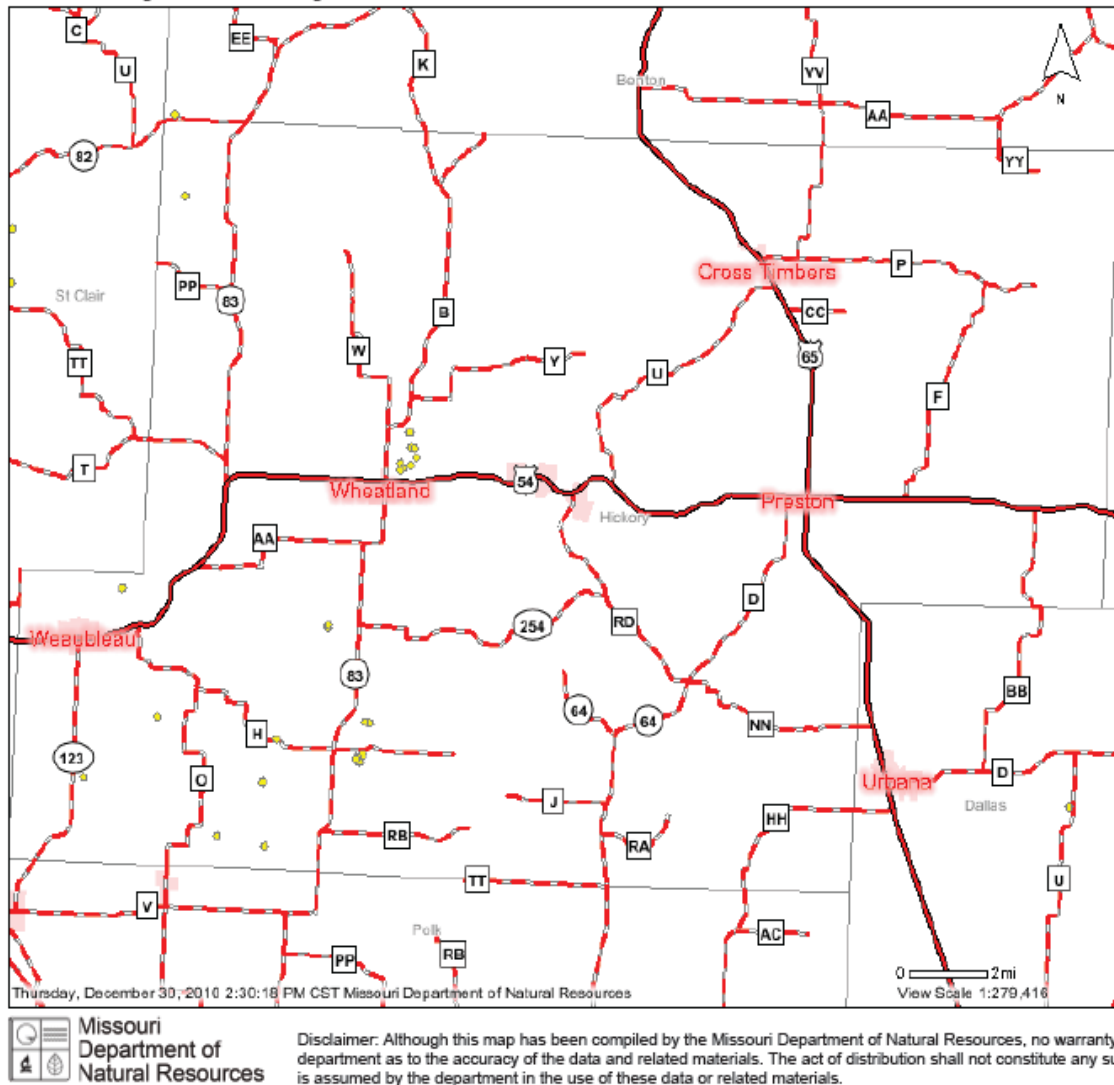
Sinkholes in Missouri are a common feature where limestone and dolomite outcrop. Dolomite is a rock similar to limestone with magnesium as an additional element along with the calcium normally present in the minerals that form the rocks. Sinkholes can be considered a slow changing nuisance; sudden, catastrophic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

There are several random areas throughout the county where sinkholes are a concern. Below is a map of sinkholes (yellow dots) located throughout Hickory County.

There are approximately 25 sinkholes within the county, but none of these sinkholes have caused structural damage to any jurisdiction within the county. For this reason, the Planning Committee did not conduct an infrastructure damage assessment. (See Figure 3.4.6-1)

Figure 3.4.6-1 Hickory County Sinkhole Locations

Hickory County Sinkholes



Potential Impact on Existing Structures

Because sinkhole collapse is not predictable there is no direct way to assess a cost impact for this hazard. In addition, there are no records kept of damages caused by sinkholes in Hickory County. 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. Areas vulnerable to the effects of sinkholes will be assessed more in Section 3.5 for parts of unincorporated Hickory County.

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

It is difficult to assess whether or not a sinkhole will have an effect on future development. Many of the sinkhole areas in Hickory County occur within public land the potential threat is minimized. Inversely, 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 can cause flooding.

3.4.7 Levee Failure Vulnerability

Jurisdictions: Hickory County and Hermitage

Overview

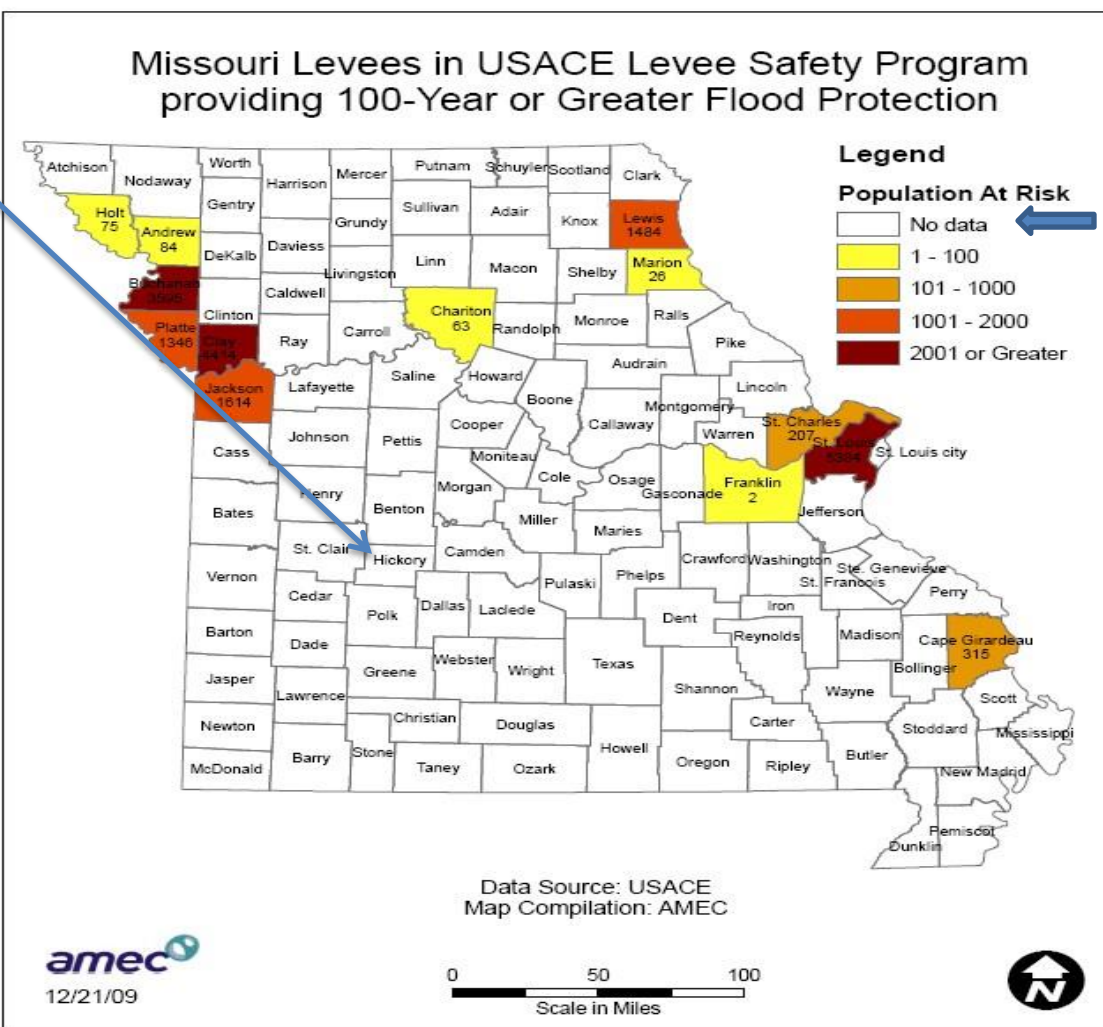
A levee as defined by the National Flood Insurance Program is defined as, “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.” Levee failure would include the walls or interior of a levee allowing water to inundate the area that the levee is meant to protect.

Currently, there is no single comprehensive inventory of levee systems in the State of Missouri, or individual counties. Levees have been constructed across the State by public entities and private entities with varying levels of protection, inspection oversight and maintenance.

The National Levee Safety Program Act of 2007 directed the development of a national levee safety program, in addition to the inventory and inspection of levees. This act provided authority to establish a sixteen member "Committee on Levee Safety," to develop recommendations for a National Levee Safety Program, including a strategic implementation plan. As this effort to establish a consistent method to inventory and inspect levees is a work in progress, comprehensive data to determine vulnerability to levee failure is somewhat limited.

As figure 3.4.7-1 from the 2010 Missouri State Hazard Mitigation Plan demonstrates, there are no known levees in Hickory County that provide 100 year or greater flood protection.

Figure 3.4.7-1 100 Year Flood Protection Levees



Potential Impact on Existing Structures

There are no known structures in Hickory County that would be vulnerable to the effects of levee failure

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

There is no data concerning levees within the county. The USACE's national Levee Database does not show any federal levees in the county. City and state data also does not reveal any information about Hickory County Levees.

Although there may be levees located in Hickory County, they are probably low-head agricultural levees, the breach of which would not impact populations of people. Because of these facts the Planning Committee did not conduct an infrastructure damage assessment.

3.4.8 Severe Winter Weather Vulnerability

Jurisdictions: All jurisdictions

Overview

Hickory County sometimes suffers from heavy damage due to severe winter storms and therefore most winter storms impact the community only temporarily. It is not uncommon for a severe winter storm to leave a long lasting mark on the community by inflicting heavy financial damage on the area but storms of this magnitude are rare.

The method that was used in the 2010 Missouri State Hazard Mitigation Plan included Hickory County and is therefore has been included in this plan. To determine vulnerability to severe winter weather across Missouri was statistical analysis of data from several sources: National Climatic Data Center (NCDC) storm events data (1993 to July 2009), FEMA's Public Assistance (PA) funds from DR-1672, DR- 1736, DR-1748, and DR-1822, Crop Insurance Claims data from USDA's Risk Management Agency (1998-2008), total building exposure from HAZUS-MR4, U.S. Census Data (2000), USDA's Census of Agriculture (2007), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute I the Department of Geography at the University of South Carolina.

Table 3.4.8-1 provides the housing density, building exposure, crop exposure, and social vulnerability data, total incidents, total property loss, and the total crop insurance paid. These are the common data elements for the analysis of severe winter weather. The total property loss column represents a combination of NCDC and FEMA PA funds. For declared events, the PA damage figures were used in lieu of NCDC data. NCDC damages represent early estimates and the FEMA PA funds represent actual expenditures.

Potential Impact on Existing Structures

A series of small winter storms can impact several jurisdictions. This increases the financial burden on communities and can have a more far reaching economic impact. Below are listed the many impacts severe winter storms can have on Hickory County.

- **Life and Property-** Many deaths from winter storms are a result of traffic accidents caused by a combination of poor driving surfaces and driving too fast for the conditions. Accidents during winter storms can be particularly devastating for often multiple cars are involved. There are also specific sections of the community that are more vulnerable than others to the complications caused by Severe Winter Weather such as the elderly. Elderly are the most susceptible to complications from excessive and/or prolonged cold or heat. According to the US Census Bureau website the estimated 2000 elderly population for Hickory County stands at 3,828. The 2008 elderly population was unavailable for this area.
- **Roads and Bridges-** Roads and bridges serve as vital arteries for all residents. Winter storms often limit the effectiveness of transportation by making driving conditions difficult and unsafe. Emergency vehicles also have trouble operating in these conditions that slow down response times thus limiting their effectiveness in an emergency.
- **Power Lines-** Ice storms often adversely impact consistent power supplies. The ice can build up on the wires causing them to fall or the ice can lead to falling tree limbs which then knock down power lines. Fallen wires and limbs can damage vehicles and pedestrians. When this occurs power outages can be dangerous. For instance, if the population relies on electricity for heat and the electricity does not work for a long time, people run the risk of hypothermia. This is a particular concern for more vulnerable populations such as the elderly.
- **Water Lines-** Winter storms and their associated cold weather lead to the ground freezing and thawing. As the ground freezes and thaws, pipes in the ground shift and sometimes break causing a lack of potable water. Also, when a pipe breaks, damage to property can be extensive and expensive with the cost falling on the property owner, not the city.

Currently, there is not a reliable or accurate way to estimate costs associated with winter storms. Too many variables exist to accurately portray how much damage would be incurred by a winter storm. For instance, the cost of a snowstorm that dropped 20 inches would be different than an ice storm that causes different types of damage and challenges to infrastructure. Locations of heavier snow accumulation, time of day, and other characteristics would all play a role in determining the cost of a winter storm. There have been 10 ice/snow storms since the previous plan was published in 2004/2005.

Table 3.4.8-1 provides the housing density, building exposure, crop exposure, and social vulnerability data, total incidents, total property loss, and the total crop insurance paid. These are the common data elements for the analysis of severe winter weather. The total property loss column represents a combination of NCDC and FEMA PA funds. For declared events, the PA damage figures were used in lieu of NCDC data. NCDC damages represent early estimates and the FEMA PA funds represent actual expenditures.

Table 3.4.8-1 Housing, Density, Building Exposure, Crop Exposure, Social Vulnerability Index, Total Incidents, Total Property Loss, and Total Crop Insurance Paid Data Hickory County							
County	Housing Units /sqmi	Total Building Exposure (\$)	Crop Exposure (2007) (\$)	Social Vulnerability Index (1-5)	Total Incidents	Total \$ Property Loss (\$)	Total Crop Insurance Paid (\$)
Hickory	15.5	\$482,823,000	\$1,948,000	4	22	\$4,601,476	\$15,937

From this statistical data collected, seven factors were considered in determining overall severe winter storm vulnerability as follows: housing density, likelihood of occurrence, building exposure, crop exposure, average annual property loss ratio, average annual crop insurance claims and social vulnerability.

To complete the vulnerability analysis utilizing the factors described above, a rating value of 1-5 was assigned to the data obtained for each factor. These rating values correspond to the following descriptive terms:

- 1) Low
- 2) Medium-low
- 3) Medium
- 4) Medium-high
- 5) High

The rating values of all factors were then combined to determine the overall vulnerability rating. Table 3.4.8-2 below provides the factors considered and the rating values assigned.

Table 3.4.8-2 Vulnerability Analysis Rating Factors

Factors Considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high-4	High (5)
Housing Density (# per sq. mile)	<50	50 to 99	100 to 299	300 to 499	>500
Building Exposure (\$)	<\$0.5B	\$0.5B to \$0.9B	\$1B to \$1.9B	\$2B to \$5.9B	>6B
Crop Exposure (\$)	<\$10M	\$10M to \$24M	\$25M to \$49M	\$50M to \$99M	>\$100 M
Social Vulnerability	1	2	3	4	5
Likelihood of Occurrence (# of events/ yrs. of data)	1.653-1.025	2.280-1.654	2.907-2.281	3.535-2.908	4.162-3.535
Annualized Property Loss Ratio (annual property loss/ exposure)	<\$600,000	\$1.099M-\$600,000	\$1.699M-\$1.1M	\$2.9M-\$1.7B	> \$3M
Overall Vulnerability Rating	<1.5	1.6-2	2.1-2.49	2.5- 2.9	> 3

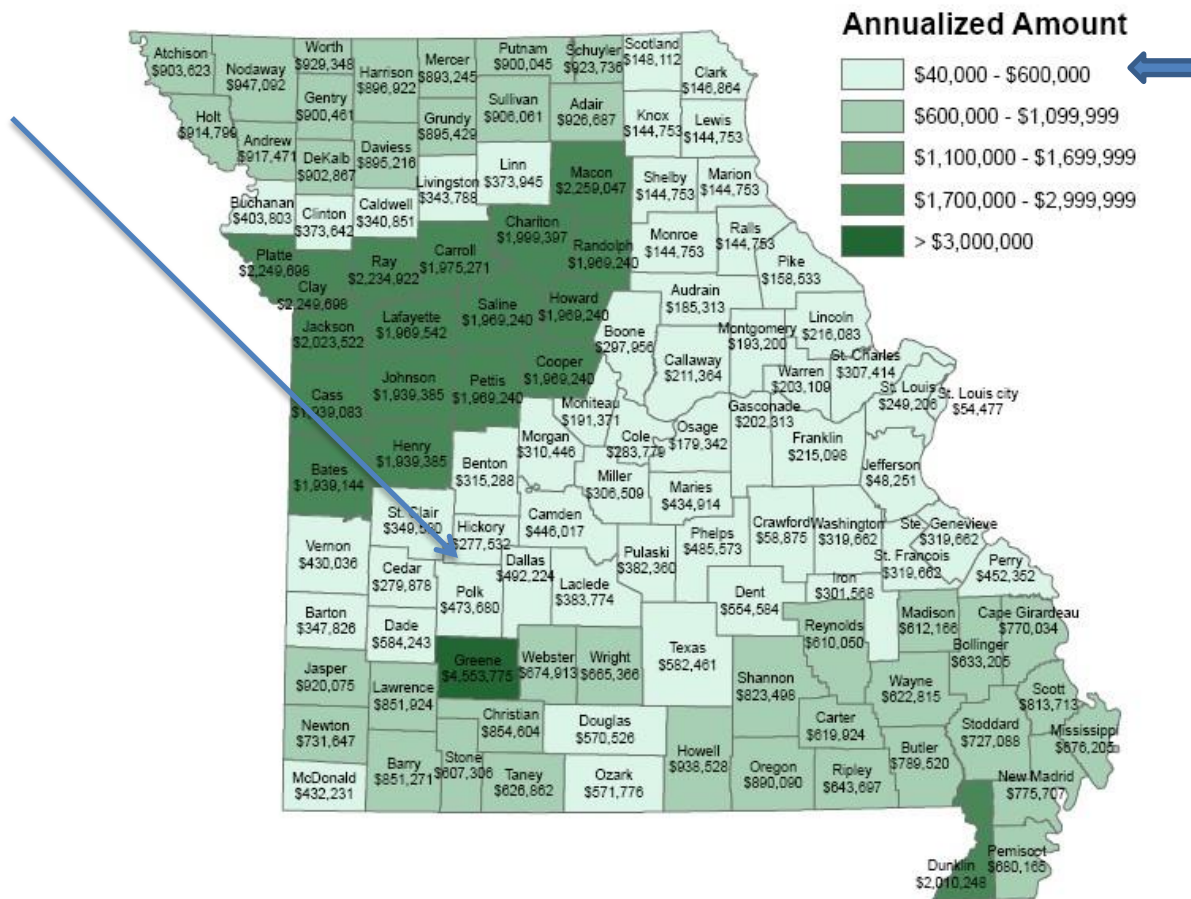
Overview and Analysis of Potential Loss Estimates to Severe Winter Weather

To determine potential loss estimates to severe winter weather in Missouri, the available historical loss data was annualized to determine future potential losses. Table 3.4.8-3 provides the annualized total loss estimates (property and crop) for all counties in Missouri and the independent City of St. Louis. Most of the property damages that occur as a result of severe winter weather are a result of utility failure (loss of power).

Table 3.4.8-3 Vulnerability Analysis for Severe Weather Hazard by County

County	Housing Density Rating	Likelihood rating	Exposure Rating	Property Loss Ratio Rating	Crop Exposure Rating	Crop Loss Ratio Rating	Social Vulnerability Index	Vulnerability Rating
Hickory	1	1	1	2	1	4	4	Medium-low

Figure 3.4.8-1 Annualized Severe Winter Weather



Data Source: NCDL database and FEMA's Public Assistance Claims
Map Compilation: AMEC

amec
01/20/2010

0 50 100
Scale in Miles



Figure 3.4.8-1 shows the annualized severe winter weather damages across Missouri. Hickory County had annualized damages in the amount of \$277,532. (Source: State of Missouri 2010 Hazard Mitigation Plan).

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Any areas of future development could be potentially impacted by the severe winter storm/extreme cold hazard because the entire planning area is exposed and vulnerable. For the severe winter storm hazard, the entire County has been identified as the hazard area.

In recent years, the weather pattern has caused more changes than development trend changes in Missouri. The last four Presidential Declarations since 2007 for winter weather has all been south of the Missouri River.

Also future development could potentially increase vulnerability to this hazard by increasing demand on the utilities and increasing the exposure of infrastructure networks. (*Source: 2010 Missouri State Hazard Mitigation plan*)

3.4.9 Tornado Vulnerability

Jurisdictions: All jurisdictions

Overview

All jurisdictions in Hickory County are vulnerable to the effects of tornadoes. All above ground structures are vulnerable to the effects of a tornado or thunderstorm and all other hazards associated with them (hail, rain, flooding, flying debris, etc.) According to NOAA, a tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Currently, none of the municipalities in Hickory County have FEMA 361 standard storm shelters.

Other hazards associated with tornadoes include;

- Hail
- Downbursts
- Heavy Rains
- Lightning
- Flash Flooding
- Straight-Line Winds

Hickory County has been hit by 12 tornadoes since 1950 with none causing NCDC reported significant loss of life. In 1982 a tornado touched down causing \$1.72 million dollars in reported damages. That is not to say that the prevention of just one loss of life shouldn't be a high priority.

Analysis of Vulnerability to Tornadoes

The State of Missouri developed a statistical vulnerability methodology which was used to determine annualized tornado losses by county. This information from the 2010 State of Missouri Hazard Mitigation Plan includes Hickory County.

This methodology used the National Climatic Data Center (NCDC) data for tornado losses between 1950 and July 31, 2009. It is important to realize that one limitation to this data is that many tornadoes that might have occurred in uninhabited areas, as well as some inhabited areas, have not been reported. The incompleteness of the data suggests that it is not appropriate for use in parametric modeling. In addition, NOAA data cannot show a realistic frequency distribution of different Fujita scale tornado events, except for recent years. Thus a parametric model based on a combination of many physical aspects of the tornado to predict future expected losses was not used. The statistical model used for this analysis was probabilistic based purely on tornado frequency and historic losses. It is based on past experience and forecasts the expected results for the immediate or extended future.

The approach to the 2010 update of tornado risk in Missouri included an update of the tornado events and annualized losses and an enhanced analysis and representation of the risk assessment results (see Table 3.4.9-1). The number of tornado occurrences was updated by adding the events that have been reported in each county since 2006 (through July 31, 2009).

The rating values of all factors were then combined to determine the overall vulnerability rating. 3.4.9-1 below provides the factors considered and the rating values assigned.

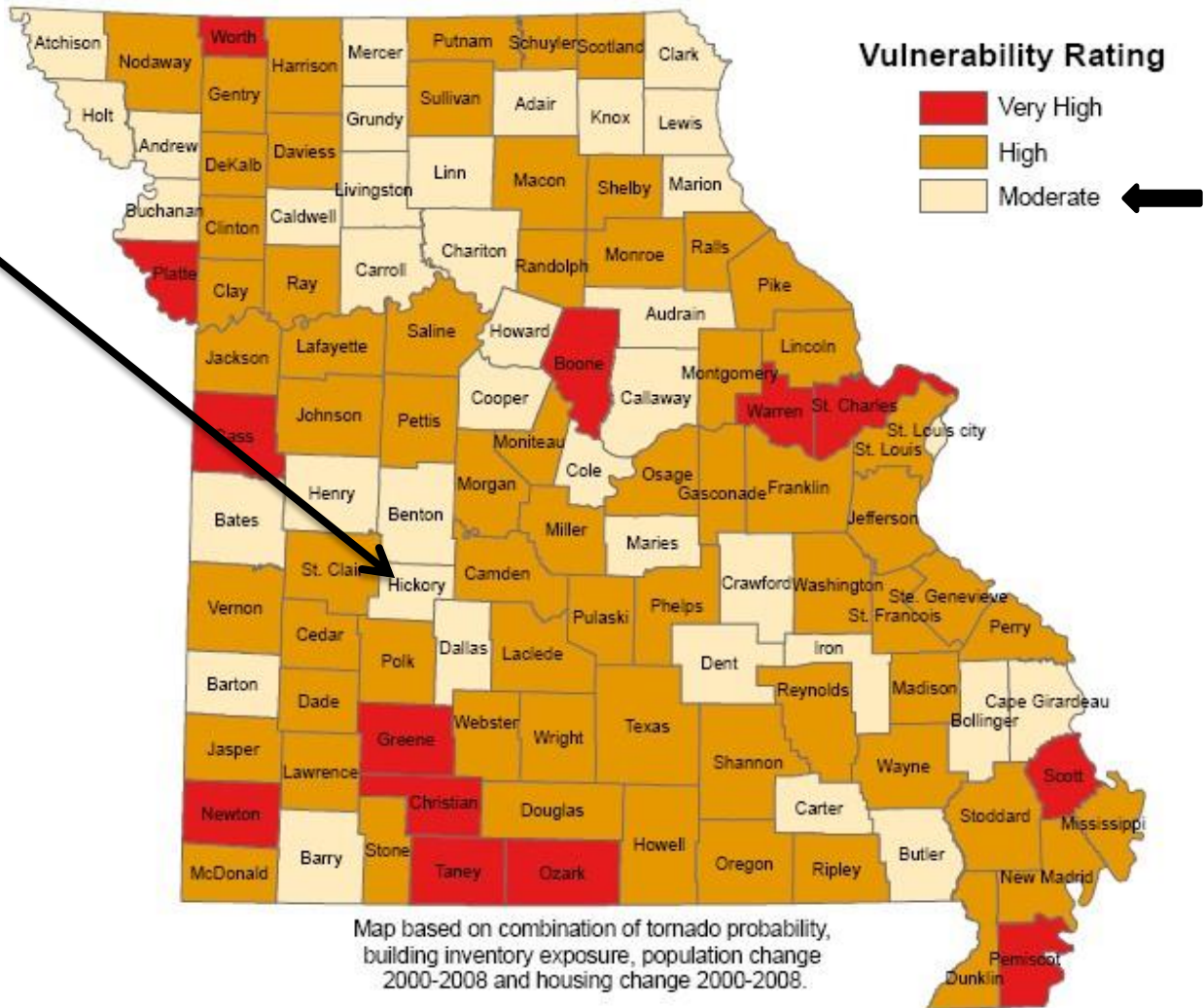
Table 3.4.9-1 Factors and Ranges Considered in Tornado Vulnerability Analysis

Factors Considered	Moderate (1)	High (2)	Very High (3)
Likelihood of Occurrence (# of events/ yrs. of data)	6-24	25-49	50-68
Loss Ratio %	0-.113	0.114-.226	0.227-0.340
Population % Change	Below 6	7-22	23-39
Housing % Change	Below 12	13-25	26-39
Overall Vulnerability Rating	4 and 5 Rating	6 and 7 Rating	8 and 9 Rating

Source: 2010 State of Missouri Hazard Mitigation Plan

Figure 3.4.9-1 below from the 2010 Missouri State Hazard Mitigation plan demonstrates that Hickory County has a moderate tornado vulnerability rating.

Figure 3.4.9-1 Missouri County Tornado Vulnerability Rating Hickory County



Data Source: Tornado data: NOAA-NCDC, Building Inventory: HAZUS-MH MR4,
Population & Housing data: US Census
Map Compilation: AMEC

amec
02/03/2010

0 50 100
Scale in Miles



Source: 2010 Missouri State Hazard Mitigation Plan

While this approach attempts to prioritize tornado vulnerable counties, it does not identify any particular geographic patterns to tornado risk. This is consistent with the random nature of tornadoes.

Potential Impact on Existing Structures

While past impacts have been relatively minimal, future disasters can cause extensive NCDC reported damage. There is a wide range of impact possible from a tornado or thunderstorm and wind speeds effect all structure types differently. Non-permanent and wood framed structures are very vulnerable to high winds in terms of destruction. While high winds are the force behind damage, it is the windblown debris that causes the most damage and deaths from a tornado.

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

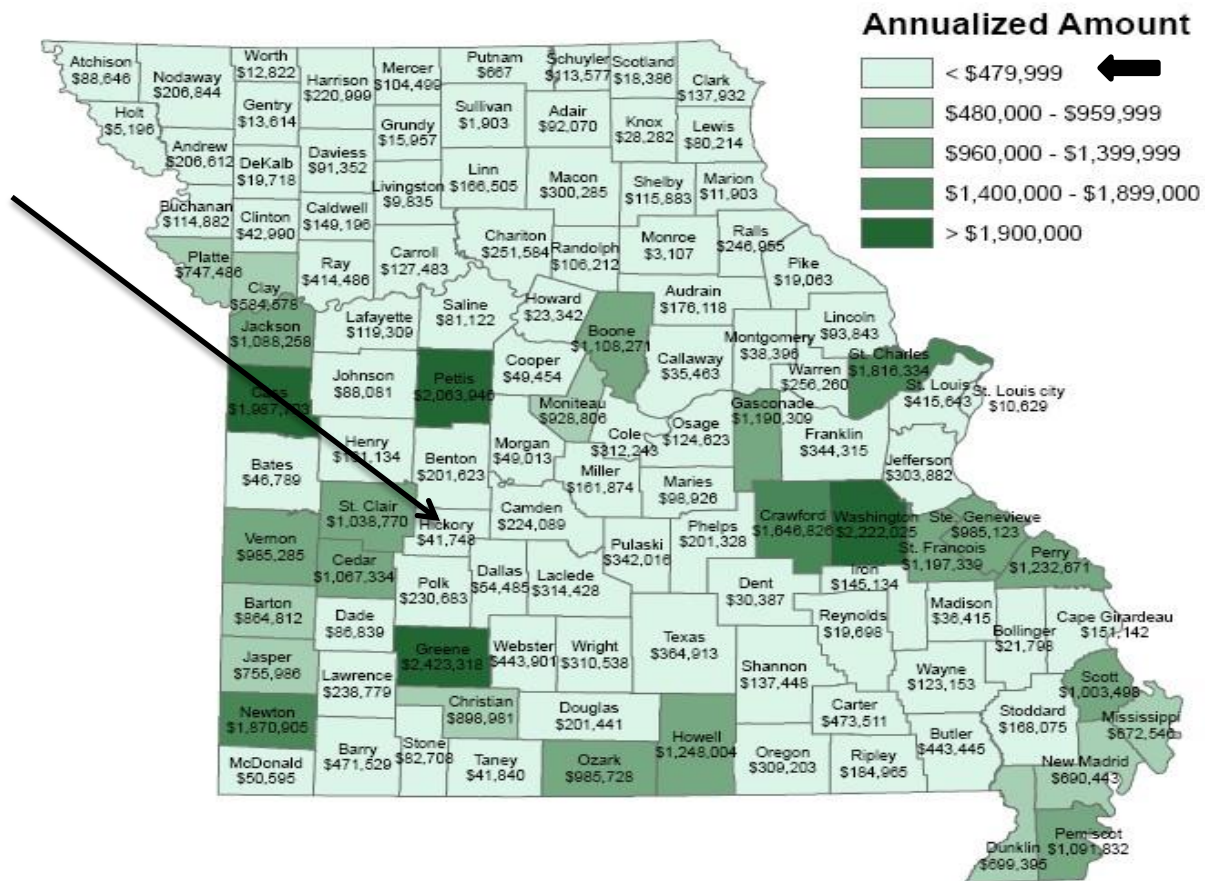
Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Due to the possible increase in population and growth and future development there will be increased vulnerability to tornadoes. Population and housing unit growth were factored into the previously described vulnerability analysis. Future development should consider tornadoes hazards at the planning, engineering, and architectural design stages.

Zoning and/or subdivision regulations across the State and Hickory County do not address severe thunderstorms, wind, hail or tornadoes. Local building regulations could be developed in highly vulnerable areas to require shatter-proof glass on critical facilities and/or facilities housing vulnerable populations, higher standards for tying down roofs, and/or other methods to mitigate impacts from severe summer storms.

As figure 3.4.9-2 below demonstrates the annualized tornado damages to current and future development may be \$41,748.

Figure 3.4.9-2 Annualized Tornado Damages



3.4.10 Thunderstorm Vulnerability (includes damaging winds, hail and lightning)

Severe Thunderstorms are a common occurrence in Hickory County. Since wind, hail, and lightning are all contributing elements of severe thunderstorms in the county, the planning for this vulnerability focused on damaging winds in excess of 67 miles per hour (58 knots), hail in excess of 0.75 inches or larger and damaging lightning strikes to analyze vulnerability, risk, and estimated losses to this hazard across the County. This analysis is from the 20101 Missouri State Hazard Mitigation Plan.

The method used to determine vulnerability to severe thunderstorms across Missouri was statistical analysis of data from several sources:

National Climatic Data Center (NCDC) storm events data (1993 to July 2009), Crop Insurance Claims data from USDA's Risk Management Agency (2004-2008), U.S. Census Data (2000), USDA's Census of Agriculture (2007), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina.

Table 3.4.10-1 provides the housing density, building exposure, crop exposure, and social vulnerability data. These are the common data elements for the analysis of wind, hail, and lightning with one exception; the lightning analysis did not consider crop exposure as crop loss is an unlikely result of lightning events.

Table 3.4.10-1 **Housing Density, Building Exposure and Crop Exposure Data Vernon**

County	Housing Units /sqmi	Total Building Exposure (\$)	Crop Exposure (2007 Census of Agriculture)	Social Vulnerability Index (1-5)
Hickory	15.5	\$482,823,000	\$1,948,000	5

The State plan also used the statistical data contained in Table 3.4.10-2 in this analysis.

Table 3.4.10-2 Additional Statistical Data Compiled for Hickory County Vulnerability

County	Total Hail Incidents	Total Hail Property Loss (\$)	Total Crop Insurance Paid for Hail Damage (\$)	Total Wind Incidents (\$)	Total Wind Property Loss (\$)	Total Crop Insurance Paid for Wind Damage (\$)	Total Lightning Incidents	Total Lightning Property Loss (\$)
Hickory	56	\$2,000	\$0	14	\$68,000	\$0	0	\$0

Potential Impact on Existing Structures

From this statistical data collected, five factors were considered in determining overall vulnerability to lightning as follows: housing density, likelihood of occurrence, building exposure, average annual property loss ratio, and social vulnerability. For hail and wind, the two additional factors of crop exposure and average annual crop insurance claims as a result of these hazards were considered.

To complete the vulnerability analysis utilizing the factors described above, a rating value of 1-5 was assigned to the data obtained for each factor. These rating values correspond to the following descriptive terms:

- 1) Low
- 2) Medium- Low
- 3) Medium
- 4) Medium-high
- 5) High

The rating values of all factors were then combined to determine the overall vulnerability rating. Table 3.4.10-3 below provides the factors considered and the ranges for the rating values assigned.

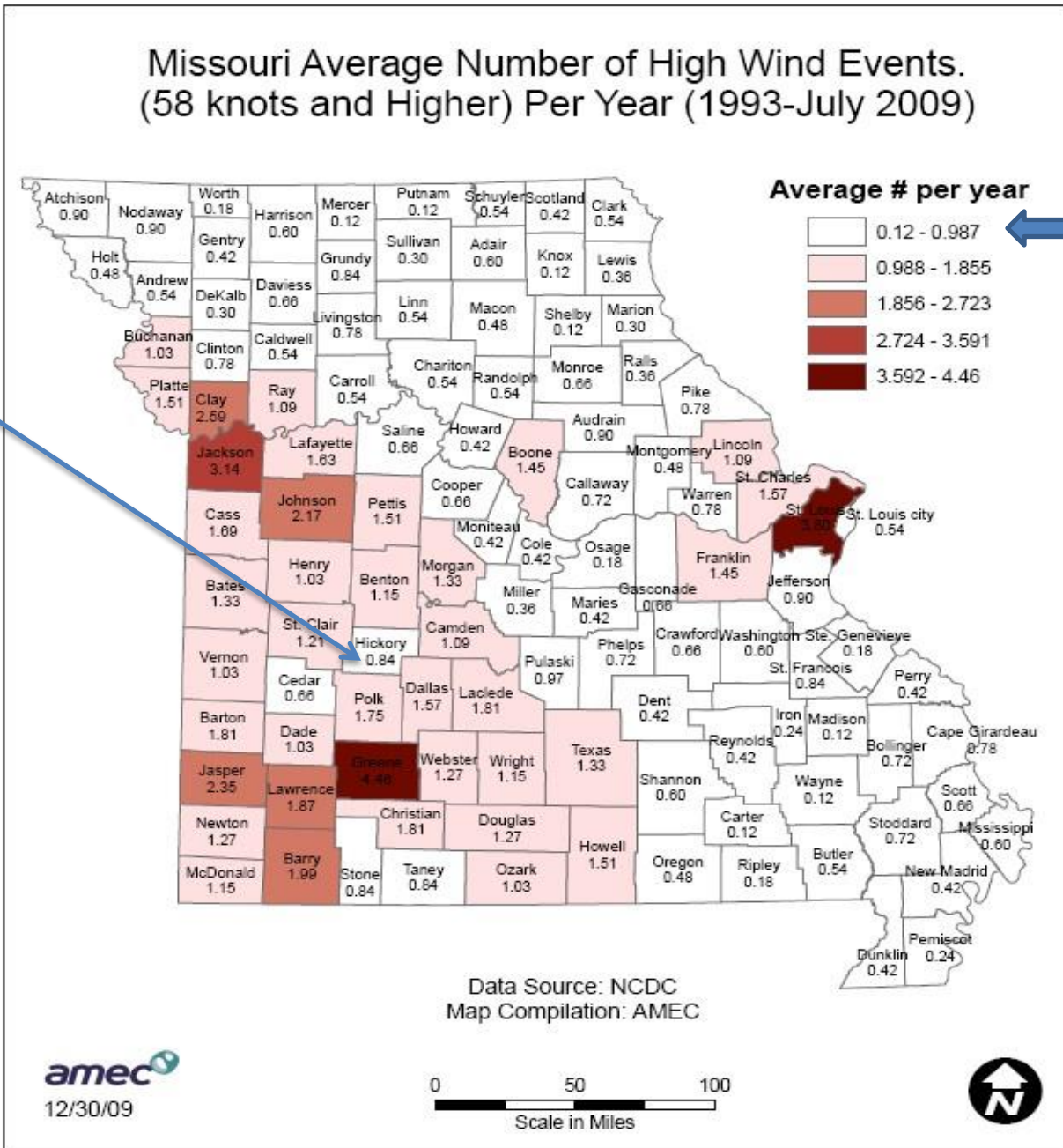
Table 3.4.10-3 Vulnerability Rating Factors

Factors Considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high-4	High (5)
Common Factors					
Housing Density (# per sq. mile)	<50	50 to 99	100 to 299	300 to 499	>500
Building Exposure (\$)	<\$0.5B	\$0.5B to \$0.9B	\$1B to \$1.9B	\$2B to \$5.9B	>6B
Crop Exposure (\$ in millions) (hail and wind only)	<\$10,000	\$10,000 to \$24,999	\$25,000 to \$49,999	\$50,000 to \$99,999	>\$100,000
Social Vulnerability	1	2	3	4	5
Wind					
Likelihood of Occurrence (# of events/ yrs. of data)	.12 to .987	.988 to 1.855	1.856 to 2.723	2.724-3.591	3.592 to 4.46
Average Annual Property Loss Ratio (annual property loss/ exposure)	0 to .0186	.0190-.0380	0.0381 to .0570	.0571 to .0760	.0761-.226
Wind Crop Loss Ratio (annual crop claims/ exposure)	0 to .0099	.010 to .019	.020-.029	.030-.040	.041-.1300
Hail					
Likelihood of Occurrence (# of events/ yrs. of data)	1.15 to 4.273	4.274 to 7.397	7.398 to 10.521	10.522 to 13.645	13.646 to 16.77
Average Annual Property Loss Ratio (annual property loss/ exposure)	0 to .015	.016 to .031	.032 to .047	.048 to .063	.063 to .080
Hail Crop Loss Ratio (annual crop claims/ exposure)	0 to .053	.054 to .10	.11 to .15	.16 to .21	.22 to .27
Lightning					
Likelihood of Occurrence (# of events/ yrs. of data)	0 to .14	.15 to .30	.31 to .45	.46 to .61	.62 to .78
Average Annual Property Loss Ratio (annual property loss/ exposure)	0 to .000427	0.000428 to .000855	.000856 to .00128	.00128 to .00170	.00171 to .00572

Source: 2010 State of Missouri Hazard Mitigation plan

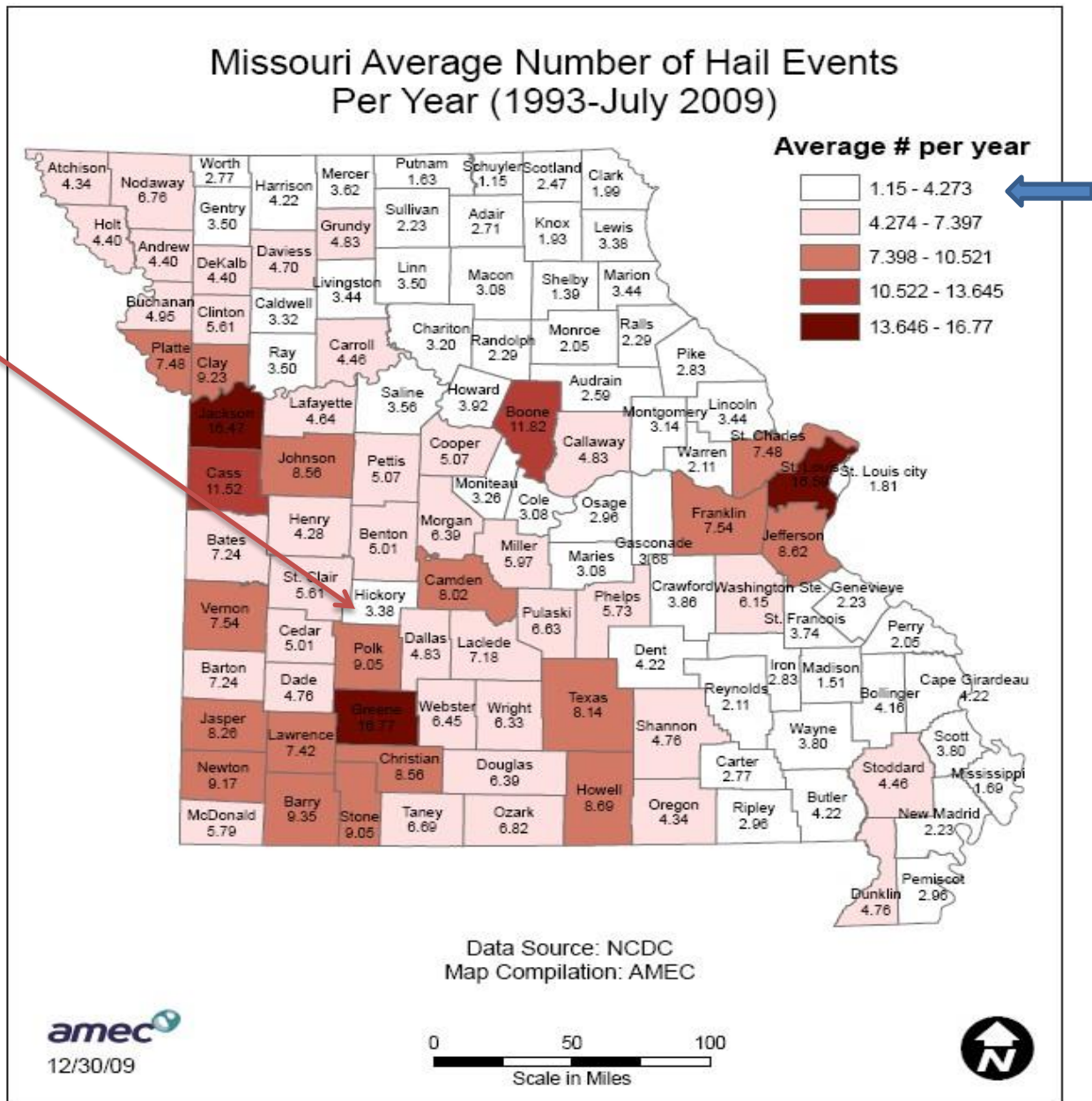
Figure 3.4.10-1, Figure 3.4.10-2, and Figure 3.4.10-3 provide the likelihood of occurrence for wind, hail, and lightning events in Missouri counties based on the historical events reported in the NCDC database for the period from 1993 to July 2009.

Figure 3.4.10-1 Hickory County High Wind Events



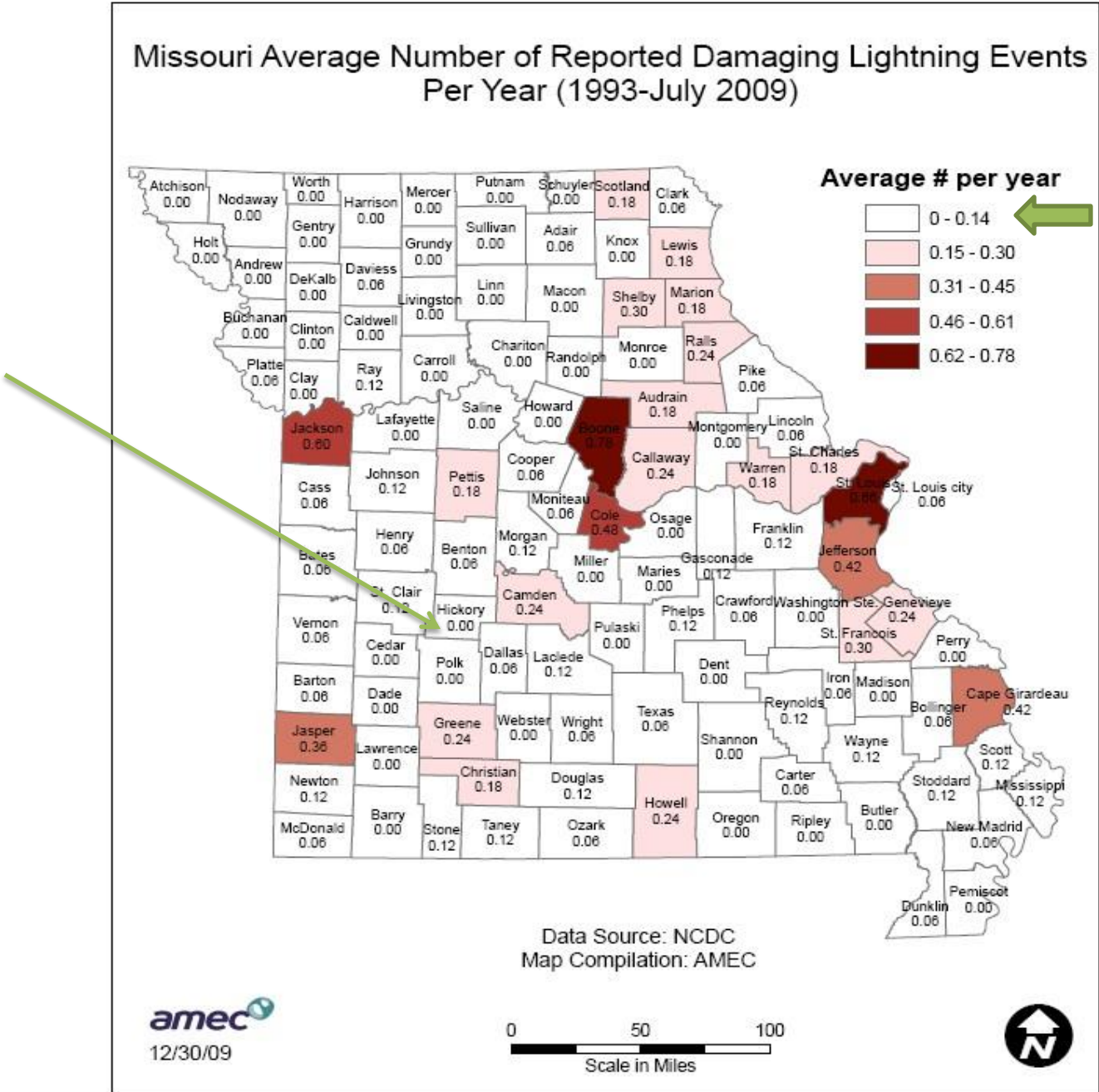
Source: 2010 State of Missouri Hazard Mitigation Plan

Figure 3.4.10-2 Hickory County Average Number of Hail Events



Source: 2010 State of Missouri Hazard Mitigation plan

Figure 3.4.10-3 **Hickory County Average Number of Damaging Lightning Events**



Source: 2010 State of Missouri Hazard Mitigation plan

Once the ranges were determined and applied to all factors considered in the analysis for wind, hail, and lightning, they were weighted equally and factored together to determine an overall vulnerability rating.

Once the overall vulnerability rating was determined for the three event types, a combined vulnerability rating was computed. In calculating the combined vulnerability rating, the hail and wind events were factored in with a multiplier of 2 since these events generally cause more damages. Table 3.4.10-4 provides the calculated ranges applied to determine overall vulnerability of Vernon county to severe thunderstorms and Table 3.4.10-5 provides the calculated vulnerability ratings for wind, hail, and lightning as well as the calculated combined

Table 3.4.10-4 Ranges for Severe Thunderstorm Combined Vulnerability Rating					
	Low (1)	Medium-low (2)	Medium (3)	Medium-high-4	High (5)
Severe Thunderstorm Combined Vulnerability	1.15 to 1.66	1.67 to 2.18	2.19 to 2.70	2.71 to 3.22	3.23 to 3.75

Source: 2010 State of Missouri Hazard Mitigation Plan

Table 3.4.10-5 Hickory County Severe Thunderstorm Combined Vulnerability Rating

	Overall Hail Vulnerab	Overall Lightning Vulnerability Rating	Overall Wind Vulnerability	Severe Thunderstorm Combined Rating	Combined Vulnerability
Hickory	1.57	1.80	1.57	1.62	Low

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Due to the possible increase in population and growth and future development there will be increased vulnerability to tornadoes. Population and housing unit growth were factored into the previously described vulnerability analysis. Future development should consider tornadoes hazards at the planning, engineering, and architectural design stages.

Zoning and/or subdivision regulations across the State and Hickory County do not address severe thunderstorms, wind, hail or tornadoes. Local building regulations could be developed in highly vulnerable areas to require shatter-proof glass on critical facilities and/or facilities housing vulnerable populations, higher standards for tying down roofs, and/or other methods to mitigate impacts from severe summer storms.

3.4.11 Wildfire Vulnerability

Jurisdictions: All jurisdictions

Overview

Wildfires in Hickory County tend to be limited in their spatial extent thus minimizing their impact. According to the Missouri Department of Conservation, 49% 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.

Vulnerability Factor Ratings

Although the National Fire Incident Reporting System does capture data on wildfires, it was determined that the Department of Conservation historical wildfire data was the best resource. Both sets of data were reviewed for the 2004-2008 time period. The Department of Conservation data had more individual events recorded per county. Therefore, this data appeared to be more comprehensive. Some fire departments report to both data sets. So, adding the two sets of data together would have double-counted fires. From the Department of Conservation wildfire data, it was determined that the average annual number of wildfires in Missouri was 2,862 burning an average annual 37,306 acres.

From the data obtained from the Department of Conservation, two factors were considered in the overview vulnerability analysis: likelihood and annualized acres burned.

After compiling historical statistics, and computing to determine the factor values for each county, each factor was divided into 5 ranges with 5 being the highest and 1 being the lowest. Table 3.4.10-1 provides that ranges that were applied to each factor.

Table 3.4.10-1 Ranges for Wildfire Vulnerability Factor Ratings

Factors Considered	Low (1)	Medium-low (2)	Medium (3)	Medium-high-4	High (5)
	Level 1 Range	Level 2 Range	Level 3 Range	Level 4 Range	Level 5 Range
Likelihood Rating	<29.56	29.56 to 59.11	59.12 to 88.67	88.68 to	>118.23
Annualized Acres Burned Rating	<100	100 to 199	200 to 499	500 to 999	>999

(Source: State of Missouri 2010 Hazard Mitigation Plan)

Table 3.4.10-2 provides the detailed statistical data that was used for the vulnerability analysis for wildfire for each county. The shaded columns are the factor ratings established by applying the above ranges. The map in Figure 3.4.10-1 that follows provides the statewide results for the likelihood factor followed by the map in Figure 3.4.10-2 that provides the overall vulnerability rating calculated by assigning an equal weight to the 2 contributing factors.

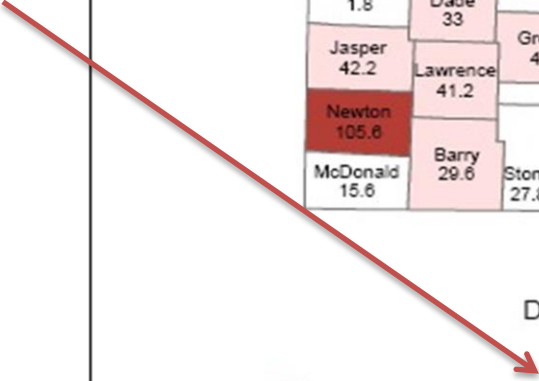
Table 3.4.10-2 Statistical Data and Factor Ratings for Wildfire Vulnerability

County	Wildfires 2004-2008	Average Annual # of Wildfires	Likelihood Rating 1-5	Acres Burned	Average Annual Acres Burned	Average Acres Burned Rating	Total Buildings Damaged
Hickory	86	17.2	1	1842.5	369	3	0

(Source: State of Missouri 2010 Hazard Mitigation Plan)

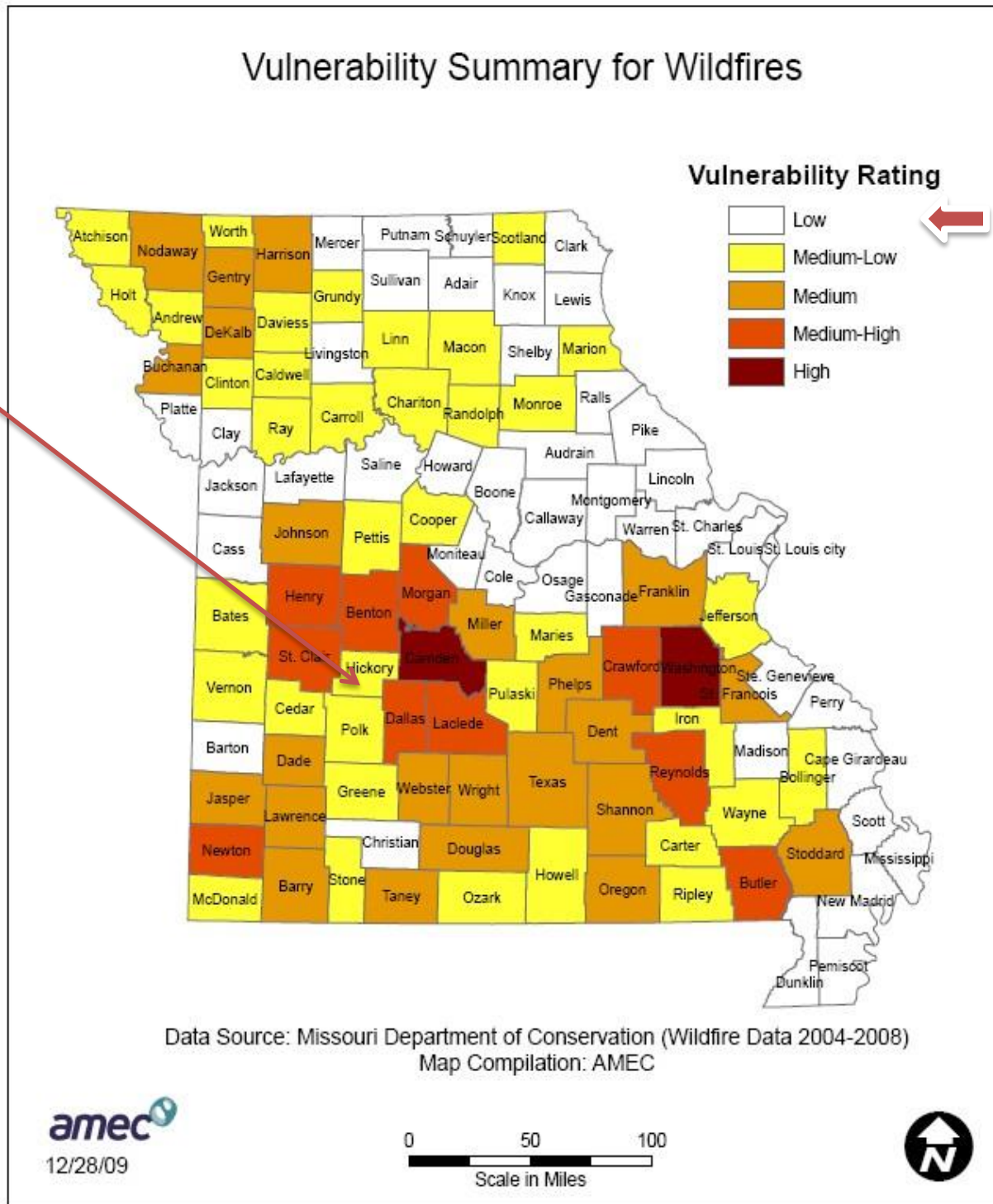
As Figure 3.4.10-1 below demonstrates there has been an average of 17.2 wildfires in Hickory County between the years of 2004 and 2008.

Figure 3.4.10-1 **Wildfire Events**



Source: State of Missouri 2010 Hazard Mitigation Plan

Figure 3.4.10-2 Wildfire Vulnerability Summary



Source: State of Missouri 2010 Hazard Mitigation Plan

Figure 3.4.10-2 above shows that Hickory County has an over-all medium-low vulnerability rating.

Potential Impact on Existing Structures

Currently, there is not a reliable or accurate way to estimate costs associated with a wildfire event. Too many variables exist to accurately portray how much damage would be incurred by a wildfire. For instance, the cost of a wildfire that strikes structures versus cropland versus forestland would all be different. Locations of the fire, time of day, and other characteristics would all play a role in determining the cost of a wildfire. Fire suppression methods also vary depending on existence of structures. Some wildfires are allowed to burn themselves out which means minimal cost for suppression. There have been two “reported” wildfires since 1999.

Potential Impact on Future Development

As stated by the United States Census Bureau the population change in Hickory County from 2010 to 2012 was only 0.6%. It is estimated that this slow population growth will continue, therefore future development in the county will also continue to grow at a slow pace.

Source: <http://quickfacts.census.gov/qfd/states/29000.html>.

Most studies of Wildland fire and residential development have focused on the cost of firefighting and solutions such as fuel reduction and fire-safe home building. Although some studies quantify the number of homes being built near forests, little research has indicated the potential magnitude of the problem in the future.

3.5 Jurisdictional Vulnerability Variations

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.

Vulnerability is defined by FEMA as the extent to which people will experience harm and property will be damaged from a hazard.

Table 3.5.1 shows the vulnerability ratings for the Planning Area as a whole and for each participating jurisdiction. Vulnerability was assessed by averaging probability and severity measurements for each hazard (see Section 3.2). Numeric values were given to each rating as follows: Low = 1, Moderate/Medium = 2, High = 3. The ratings for probability and severity were added and averaged, then rounded up to arrive at the vulnerability rating. The rating scale used for vulnerability is located within Table 3.5-1.

Below the measures of Probability and Severity have been restated.

Measure of Probability – The likelihood that the hazard will occur.

- 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).

Measure of Severity – The deaths, injuries, or damage (property or environmental) that could result from the hazard.

- Low – Few or minor damage or injuries are likely; death is possible, but not likely.
- Moderate – Injuries to personnel and damage to property and the environment is expected; death is possible.
- High – Major injuries/death and/or major damage will likely occur
A vulnerability rating highlighted in yellow indicates where the vulnerability in a Jurisdiction varies from the overall vulnerability of the Planning Area.

Table 3.5-1 **Jurisdictions' Vulnerability**

Participating Jurisdictions' Vulnerability										
	Property Damage					Injury and Death				
N/A	Not Applicable					Not Applicable				
L	0-5%					Little or None				
M	5-10%					Injuries Possible				
H	10-100%					Major Injuries and Death Likely				
	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Land Subsidence/ Sinkhole	Levy Failure	Severe Winter Weather	Tornado and Thunderstorm	Wildfire
Planning Area	M	M	L	M	H	L	M	M	H	M
Hickory County	M	M	L	M	H	M	M	M	H	M
Cross Timbers	L	M	L	M	M	L	L	M	H	M
Hermitage	M	L	L	M	H	L	M	M	H	L
Preston	L	M	L	M	L	L	L	M	H	L
Weaubleau	L	M	L	M	L	L	L	M	H	L
Wheatland	L	M	L	M	L	M	L	M	H	L
Hermitage R-1V School District	M	N/A	L	M	N/A	L	N/A	M	H	L
Hickory County R-I School District	L	N/A	L	M	N/A	L	N/A	M	H	L
Weaubleau R- III School District	L	N/A	L	M	N/A	L	N/A	M	H	L
Wheatland R-II School District	L	N/A	L	M	N/A	L	N/A	M	H	L

The following portion of this section assesses variations in vulnerability and provides information on structures exposed to potential hazards in jurisdictions that vary from the overall Planning Area. Data was provided by participating jurisdiction's insurance information, the Hickory County Assessor's office, US Army Corps of Engineers, HAZUS MH, and the State Emergency Management Agency (SEMA).

Variations in vulnerability are based on data found throughout this plan. Vulnerable structures were calculated by applying the maximum percentage correlating with the vulnerability rating as seen in the following figure.

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.

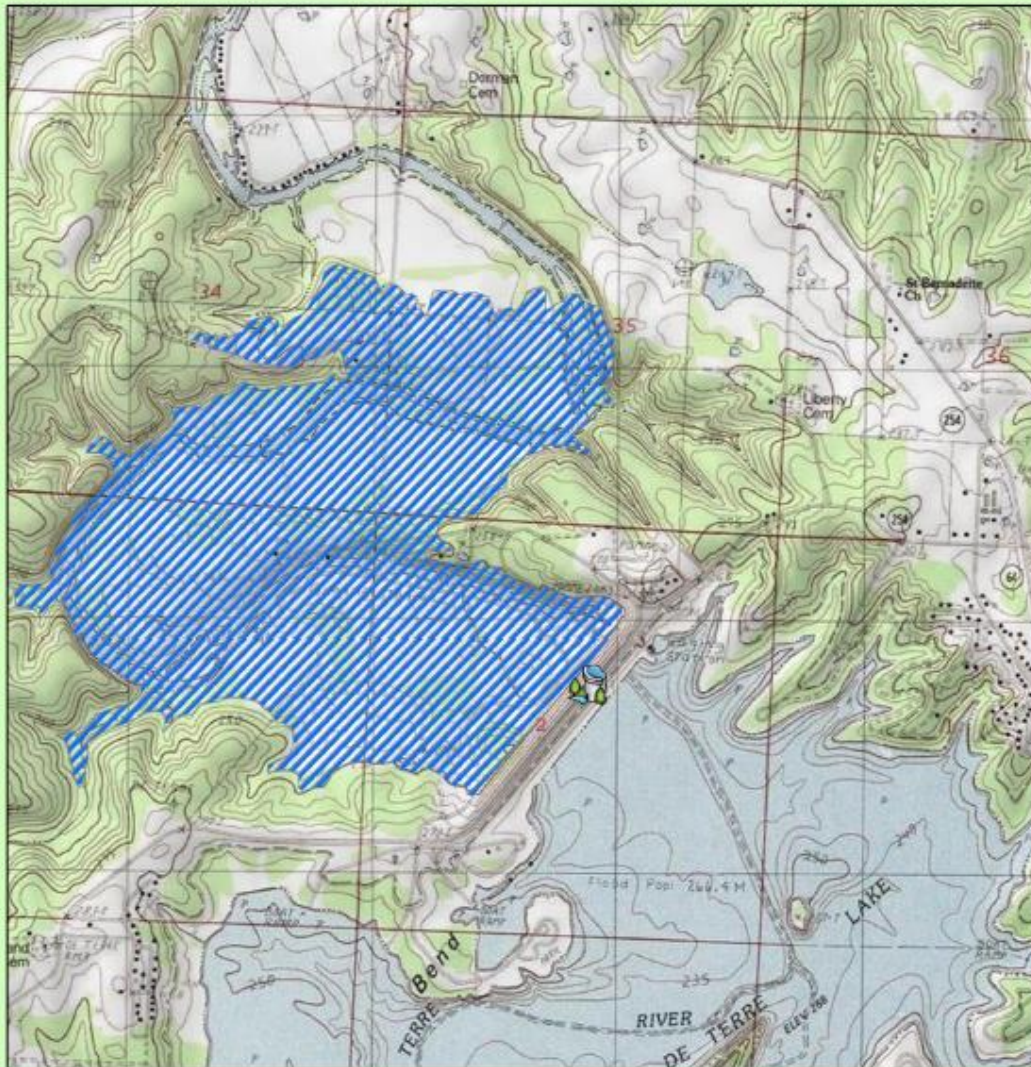
Dam Failure

Parcel data for areas downstream of high hazard dams is shown in Section 3.4.1. Hermitage and Hartsburg received “Medium” vulnerability ratings due to the number of High Hazard dams as compared to possible affected area. Again, inundation information is not available to accurately quantify vulnerability.

Jurisdictions at greater risk:

Hermitage

Pomme De Terre Dam Failure



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Pomme De Terre Lake is the largest concern for the entire county. All other dam maps are listed in Section 6.

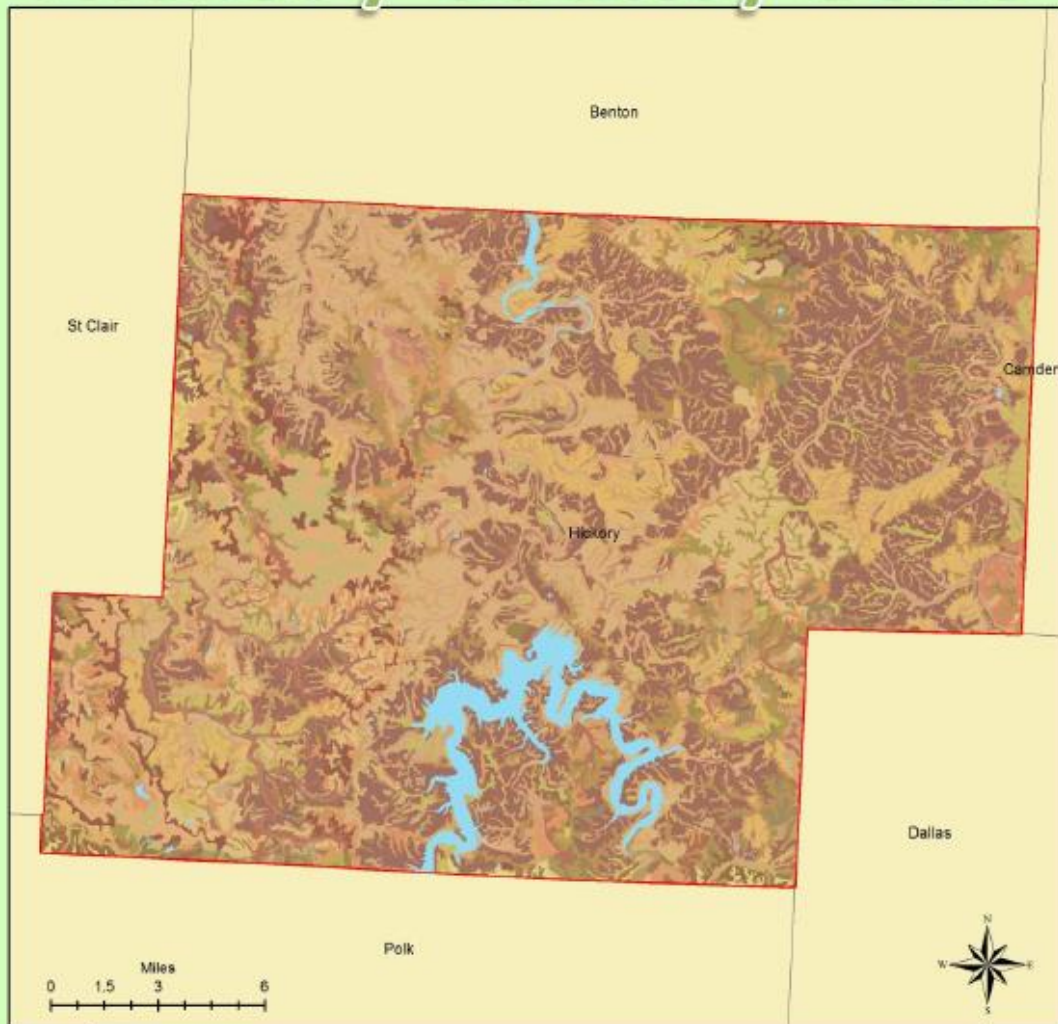
Drought

According to the 2007 US Census of Agriculture, 55% of Hickory County land use is tied to farming activities. The Missouri State Drought Plan states that rural areas in the state are more vulnerable to the effects of drought. Incorporated jurisdictions are less vulnerable to the effects of drought due to suburban infrastructure.

Jurisdictions at greater risk:

Hickory County

Hickory County Soils



<ul style="list-style-type: none"> Barren soil, 1 to 5 percent slopes Barren soil, 6 to 10 percent slopes Barren soil, 11 to 15 percent slopes Barren soil, 16 to 20 percent slopes Barren soil, 21 to 25 percent slopes Barren soil, 26 to 30 percent slopes Barren soil, 31 to 35 percent slopes Barren soil, 36 to 40 percent slopes Barren soil, 41 to 45 percent slopes Barren soil, 46 to 50 percent slopes Barren soil, 51 to 55 percent slopes Barren soil, 56 to 60 percent slopes Barren soil, 61 to 65 percent slopes Barren soil, 66 to 70 percent slopes Barren soil, 71 to 75 percent slopes Barren soil, 76 to 80 percent slopes Barren soil, 81 to 85 percent slopes Barren soil, 86 to 90 percent slopes Barren soil, 91 to 95 percent slopes Barren soil, 96 to 100 percent slopes 	<ul style="list-style-type: none"> Barren soil, 1 to 5 percent slopes Barren soil, 6 to 10 percent slopes Barren soil, 11 to 15 percent slopes Barren soil, 16 to 20 percent slopes Barren soil, 21 to 25 percent slopes Barren soil, 26 to 30 percent slopes Barren soil, 31 to 35 percent slopes Barren soil, 36 to 40 percent slopes Barren soil, 41 to 45 percent slopes Barren soil, 46 to 50 percent slopes Barren soil, 51 to 55 percent slopes Barren soil, 56 to 60 percent slopes Barren soil, 61 to 65 percent slopes Barren soil, 66 to 70 percent slopes Barren soil, 71 to 75 percent slopes Barren soil, 76 to 80 percent slopes Barren soil, 81 to 85 percent slopes Barren soil, 86 to 90 percent slopes Barren soil, 91 to 95 percent slopes Barren soil, 96 to 100 percent slopes 	<ul style="list-style-type: none"> Barren soil, 1 to 5 percent slopes Barren soil, 6 to 10 percent slopes Barren soil, 11 to 15 percent slopes Barren soil, 16 to 20 percent slopes Barren soil, 21 to 25 percent slopes Barren soil, 26 to 30 percent slopes Barren soil, 31 to 35 percent slopes Barren soil, 36 to 40 percent slopes Barren soil, 41 to 45 percent slopes Barren soil, 46 to 50 percent slopes Barren soil, 51 to 55 percent slopes Barren soil, 56 to 60 percent slopes Barren soil, 61 to 65 percent slopes Barren soil, 66 to 70 percent slopes Barren soil, 71 to 75 percent slopes Barren soil, 76 to 80 percent slopes Barren soil, 81 to 85 percent slopes Barren soil, 86 to 90 percent slopes Barren soil, 91 to 95 percent slopes Barren soil, 96 to 100 percent slopes 	<ul style="list-style-type: none"> Barren soil, 1 to 5 percent slopes Barren soil, 6 to 10 percent slopes Barren soil, 11 to 15 percent slopes Barren soil, 16 to 20 percent slopes Barren soil, 21 to 25 percent slopes Barren soil, 26 to 30 percent slopes Barren soil, 31 to 35 percent slopes Barren soil, 36 to 40 percent slopes Barren soil, 41 to 45 percent slopes Barren soil, 46 to 50 percent slopes Barren soil, 51 to 55 percent slopes Barren soil, 56 to 60 percent slopes Barren soil, 61 to 65 percent slopes Barren soil, 66 to 70 percent slopes Barren soil, 71 to 75 percent slopes Barren soil, 76 to 80 percent slopes Barren soil, 81 to 85 percent slopes Barren soil, 86 to 90 percent slopes Barren soil, 91 to 95 percent slopes Barren soil, 96 to 100 percent slopes
--	--	--	--

This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011

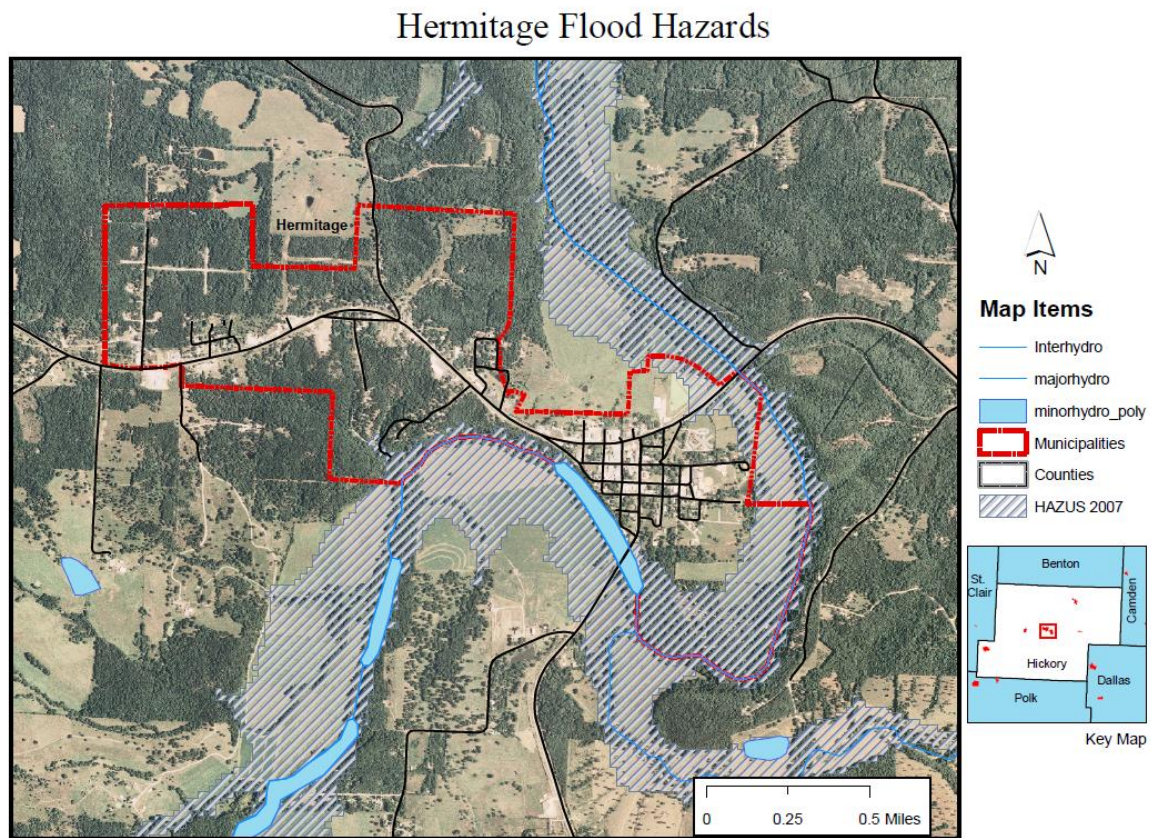


Flooding

Portions of Hermitage lay within the 100 year flood plain. Specific value assessment data for these communities is addressed in Section 3.4.5. A flood map for this county was extremely hard to retrieve due to the county's lack of participation with the NFIP and never been previously mapped. SEMA provided the Hermitage Flood Hazard map in addition to the county flood map. In addition to those communities that are at high risk for river flooding, all other jurisdictions experience some type of complication associated with flash flooding due to storm water runoff or sheet flooding. These other jurisdictions were given a rating a low vulnerability because probability and severity were also low for these areas.

Jurisdictions at greater risk:

Hermitage and unincorporated Hickory County



Data sources: Camden, Benton, St. Clair, Polk, Dallas, and Hickory County 2007 HAZUS-MH.
This map does not convey official regulatory information. This map is intended for planning purposes only.

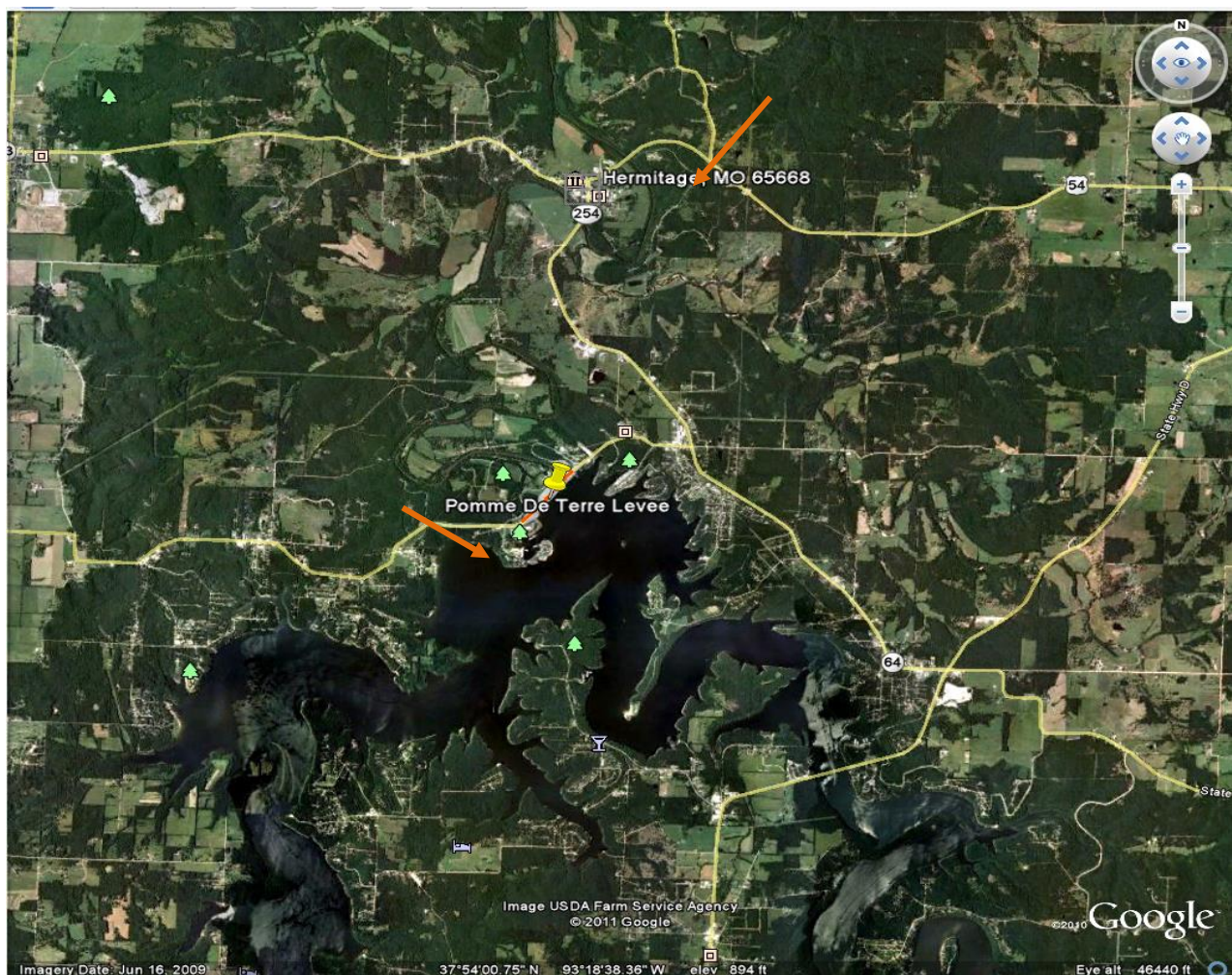
Levee Failure

Hermitage lies behind levees that are part of the Army Corps of Engineers Rehabilitation Program. There are no formal levee districts but rather a few owned privately and by the USACE. Most areas behind these levees are in designated floodplains. Privately owned levees are maintained by their owners. Official data on the locations of private levees is not available. Figure 3.5-1 depicts general levee locations around the jurisdictions of Hermitage.

Jurisdictions at greater risk:

Hermitage and unincorporated Hickory County.

Figure 3.5-2 Depicts major levees in comparison to Hermitage proper.



Wildfire

As stated in Section 3.2.10, Wildfire in Hickory County generally stems from human activities such as burning garden plots, trash, and brush. Because these activities occur more frequently in rural, unincorporated areas of Hickory County those areas at greater risk.

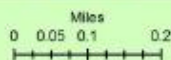
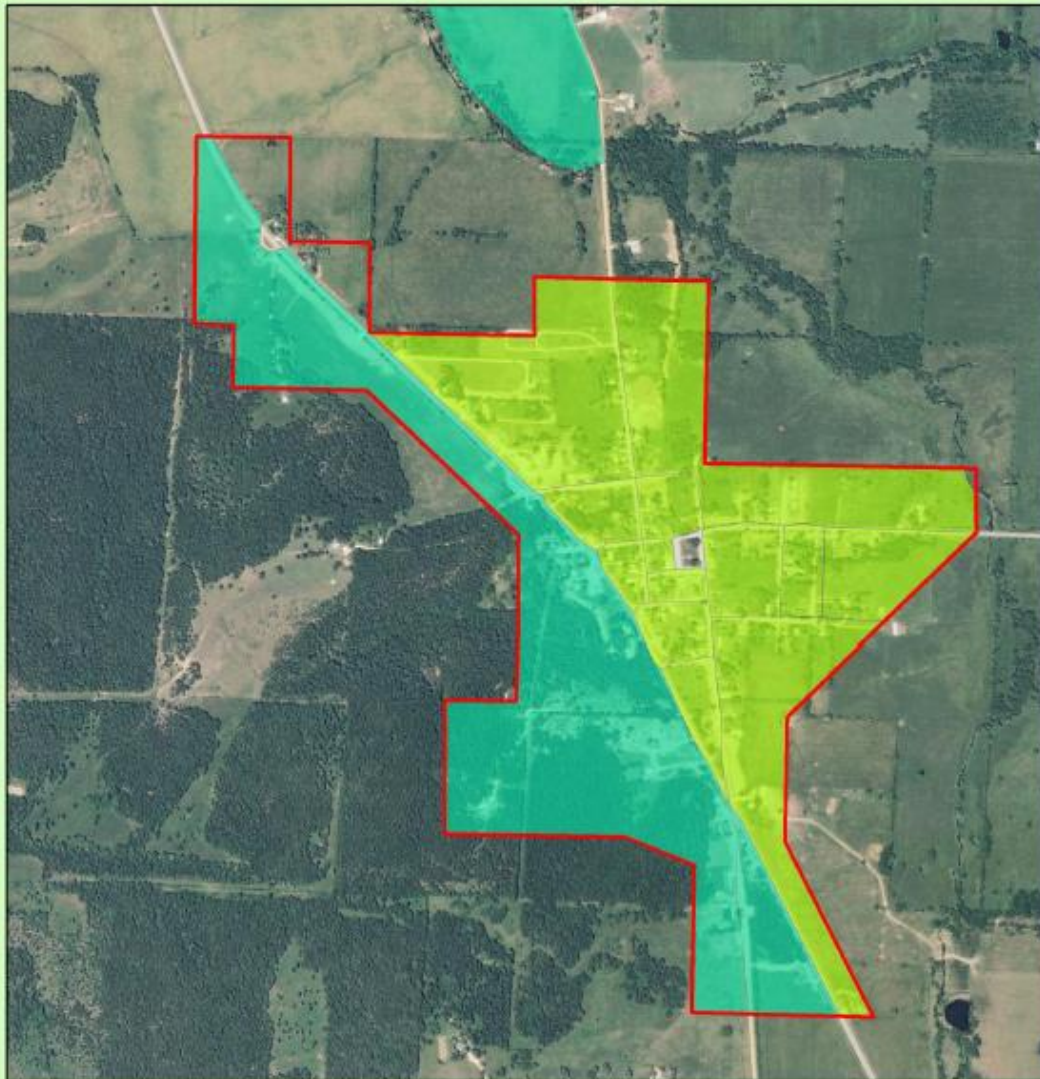
According to statistics from the Missouri Department of Conservation (see Section 3.2.10, Figure 3.41), rural areas of Hickory County and the rural/urban interfaces are most at risk from wildfires. From January, 2005 until the present, there have been 14,598 acres affected by wildfire according to the MDC's Forest Fire Reporting.

The jurisdiction of Hermitage is placed in a higher risk category due to the WUI (Wildland Urban Interface) in those communities. More information on the WUI can be found in Section 3.2.10.

Jurisdictions at greater risk:

Hermitage

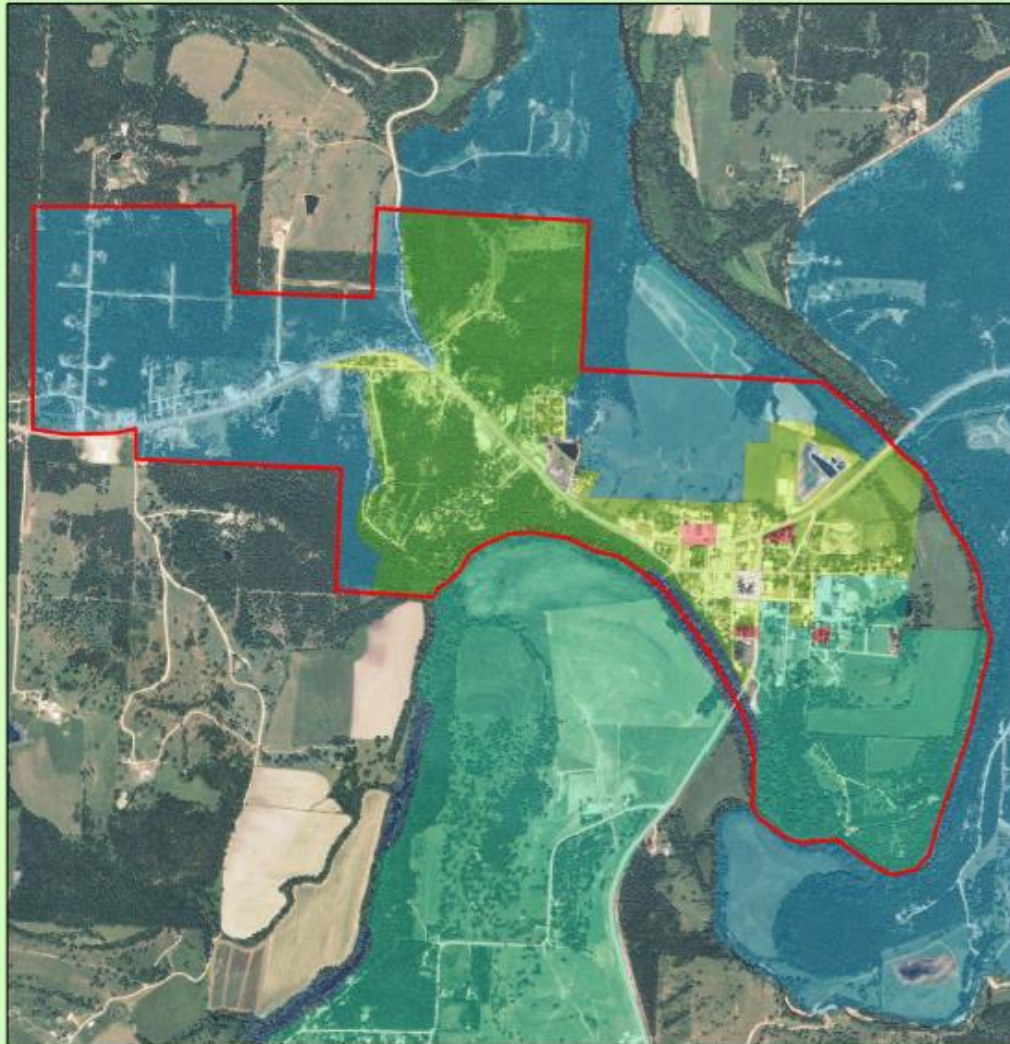
Cross Timbers Wildfire



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



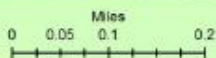
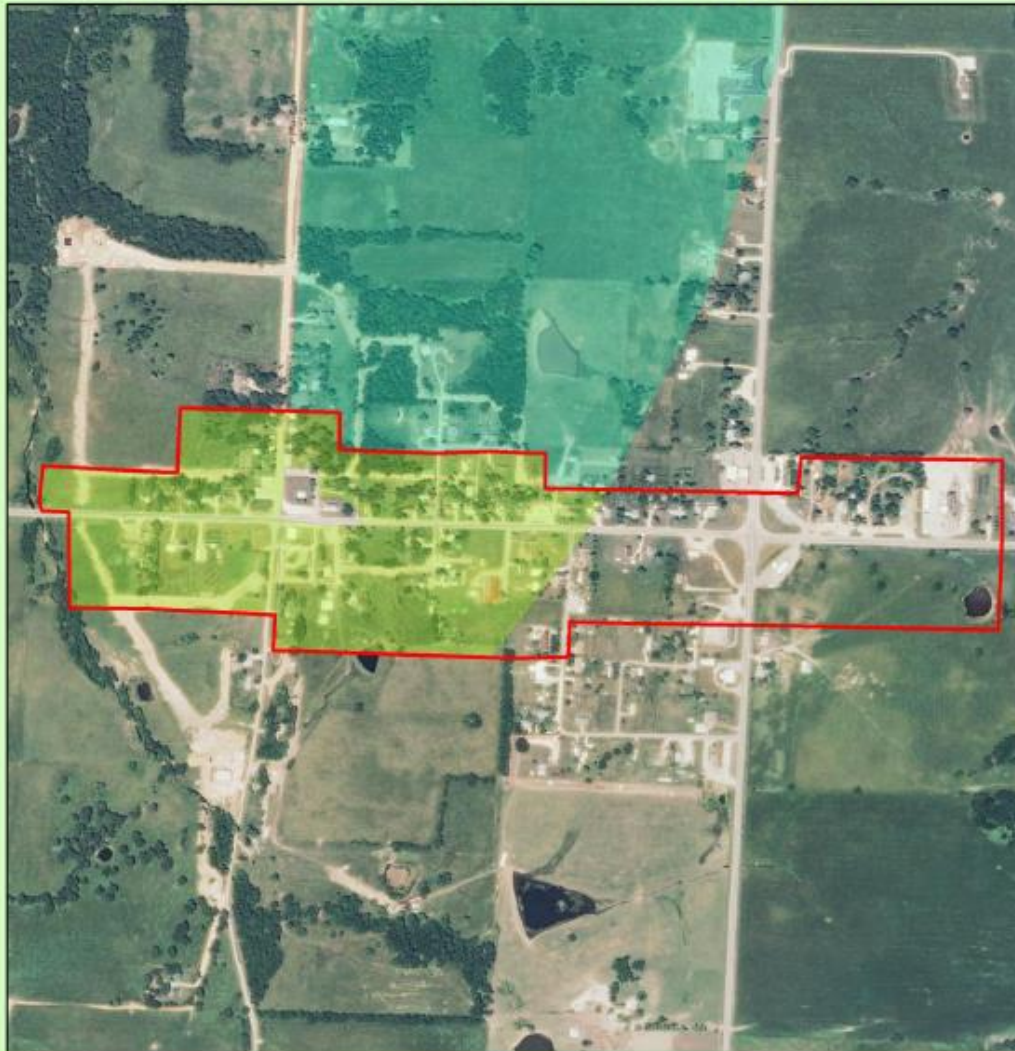
Hermitage Wildfire



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



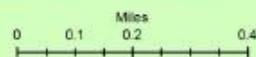
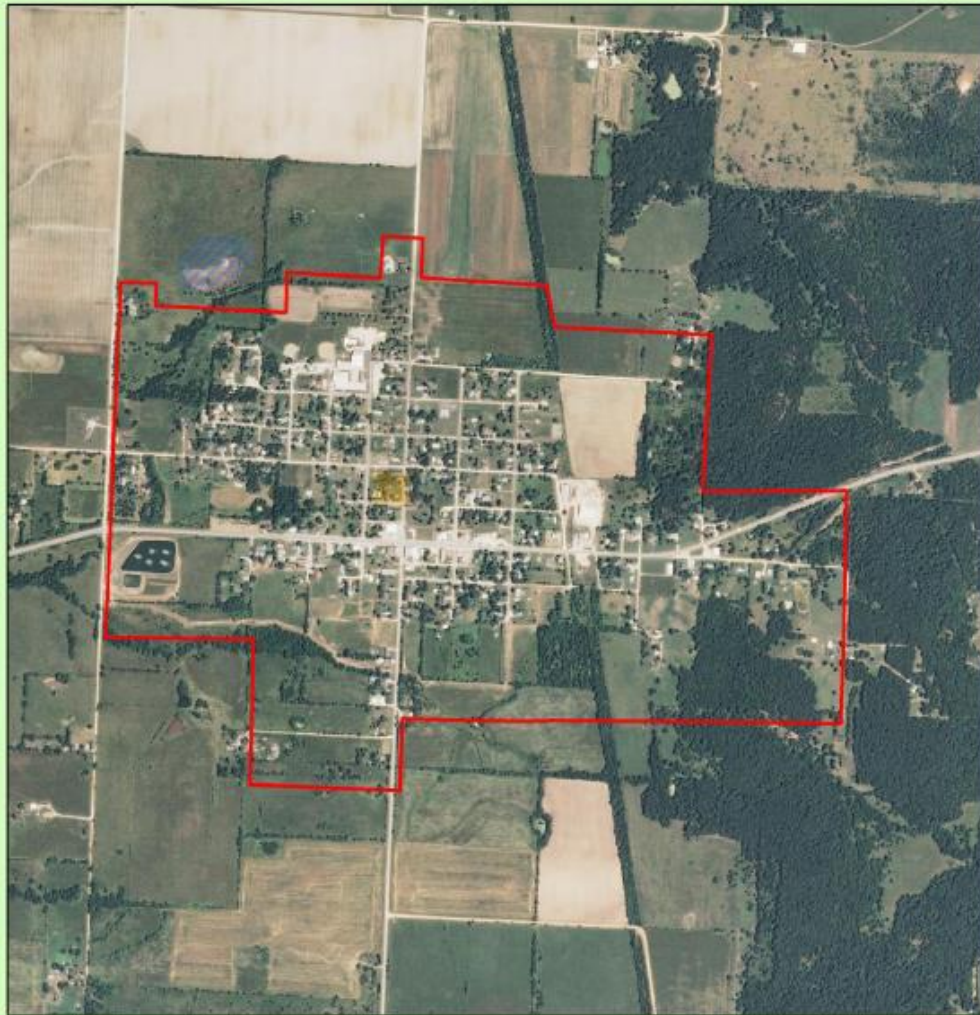
Preston Wildfire



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



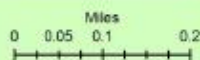
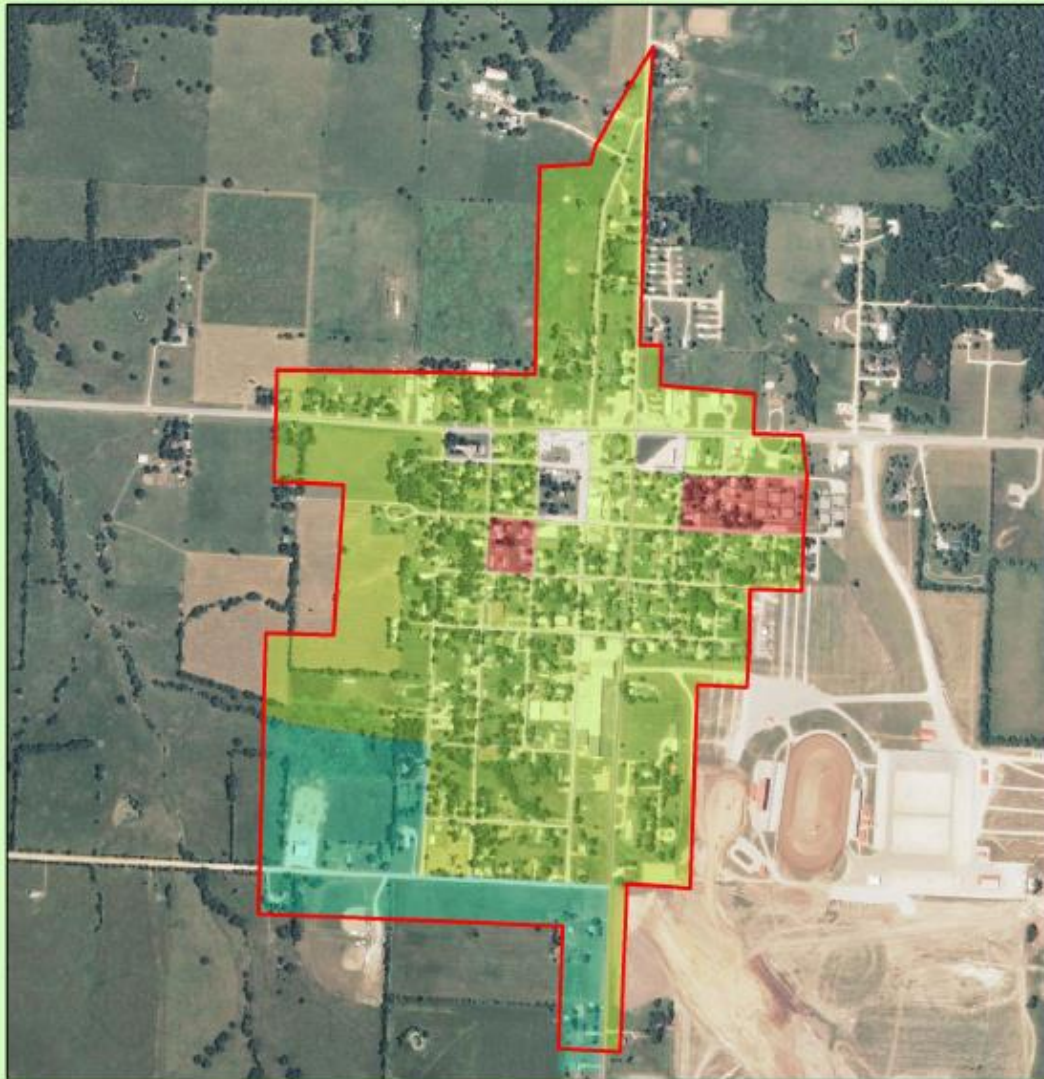
Weaubleau Wildfire



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Wheatland Wildfire



This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Section 4 Mitigation Strategies

4.1 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.

Hazard mitigation goals were developed during the planning process for the original Hickory County Hazard Mitigation Plan in 2004. For the current update, the Hazard Mitigation Technical Steering Committee reviewed these goals; language changes were made for clarification while retaining the essential focus of the original goals.

The six county hazard mitigation goals for the Hickory County Hazard Mitigation Plan (2012) are:

- Goal 1: Prevention-Reduce risks and vulnerabilities of people in hazard-prone areas
- Goal 2: Property Protections-Reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.
- Goal 3: Natural Resource Mitigation-Promote education, outreach, research, and development programs to improve the knowledge and awareness among the citizens and industry about natural hazards they may face.
- Goal 4: Emergency Services-Strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.
- Goal 5: Structural Hazard Mitigation-Establish priorities for reducing risks to the citizens/ business owners and their property with emphasis on long-term and maximum benefits to the public.
- Goal 6: Resources-Secure resources for investment into hazard mitigation.

4.2 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 (2004-2005) 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 2005 plan contained a comprehensive list of mitigation actions which served as a starting point for update discussions. The Technical Steering Committee for the update (2010-2012) reviewed and discussed all the mitigation actions from the original plan. The current status of each of the 2005 mitigation actions from the original plan was evaluated. It was determined that while progress had been made on some of the 2005 actions, implementation of many actions had not occurred. This was largely because of the lack of resources. Several of the 2005 actions were eliminated from the 2012 update because they were not practical or feasible, and were not supported by the population the following actions were eliminated.

- Under Objective 5.1
Recommendation: Encourage a self-inspection at critical facilities to assure that the building infrastructure is earthquake and tornado resistant.
- Under Objective 5.3
Recommendation: Encourage local and county governments to develop and implement zoning regulations.

Under Objective 2.2

Recommendation: Encourage cities and counties to implement cost-share programs with private property owners for hazard mitigation projects that benefit the community as a whole.

Another change from the 2005 Plan is that under Objective 5.3 is the recommendation to “encourage current NFIP participants to continue to comply with the regulations.” The wording of this action changed and split into two different actions. The change was to ensure that NFIP participants continued to participate, and non-participants were encouraged to become members.

In addition some of the actions were combined for efficiency and to avoid duplication. The remainder of the actions in the 2005 plan was carried forward into the 2012 Update without substantive change.

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. This approach was useful in developing appropriate new actions, when deemed important.

4.3 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 Review and Prioritization of Mitigation Actions and Objectives

In accordance with Section 201.6 of the regulations detailed above, the Planning Committee prioritized the actions, creating a timeframe for implementation. In drafting this prioritization, Kaysinger Basin Regional Planning Commission (KBRPC) and community planning partners worked cooperatively to determine which STAPLEE criteria each action did or was likely to be achieved. The Hazard mitigation Technical Steering Committee then looked at each hazard and its associated mitigation actions in order to make a preliminary prioritization of the actions for the Planning Area as a whole. Each action was discussed with a view toward feasibility, jurisdictions to be involved, benefit/cost ratio, and timeframe.

Each of the actions proposed for the 2012 Update was reviewed using the criteria, and a high, medium or low priority was assigned to each action based on the results of the STAPLEE analysis. The definition of each priority was established as follows.

- **High:** To be implemented within the next year if possible.
- **Medium:** To be implemented within the next two to five years, if possible
- **Low:** To be implemented after the next five years, if possible.

The STAPLEE criteria are defined in table 4.3-1 below.

Table 4. 3-1 Definition of the STAPLEE Criteria		
Abbreviation	Criteria	Definition of the Criteria
S	Social	Mitigation action are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T	Technical	Mitigation actions are technically most effective if they provide long-term reduction of loses and have minimal secondary adverse impacts.
A	Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P	Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.
L	Legal	It is crucial that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E	Economical	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective and possible to fund.
E	Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

The results of the Planning Committee's STAPLEE analysis of each action are included on the following pages in the discussion of the individual action items.

Prioritization by Participating Jurisdictions

The prioritization of the proposed 2012 mitigation actions by the Hazard Mitigation Technical Steering Committee was a preliminary overall prioritization for the entire Planning Area. In the case of the educational institutions, the representatives from the school districts were given the opportunity to develop mitigation actions specific to their institutions. This was accomplished through fax and email correspondence between the Planning Committee and the superintendents of the school districts.

All Other Participating Jurisdictions

After the preliminary overall prioritization by the Hazard Mitigation Technical Steering Committee, the mitigation actions suggested for the specific participating jurisdictions were handed over to the representatives or governing bodies of those jurisdictions for final prioritization, implementation, and administration decisions.

It was recognized that participating jurisdictions might choose to exclude some suggested mitigation actions based on current specifics of time, resources, and capabilities or add new mitigation actions based on specific issues. Finally, there was the possibility that participating jurisdictions might choose to make changes to the preliminary prioritization.

An information sheet (“Information and Guidelines for Assessing Mitigation Actions for Your Jurisdiction”) was given to each participating jurisdiction. This sheet gave the following guidance:

- Explanation of the scales used for the preliminary prioritization and the cost/benefit assessment
- Instruction that the preliminary prioritization needed to be reviewed and either accepted or changed
- Instruction that benefit vs. cost must be taken into consideration in the prioritization process.

A questionnaire regarding the process used in finalizing the mitigation actions for the jurisdiction was included with the information sheet. Follow-up calls and/or emails were made to representatives of the participating jurisdictions by the Plan Author to clarify the process and decisions made regarding the mitigation actions.

4.4 Mitigation Goals, Objectives, and Actions

A comprehensive list of goals, objectives, and mitigation actions for the Hickory County Hazard Mitigation Plan (2012) follows. The mitigation actions listed for the entire Planning Area; participating jurisdictions will differ in the specific actions undertaken in their jurisdictions. In accordance with implementing regulations, after each action is a summary narrative discussion. The summary includes information on which of the hazards are addressed by the proposed action, the jurisdictions choosing the action, the lead agency and partners for implementation, possible funding sources, estimated costs, discussion of financial considerations, the assigned STAPLEE priority, and the status of the actions carried over from the 2005 Plan.

Goal 1: The County, incorporated cities and schools should reduce risks and vulnerabilities of people in hazard prone areas.

Objective 1.1 The County, incorporated cities, and schools should advise the public about health and safety precautions to guard against loss of life from natural hazards.

1.1.1 The County EMD should provide education programs on personal emergency preparedness

- **Hazards Addressed:** All Hazards
- **Lead Agency:** Hickory County
- **Partners (if any):** State emergency management for possible source materials, as well as the legislative bodies of the participating jurisdictions and school districts.
- **Funding Source:** Include in the salaries of personnel.
- **Estimated Costs:** None.
- **Discussion of Cost vs. Benefits:** Virtually cost-free and provides the significant benefit of increasing public awareness.
- **STAPLEE Priority:** Medium
- **Action Status:** This action was carried over from the 2005 Plan without progress having been made.

1.1.2 Add earthquake drills as required drills each year.

- Hazards Addressed: Earthquakes
- Jurisdictions Choosing This Action: Hickory County
- **Lead Agency:** County Emergency Management Agency
- Partners (if any): LEPC
- Funding Sources: Local Funding
- **Estimated Costs:** None beyond cost of funding personnel.
- **Discussion of Cost vs. Benefits:** Virtually cost-free and providing high benefits of public preparedness for a serious event that could cause unprecedented damage, but has not occurred in anyone's memory.
- STAPLEE Priority: Medium
- **Action Status:** Making the drills mandatory is an action that is new to the Plan Update. Publicizing the drills widely was part of the 2005 plan. Because no progress had been made on the proposed action, the planning Committee proposed mandatory drills.

Objective 1.2 The County, incorporated cities, and schools should use the latest technology, when funds are secured, to provide adequate warning, communications, and mitigation of hazard events.

1.2.1 Assist communities with securing funding for early warning systems, improved communication systems, GIS/GPS, and mitigation projects.

Hazards Addressed: All hazards for GIS/GPS, communications, mitigation projects. Warning systems would be more likely to address tornadoes and severe storms.

Jurisdictions Choosing This Action: Hickory County and all participating communities and school districts.

Lead Agency: County Emergency Management Agency

Partners (if any): Potentially the governing bodies of the local jurisdictions and school districts.

Funding Sources: Mitigation grants, emergency management grants, local funding.

Estimated Costs: Potentially several hundred thousands dollars, depending on the complexity of the systems to be purchased.

Discussion of Cost vs. Benefits: The GIS systems could be high cost, but providing high benefits of warning the public in the event of tornadoes. The GIS ability could open up a lot of opportunities for more in-depth analysis of hazards and their impact on the planning area. Low possibility of obtaining funds locally for a rural county with declining population.

STAPLEE Priority: Medium

Action Status: This action was the result of combining two actions from the previously approved plan. As stated above, the Planning Committee considered the 2005 actions as having been completed, since the city of Weaubleau purchased a warning siren.

However, the Planning Committee wanted to expand on that accomplishment, and therefore included the action in the Plan Update in order to get warning systems for other communities.

1.2.2 Promote the purchase of weather radios by local residents to ensure advanced warning about threatening weather or disasters

Hazards Addressed: Thunderstorms/tornadoes, severe winter weather.

Jurisdictions Choosing this Action: Hickory County and all participating jurisdictions and school districts.

Lead Agency: County Emergency Management Agency.

Partners (if any): N/A

Funding Sources: Local Funding.

Estimated Costs: None, unless funds become available to provide free weather radios.

Discussion of Cost vs. Benefits: Virtually cost-free and providing high benefits of public awareness.

STAPLEE Priority: Medium

Action Status: The Planning Committee, when reviewing the previously approved plan, considered this action as having been accomplished. The County LEPC purchased and sold over 1,000 weather radios. However, this action is of a continuing nature. The Planning Committee determined to carry this action over into the future, and try to purchase more weather radios for distribution.

1.2.3 Partner with local radio stations to assure that appropriate warning is provided to county residents of impending disasters.

Hazards Addressed: All hazards except perhaps drought.

Jurisdictions Choosing this Action: Hickory County Emergency Management Agency.

Lead Agency: Local radio stations

Partners (if any): LEPC

Funding Sources: Local Funding.

Estimated Costs: None beyond costs of funding personnel.

Discussion of Cost vs. Benefits: Virtually cost-free and providing high benefits to the public.

STAPLEE Priority: High

Action Status: This action was carried over from the 2005 plan without progress having been made.

Objective 1.3 The County, incorporated cities, and schools should reduce danger to and enhance protection of, dangerous areas during hazardous events.

1.3.1 Tree trimming programs and dead tree removal

Hazards Addressed: Eliminating hazards to overhead utility lines that may cause service interruptions.

Jurisdictions Choosing this Action: Hickory County and all participating jurisdictions and school districts.

Lead Agency: Local jurisdictions public works departments.

Partners (if any): Local utility providers

Funding Sources: Local funding

Estimated Costs: None beyond cost of funding personnel.

Discussion of Cost vs. Benefits Part of normal public works budget, providing high benefits to citizens.

STAPLEE Priority: High

Action Status: This action was carried over from the 2005 plan with some progress having been made. Power and Phone utilities usually adopt the practice of tree trimming around their lines.

1.3.2 Examine potential road and bridge upgrade that would reduce danger to residents during occurrences of natural disaster, assisting communities/county in securing funding for road and bridge improvements.

Hazards Addressed: Potentially unsafe road surfaces and bridge sub-structures and bridge surface condition.

Jurisdictions Choosing this Action: Hickory County

Lead Agency: County Commission

Partners (if any): Missouri Department of Transportation

Funding Sources: Issuing Bonds, Applying for Grants.

Estimated Costs: Studies may be relative expensive, with actual repairs may be very expensive.

Discussion of Costs vs. Benefits: Any needed repairs could be high cost, but providing high benefits of providing safer transportation avenues. Low possibility of obtaining funds locally for a rural county with declining population.

STAPLEE Priority: Medium

Action Status: This action has been carried over from the 2005 plan with some progress having been made on some county roads and bridges, as well as some improvement to state roads and bridges in Hickory County.

Goal 2: The County, incorporated cities, and schools should reduce the potential impact of natural disasters on new and existing properties and infrastructure and the local economy.

Objective 2.1 The County, incorporated cities, and schools should implement cost-effective activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to natural hazards.

2.1.1. Encourage businesses to develop emergency plans

Hazard Addressed: Worker and community safety

Jurisdictions Choosing This Action: All participation jurisdictions.

Lead Agency: Hickory County Emergency Management.

Partners (if any): Local manufacturers

Funding Source: Internal funding

Estimated Cost: None beyond cost of funding personnel.

Discussion of Cost vs. Benefits: Virtually cost-free and providing high benefits of increased employee and community safety.

STAPLEE Priority: High

Action Status: This action has been carried over from the previously approved plan. No progress has been made. Most businesses in the county are small in nature, with less formalized procedures in place. This action will be reviewed in the next plan update to determine if it is appropriate for inclusion in the Hickory County Plan.

Objective 2.2 The County, incorporated cities, and schools should discourage new development and encourage preventative measures for existing development in areas vulnerable to natural hazards, thereby reducing repetitive losses to the NFIP.

2.2.1 Educate residents about the dangers of floodplain development and the benefits of the National Flood Insurance Program.

Hazard Addressed: Flooding

Jurisdictions Choosing this Action: Hickory County, Cross Timbers and Weaubleau.

Lead Agency: Legislative bodies of all participating jurisdictions.

Partners (if any): NFIP, FEMA and SEMA

Funding Sources: Additional funding not needed

Estimated Costs: None beyond cost of funding personnel.

Discussion of Cost vs. Benefits: With no additional cost involved this action will add safety and decreased community losses during flood events.

STAPLEE Priority: High

Action Status: This action was carried over from the 2005 plan without progress having been made. Note that although formalized education efforts have not been made, the discussions have occurred at local legislative body meetings. In addition the local press has provided some education concerning hazards.

2.2.2 Jurisdictions participation in the NFIP will continue to participate in the program.

Hazards Addressed: Flooding

Jurisdictions Choosing this Action: All Jurisdictions.

Lead Agency: Legislative bodies of all participating jurisdictions.

Partners (if any): NFIP and FEMA

Funding Sources: None needed.

Estimated Cost: None

Discussion of Cost vs. Benefits: Very high benefit in avoiding disastrous losses to citizenry in the even of future flooding at no cost.

STAPLEE Priority: High

Action Status: This is a new action to the plan update.

2.2.3 Jurisdictions not currently participating in the NFIP will be encouraged to become active participants in the program.

Hazards Addressed: Flooding

Jurisdictions Choosing This Action: All

Lead Agency: Legislative bodies of the participating jurisdictions. Note that school districts are not eligible to participate in the NFIP.

Partners (if any): NFIP and FEMA

Funding Sources: None needed.

Estimated Cost: None

Discussion of Cost vs. Benefits: No cost and very high possible benefits in making citizenry eligible to buy flood insurance not available through most individual insurance policies.

Action Status: This action is new to the plan update.

Objective 2.3 The County, incorporated cities, and schools should use regulations to ensure that development will not put people in harm's way or increase threats to existing properties.

2.3.1 Encourage minimum building standards for building codes in all cities

Hazards Addressed: Flooding, thunderstorms/tornadoes, earthquakes, severe winter weather, and wildfire.

Jurisdictions Choosing this Action: All

Lead Agency: Local building inspectors or economic development committee.

Partners (if any) Community betterment committee.

Funding Sources: Not needed

Estimated Cost: None beyond cost of funding personnel.

Discussion of Cost vs. Benefits: Although the implementation cost would be low, this could be a difficult action to get all partners to agree on.

STAPLEE Priority: Low, because the adoption of building codes can be a politically charged activity not popular with all segments of the community.

Action Status: This action was part of the previously approved plan, but no progress has been made in implementation.

2.3.2 Encourage local and county governments to develop and implement regulations for the securing of hazardous materials, tanks, and mobile homes.

Hazards Addressed: Flooding, thunderstorms/tornadoes, earthquakes, dam/levee breach, and wildfire.

Jurisdictions Choosing this Action: Encouragement would come from the county EMA.

Lead Agency: Hickory County EMA

Partners (if any) Local Emergency Planning Committee (LEPC)

Funding Sources: No additional funding will be needed.

Estimated Cost: No additional funding required.

Discussion of Cost vs. Benefit: No cost and high possible benefits by providing safer storage of hazardous materials in the county.

STAPLEE Priority: High

Action Status: The action was part of the previously approved plan, but no progress has been made in the implementation of this action.

Goal 3: The County, incorporated cities, and schools should promote education, outreach, research and development programs to improve the knowledge and awareness among citizens and industry about hazards they may face, their vulnerability to identified hazards, and hazard mitigation alternatives that can reduce their vulnerabilities.

Objective 3.1 The County, incorporated cities, and schools should heighten public awareness of the full range of natural hazards by developing education and outreach programs.

3.1.1 Develop a consistent public relations effort consisting of public service press releases from Emergency Management with distribution of SEMA brochures at public and other preparedness information at facilities and events.

Hazards Addressed: All hazards

Jurisdictions Choosing This Action: All

Lead Agency: Emergency Management Agencies

Partners (if any): Local news media, radio stations and SEMA.

Funding Sources: No additional funding needs anticipated.

Estimated Cost: None

Discussion of Cost vs. Benefits: Although there should be no additional cost, the effects of “public service announcements” can be hard to quantify, therefore this action will receive a lower STAPLEE rating.

STAPLEE Priority: Low

Action Status: This action has been combined with action 3.1.2 from the previously approved 2005 Plan. SEMA brochures were distributed at several public events since the 2005 Plan was approved. In addition, brochures were made available at public facilities like county office buildings. This type of activity is continuous and ongoing. The Planning Committee determined that it was in everyone’s interest to continue distribution, and included the action in the Plan Update.

Objective 3.2 The County, incorporated cities, and schools should publicize and encourage the adoption of appropriate hazard mitigation measures by county and city governments.

3.2.1 Cities/counties should continually re-evaluate the hazard mitigation plan and merge with other community planning, developing press releases concerning completed hazard mitigation projects.

Hazards Addressed: Potentially all hazards could be addressed, depending on which of the mitigation actions are implemented.

Jurisdictions Choosing This Action: All Jurisdictions

Lead Agency: Emergency Management Agency.

Partners (if any): Community planning committee.

Funding Sources: Not needed.

Estimate Cost: None beyond cost of funding personnel.

Discussion of Cost vs. Benefits: This would be a low cost action item with high benefits.

STAPLEE Priority: High

Action Status: This action also combined two actions for the previously approved plan. Re-evaluation of the hazard mitigation plan did not occur between the approval of the previous plan and the commencement of the plan update process. Press releases did detail accomplishment of hazard mitigation projects, however. It is planned that re-evaluation of the plan will occur annually once the update is approved.

3.2.2. Create safe rooms in schools.

Hazards Addressed: Primarily for tornadoes, though safe rooms could be used as shelter during other hazard events.

Jurisdictions Choosing This Action: School Districts

Lead Agency: School district superintendents.

Partners (if any): Missouri State Emergency Management Agency.

Funding Sources: 75% could be funded through HMGP funding, if available, with a 25% local match requirement.

Estimated Cost: Precise cost estimates would be made at the time that funding is available based on the proposed size of the safe room.

Discussion of Cost vs. Benefits: This would be a very high cost project even for a small safe room, but with significant benefits.

STAPLEE Priority: This project rated very high on the STAPLEE analysis, since it is so strongly supported by almost every sector in the community. However without outside funding grants, it is not likely that the project would be feasible.

Action Status: This is a new action in the Plan Update.

Objective 3.3 The County, incorporated cities, and schools should educate the public on actions they can take to prevent or reduce the loss of life and property from all natural hazards.

3.3.1 Encourage county health department and local American Red Cross chapter to use publicity campaigns that make residents aware of proper measures to take during times of extreme heat or cold.

Hazards Addressed: Extreme Heat and severe winter weather.

Jurisdictions Choosing This Action: Hickory County

Lead Agency: County Health Department

Partners (if any): EMA and Red Cross

Funding Sources: No new sources needed

Estimated Costs: None anticipated.

Discussion of Cost vs. Benefits: If public service announcements use, medium benefit with no cost involved.

STAPLEE Priority: Medium

Action Status: This action has been carried over from the previously approved plan but has not been implemented.

Objective 3.4 The County, incorporated cities, and schools should provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

3.4.1 Ask SEMA specialist to present information to city councils, county commissions, KBRPC, and Hickory County Emergency Planning Committee.

Hazards Addressed: Flooding, thunderstorms/tornadoes, earthquakes, severe winter weather, and wildfire.

Jurisdictions Choosing This Action: All jurisdictions.

Lead Agency: County Emergency Management Agency.

Partners (if any): State Emergency Management Agency

Funding Sources: Outside funding not needed.

Estimated Cost: None

Discussion of Cost vs. Benefits: Although this action item has no significant cost it is, at times, difficult to engage the public in mitigation efforts.

STAPLEE Priority: Medium

Action Status: This action is carried over from the previously approved plan but has not been implemented.

Goal 4: The County, incorporated cities and schools should strengthen communication and coordinate participation between public agencies, citizens, non-profit organizations, business, and industry to create a widespread interest in mitigation.

Objective 4.1 The County, incorporated cities, and schools should build and support local partnerships to continuously become less vulnerable to hazards.

4.1.1 Encourage and participate in joint training (or drills), partnering activities, and informational meetings between agencies, public and private entities (including schools and businesses), pooling different agency resources to achieve widespread results.

Hazards Addressed: All hazards.

Jurisdictions Choosing This Action: All Jurisdictions

Lead Agency: Emergency Management Director

Partners (if any) Local fire department, LEPC's, School Superintendents and manufacturing response teams.

Funding Sources: Training Grants, LEPC exercise funds, private industry donations.

Estimated Cost: Could be very little cost up to large amount of funds needed for a full-scale operational exercise.

Discussion of Cost vs. Benefits: Although this action item may provide high benefits of public preparedness for a serious event, the logistics and possible high cost will likely not elicit high public support.

STAPLEE Priority: Low

Action Status: This action is carried over for the previously approved plan but has not been implemented.

Goal 5: The County, incorporated cities, and schools should establish priorities for reducing risks to the people and their property with emphasis on long term and maximum benefits to the public rather than short term benefits of special interest.

Objective 5.1 The County, incorporated cities, and schools should incorporate hazard mitigation into the long range planning and development activities of the county and each jurisdiction

5.1.1 All communities need to develop storm water management plans, and include storm water management considerations in all new development.

Hazards Addressed: Flooding.

Jurisdictions Choosing This Action: Hickory County and all jurisdictions.

Lead Agency: Public Works Departments of the participating communities. In those instances where the community does not have a Public Works Department, the legislative body would be the lead agency. The lead agencies for the school districts would be the school boards.

Partners (if any): None

Funding Sources: City and County revenues pay public employee salaries.

Estimated Cost: None

Discussion of Cost vs. Benefits: Strongly benefits the communities at a low cost.

STAPLEE Priority: Formal storm water management plans may not be practical or feasible for smaller communities, and so this action received a lower priority score. In addition, new development is not occurring in many of the participating jurisdictions. Political support could be low.

Action Status: This action is a combination of two actions carried over from the previously approved plan but has not been implemented.

5.1.2 Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

Hazards Addressed: All Hazards.

Jurisdictions Choosing This Action: All Jurisdictions

Lead Agency: Emergency Management Directors.

Partners (if any): LEPC's, Fire districts / departments and local legislative bodies.

Funding Sources: City and County revenues pay public employee salaries.

Estimated Cost: No additional cost above normal operating budgets.

Discussion of Cost vs. Benefits: High benefits to the communities at a low cost.

STAPLEE Priority: High

Action Status: This action is carried over from the previously approved plan but has not been implemented.

Objective 5.2 The County, incorporated cities, and schools should promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

5.2.1 Encourage local government to purchase properties in the floodplain as funds become available and convert that land into public/recreational space.

Hazards Addressed: Flooding

Jurisdictions Choosing This Action: Hickory County and Hermitage.

Lead Agency: local legislative bodies.

Partners (if any): None

Funding Sources: Grants, community investments.

Estimated Cost: Precise cost estimates would be made at the time that funding is available based on the proposed size and location of land to be purchased.

Discussion of Cost vs. Benefits: This would be a very high cost project for larger land areas, but with significant benefits.

STAPLEE Priority: As in action 5.1.1 land purchase plans may not be practical or feasible for smaller communities, and so this action received a lower priority score. In addition, new development is not occurring in many of the participating jurisdictions. Political support could be low

Action Status: This action is carried over from the previously approved plan but has not been implemented.

5.2.2 Encourage communities to zone all areas in floodplain as open space

Hazards Addressed: Flooding

Jurisdictions Choosing This Action: Hickory County and Hermitage.

Lead Agency: Local legislative bodies.

Partners (if any): None

Funding Sources: None needed

Estimated Cost: None

Discussion of Cost vs. Benefits: Re-zoning of areas in floodplains will have little to no cost while providing high benefit of eliminating repeated losses in floodplain areas.

STAPLEE Priority: High

Action Status: This action is carried over from the previously approved plan but has not been implemented.

Goal 6: The County, incorporated cities and schools should secure resources for investment in hazard mitigation.

Objective 6.1 The County, incorporated cities, and schools should research the use of outside sources for funding.

6.1.1 Work with SEMA coordinator to learn about new mitigation funding opportunities

Hazards Addressed: All Hazards.

Jurisdictions Choosing This Action: All jurisdictions.

Lead Agency: Local legislative bodies.

Partners (if any): SEMA

Funding Sources: None needed.

Estimated Cost: No additional cost above normal operating budgets.

Discussion of Cost vs. Benefits: Medium benefits the communities at a low cost.

STAPLEE Priority: Medium

Action Status: This action is carried over from the previously approved plan but has not been formally implemented. However, interaction between the county and SEMA has occurred since the 2005 plan was approved. Informal communication concerning mitigation funding opportunities has occurred.

6.1.2 Structure grant proposals for road/bridge upgrades so that hazard mitigation concerns can be met.

Hazards Addressed: Flooding

Jurisdictions Choosing this Action: All

Lead Agency: Local legislative bodies.

Partners (if any): FEMA and Kaysinger Regional Planning Commission.

Funding Sources: None needed if grants completed by local legislative body, and are non-matching grants.

Estimated Cost: No additional cost above normal operating budgets if grants are completed in-house and are non matching grants.

Discussion of Cost vs. Benefits: There are very few grants that do not require matching funds from the applying jurisdictions. In the case of a grant requiring matching funds, this action may not be supported by the public.

STAPLEE Priority: Medium

Action Status: This action is carried over from the previously approved plan but has not been implemented.

6.1.3 Work with state/local/federal agencies to include mitigation planning in all economic and community development projects.

Hazards Addressed: All Hazards.

Jurisdictions Choosing This Action: All jurisdictions.

Lead Agency: Local legislative bodies

Partners (if any): FEMA, SEMA, LEPC, and Economic Development Committees.

Funding Sources: No additional funding anticipated.

Estimated Costs: No additional cost above normal operating budgets.

Discussion of Cost vs. Benefits: Low cost with high benefits to the jurisdiction.

STAPLEE Priority: High

Action Status: This action has been changed from the previously approved plan to include mitigation planning.

4.5 NFIP Participation

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.

Hickory County has never been mapped, nor is it a member of the NFIP or has a FIRM available.

The jurisdictions of Hickory County and the county itself have very limited GIS, engineering, and planning capabilities.

The importance of current and accurate FIRM maps in a locale highly susceptible to flooding events, such as Hickory County, cannot be stated strongly enough. Hickory County has seen little growth and development.

Accurate flood maps are the basis of the NFIP. Appropriate and effective mitigation begins with accurate information.

Table 4.5-1 Listing of communities registered with the NFIP

CID #	Community	Initial FHBM	Initial FIRM	Curr EFF Map Date	Sanction Date	Tribal?
290634	Weaubleau	1/31/75	-----	NSFHA	9/10/84	No
290610	Cross Timbers	2/21/75	-----	2/21/75	2/21/76	No

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

4.6 Funding Sources

There are numerous ways which local mitigation projects can be funded.

Local Funds

These funds come predominantly from property and sales tax revenues; they are generally allocated directly to school, public works, and other essential government functions. While there may be little room for mitigation funding within this revenue stream, mitigation activities frequently will be a part of essential government functions. For example, money that is allocated for a new school can fund stronger than normal roofs to help the school in the event of a tornado.

Non-Governmental Funds

Another potential source of revenue for local mitigation efforts are contributions of nongovernmental 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.

Federal Funds

The bulk of federal funding for mitigation is available through the FEMA Mitigation Grants Programs; another possible funding source is Community Development Block Grants (CDBG) after a Presidential Disaster Declaration.

FEMA MITIGATION GRANTS PROGRAMS - Jurisdictions which have adopted a FEMA approved Hazard Mitigation Plan are eligible for hazard mitigation funding through FEMA grant programs. The following five FEMA grant programs currently provide hazard mitigation funding:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Repetitive Flood Claims (RFC)
- Severe Repetitive Loss (SRL)

Mitigation activities which are eligible for funding vary between the programs. All potential projects must match the stated goals and objectives of the Hickory County Hazard Mitigation Plan and the State of Missouri Hazard Mitigation Plan.

Eligible Activities

Eligible Activities	HMGP	PDM	FMA	RFC	SRL
1. Mitigation Projects	✓	✓	✓	✓	✓
Property Acquisition and Structure Demolition or Relocation	✓	✓	✓	✓	✓
Structure Elevation	✓	✓	✓	✓	✓
Mitigation Reconstruction					✓
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; a planner at Kaysinger Basin RPC is trained on this software.

Application for most of the mitigation grant programs must be made through eGrants, FEMA's web-based, electronic grants management system. HMGP has a paper application.

Cost share requirements and the application format for these five programs are shown. 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.

Cost Share Requirements

Programs	Mitigation Activity Grant (Percent of Federal/Non-Federal Share)
HMGP	75/25
PDM	75/25
PDM—subgrantee is small impoverished community	90/10
PDM—Tribal grantee is small impoverished community	90/10
FMA	75/25
FMA—severe repetitive loss property with Repetitive Loss Strategy	90/10
RFC	100/0
SRL	75/25
SRL—with Repetitive Loss Strategy	90/10

Details of each program are discussed below.

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration. After a major disaster, communities may be able to identify additional areas where mitigation can help prevent losses in the future.

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.

The HMGP can be used to fund projects to protect 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 their state which is responsible for setting priorities for funding and administering the program.

More information on this program is available at: www.fema.gov/government/grant/hmgp/

Pre-Disaster Mitigation Program (PDM)

With the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster Declaration.

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.

More information on this program is available at: www.fema.gov/government/grant/pdm/

Flood Mitigation Assistance Program (FMA)

FMA 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 an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

FMA funding for the state depends on the number of repetitive losses in the state. The frequency of flooding in Missouri in recent years, coupled with the losses incurred, has caused Missouri's funding to rise. This is a good program for smaller projects like low water crossings, according to Sheila Huddleston, Missouri State Hazard Mitigation Officer.

For FMA, not more than one half of the non-Federal may be provided from in-kind contributions.

More information on this program is available at: www.fema.gov/government/grant/fma/

Repetitive Flood Claims Grant Program (RFC)

The Repetitive Flood Claims (RFC) grant program was authorized in 1968 to assist States and communities in reducing flood damages to insured properties that have had one or more claims to the NFIP.

In order to apply for funding through this 100% Federal share program, a community must show that it can't meet FMA requirements due to lack of cost share match or capacity to manage the activities. This doesn't necessarily mean it needs to be a low-income community. A St. Louis area community was awarded a RFC grant on the basis that it couldn't meet FMA requirements because it was in the middle of the budget cycle.

More information on this program is available at: www.fema.gov/government/grant/rfc/

Severe Repetitive Loss Grant Program (SRL)

The Severe Repetitive Loss (SRL) grant program was authorized in 2004 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) properties insured under the NFIP.

A 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 ten-year period, and must be greater than 10 days apart. There are very specific requirements for this grant program; requirements need to be studied carefully before making application. For buyouts under SRL, a property must be on FEMA's validated SRL list to be eligible. Property owner consultations are required before submitting an application.

More information on this program is available at: www.fema.gov/government/grant/srl/

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.

Section 5 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.

5.1 Plan Monitoring and Evaluation

The Hickory County Hazard Mitigation Plan will be monitored and evaluated on a yearly basis beginning in the year following approval and adoption. This would mean there will be four monitoring/evaluation periods (January/February 2013, January/February 2014, January/February 2015, and January/February 2016). The last monitoring and evaluation in 2017 will lead into the 5-year update process.

The monitoring and evaluation will be facilitated through Kaysinger Basin Regional Planning Commission. It will consist of the following:

1. Surveys will be sent to all participating jurisdictions for information including: mitigation actions which have been implemented in the jurisdiction, changes in priorities of mitigation actions within the jurisdiction, needs not addressed by the current plan. A sample survey is shown in Figure 5.1.
2. Survey information will be collected by planners at Kaysinger Basin RPC.
3. Meeting(s) of the Hazard Mitigation Technical Steering Committee will be convened by Kaysinger Basin RPC to discuss survey feedback, any changes in hazard risks in the county, and any other pertinent information.
4. A yearly report will be written and included in the current plan.

Hickory County has developed a method to ensure that regular review of the Hickory County Natural Hazard Mitigation plan occurs. The county's hazard Mitigation Plan Committee consists of the County Commissioners, municipal officials, members of the Hickory County Emergency Management Committee, and a team member from Kaysinger Basin Regional Planning Commission.

The county EMD will be responsible for contacting all Hazard Mitigation Planning Committee members and organizing annual meetings. The County Commission, the EMD and the participating municipalities will be responsible for monitoring and evaluating the progress of the mitigation strategies in the plan.

They will review each goal and objective to determine their relevance to changing situations in the county, as well as changes in State or Federal policy, and to ensure that they are addressing current and expected conditions.

They will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of their projects, including which implementation process worked well, and difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised.

Following the annual review, the County EMD will then have three months to update and make changes to the plan as determined necessary before submitting it to the Committee members and the State Hazard Mitigation Officer. If no changes are necessary, the State Hazard Mitigation Officer will be given a justification for this determination.

This Hazard Mitigation Planning Committee shall consist of, at a minimum the following members:

- One member of the Hickory County Commission.
- One member of the Hickory County Local Emergency Planning Commission
- The Hickory County Emergency Management Director
- Two representatives from local industry
- Other county residents that may wish to attend.

This Mitigation Plan Review meeting shall occur on or before April 1 of each year, beginning in 2014.

The general public will be encouraged to attend Hazard Mitigation Planning Committee meetings through posted notices, reminders or announcements. Kaysinger Basin Regional Planning Commission will continue to host any announcements as well as a copy of the latest plan on the Kaysinger Basin Regional Planning Commission website at <http://www.kaysinger.com/>.

Figure 5.1**Yearly Survey of Mitigation Actions for (Sample)**

Action #	Mitigation Action	Priority	Plan for Implementation and Administration	Lead Department or Agency	Projected Completion Date	Criterion for Completion	Current Status of Mitigation Action	Comments
1.2.2	Encourage underground utilities in improvements and new development.	High	This is being done and will continue.	City Administrator	Ongoing	Utilities are underground in new developments		
2.1.6	Develop policy and enforcement regulations concerning burning permits.	Medium	Will write regulations for adoption by City Council	Dept of Public Works	2017	Policy is in place and enforced		
5.0.1	Adopt procedures for review of subdivision plans to minimize flood problems.	High	Adoption will come before Council in 2010	City Administrator	2010	Procedures are adopted.		

Please indicate the current status of each mitigation action on the above chart. Please note any change to the priorities of actions.

Are there any changes in your jurisdiction which may affect the content of the Boone County Hazard Mitigation Plan? If so, please describe.

5.2 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.

Assuming approval and adoption of the current plan occurs in the summer of 2012, the Hickory County Hazard Mitigation Plan will need to be updated and reapproved by FEMA in the summer of 2015. A proposed schedule for the update is shown in Figure 5.2.

Proposed Schedule for 5-year Update of Hazard Mitigation Plan PED=Plan Expiration Date		
Activity	Timeline to Begin	Responsible Party
Preliminary update of data	Yearly during maintenance review	KBRPC
Prepare cost estimates for update of plan to submit to SEMA	PED 13 months	KBRPC
Receive MOA from SEMA for update	PED 11 months	SEMA
Review data for any additional updates	PED 11 months	KBRPC
Contact participating jurisdictions re: technical steering committee officials	PED 10 months	KBRPC
Survey to participating jurisdictions re: capabilities, vulnerable assets, future development	PED 10 months	KBRPC
Meetings to conduct preliminary review and update	PED 9 months	Technical Steering Committee
Public meeting #1 for comment and input on draft update	PED 7 months	KBRPC/TSC
Draft of update due at SEMA	PED 6 months	KBRPC
Participating jurisdictions hold meetings to discuss plan updates	PED 6 months	Participating jurisdictions
Public meeting #2 for comment and input on final update	PED 4 months	KBRPC/TSC
Final plan due at SEMA before submission to FEMA	PED 3 months	KBRPC
Plan reviewed by SEMA	PED 3 months	SEMA
Required changes made to plan	PED 2.5 months	KBRPC

Plan submitted to FEMA	PED 2 months	SEMA
Participating jurisdictions adopt approved plan	PED 1 month	Participating jurisdictions

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 Technical Steering Committee throughout the five year process would be highly beneficial in taking mitigation planning to the next level.

The following data gaps in the current plan should be examined during the 2015 update process:

Dam Failure

Information from the mapping of the high hazards dams in the county should be completed before 2015. Emergency Action Plans (EAPs) may have been written for some, or all, of the regulated dams in the county by this time. The following sites may be helpful in obtaining current information on the progress of this work: DNR's Dam Safety Program. (<http://www.dnr.mo.gov/env/wrc/damsft/damsfthp.htm>) and DamSafetyAction.org,

Flood

To the best of my ability, flooding, dam failure, and levee failure are represented in Appendix B. With more experience and time, detailed HAZUS mapping should be incorporated into the 2015 update.

Levee Failure

There are some data gaps in assessing vulnerability to levee failure which, while not critical to gaining an overall perspective on vulnerability, would increase accuracy if available. Inundation information is not readily available for areas protected by levee districts and areas protected by non-district or private levees are not known.

The US Army Corps of Engineers, working with the FEMA and other federal, state, and local agencies, assembled a Regional Interagency Levee Task Force (ILTF) in 2008 to provide a uniform approach across the area impacted by flooding in the Midwest. Data is currently being updated and made more available through this task force. The following website may be helpful in providing the most current information on levee failure during the 2015 update: <http://www.iwr.usace.army.mil/iltf/index.cfm>

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.

The Hickory County Hazard Mitigation Plan will be partly integrated into the Hickory County Emergency Operations Plan when it is updated each year. The EOP update is the responsibility of the Emergency Management Director and staff. The Emergency Operations Plan covers all jurisdictions within Hickory County.

Specific information on integration of the plan into other planning mechanisms in the participating jurisdictions is shown in Figure 5.3. This information was verbally collected after meeting with each city clerk, commissioners, and the Hickory County Health Department.

Figure 5.3 Depicts each town's idea of implementing this HMP into other plans.

Jurisdiction	Plan of Implementation of HMP into Other Plans
Hickory County	Parts of this plan will be added to the County EOP.
Cross Timbers	As soon as a new EMD is hired, the local EOP will be integrated into this HMP.
Hermitage	This plan will eventually be incorporated into the Master Plan and local EOP.
Preston	This plan will be integrated into the local EOP.
Weaubleau	This plan will be integrated into the local EOP.
Wheatland	This plan will be integrated into the local EOP.
Hermitage R-IV School District	Parts of this plan will be integrated with the schools emergency operation and procedure plans
Hickory Co. R-I School District	Parts of this plan will be integrated with the schools emergency operation and procedure plans
Weaubleau R-III School District	Parts of this plan will be integrated with the schools emergency operation and procedure plans
Wheatland R-II School District	Parts of this plan will be integrated with the schools emergency operation and procedure plans

5.4 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 Hickory County Hazard Mitigation plan will be remain continually available on the website of the Kaysinger Basin Regional Planning Commission (www.kaysinger.com) 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 Hickory County Emergency Management Director will facilitate presenting the entire plan to interested groups within the county such as:

- Health Department Personnel
- City Fire and Rural Fire Protection Districts
- City Elected Officials/Administrators
- Educational Personnel
- Local Emergency Planning Committees
- Local Police/Sheriff Department Personnel
- Public Safety Joint Communications Committee Meeting

Public notice of the upcoming yearly review and maintenance of the plan will be given via postings on the Kaysinger Basin RPC website and through the KBRPC newsletter. 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.)

Section 6 Maps

Education Facilities

Population Density

Land Use/Cover

Sinkhole Map

Healthcare Facilities

Transportation

Floodplain Maps

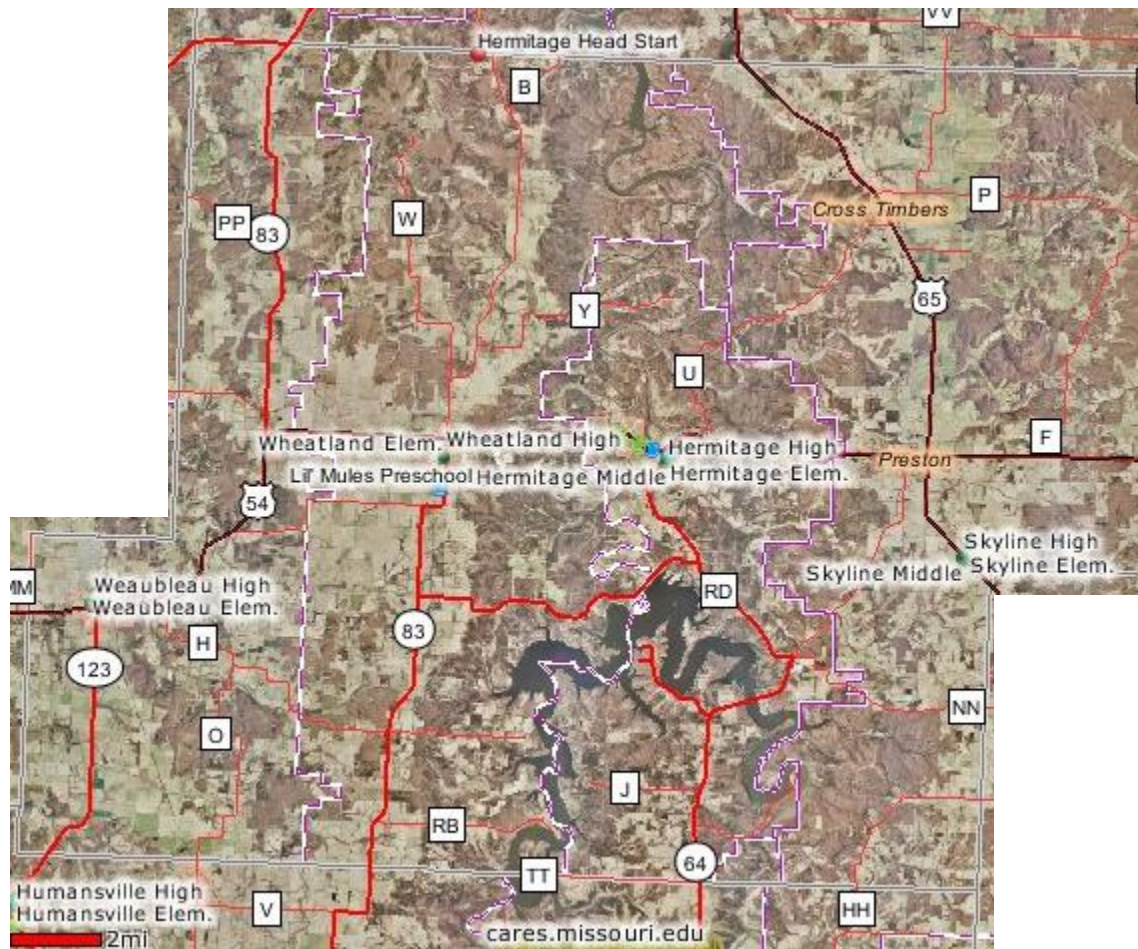
Dams

Soils

Topographic Map

* Some of Section 6 maps were created with CARES Interactive Maps.

Education Facilities



MoDOT Roads and Highways, 2007

- Interstate
- U.S. Highway
- State Numbered Highway
- State Lettered Highway
- County Boundaries, 2007
- School Districts - 2007

Incorporated Areas, 2007

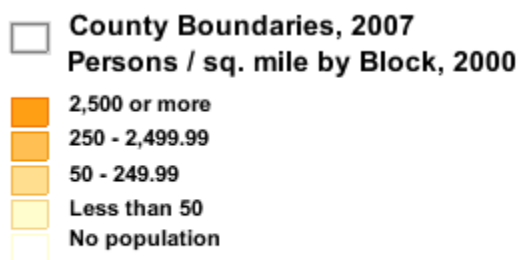
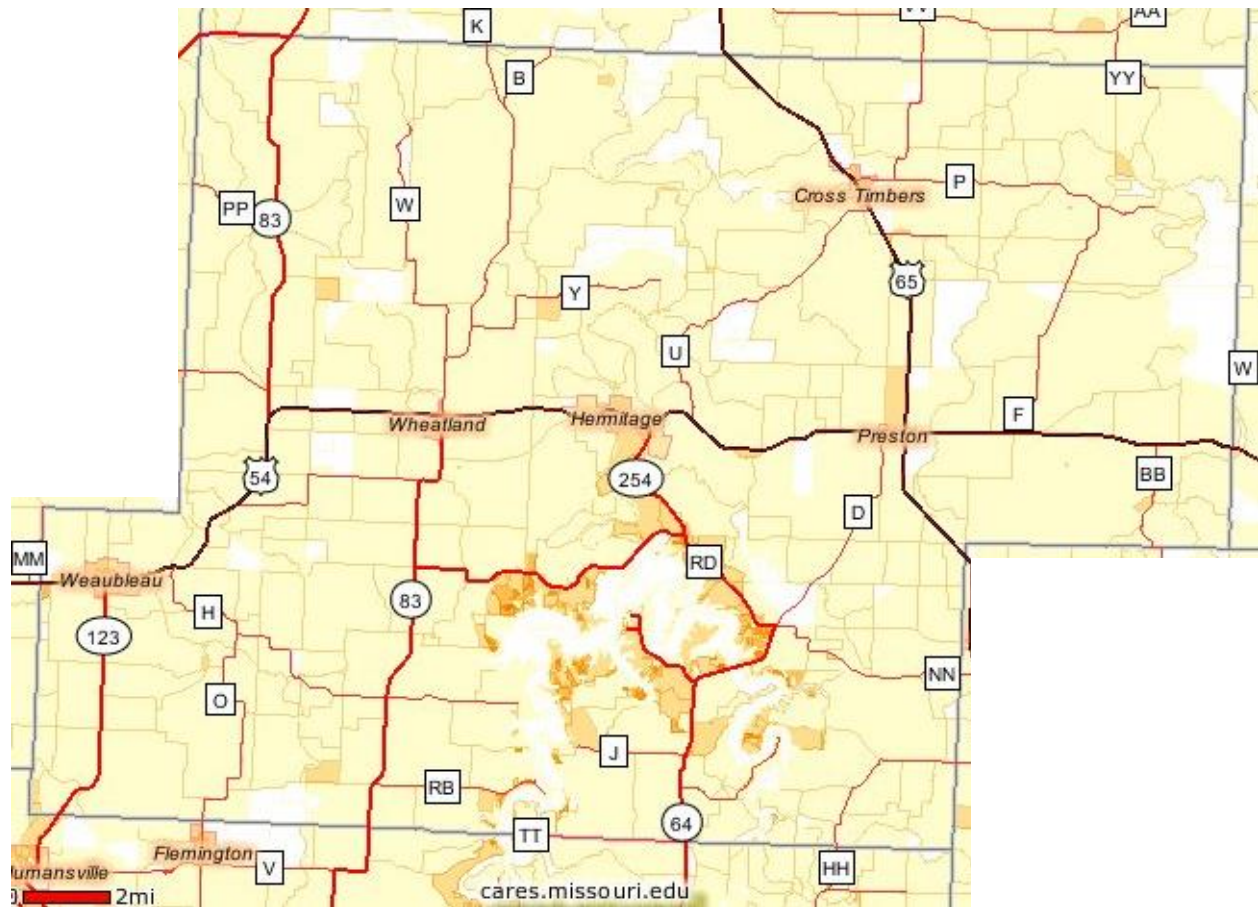
- City
- Town
- Village
- Census Designated Place
- Other

2007 Aerial Photos (NAIP)

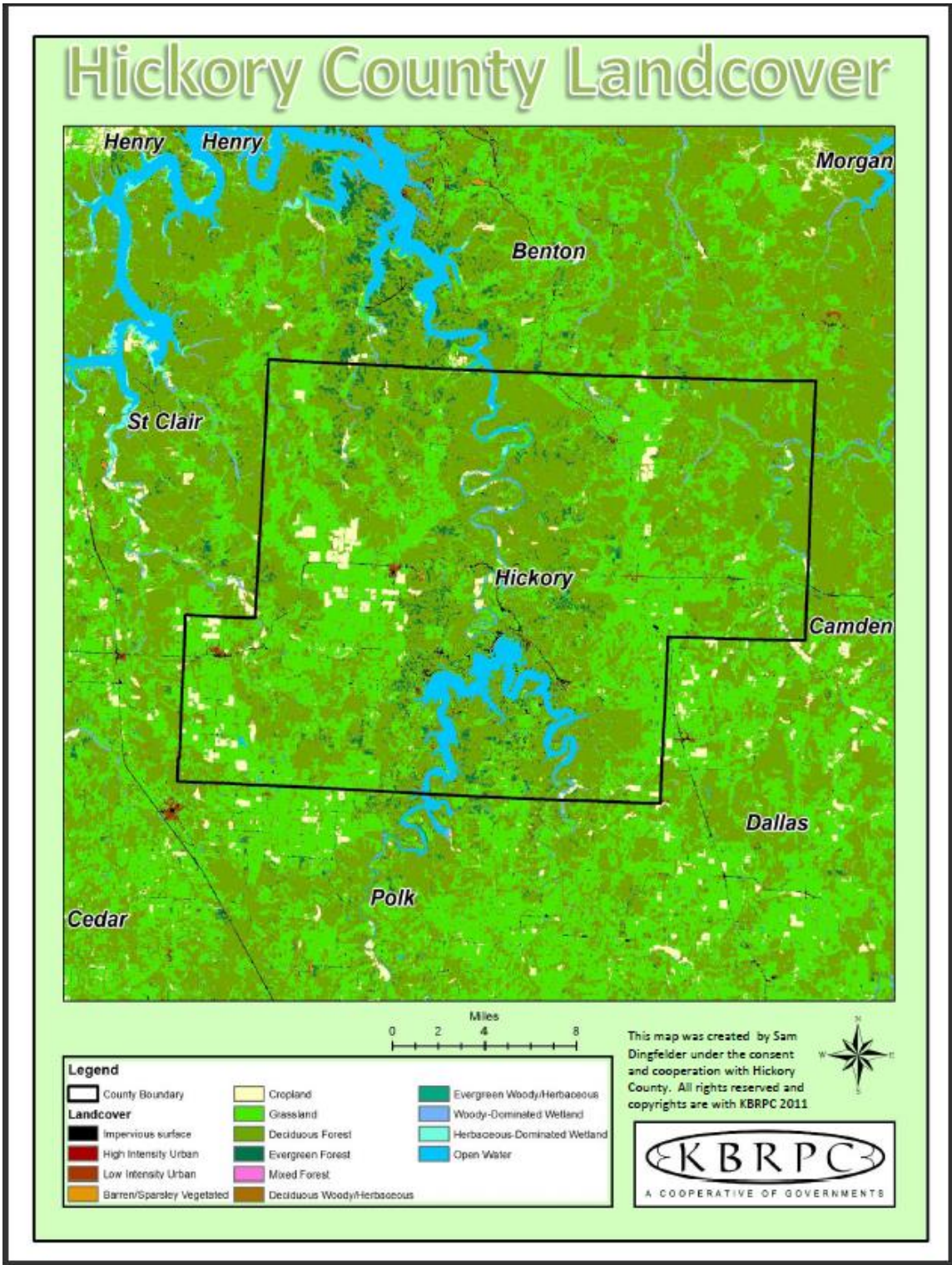
Higher Education 2007

- Public Institutions
- Public / Technical Institutions
- Private Institutions
- Technical / Professional Institutions
- Theological Institutions
- Schools 2007 (DESE)
- Licensed Child Care Family Homes
- Head Start Programs
- Licensed Child Care Centers
- Child Care Centers (NAEYC Accredited), 2007

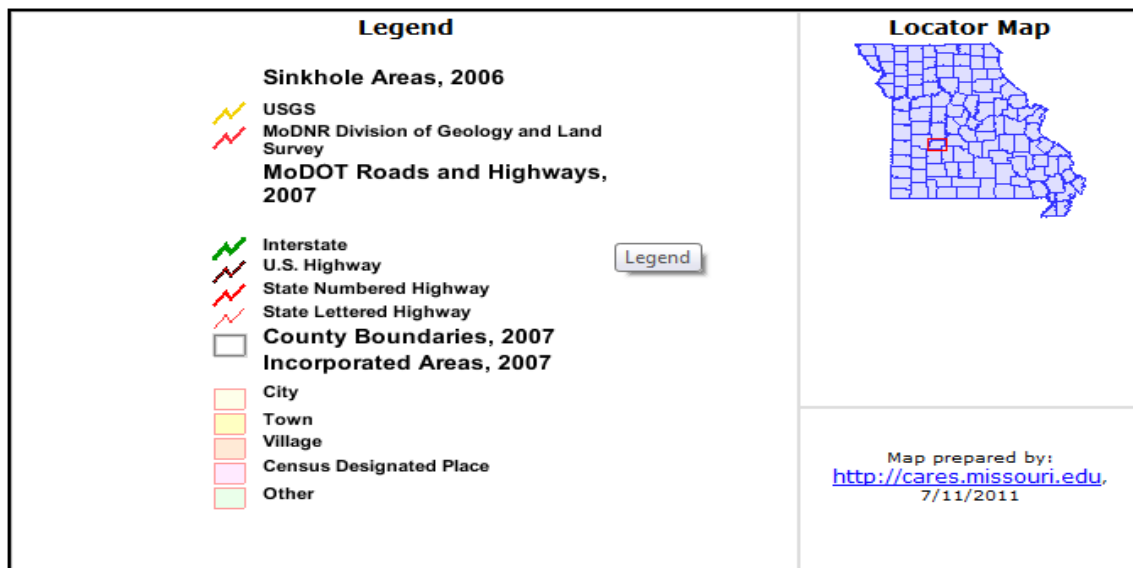
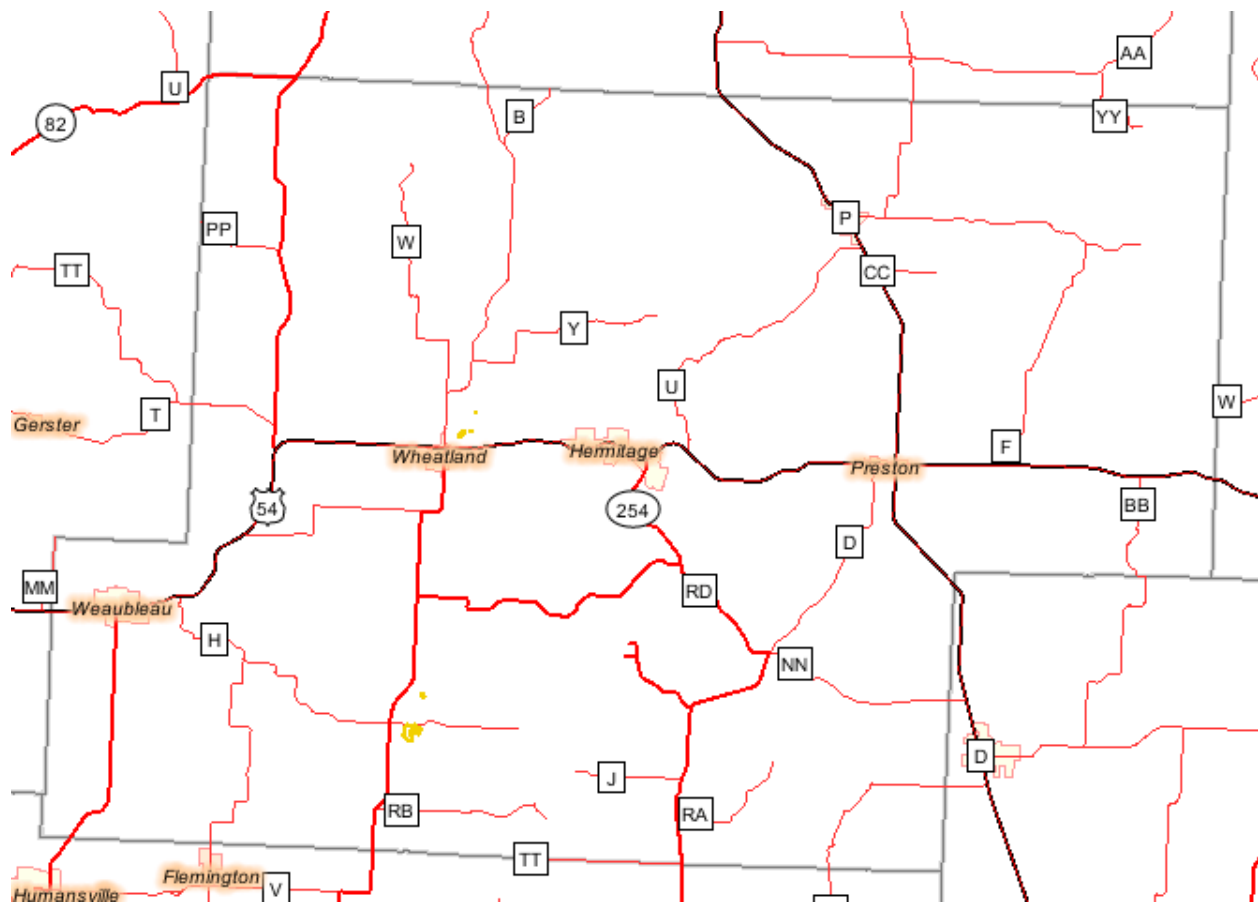
Population Density



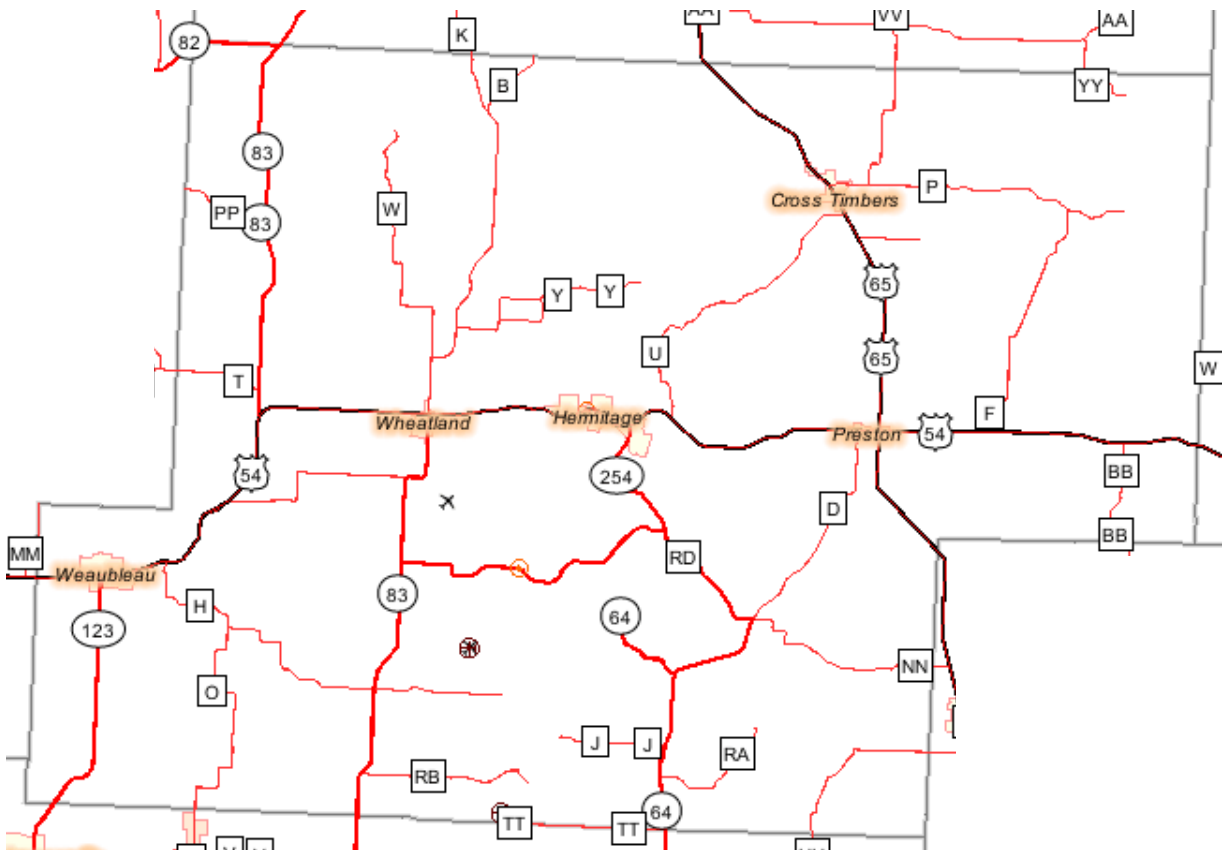
Land Cover



Sinkhole



Transportation



MoDOT Roads and Highways, 2007

- Interstate
- U.S. Highway
- State Numbered Highway
- State Lettered Highway
- County Boundaries, 2007
- Incorporated Areas, 2007 (cont)

- City
- Town
- Village
- Census Designated Place
- Other
- 2007 Aerial Photos (NAIP)

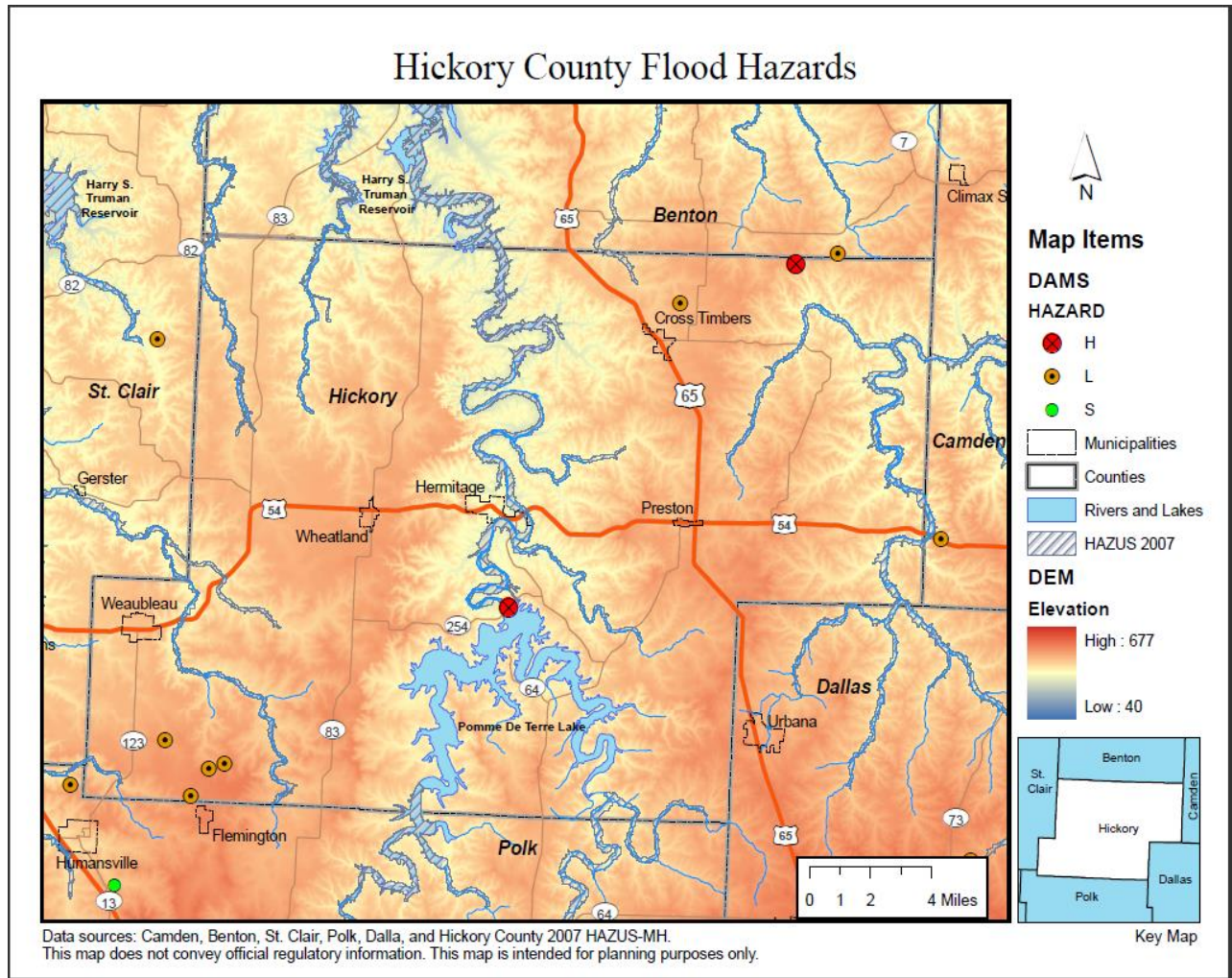
The map displays the service area of the Lake Area Primary Care Clinic, centered in Missouri. Key locations and features include:

- Central Location:** LAKE AREA PRIMARY CARE CLINIC (marked with a yellow star).
- Surrounding Towns:** EOLA, Wheatlend, Hermitage, Cross Timbers, and Weaubleau.
- Highways:** US-54, US-83, US-65, and MO-123.
- Other Medical Facilities:** HERMITAGE FAMILY MEDICAL CEN, HERMITAGE FAMILY MEDICAL CEN, CHRISTIAN HEALTH CARE OF HERMITAGE, NORTHWOOD HILLS CARE CENTER, and HUMANSVILLE FAMILY CARE CENTER.
- Geographic Features:** Rivers and lakes are shown in blue.
- Scale:** A scale bar at the bottom left indicates a distance of 2 miles.
- Source:** The URL cares.missouri.edu is listed at the bottom.

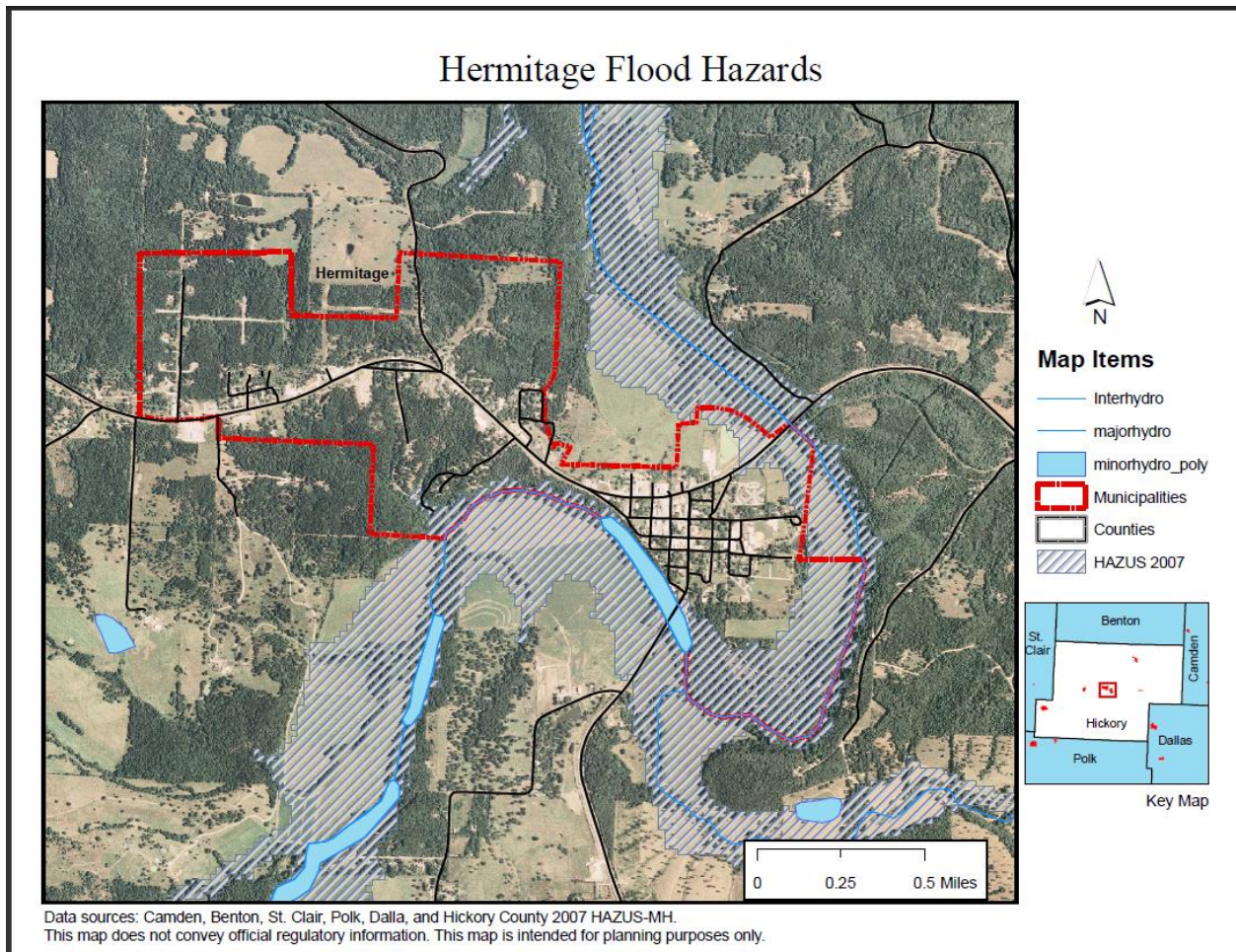
- ## Kaysinger Basin RPC / Hickory County Hazard Mitigation Plan

Floodplain Maps

There are no floodplain maps available for Hickory County. They are not members of the NFIP as of July 2013. Neither FEMA nor CARES mapping have any flood maps available for this county. Current maps were provided by SEMA.



City of Hermitage Flood Map



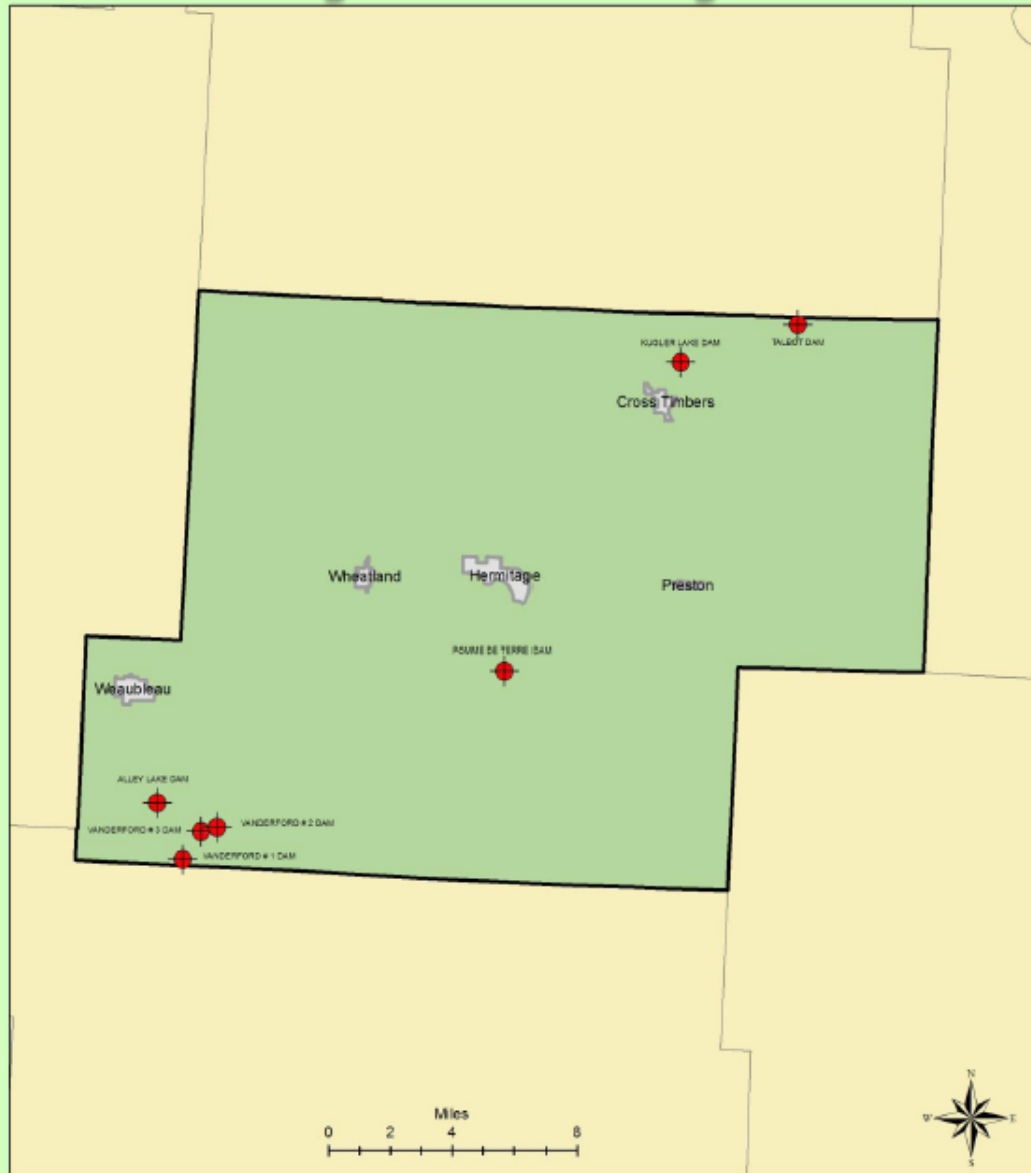
County Dam

(There are no regulated dams in the county. Pomme De Terre Lake is an U.S. Army Corp of Engineers Lake)



Source: Google Earth

Hickory County Dams



Legend

- Dams
- City Limits
- County Boundary

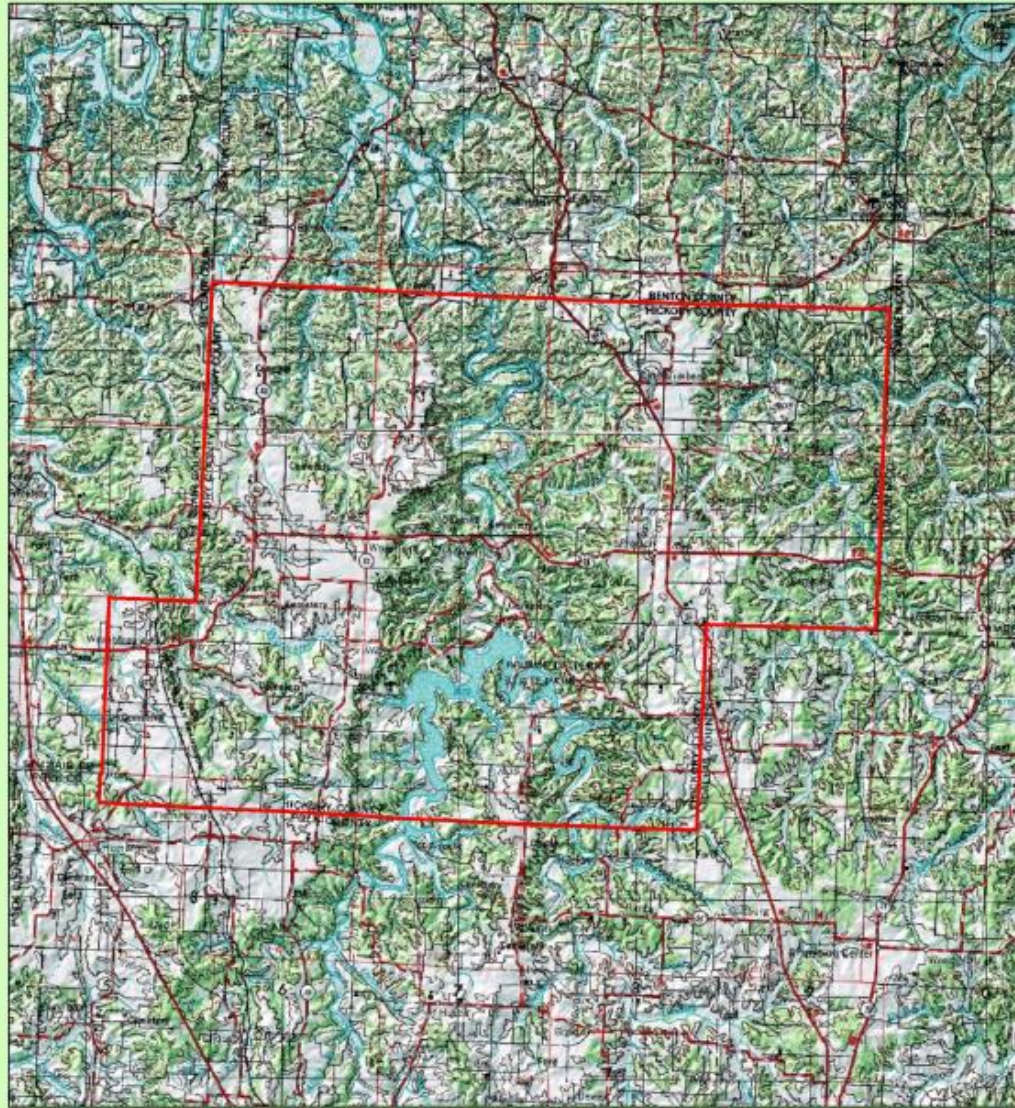
This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



This topographic map shows a portion of Missouri, including Benton, St. Clair, Polk, and Dallas counties. The terrain is depicted with brown and green shading, indicating elevation. A red rectangular area highlights a specific region within Benton and St. Clair counties. Within this red area, the town of Hickory is labeled. To the east of the red area, in Benton County, the town of Camden is marked with a blue dot. The map includes a scale bar at the bottom left, ranging from 0 to 6 miles, and a compass rose at the bottom right, showing North (N), South (S), East (E), and West (W). The towns of Benton, St. Clair, Polk, and Dallas are also labeled on the map.




Hickory County Topography



0 2.5 5 10
Miles



Legend

 County Boundary

This map was created by Sam Dingfelder under the consent and cooperation with Hickory County. All rights reserved and copyrights are with KBRPC 2011



Appendix A

Adoption Resolutions

The following resolution was adopted by Hickory County, Missouri on

_____, 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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, Hickory County participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens of Hickory County have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, Hickory County 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 County Commission that Hickory County adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the County Commission.

Presiding Commissioner

Date

Eastern Commissioner

Date

Western Commissioner

Date

The following resolution was adopted by the City of Cross Timbers, Hickory County, Missouri on

_____, 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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 C of Cross Timbers participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens of the City of Cross Timbers have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the City of Cross Timbers 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 that the City of Cross Timbers adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the Board of Aldermen.

Mayor

Date

Alderman

Date

Alderman

Date

The following resolution was adopted by the City of Hermitage, Hickory County, Missouri on _____, 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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 Hermitage participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens of the City of Hermitage have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the City of Hermitage 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 that the City of Hermitage adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the Board of Aldermen.

Mayor

Date

Alderman

Date

Alderman

Date

Alderman

Date

Alderman

Date

The following resolution was adopted by the Village of Preston, Hickory County, Missouri on _____, 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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 Village of Preston participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens of the Village of Preston have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the Village of Preston 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 that the Village of Preston adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the Board of Aldermen.

<hr/>	
Mayor	Date
<hr/>	
Alderman	Date
<hr/>	
Alderman	Date
<hr/>	
Alderman	Date
<hr/>	
Alderman	Date
<hr/>	

The following resolution was adopted by the City of Weaubleau, Hickory County, Missouri on _____, 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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 Weaubleau participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens of the City of Weaubleau have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the City of Weaubleau 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 Alderman that the City of Weaubleau adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the Board of Alderman.

_____ Mayor	_____ Date
_____ Alderman	_____ Date
_____ Alderman	_____ Date
_____ Alderman	_____ Date
_____ Alderman	_____ Date

The following resolution was adopted by the City of Wheatland, Hickory County, Missouri on _____, 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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 Wheatland participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens of the City of Wheatland have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the City of Wheatland 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 Alderman that the City of Wheatland adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the Board of Alderman.

Mayor

Date

Alderman

Date

Alderman

Date

Alderman

Date

The following resolution was adopted by the Hermitage R-IV School District, Hickory County, Missouri on _____ 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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, Hermitage R-IV School District participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens and school officials of the Hermitage R-IV District have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the City of Hermitage and Hermitage R-IV District 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 School Board that the Hermitage R-IV District adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the School Board.

Superintendent

Date

President

Date

The following resolution was adopted by the Hickory County R-I School District, Hickory County, Missouri on _____ 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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, Hickory R-I School District participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens and school officials of the Hickory R-I District have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the County and Hickory County R-I District 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 School Board that the Hickory County R-I District adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the School Board.

Superintendent

Date

President

Date

The following resolution was adopted by the Weaubleau R-III School District, Hickory County, Missouri on _____ 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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, Weaubleau R-III School District participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens and school officials of the Weaubleau R-III District have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the County and Weaubleau R-III District 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 School Board that the Weaubleau R-III District adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the School Board.

Superintendent

Date

President

Date

The following resolution was adopted by the Wheatland R-II School District, Hickory County, Missouri on _____ 2013.

RESOLUTION NO. _____

WHEREAS, the Hickory 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, Wheatland R-II School District participated in the preparation of the Hickory County Hazard Mitigation Plan; and

WHEREAS, the citizens and school officials of the Wheatland R-II District have been afforded an opportunity to comment and provide input on the Plan and the mitigation actions therein; and

WHEREAS, the County and Wheatland R-II District 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 School Board that the Wheatland R-II District adopts the Hickory County Hazard Mitigation Plan as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this ____ day of _____, 2012 at the meeting of the School Board.

Superintendent

Date

President

Date

Appendix B

Sign-In Sheets from Meetings

Hickory County Sign-In

Hickory Co.

Kaysinger Basin Regional Planning Commission
Hazard Mitigation Plan Meeting - Date: 7/12/11
Location: Wheatland Sr. Center Time: 3:00 - 4:15

Name:	Title:
Sonia Kennedy - City of Wheatland	City Clerk
Sheila Chaney - City of Wheatland	City Clerk
WILLIAM HARRISON HCEHD	END
JC Owsley Hickory County	Commissioner
Robert Sawyer Hickory County	Commissioner
WAT DARTLING II	LEPC

11/3/10

[illegible]

Hickory County

✓
✓

Preston Sign-In

Hickory Co.

7-8:30

10-5-10

Notes

Preston Town Hall Meeting

Name!

Title!

Ellie Snyder -

Renny Childress

Buddy Irvine

Lyle Holman

DARLA FENSOM

Ray West

Barbara Childress

JERRY DE FREECE

Joshua Hartley

Colp Club

Chairman

Trustee

Trustee

TRUSTEE

Engineer

Citizen

WATER OPERATOR

Citizen

Hickory Co.

10/19/10

Kaysinger Basin RPC / Hickory County Hazard Mitigation Plan

Wheatland Sign-In

Oct. 25

Kaysinger Basin Regional Planning Commission	
Hazard Mitigation Plan	
Location: Wheatland City Hall	Time: 6:30 - 8:30
Name	Title
- Scott Vogler	MECA MECO
- Rich Hayes	MECA MECA MECO
Gynemia Walker	Business Owner
Bobby Besset	Building Owner
Kevin Jackson	resident
Bryson Oliver	Mayor
Jim [unclear]	Allderman
Shirley Brishness	allderman
Dwight Kennedy	allderman
Kevin Nelson	Operator

Hermitage R-IV School District Sign-In

Hickory Co.

Kaysinger Basin Regional Planning Commission	
Hazard Mitigation Plan Meeting - Date: 5/18/11	
Location: Hermitage R-IV School District	Time: 6:30 - 7:00

Name:	Title:
✓ Wendy Moeller	Elem. Principal
Anna Christian	Board Member
Glen Long	Board Member
Garland Duke	Board Member
✓ Shelly Dubruchon	Superintendent
Scotty Duke	BOARD MEMBER
Resabe Willis	Bookkeeper / Bd Secy
Rebecca Richards	Board member
Steve Rogers	Board Member
✓ Ed Vest	Secondary principal
✓ Monica Whitney	Teacher
✓ Krissy Friedman	Teacher
✓ Bethany Whitlock	Student
✓ Rebecca L Bishop	Teacher
✓ Kaylee Christian	Student
✓ Ashley Crawford	Student
✓ Stephanie Thomas	Student
✓ Erica Idener	Student
✓ Gil Salmon	Business Teacher

Hickory Co.

Kaysinger Basin RPC / Hickory County Hazard Mitigation Plan

Weaubleau R-III School District Sign-In

Kaysinger Basin Regional Planning Commission	
Hazard Mitigation Plan Meeting - Date: 5-18-2011	
Location: Weaubleaf School	Time: 7:00 pm - 7:45
Name:	Title:
Sheila Naggett	El. Administrative Assistant
Jamie Cooper	Special Education Coordinator
Mark Zelt	Principal
Dale Atkins	Board Member
Brenda Porter	Board member
Karen Kauffman	" "
Asbrent G. Lowe	Board Member
MARK KOEHLER	" "
Brian Wood	" "
Shanda Cronney	member
Karen Wiley	Secretary of Board
Erin Wells	Superintendent

Wheatland R-II School District Sign-In

Hickory Co.

Kaysinger Basin Regional Planning Commission	
Hazard Mitigation Plan Meeting - Date: 5/19/11	
Location: Wheatland R-II District	Time: 7:00 - 8:00
Name:	Title:
Tracy Smith	Board Member
Shea Shaddox	Board Member
Justin Phillip	Board Member
Justin Hill	BOARD MEMBER
J. Gammage	Superintendent
Matt Smith	Principal
T.J. Sawyer	Board Member
Pete Walker	Member

Hickory Co.

Kaysinger Basin RPC / Hickory County Hazard Mitigation Plan

Hickory County Coalition Meeting Sign-In

Hickory County

Kaysinger Basin Regional Planning Commission Hazard Mitigation Plan Meeting - Date: 5-5-11	
Location: Wheatland Sr. Center	Time: 4:00 - 5:30

Name:	Title:
Darryl Hart	West Central Hickory Co Outrigger
Randal Hart	WCMCAA Hickory County Outreach
Jim McCarty	Foster Parents Support Group
Douglas Ives	US Coast Guard Aux
Jerry Whitson	HCHD
Deborah Kerk	Pathways
Alisa Carter	HC Health Dept
Hacy Conwell	Hick. Co. Library
Julie Foster	Prevention Coordinator
Michael Henderson	Hickory Co. Associate Judge
	Library Admin.

Appendix C

Press Releases/ Meeting Announcements

AN ECONOMIC DEVELOPMENT DISTRICT
KAYSINGER BASIN REGIONAL PLANNING COMMISSION
BATES BENTON CEDAR HENRY HICKORY ST. CLAIR VERNON



April 15, 2011

Hickory County Clerk; Mrs. Lindsey

Enclosed are some last minute questionnaires for updating the Natural Hazard Mitigation Plan. Your help throughout this process has been greatly appreciated this far. I will be holding one more county- wide meeting and some additional meetings with the Hickory County Health Department. Please encourage your Emergency Management Director to attend that meeting on May 2nd at 6:30 in the MU Extension Office.

If you should have any further questions or concerns please feel free to contact me at (660) 885-3393.

Sincerely,

Amantha Dingfelder
Regional Planner



908 North Second Street - Clinton, Missouri 64735 - (660) 885-3393 phone - (660) 885-4166 fax

Hickory County The Index

Preston considers sewer issues

The Preston Village Board of Trustees met October 5 and discussed the new sewer system being constructed to serve the village.

After discussing paying Davis Structure and Development Corporation, the board voted to have Ray West of Hood-Rich Engineering prepare a change order to retain 1% of the contract money owed to Davis.

West also presented estimates of funds needed in the amount of \$62,370.96. The board approved the payment with the 1% retainer. They also authorized the clerk to transfer \$48,349 from the DNR account to the USDA account. The council also approved the operating permit for the sewer system.

A change order was approved that involved purchasing an 8-foot gate at lift station E and to approve additional contract time of 46 days.

The clerk reported that she had received insurance quotes for the treatment plant and the lift stations, but the board took no action on the matter.

The board also:

- Received a water department report noting that a new meter had been set at one rental property and that Jerry DeFreece will be ordering water taps;

- Voted to purchase a maximum of 30 locks not to exceed \$500;

- Met with Samantha Dingfelder of Kaysinger Basin Regional Planning Commission to discuss Preston's role in the updating of Hickory County's Natural Hazard Mitigation Plan;

- Approved the village budget for 2011; and

- Held a closed session to discuss litigation and real estate but reported no business from that session.

Hickory County The Index

Hickory Co. - Oct. 4, 2010

Index

KBRPC plans town hall event

Kaysinger Basin Regional Planning Commission will discuss the public's role in updating the county's Natural Hazard Mitigation Plan at a town hall meeting at Cross Timbers Wednesday, October 6, at 6 p.m. A similar meeting was held at Preston Tuesday, October 5.

A Natural Hazard Mitigation Plan identifies hazards within each county, the concerns of the citizens in case of a natural disaster, and

how to mitigate for such events. This plan is updated every five years and is required by the Federal Emergency Management Agency. Having this plan allows each county and participating cities and schools to apply for federal grants.

Information about the meeting is available by contacting Sam Dingfelder at Kaysinger Basin Regional Planning Commission at 660-885-3393.

Hickory County The Index

