

# State of Arkansas





# Hazard Mitigation Plan

**September 2023**

# Table of Contents


**SECTION 1 - INTRODUCTION, ASSURANCES, AND ADOPTION.7**

1.1 – INTRODUCTION.....8

1.2 – ASSURANCES .....8

1.3 – AUTHORITIES.....9

1.4 - ADOPTION PROCLAMATION .....9

**SECTION 2 - STATE LEVEL DATA .....10**

2.1 - INTRODUCTION.....11

2.2 - STATEWIDE POPULATION DATA .....11

2.3 STATEWIDE HOUSING DATA.....16

2.4 ORGANIZATION OF STATE GOVERNMENT .....18

2.5 STATE OWNED AND OPERATED FACILITIES .....18

2.6 STATEWIDE LAND USE PATTERNS .....20

2.7 STATEWIDE ECONOMIC ACTIVITY PATTERNS .....21

2.8 CLIMATE CHANGE.....22

2.9 FUTURE DEVELOPMENT.....22

**SECTION 3 - RISK ASSESSMENT .....24**

3.1 - INTRODUCTION.....25

3.2 - HAZARD IDENTIFICATION PROCESS .....25

3.3 - SECTORS ASSESSED .....25

3.3.1 - POPULATIONS .....25

3.3.2 - GOVERNMENT .....25

3.3.3 - BUILT ENVIRONMENT .....25

3.3.4 - NATURAL RESOURCES .....26

3.3.5 - ECONOMY.....26

3.4 - METHODOLOGIES USED .....26

3.4.1 - DATA CHOICES AND LIMITATIONS .....26

3.4.2 - GENERAL INVENTORIES.....26

3.4.3 - TECHNIQUES AND APPROACHES .....27

3.5 - EMERGENCY MANAGEMENT ACCREDITATION PROGRAM..27

3.6 - HAZARD PROFILE ORGANIZATION AND KEY TERMS.....27

**SECTION 4 - HAZARD PROFILES AND VULNERABILITIES .....29**

4.1 - INTRODUCTION.....30

4.2 - METHODOLOGY.....30

4.3 DECLARED FEDERAL DISASTERS AND EMERGENCIES.....30

4.4 IDENTIFIED POTENTIAL HAZARDS .....33

4.4.1 DAM AND LEVEE FAILURE.....35

4.4.1.2 – DAM LOCATION AND EXTENT .....35

4.4.1.3 HIGH HAZARD DAMS.....39

4.4.1.4 – LEVEE LOCATION AND EXTENT.....39

4.4.1.5 – PREVIOUS OCCURRENCES .....45

4.4.1.6 – HAZARD PROBABILITY ANALYSIS.....46

4.4.1.7 – VULNERABILITY ASSESSMENT ..... 46
4.4.1.8 – IMPACT AND CONSEQUENCE ANALYSIS ..... 52
4.4.2 DROUGHT ..... 54
4.4.2.1 - LOCATION AND EXTENT ..... 54
4.4.2.2 PREVIOUS OCCURRENCES ..... 54
4.4.2.3 – HAZARD PROBABILITY ANALYSIS ..... 56
4.4.2.4 VULNERABILITY ANALYSIS ..... 56
4.4.2.5 – IMPACT AND CONSEQUENCE ANALYSIS ..... 58
4.4.3 EARTHQUAKE ..... 60
4.4.3.1 LOCATION AND EXTENT ..... 60
4.4.3.2 PREVIOUS OCCURRENCES ..... 60
4.4.3.3 HAZARD PROBABILITY ANALYSIS ..... 63
4.4.3.4 VULNERABILITY ANALYSIS ..... 63
4.4.3.5 POPULATIONS IMPACTS ..... 65
4.4.3.6 ESSENTIAL FACILITIES IMPACT ..... 66
UTILITY IMPACTS ..... 66
BUILDING IMPACTS ..... 67
TRANSPORTATION IMPACTS ..... 67
PIPELINE SYSTEM IMPACTS ..... 68
OTHER CRITICAL INFRASTRUCTURE IMPACTS ..... 68
DEBRIS IMPACTS ..... 68
4.4.3.7 DIRECT ECONOMIC LOSSES ..... 68
4.4.3.8 CONSEQUENCE ANALYSIS ..... 69
4.4.4 EXPANSIVE SOIL ..... 71
LOCATION AND EXTENT ..... 71
4.4.4.2 – PREVIOUS OCCURRENCES ..... 71
4.4.4.3 – HAZARD PROBABILITY ANALYSIS ..... 71
4.4.4.4 – VULNERABILITY ANALYSIS ..... 72
4.4.4.5 – CONSEQUENCE ANALYSIS ..... 81
4.4.5 FLOOD ..... 83
4.4.5.1 – LOCATION AND EXTENT ..... 83
4.4.5.2 – PREVIOUS OCCURRENCES ..... 85
4.4.5.3 – NFIP COMMUNITIES ..... 88
4.4.5.4 – FEMA FLOOD POLICY AND LOSS DATA ..... 88
4.4.5.5 – REPETITIVE LOSS PROPERTIES ..... 88
4.4.5.6 – HAZARD PROBABILITY ANALYSIS ..... 89
4.4.5.8 – VULNERABILITY ANALYSIS ..... 90
4.4.5.9 – CONSEQUENCE ANALYSIS ..... 107
4.4.6 LANDSLIDE ..... 109
4.4.6.1 – LOCATION AND EXTENT ..... 109
4.4.6.2 – PREVIOUS OCCURRENCES ..... 110
4.4.6.3 – HAZARD PROBABILITY ANALYSIS ..... 111
4.4.6.4 VULNERABILITY ANALYSIS ..... 111
4.4.6.5 – IMPACT AND CONSEQUENCE ANALYSIS ..... 113
4.4.7 SEVERE STORMS ..... 115
4.4.7.1 – LOCATION AND EXTENT ..... 115

4.4.7.2 – PREVIOUS OCCURRENCES .....115
4.4.7.3 – HAZARD PROBABILITY ANALYSIS .....118
4.4.7.4 – VULNERABILITY ANALYSIS.....119
4.4.7.5 – IMPACT AND CONSEQUENCE ANALYSIS.....126
4.4.8 SEVERE WINTER STORMS .....128
4.4.8.1 – LOCATION AND EXTENT.....128
4.4.8.2 – PREVIOUS OCCURRENCES .....129
4.4.8.3 – HAZARD PROBABILITY ANALYSIS .....130
4.4.8.4 – VULNERABILITY ANALYSIS.....130
4.4.8.5 – IMPACT AND CONSEQUENCE ANALYSIS.....135
4.4.9 TORNADO .....137
4.14.1 – LOCATION AND EXTENT.....137
4.4.9.2 – PREVIOUS OCCURRENCES .....138
4.4.9.3 – HAZARD PROBABILITY ANALYSIS .....140
4.4.9.4 – VULNERABILITY ANALYSIS.....140
4.4.9.5 – IMPACT AND CONSEQUENCE ANALYSIS.....145
4.4.10 WILDFIRE .....147
4.4.10.1 – LOCATION AND EXTENT .....147
4.4.10.2 – PREVIOUS OCCURRENCES .....147
4.4.10.3 – HAZARD PROBABILITY ANALYSIS .....150
4.4.10.4 – VULNERABILITY ANALYSIS .....154
4.4.10.5 – IMPACT AND CONSEQUENCE ANALYSIS.....157
4.4.11 MAJOR DISEASE.....159
4.4.11.1 – LOCATION AND EXTENT .....159
4.4.11.2 – PREVIOUS OCCURRENCES .....160
4.4.11.3 – HAZARD PROBABILITY ANALYSIS .....161
4.4.11.4 – VULNERABILITY ANALYSIS .....161
4.4.11.5 – IMPACT AND CONSEQUENCE ANALYSIS.....163
4.4.12 HAZARDOUS MATERIALS .....165
4.4.12.1 – LOCATION AND EXTENT .....165
4.4.12.2 – PREVIOUS OCCURRENCES .....174
4.4.12.3 – HAZARD PROBABILITY ANALYSIS .....180
4.4.12.4 – VULNERABILITY ANALYSIS .....181
4.4.12.5 – IMPACT AND CONSEQUENCE ANALYSIS.....187
4.4.13 NUCLEAR INCIDENT .....189
4.18.1 – LOCATION AND EXTENT.....189
4.4.13.2 – PREVIOUS OCCURRENCES .....189
4.4.13.3 – HAZARD PROBABILITY ANALYSIS .....189
4.4.13.4 – VULNERABILITY ASSESSMENT.....190
4.4.13.5 – IMPACT AND CONSEQUENCE ANALYSIS.....190
4.4.14 TERRORISM .....192
4.4.14.1 – LOCATION AND EXTENT .....192
4.4.14.2 – PREVIOUS OCCURRENCES .....192
4.4.14.3 – HAZARD PROBABILITY ANALYSIS .....192
4.4.14.4 – VULNERABILITY ANALYSIS .....192
4.4.14.5 – IMPACT AND CONSEQUENCE ANALYSIS.....194

4.4.15 CYBER SECURITY .....196
**SECTION 5 - CAPABILITY ASSESSMENT .....197**
5.1 – STATE OF ARKANSAS EMERGENCY MANAGEMENT CODES.... 198
5.2 – STATE OF ARKANSAS DEPARTMENTAL CAPABILITIES.....198
5.3 – RELATED MITIGATION PLANNING EFFORTS.....204
5.4 – STATE OBSTACLES AND CHALLENGES.....206
5.5– LOCAL JURISDICTION CAPABILITIES ASSESSMENT.....206
5.6 – OPPORTUNITIES FOR CAPABILITY IMPROVEMENT.....210
**SECTION 6 - MITIGATION STRATEGY .....211**
6.1 – INTRODUCTION .....212
6.2 – GOALS AND OBJECTIVES .....212
6.3 – PRIORITIZATION OF MITIGATION ACTIONS.....213
6.4 – EMERGENCY MANAGEMENT ACCREDITATION PROGRAM INTEGRATION .....213
6.5 –MITIGATION ACTIONS .....214
6.6 –COMPLETED MITIGATION ACTIONS .....217
6.7 –RISK REDUCTION FOR COMPLETED ACTIONS.....228
6.8 – PRIMARY HAZARD MITIGATION FUNDING MECHANISMS .229
6.9 – ADDITIONAL HAZARD MITIGATION FUNDING MECHANISMS. 230
6.10 – REPETITIVE FLOOD LOSS STRATEGY.....233
HIGH HAZARD POTENTIAL DAM STRATEGY.....245
**SECTION 7 - COORDINATION OF LOCAL MITIGATION PLANNING .....254**
7.1 – INTRODUCTION .....255
7.2 – LOCAL PLAN STATUS.....255
7.3 – LOCAL MITIGATION FUNDING .....257
7.4 – AVAILABLE TECHNICAL ASSISTANCE .....258
7.5 – REVIEW AND APPROVAL OF LOCAL HAZARD MITIGATION PLANS .....258
7.6 – PRIORITIZING LOCAL ASSISTANCE FOR MITIGATION PLANNING.....258
7.7 – PRIORITIZING LOCAL ASSISTANCE FOR MITIGATION PROJECTS.....259
7.8 – LOCAL/STATE PLAN UTILIZATION AND INTEGRATION .....260
7.9 – SMALL AND IMPOVERISHED COMMUNITIES .....261
**SECTION 8 - PLAN MAINTENANCE PROCESS .....262**
8.1 – HAZARD MITIGATION PLAN MONITORING AND EVALUATION.....263
8.2 – PLAN UPDATES.....263
8.3 – MONITORING OF MITIGATION ACTIONS AND PROJECT CLOSEOUTS.....264
8.4 – REVIEW OF MITIGATION GOALS, OBJECTIVES AND ACTIONS 265
**SECTION 9 - PLANNING PROCESS .....266**
9.1 – DOCUMENTATION OF THE PLANNING PROCESS .....267
9.2 – 2023 PLAN CHANGES .....267

9.3 – MITIGATION PLANNING COMMITTEE.....267
9.4 – STAKEHOLDER PARTICIPATION.....268
9.5 – PUBLIC PARTICIPATION.....269
9.6 – PLANNING MEETINGS.....269
9.7 – HAZARD MITIGATION PROGRAM INTEGRATION.....270
**LIST OF ACRONYMS .....272**
**ONGOING STUDIES .....273**

# Section 1 - Introduction, Assurances, and Adoption





## 1.1 - Introduction

The State of Arkansas Hazard Mitigation Plan (HMP) is one of many planning tools utilized in order to make our state more resilient to natural and man-made hazards. The information contained in the 2023 update will continue to serve as a guide toward community sustainability and the reduction of the state's vulnerability to hazards. Each hazard that poses a significant risk to the State of Arkansas has been assessed using the same methodology, providing historical background, vulnerability, exposure and potential loss.

The HMP outlines the mitigation strategy developed by the mitigation planning team and adopted by the State of Arkansas; this strategy includes long-term goals, short-term objectives and the assignment of specific, measurable actions. The HMP will be maintained regularly and updated on a five year planning cycle in accordance with Federal Emergency Management Agency (FEMA) regulations. This will ensure the state's future eligibility for federal disaster funding.

The implementation of this HMP is intended to help break the continuing cycle of disaster, damage, and reconstruction that our citizens have been suffering by focusing on the mitigation element of the comprehensive emergency management system. This mitigation element includes policy, planning and project activities that will reduce the vulnerability of Arkansas communities to all identified hazards.

## 1.2 - Assurances

44 CFR 201.4(c)(7) Assurances. The plan must include assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR parts 200 and 3002. The State will amend its plan whenever necessary to reflect changes in State or Federal statutes and regulations.

The State of Arkansas certifies that it will comply with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 Code of Federal Regulations (CFR) 13.11(c), and will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

This HMP was prepared to comply with all of the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended by the Disaster Mitigation Act of 2000. This HMP complies with all the requirements of:

- Code of Federal Regulation (44 CFR) pertaining to hazard mitigation planning
- FEMA planning directives and guidelines
- Interim and final rules pertaining to hazard mitigation planning and grant funding
- Relevant presidential directives
- Office of Management and Budget circulars
- Any additional and relevant federal government documents, guidelines, and rules.

## 1.3 - Authorities

The HMP relies on the authorities given to the State of Arkansas by its citizens and encoded in state law. It is intended to be consistent with all policies and procedures that govern activities related to the mitigation programing and planning. In all cases of primacy, State of Arkansas laws, statutes, and policies will supersede the provisions of the plan. The HMP is consistent with the following state authorities:

- Constitution of the State of Arkansas, as amended
- Arkansas Code Annotated (A.C.A.) § 12-49-401 Emergency Management Assistance Compact
- A.C.A. § 12-75 Arkansas Emergency Services Act of 1973
- A.C.A. § 12-77-103 Arkansas Earthquake Program
- A.C.A. § 12-80 Earthquake Resistant Design for Public Structures
- A.C.A. § 14-14-1107 Natural Disasters
- A.C.A. § 14-16-112 Flood Control
- A.C.A. § 14-91-3 Construction in Levee or Flood Control District
- A.C.A. § 14-268 Flood Loss Prevention
- A.C.A. § 15-21-601 Earthquake Activity
- A.C.A. § 15-24 Flood Control
- A.C.A. § 18-15-309 Flood Control Improvements
- A.C.A. § 19-5-1006 Disaster Assistance Fund
- A.C.A. § 19-7-403 Lease of Lands for Flood Control Purposes
- A.C.A. § 23-102-101 Arkansas Earthquake Authority Act
- A.C.A. § 27-72-314 Disaster Counties

In addition, this HMP will be consistent with all relevant federal authorities as well as Emergency Management Accreditation Program (EMAP) mitigation standards.

## 1.4 - Adoption Proclamation

44 CFR Requirement 201.4(c)(6): The plan must be formally adopted by the State prior to submittal to us for

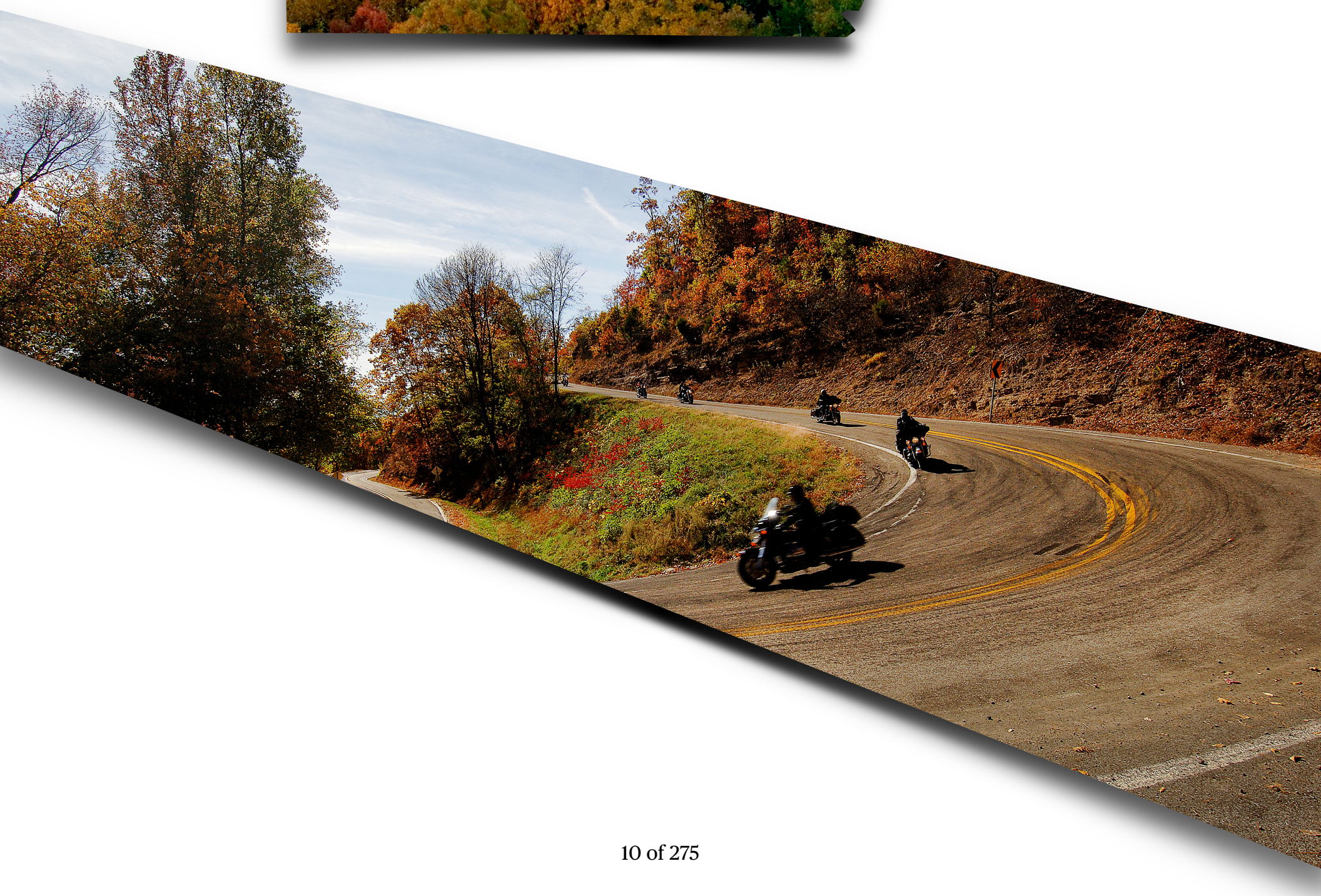
The 2023 Arkansas All Hazards Mitigation Plan was approved and adopted by the Governor of Arkansas on September 1, 2023.

The adopted HMP was then submitted to the FEMA Region VI on September 5, 2023 and approved on September 5, 2023.

Administration and oversight of the hazard mitigation program is the responsibility of the Arkansas Division of Emergency Management (ADEM) Mitigation Branch. The HMP will be reviewed annually and will be updated every five years, or as required by changing hazard mitigation regulations or guidelines.

# Section 2 - State Level Data





## 2.1 - Introduction

44 CFR 201.4(c)(2)(ii): An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned or operated critical facilities located in the identified hazard areas shall also be addressed; **(iii)** An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.

Data concerning development trends and conditions is of great importance in determining statewide risk and vulnerability to identified hazards, especially in locations which are susceptible to identified hazards. In general, any increase in population or development in hazard susceptible areas tends to increase both the risk and the vulnerability to that hazard. As such, the information presented in this chapter details relevant population and building statistics for the State of Arkansas. This data will then be used to determine and refine potential hazard vulnerability in succeeding sections.

## 2.2 - Statewide Population Data

The State of Arkansas has been experiencing drastic population changes since 2010. Of note:

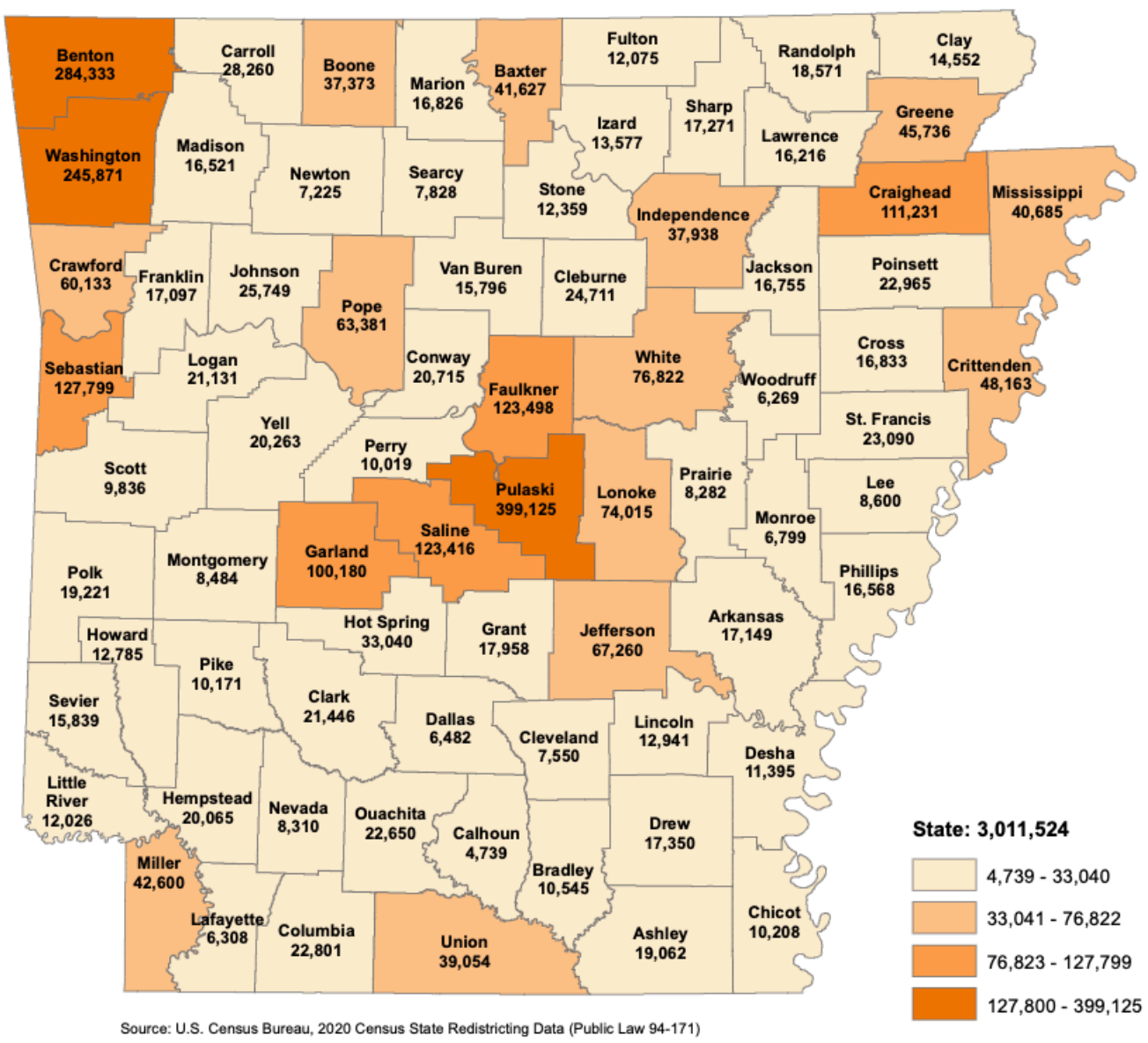
- The state has gained 95,606 persons over the 10-year period of 2010 to 2020
- This population gain represents a growth of 4%
- This population gain equates to a yearly growth rate of 0.4%

The following map presents population data for the State. In general, the higher a county's population and population growth, the greater the chance their hazard vulnerability will increase as well.

Of note:

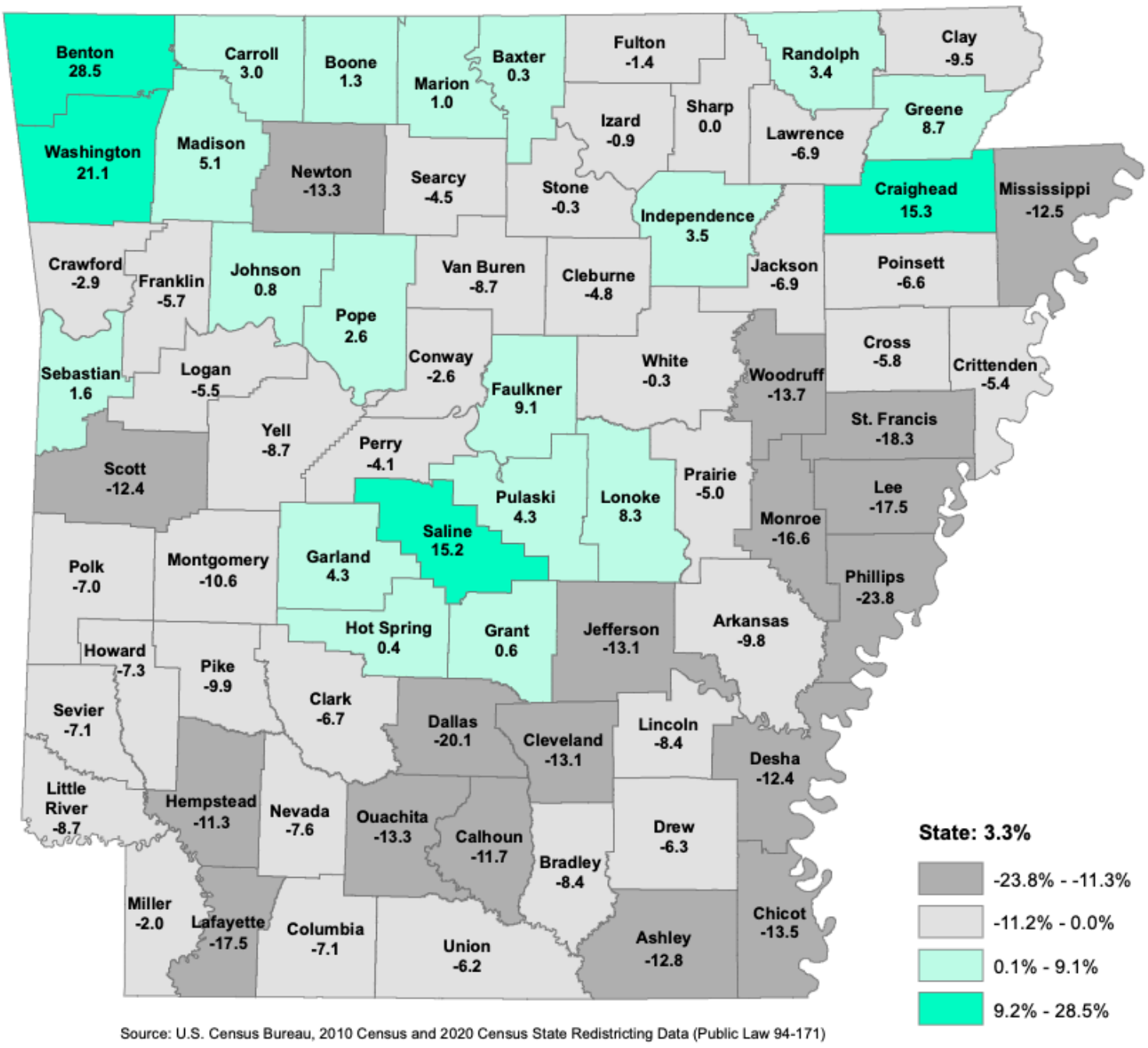
- Population gains were noted in 21 counties
- Population declines were seen in 54 counties
- The greatest population increase was seen in urban areas of the state, including counties surrounding the city of Little Rock (Lonoke, Faulkner, Garland, Grant, Hot Spring, Saline, and Pulaski) and the cities of Bentonville and Fayetteville (Benton and Washington) as well a Craighead County.

**Arkansas 2020 Census Population**



Source: U.S. Census Bureau, 2020 Census State Redistricting Data (Public Law 94-171)

**Percent Change in Total population 2010- 2020**



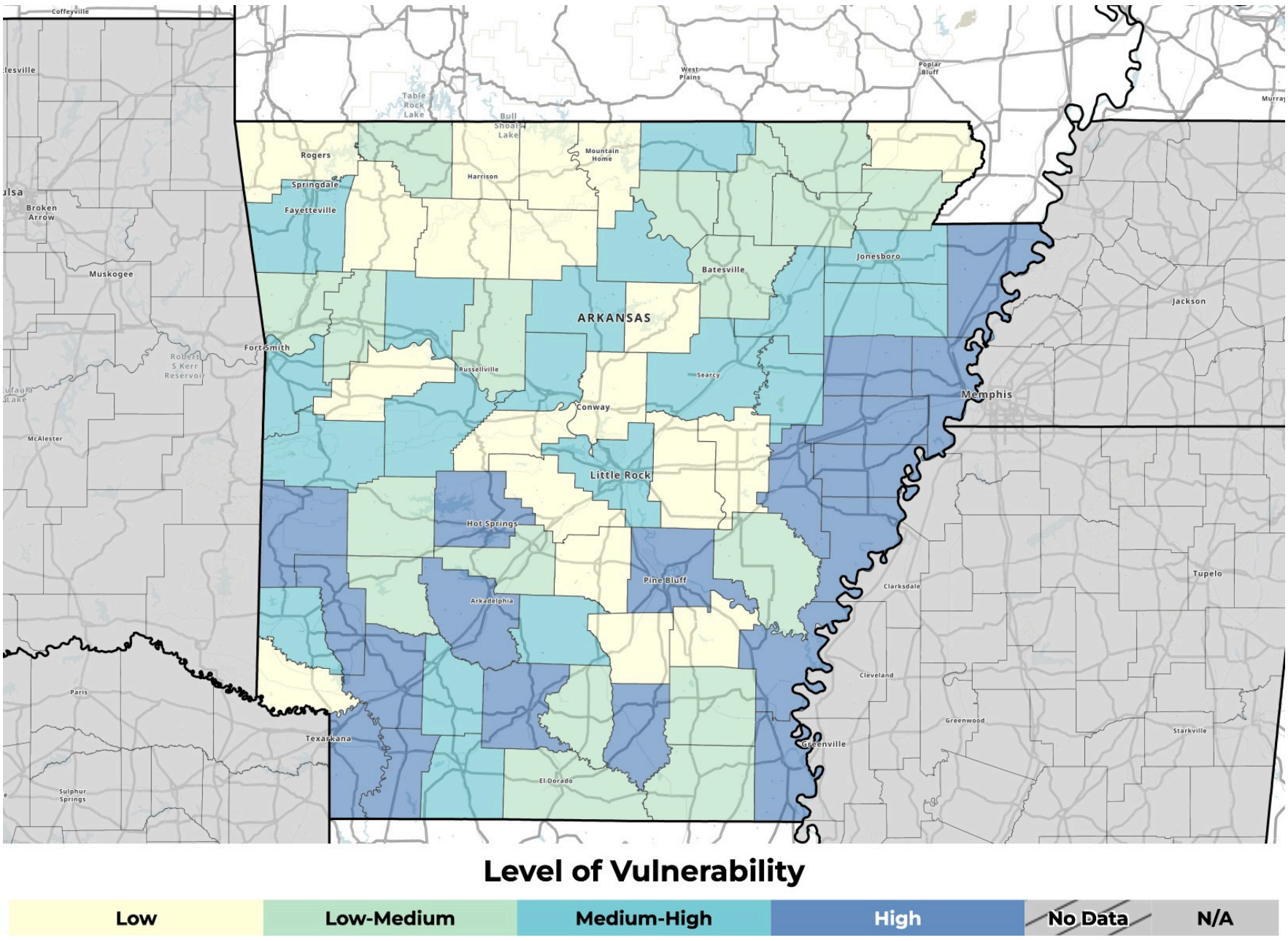

Source: U.S. Census Bureau, 2010 Census and 2020 Census State Redistricting Data (Public Law 94-171)

In addition to population density, other factors can potentially increase vulnerability to a hazard as well. This may include but not limited to socially vulnerable and underserved communities. FEMA defines underserved communities as groups that have limited or no access to resources or that are otherwise disenfranchised. These groups may include people who are socioeconomically disadvantaged; people with limited English proficiency; geographically isolated or educationally disenfranchised people; people of color as well as those of ethnic and national origin minorities; women and children; individuals with disabilities and others with access and functional needs; and seniors.

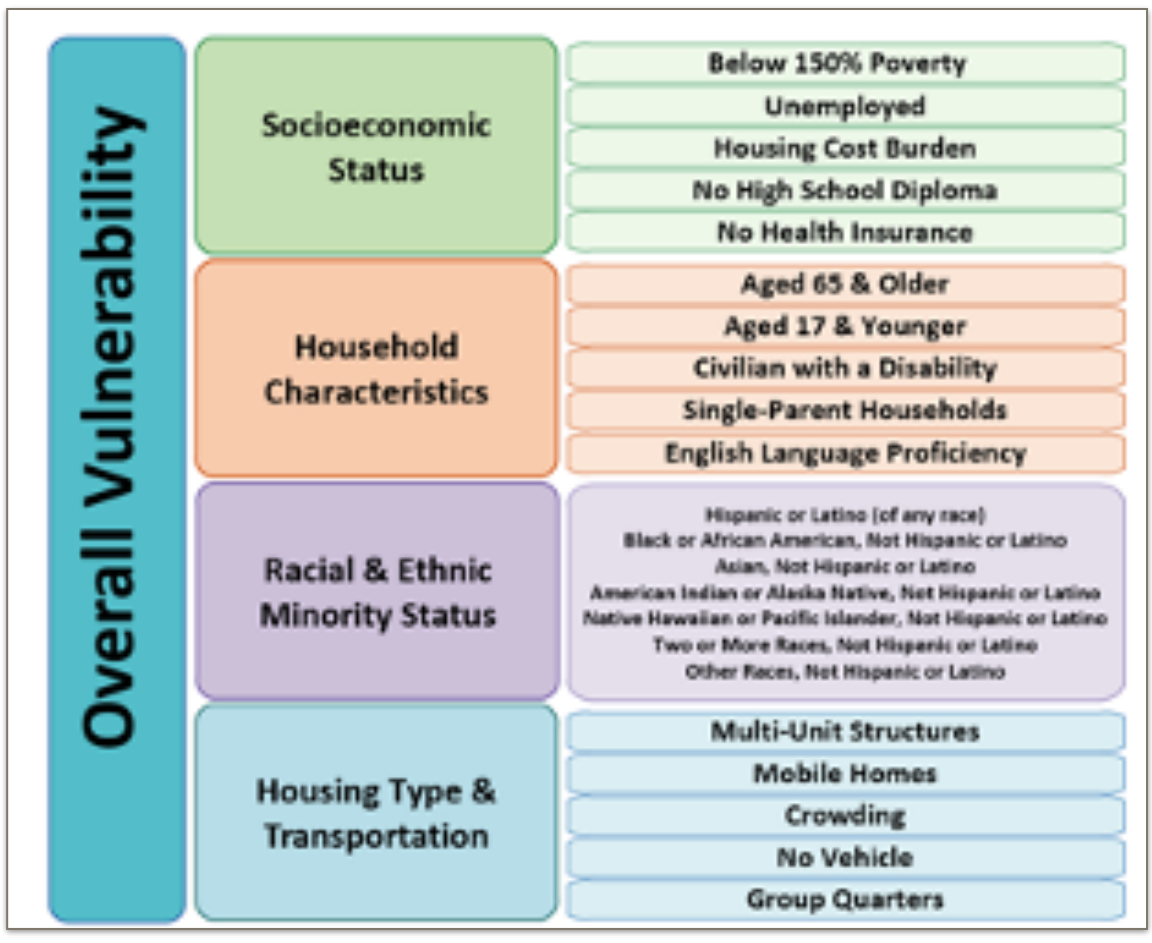
| | |
|---|---|
| Total Population: | 3,011,524 |
| Population of one race: | 2,797,949 |
| White alone | 2,114,512 |
| Black or African American alone | 453,783 |
| American Indian and Alaska Native alone | 27,177 |
| Asian alone | 51,839 |
| Native Hawaiian and Other Pacific Islander alone | 14,533 |
| Some Other Race alone | 136,105 |

**Social Vulnerability**

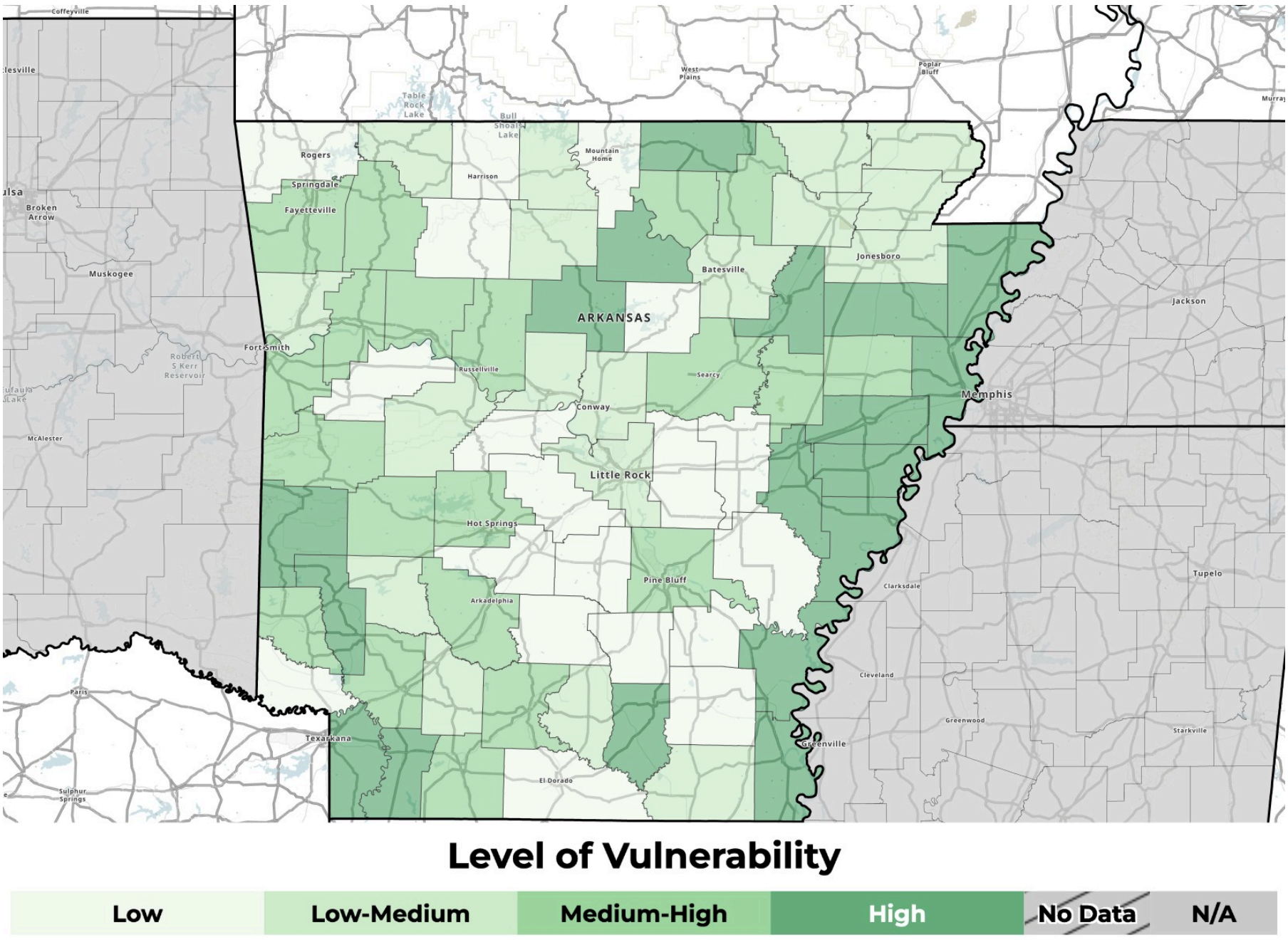
**Social vulnerability** refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human-caused threats, such as toxic chemical spills. The CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI 2020) Map depicts the social vulnerability of communities, at county level, within a specified county. CDC/ATSDR SVI 2020 groups sixteen census-derived factors into four themes that summarize the extent to which the area is socially vulnerable to disaster. The factors include economic data as well as data regarding education, family characteristics, housing, language ability, ethnicity, and vehicle access. Overall Social Vulnerability combines all the variables to provide a comprehensive assessment.



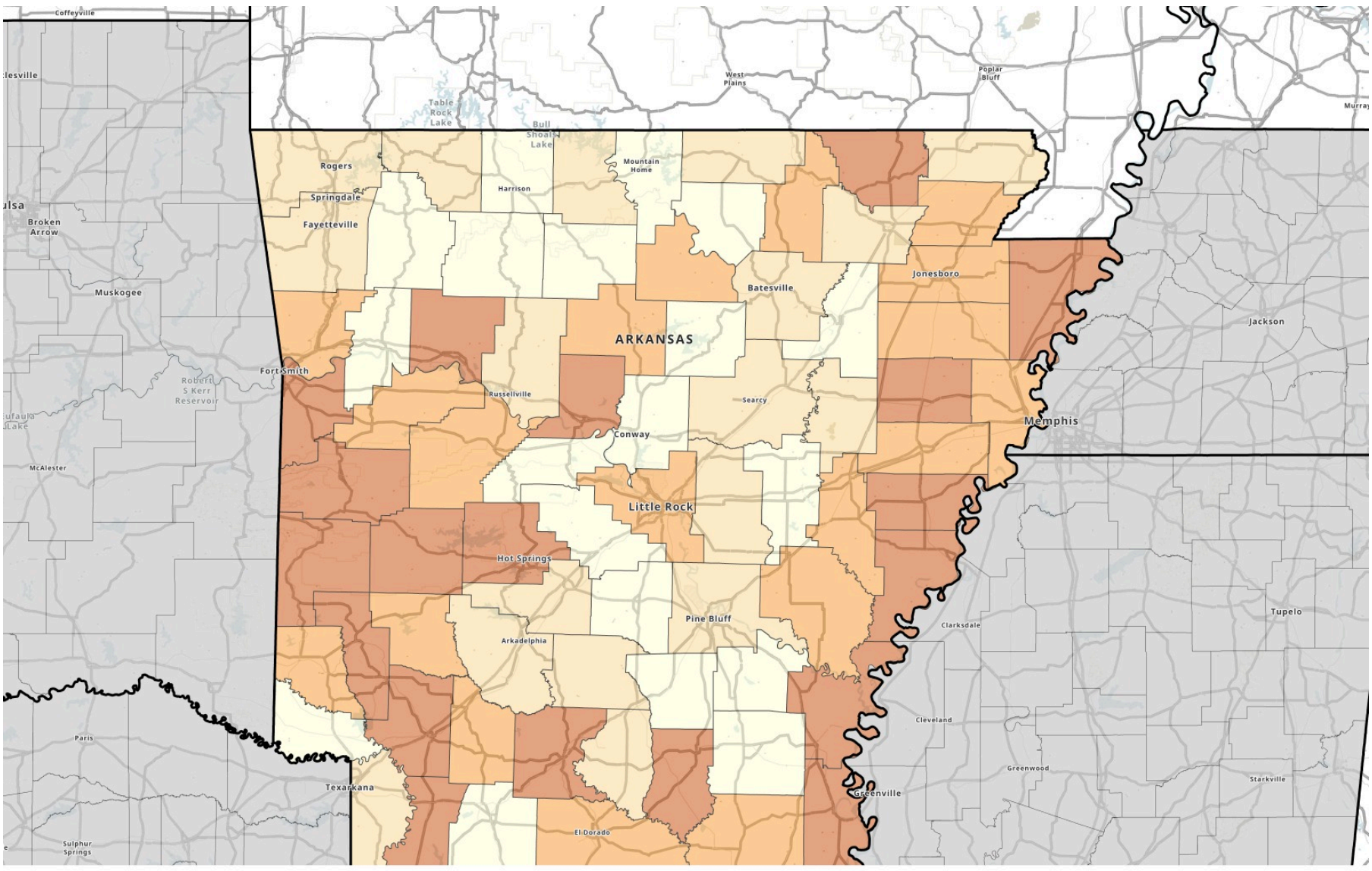

The below graphic shows the 16 census derive factors broken down by theme.



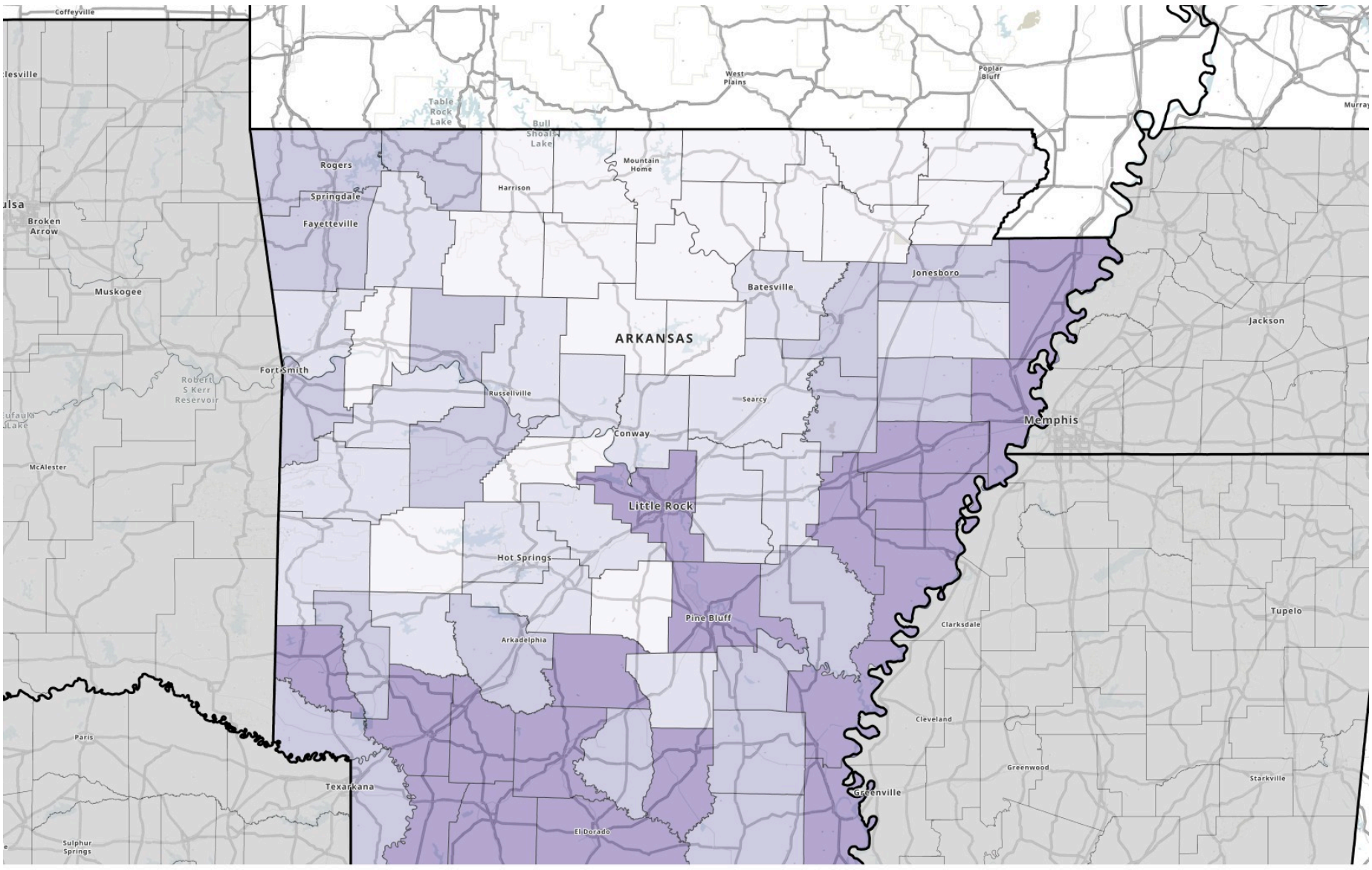
## Socioeconomic Status Map




## Household



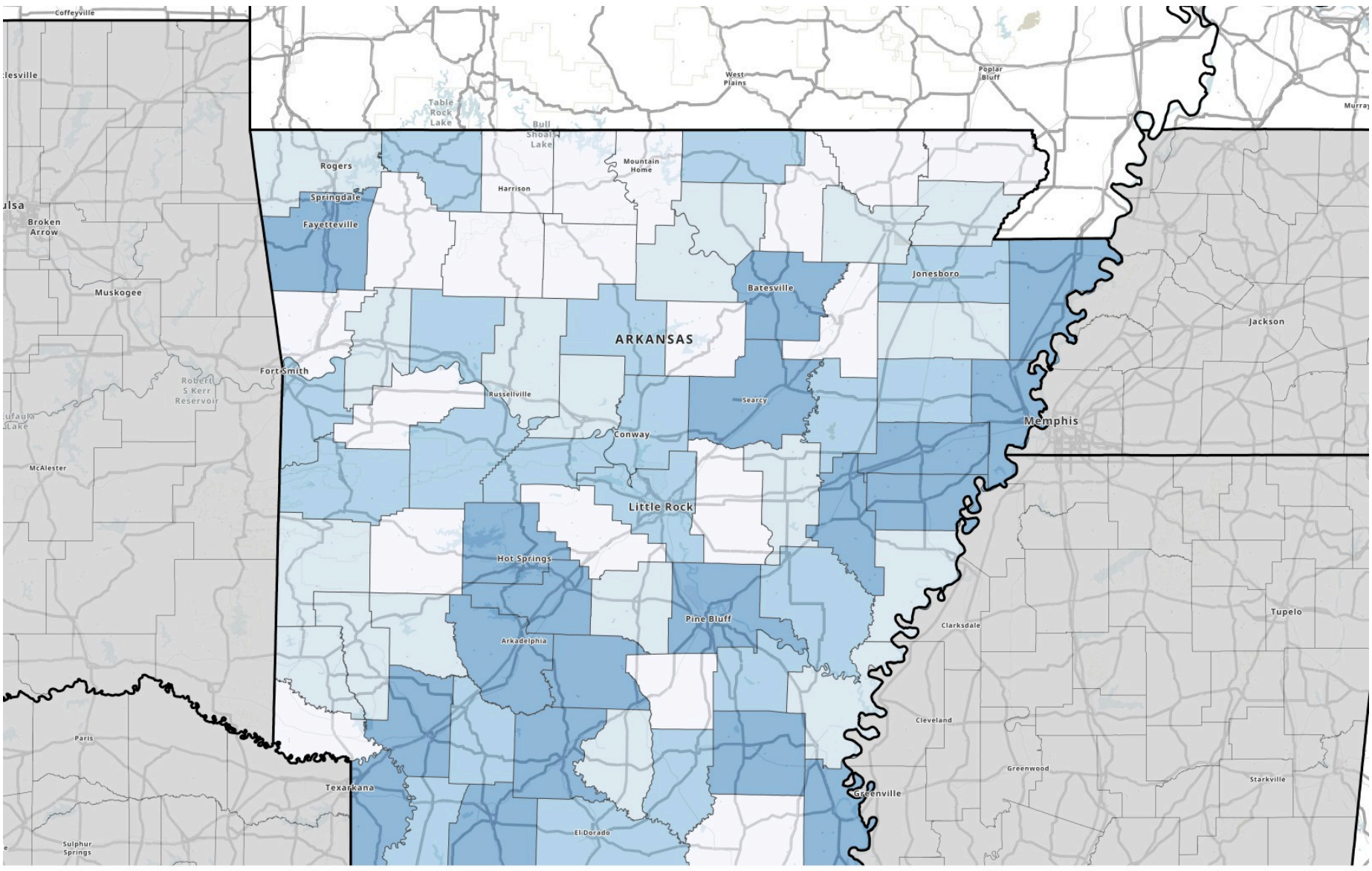
## Racial and Ethnic Minority




**Level of Vulnerability**

| Low | Low-Medium | Medium-High | High | No Data | N/A |
|---|---|---|---|---|---|

## Housing Type and Transportation




**Level of Vulnerability**

| Low | Low-Medium | Medium-High | High | No Data | N/A |
|---|---|---|---|---|---|

## 2.3 Statewide Housing Data

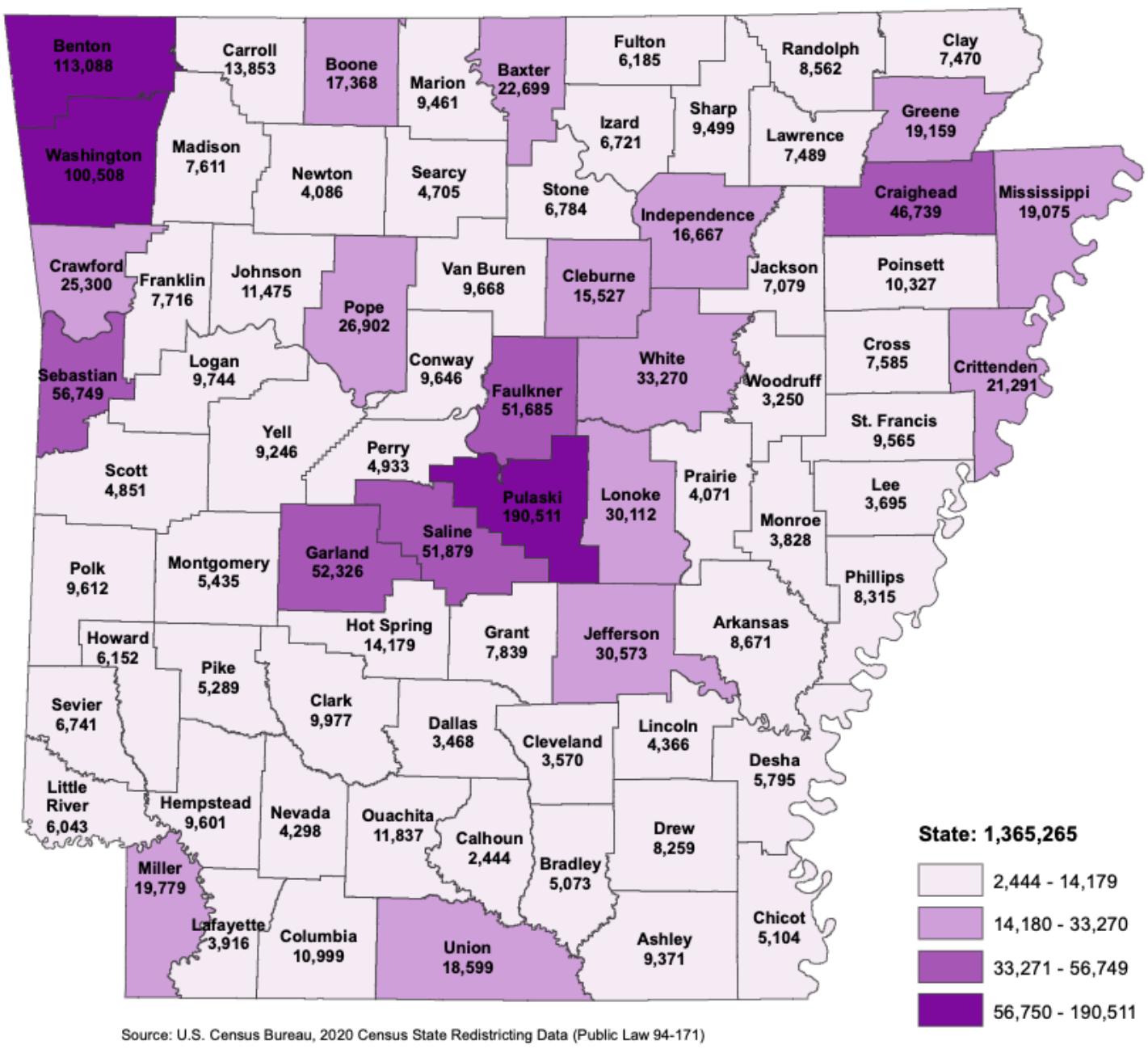
Closely tracking population data, but tending to lag population changes, housing data is a good indicator of changing state demographics and growth. Over the period 2010 to 2020 the State of Arkansas has been experiencing a yearly housing increase of 3.7%, or 50,515 units. Counties experiencing housing growth or decrease are detailed on the following graphic. In general, the higher a county's housing stock, the greater the chance their hazard vulnerability will increase as well.

Of note:

- Housing gains were noted in 24 counties
- Housing declines were seen in 51 counties
- Static housing change (less than 100 units difference) was seen in four counties
- The greatest housing increase was seen in urban areas of the state, including counties surrounding the city Little Rock (Lonoke Faulkner, Saline, and Pulaski) and the cities of Bentonville and Fayetteville (Benton and Washington)
- Similar to the above referenced population data, nine counties (Benton, Craighead, Faulkner, Lonoke, Pulaski, Saline, Sebastian, Washington and White) contributed 133,125 housing units to the statewide housing units gain of 37,320 housing units (73.3%)
- Mobile homes make up a high percentage of the housing stock in the State of Arkansas. Mobile homes comprise 25% or greater of the housing stock in Calhoun, Cleveland, Drew, Grant, Lafayette, Lincoln, and Stone Counties.
- Mobile home housing stock has increased in 22 counties from 2015 to 2020.

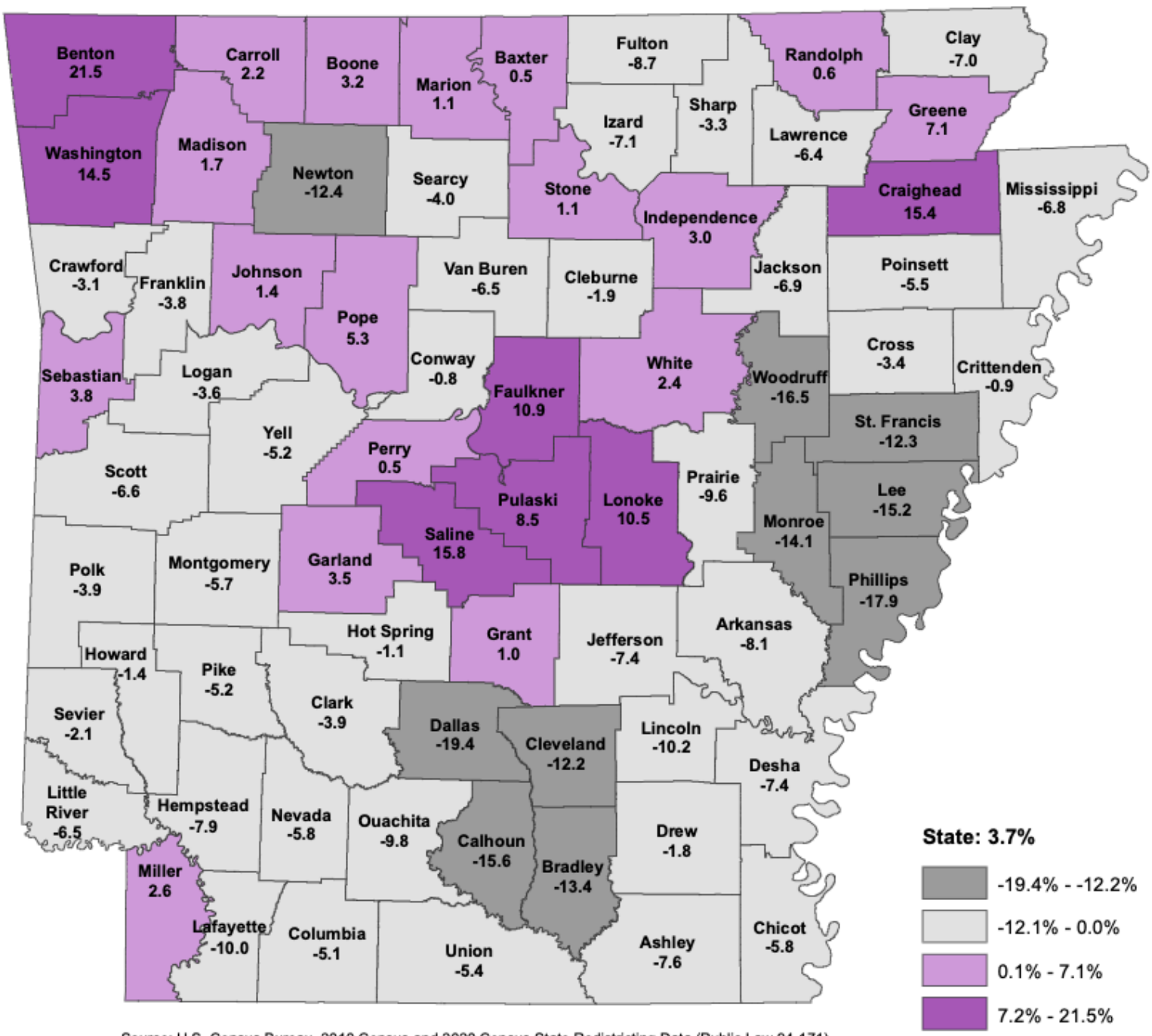
The state of Arkansas worked with the University of Arkansas Little Rock census team and many of the Planning and Development Districts to gather information relating to housing data and housing trends. Discussions and information gathering will continue especially as the state grows economically and gains more industry.

**Total Housing Units for Arkansas by County - 2020**




Source: U.S. Census Bureau, 2020 Census State Redistricting Data (Public Law 94-171)

## Percent Change in Total Housing Units for Arkansas by County: 2010 - 2020




Source: U.S. Census Bureau, 2010 Census and 2020 Census State Redistricting Data (Public Law 94-171)



## 2.4 Organization of State Government

In April 2019 the State of Arkansas underwent a reorganization at the state level. This reorganization  transformed the state government from 42 cabinet level positions/agencies to 15. The reorganizations resulted in the 15 departments:

- Department of Health
- Department of Veteran Affairs
- Department of Labor and Licensing
- Department of Education
- Department of Public Safety
- Department of Agriculture
- Department of Commerce
- Department of Military
- Department of Finance and Administration
- Department of Human Services
- Department of Parks, Heritage, and Tourism
- Department of Transformation and Shared Services
- Department of Corrections
- Department of Energy and Environment
- Department of Inspector General

An organization chart for the 2019 transformation will be located in the appendix section of this plan. This org chart will detail what departments now contain which state level agencies.

## 2.5 State Owned  and Operated Facilities

Data was collected statewide for State of Arkansas owned and operated facilities.  Changes to the vulnerability of state-owned buildings, infrastructure and critical facilities have been insignificant over the past five years due to the lack of new construction.

The following table displays the number of state owned facilities for each county, as well as their replacement values.  During the planning process only properties that had a value of $100,000 or more was included in this assessment. This table below and those that are throughout the plan represent the most valuable and when dealing with specific hazards the most vulnerable state assets. The replacement values were obtained through the Arkansas Insurance Department and ADEM using best available data, and represent total facility destruction. This data will be used to determine potential hazard vulnerability in subsequent sections. While the amounts below assume a worst-case scenario event, future state plan updates will have refined figures that estimate dollar losses specific to each hazard, rather than assuming total facility destruction.

| County | State-Owned Properties valued over $100,000 | Total Valuation | Critical Facilities | Critical Facility Values |
|---|---|---|---|---|
| State of Arkansas | 3792 | $10,898,646,452.31 | 576 | $2,361,260,565.35 |
| Arkansas | 18 | $8,188,582.03 | 8 | $4,632,718.64 |
| Ashley | 6 | $2,687,791.08 | 6 | $2,687,791.08 |
| Baxter | 45 | $91,766,282.09 | 5 | $2,219,240.82 |
| Benton | 42 | $187,483,529.72 | 9 | $20,793,432.56 |
| Boone | 34 | $88,586,892.96 | 8 | $9,303,386.12 |
| Bradley | 50 | $34,148,922.88 | 6 | $7,137,451.50 |
| Calhoun | 4 | $1,419,567.33 | 3 | $1,174,960.59 |
| Carroll | 7 | $2,073,119.30 | 4 | $1,545,985.64 |
| Chicot | 64 | $80,475,656.77 | 6 | $43,713,906.99 |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 |
| Clay | 16 | $10,077,262.01 | 4 | $987,511.15 |
| Cleburne | 11 | $36,847,548.25 | 4 | $2,061,124.38 |
| Cleveland | 3 | $705,243.86 | 3 | $705,243.86 |
| Columbia | 115 | $445,672,715.10 | 3 | $1,028,401.23 |
| Conway | 76 | $55,626,364.83 | 4 | $1,627,388.29 |
| Craighead | 227 | $1,319,922,341.64 | 10 | $9,154,672.74 |
| Crawford | 38 | $25,365,272.07 | 5 | $3,640,863.16 |
| Crittenden | 35 | $127,719,120.92 | 8 | $3,690,430.15 |
| Cross | 65 | $36,051,200.33 | 6 | $3,375,873.26 |
| Dallas | 6 | $2,111,608.88 | 4 | $1,554,408.18 |
| Desha | 13 | $4,733,763.86 | 4 | $1,564,467.00 |
| Drew | 17 | $7,416,013.74 | 9 | $4,664,369.45 |
| Faulkner | 295 | $1,217,867,581.07 | 8 | $7,761,135.06 |
| Franklin | 17 | $34,387,533.73 | 3 | $842,906.65 |
| Fulton | 24 | $12,583,989.23 | 5 | $2,214,766.13 |
| Garland | 120 | $170,275,197.06 | 9 | $9,311,635.69 |
| Grant | 8 | $4,117,068.71 | 7 | $4,001,568.71 |
| Greene | 47 | $31,323,797.11 | 6 | $4,320,196.19 |
| Hempstead | 73 | $76,583,328.98 | 10 | $8,713,511.18 |
| Hot Spring | 84 | $301,854,794.31 | 10 | $193,799,059.91 |
| Howard | 16 | $11,098,640.33 | 6 | $3,048,527.15 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 |
| Izard | 34 | $107,021,175.39 | 6 | $3,530,254.70 |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 |
| Jefferson | 161 | $393,195,391.16 | 27 | $219,978,530.97 |
| Johnson | 16 | $8,150,351.06 | 6 | $2,998,316.49 |
| Lafayette | 15 | $6,608,475.68 | 6 | $1,878,830.68 |
| Lawrence | 32 | $21,602,740.78 | 4 | $1,656,152.26 |
| Lee | 36 | $147,668,860.84 | 8 | $124,325,081.05 |
| Lincoln | 134 | $294,072,621.01 | 22 | $194,270,813.56 |
| Little River | 15 | $5,330,273.81 | 4 | $1,881,746.22 |
| Logan | 87 | $136,349,990.20 | 4 | $1,116,877.63 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 |
| Madison | 17 | $7,116,437.26 | 5 | $2,583,642.97 |
| Marion | 10 | $12,118,168.36 | 6 | $2,829,428.22 |
| Miller | 17 | $112,750,921.68 | 4 | $2,136,754.03 |
| Mississippi | 53 | $136,317,546.13 | 6 | $2,876,716.16 |
| Monroe | 5 | $2,343,993.15 | 5 | $2,343,993.15 |
| Montgomery | 6 | $1,786,277.98 | 4 | $1,506,992.51 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 |
| Newton | 8 | $2,973,644.76 | 5 | $2,186,847.15 |
| Ouachita | 67 | $132,961,321.03 | 9 | $4,729,918.11 |
| Perry | 7 | $2,365,119.68 | 3 | $675,236.80 |
| Phillips | 25 | $24,218,066.63 | 4 | $1,994,460.34 |
| Pike | 33 | $16,250,267.73 | 4 | $1,567,310.07 |
| Poinsett | 31 | $26,949,937.41 | 6 | $3,192,391.42 |
| Polk | 18 | $19,618,252.24 | 4 | $1,736,600.40 |
| Pope | 127 | $549,329,560.19 | 10 | $5,326,204.73 |

| | | | | |
|---|---|---|---|---|
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 |
| Pulaski | 445 | $2,676,770,640.25 | 104 | $1,247,800,470.37 |
| Randolph | 39 | $88,255,338.41 | 4 | $2,624,642.63 |
| Saline | 68 | $158,283,776.17 | 5 | $1,795,505.00 |
| Scott | 8 | $2,665,524.39 | 5 | $1,638,971.22 |
| Searcy | 6 | $2,813,373.71 | 4 | $1,927,101.02 |
| Sebastian | 50 | $80,970,807.10 | 14 | $21,570,578.51 |
| Sevier | 4 | $1,311,098.72 | 4 | $1,311,098.72 |
| Sharp | 11 | $11,336,228.20 | 5 | $1,969,885.73 |
| St. Francis | 51 | $79,811,432.22 | 8 | $8,784,795.86 |
| Stone | 40 | $37,290,337.17 | 5 | $1,869,090.84 |
| Union | 50 | $131,527,527.57 | 6 | $3,765,195.32 |
| Van Buren | 7 | $2,434,162.08 | 4 | $1,700,450.94 |
| Washington | 108 | $111,752,738.51 | 12 | $6,780,582.89 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 |
| Woodruff | 4 | $1,249,134.83 | 4 | $1,249,134.83 |
| Yell | 39 | $16,311,150.68 | 7 | $4,149,915.87 |

## 2.6 Statewide Land Use Patterns

In general, statewide land use is determined by four major types of regulation, zoning ordinances, floodplain ordinances and building code requirements. In the State of Arkansas:

- Zoning regulations are determined by local governments
- State level floodplain regulations are determined by Arkansas Code, Title 14 - Local Government, Subtitle 16 - Public Health and Welfare Generally, Chapter 268 - Flood Loss Prevention.
- Fire: 2021 Arkansas Fire Prevention Code, (2021 IFC with Arkansas Amendments)
- Building: 2021 Arkansas Building Code, (2021 IBC with Arkansas Amendments)

These four types of regulations have a major effect on land use changes and can significantly alter a state's hazard vulnerability landscape. Specific examples that can alter the landscape include:

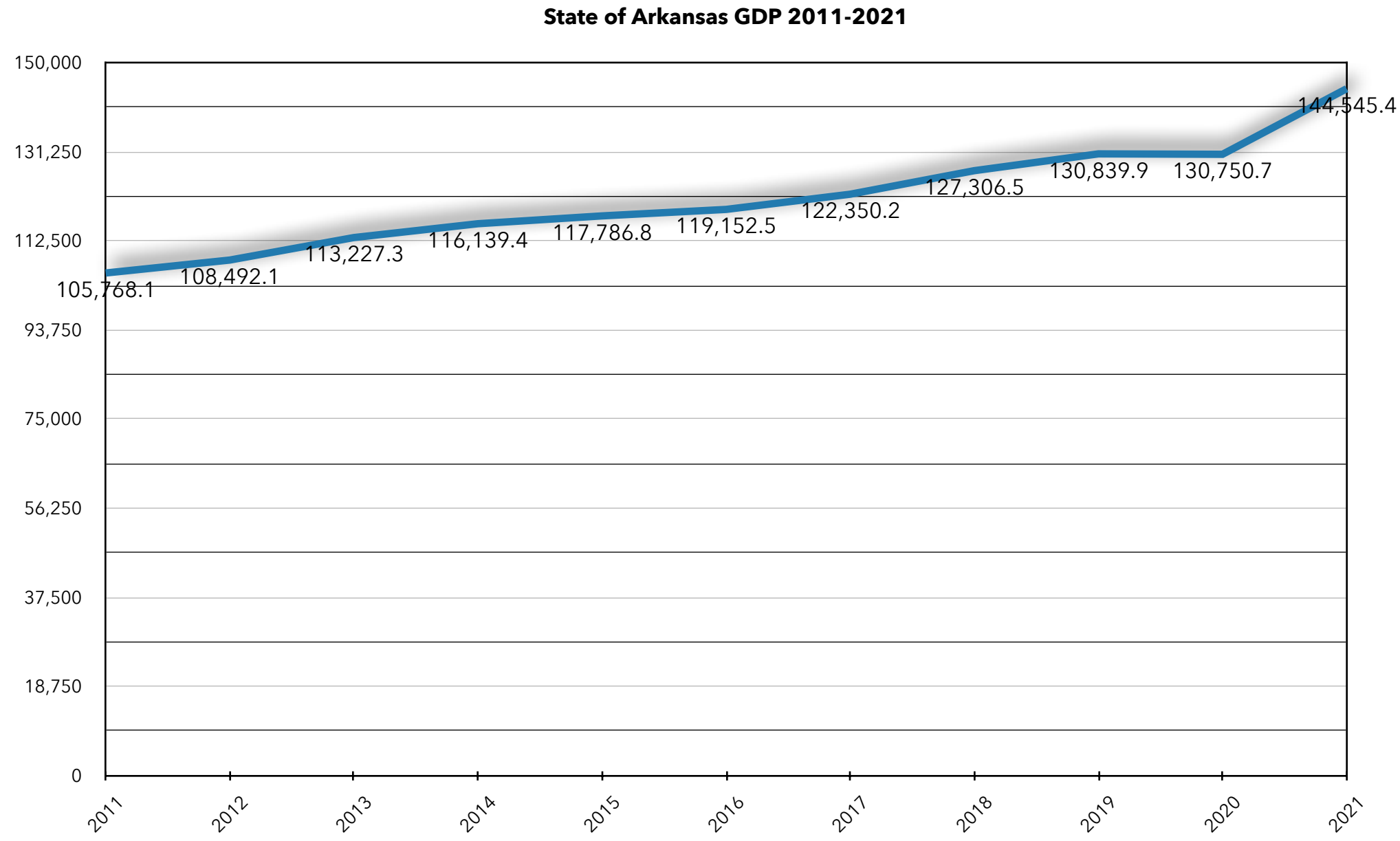
- Unrestricted residential growth can increase a population's exposure to identified hazard prone areas.
- Rapid, unchecked development can put a strain on a community's vulnerable resources such as its energy infrastructure.
- Residential development constructed quickly and inexpensively to meet consumer demand will often lack long term mitigation measures and resiliency.
- Rapid development can alter the landscape in ways affecting urban runoff, drainage, or other environmental considerations which have drastic effects on floodplains.



## 2.7 Statewide Economic Activity Patterns

Arkansas's continued economic growth has similar impacts on its vulnerability as does its population and housing growth. Vulnerability can be increased in two ways, by location-based growth in identified hazard prone areas, or by the industry type itself as is the case with chemical manufacturing, mining or energy generation.

Gross domestic product (GDP) is a measure of the entire output of a defined economy, and roughly equals the total dollar amount of all goods and services produced within a defined area. GDP is the most comprehensive measure of economic activity and business growth. The Bureau of Economic Analysis data indicates Arkansas has shown a slight increase in GDP over the 10 past years (3.04% per year on average), with the greatest growth during that period seen between 2020 - 2021 at 9.54%.

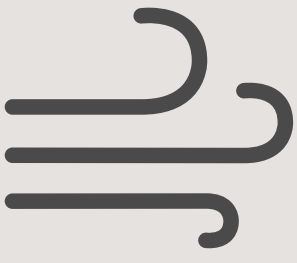





## 2.8 Climate Change

Over the last few decades, the State of Arkansas has experienced multiple natural disasters that have caused substantial damage to residential homes as well as public infrastructure. Studies have shown that this has the potential to get worse as climate change occurs. Arkansas is one of the largest agricultural producing states in the nation. Given the right impact on the climate, this could have a profound impact on not only the economy but also the health and well being of citizens. With this in mind, the Arkansas State Hazard Mitigation plan integrates information and planning elements for 10 natural hazards that could affect the State of Arkansas

**Climate Change Projections for Arkansas**

| Climate Changes | Related Natural Hazards | Projections by the end of 2050 |
|---|---|---|
| **Changes in Temperature**  | • Extreme Temperatures<br>• Excessive Heat | Temperatures are expected to increase in the future. In many cases these temperatures are expected to break existing records during each of the season Arkansas experiences. |
| **Changes in Precipitation**  | • Flooding<br>• Drought<br>• Land slide<br>• Expansive Soil | Data is limited but there are some studies that estimate that precipitation will increase in certain seasons such as spring and decrease in other. |
| **Extreme Weather**  | • Tornadoes<br>• Thunderstorms<br>• Severe Winter Weather/Ice Storms<br>• Other severe weather | Data is limited on extreme weather such as thunderstorms and tornadoes for Arkansas. |

with the following three climate changes: changes in precipitation, rising temperatures, and extreme weather. Projected climate changes will alter natural hazards by increasing the severity of the events, frequency at which they occur, and the duration.

Throughout this plan, climate change will be assessed as a possible impact on various natural hazards. Under each hazard in this plan, climate change will be addressed and an assessment will be conducted of possible impacts on populations, government, infrastructure, natural resources/environment, as well as economy.

## 2.9 Future Development

Future development speaks to the potential impacts of land use and demographic changes in hazard prone areas. Data in this section is speculative, as future conditions are subject to numerous unpredictable factors. While past trends are used to inform the discussion, previous historical trends are no guarantee of future conditions.

As indicated in the data included in this section, the State of Arkansas has seen population gains in 21 counties and declines in 54 counties. For those counties experiencing population growth, the potential impacts of some hazards could increase the risk of death or injury to their populations.  And while increasing populations will likely be a greater risk to natural disasters due to increased exposure, they will also increase the risk of major disease and potentially terrorism. Additionally, and of concern, is increasing population density in urban areas potentially resulting in a sizable increase in population exposure to specific hazards such as flooding, dam or levee failure, and tornados.

As indicated in the data above, the State of Arkansas has seen housing gains in 24 counties. Increase building stock results in increase exposure to both natural and man-made hazards.  Of importance is the location and building and design specifications of these new structures.  Solid zoning and construction ordinances will assist in ensuring these structures are resilient to disaster and help protect the population from harm.  Increasing building density in urban areas could potentially result in a sizable increase in exposure to specific hazards such as flooding, dam or levee failure, and tornados. Additionally, and of concern, is the high percentage of mobile home housing stock, as these homes are particularly susceptible to a wide range of identified hazards. Mobile home housing stock has increased in 48 counties from 2015 to 2020.

Of specific future development note:

- In many parts of the state, the potential for development near dams is not limited by any ordinance or regulation. Additionally, many of the most populated counties, and counties experiencing the most population and building growth, are in high vulnerability areas.

- The potential for continued development in areas protected by levees is generally not limited, and may only be constrained by building code requirements or the requirement for flood insurance.

- Agriculture is the sector most impacted by drought. Arkansas has seen a 237% increase in the USDA estimated crop exposure value but a 63% decrease in USDA reported crop loss. However, it is likely that with increasing crop valuation, the impacts of future drought will be significant.

- Out of the 24 northeastern Arkansas counties identified as being most vulnerable to earthquakes, 19 have seen a population and housing unit decrease over the past 10 years. Craighead County has seen a substantial population and housing unit growth over the past 10 years, and as such, have increased vulnerability to earthquakes, liquefaction and lateral spreading.

- The effects of expansive soil can be mitigated with engineering design requirements and the institution/application of building codes.

- Communities in counties that participate in the NFIP for compliance regarding any development in the floodplain should occur according to its corresponding floodplain management ordinance.

- According to the State's minimum standards, the first-floor elevations of residential property must be above the base flood elevation. For non-residential properties, the standard is to either elevate or flood proof to above the base flood elevation.

- Communities/areas in which landslides do occur should consider placing construction standards, requiring construction permits, establishing planning zones/ordinances. This will protect the home owner, the bank, the insurance companies and nearby neighbors, property values.

- Agriculture has a significant potential for an economic impact resulting from severe storm and severe winter events. Arkansas counties with a large agricultural base, all of which showed an increase in crop exposure value according to the USDA Census of Agriculture, will continue to increase susceptibility to severe storm damage as agricultural development is expanded. In addition, continued population gains in the state will increase building and property exposure to these hazards.

- New development anywhere in Arkansas will be susceptible to tornado impacts. New manufactured housing development will be susceptible to damage, particularly if not anchored properly. Regional population centers, which are experiencing growth, would also be more susceptible to this hazard. These increased populations may result in an increased number of injuries and deaths as smaller tornados could have a magnified impact.

- New development anywhere in Arkansas will be susceptible to wildfire impacts, however development in the Wildland Urban Interface (WUI) will increase susceptibility. Urban development areas are generally low density, recently cleared of vegetation, and at a low risk for fires.

- Local growth along transportation corridors or near Hazardous Materials (HazMat) facilities will increase the risk to this hazard. As the infrastructure and population of urban centers increases, along with the number and type of hazardous chemicals stored and transported through the region, the amount of potential losses could increase.

- Any increase in the agricultural industry relating to the rearing, transporting and holding of animals will increase the risk of future impactful animal disease outbreaks.

- Any population increase within the federally mandated 50-mile radius emergency planning zone for Arkansas Nuclear One would increase the risk to a nuclear hazard.

- In general, acts of terrorism have historically been carried out in major population centers or on targets of high significance within the United States. When large public events are held in Arkansas, more potential exists for these venues to become targets of attack.

# Section 3 - Risk Assessment



## 3.1 - Introduction

The goal of this section is to layout the risk assessment process that the State of Arkansas undertook to complete this plan and to explain keys sectors that were assessed through the hazard identification process. This section will also cover some of the limitations that may have been discovered through the planning process by the planning team and various state agencies.

## 3.2 - Hazard Identification Process

To identify hazards of concern for the State of Arkansas Hazard Mitigation Plan, the planning team reviewed the 2018 State Hazard Mitigation Plan (SHMP), previous occurrences, and the Arkansas Threat and Hazard Identification and Risk Assessment (THIRA). Natural and Manmade hazards are events that threaten lives, property, and other assets. For purposes of identification and definition we are defining hazards into two primary categories: 1. Natural hazards - which consist of natural events that often times can be predicted and tend to occur repeatedly in the same geographical locations, especially when they are related to weather patterns or physical characteristics of an area. 2. Manmade hazards - which are more difficult to predict since they are not naturally occurring. These type of events can be the result of many different types  of hazards and outcomes. For this plan the State of Arkansas has identified ten natural hazards and five manmade hazards.

## 3.3 - Sectors Assessed

### 3.3.1 - Populations



For each hazard, and to the extent practicable for this plan update, the impacts on human health, particularly vulnerable populations, were evaluated and incorporated into each hazard profile. During the planning process that planning team used the storm events database as well as the 2020 census to evaluate where hazards could occur and what populations could be most at risk. The new Census data was supplemented by Center for Disease and Control information regarding vulnerable populations (including but not limited to disabled, low-income, communities of color, and low English proficiency populations) that could potentially be more severely impacted by each hazard under current and future conditions. Among other factors, these populations may require extra time or outside assistance during evacuations or during events that cause power outages or isolation, and are considered to be more likely to seek or require emergency services.

### 3.3.2 - Government



The government sector includes such State-owned assets as transportation (e.g., roads, bridges, and rail), buildings, landholdings, and other infrastructure, such as pump stations and dams. The State of Arkansas owns and operates more than 5,000 structures. Arkansas Building Authority provides state agencies with public building design, construction, maintenance, and real estate services; and manages an inventory of state property infrastructure. There are more than 100 types of facilities in the Arkansas Building Authority and Arkansas Insurance Department database that are included in this risk and vulnerability assessment.

### 3.3.3 - Built Environment



The built environment sector includes critical facilities owned by the State of Arkansas and critical infrastructure sectors that provide or link to key lifeline services, social welfare, and economic development. The State-owned critical facilities assessed were derived from the State's property infrastructure and critical facilities inventory data set provided by Arkansas Insurance Department and Department of Public Safety. The state data were more accurate in terms of location and more current than the default critical facility inventories in Hazus. The facility types used include military facilities, police facilities, fire facilities, hospitals, emergency operation centers, and colleges/universities. Critical infrastructure sectors that were qualitatively assessed when applicable and where information was available include:

- Agriculture (including farms, land, crops, livestock, and operations)
- Energy (production, transmission, storage, and distribution, including power plants, substations, electric lines, natural gas systems, and fuel systems)
- Public safety (including public safety facilities and communications)
- Public health (including public health facilities and services provided)

- Transportation (including roads, highways, bridges, tunnels, subways, commuter and commercial rail, ferries, buses, airports, and ports)

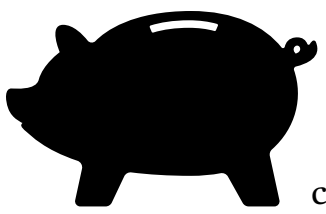
- Water infrastructure (including water sources, pump stations, storage tanks or reservoirs, distribution systems, and drinking water)

### 3.3.4 - Natural Resources



The natural resources and environment sector includes land-based assets owned by the State. It also includes key habitats and natural landscapes documented by the Arkansas Department of Agriculture and Areas of Critical Environmental Concern. A list of available natural resources that can be found and available in Arkansas will be listed and documented in this plan. This list may include natural resources that are are privately held.

### 3.3.5 - Economy



The components in the economy sector include economic loss resulting from damage to critical state assets, the built environment, municipal resources, natural resources, and other sectors. Many sectors of the economy are dependent on the integrity of natural resources. For example, if a state park resource such as a camping site is damaged beyond repair by a storm, that site will no longer attract tourists and the local and state economy may experience a loss of revenue from tourism and recreation.

## 3.4 - Methodologies Used

During the planning process a variety of methodologies were used to gather the necessary data to complete the plan. Some of the data came from federal and state owned agencies that track and publish data relating to various hazards. Research is one of the key methodologies that was used during the planning process. Calculations provided through analysis software also aided on the creation of this plan. One such analysis software that was used is the Federal Emergency Management Agency HAZUS software. Using this software helps to provide possible outcome during certain events and allows better preparations to take place to mitigate their effects.

### 3.4.1 - Data Choices and Limitations

Data choices that were used for this plan was based on a variety of factors and would include but not be limited to: Peer reviewed scientific journals, federal and state databases, historically document account,  scientific studies and research, and or be from a creditable source such as a established NGO or entity specialized and recognized in that field.

The following data limitations were identified and strategies developed to assist in future plan updates:
- Digital Flood Insurance Rate Maps are not available for  all counties and areas throughout the State of Arkansas.
- Hazard data for some hazards are limited. This includes  expansive soil, landslides, dam failure, cyber security, and pandemics.
- Throughout the risk assessment and planning process climate data was derived from research and the latest data available at the time of the plans creation.

### 3.4.2 - General Inventories

Inventories that were used in the creation of this plan include and came from the following agencies:
- Inventory of state owned/operated facilities - Arkansas Insurance Department
- National Inventory of Dams  - Army Corp of Engineers
- Inventory of Critical Facilities - Arkansas Department of Public Safety, Department of Homeland Security (DHS)
- National Inventory of Levees - Army Corps of Engineers, Federal Emergency Management Agency (FEMA)
- Crop Loss Data - United States Department of Agriculture (USDA)
- Storm Events Database - National Weather Service, National Oceanic and Atmospheric Administration (NOAA)
- Drought Data - National Drought Mitigation Center, University of Nebraska-Lincoln
- U.S. Forest Service
- U.S. Census 2020
- U.S. Geological Survey
- Arkansas Economic Development Commission
- U.S. Department of Commerce - Economic Development Administration
- Written and oral communication from state and national hazard experts

### 3.4.3 - Techniques and Approaches

The State of Arkansas started the planning process by assembling the various state and federal partners that are required for the planning process. Once these partners were identified a meeting was held to assemble the necessary information and resources for the implementation of a successful mitigation plan. The group would communicate regularly under the guidance of the Arkansas Division of Emergency Management.  One of the first task that the group had was to assess the various risk that the state could face. Using FEMA guidance and regulations it was determined that climate change would also be addressed under this plan.

Regarding climate change the group used the data that was available and used the baseline year for climate change of 2022. Various reports and scientific journals were used to make generalized assumptions where necessary when it came to hazards in Arkansas that could be impacted by climate change.

Once the hazards were assessed a mitigation strategy was assessed and created specifically for Arkansas and the hazards that could be faced. After successful completion of all steps the plan was reviewed by FEMA and approved. Upon the approval being granted the state adopted the plan and implemented it.

## 3.5 - Emergency Management Accreditation Program

Emergency Management Accreditation Program (EMAP),  functions as an independent non-profit organization that fosters excellence and accountability in emergency management programs, by establishing credible standards applied in a peer review accreditation process.

The ANSI/EMAP 5-2019 Emergency Management Standard by EMAP is the set of 66 standards by which programs that apply for EMAP accreditation are evaluated. The  Emergency Management Standard is designed as a tool for continuous improvement as part of the voluntary accreditation process for local, state, federal, higher education and tribal  emergency management programs.

The Emergency Management Standard covers:

- Program Management, Administration and Finance, and Laws and Authorities
- Hazard Identification, Risk Assessment and Consequence Analysis
- Hazard Mitigation
- Prevention
- Operational Planning and Procedures
- Incident Management
- Resource Management, Mutual Aid and Logistics
- Communications and Warning
- Facilities
- Training
- Exercises, Evaluations and Corrective Action
- Emergency Public Education and Information

## 3.6 - Hazard Profile Organization and Key Terms

The hazard profile sections examine the natural hazards and manmade hazards that have the potential to impact the State, identify counties and populations that are most vulnerable to each hazard, and estimate potential losses from the hazards at the state and local levels.

Extensive GIS analysis and Hazus modeling were performed, integrating information from federal, state, and local sources. Each hazard profile contains updated maps or data, where applicable; and presents risks, in addition to areas most vulnerable to the hazard. The vulnerability of various jurisdictions of the state to each hazard was addressed depending on the available data and other information that were used for the statewide risk assessment. All hazard profiles were updated for the 2023 SHMP with any new available information, and data from the 2018 SHMP were retained where it was appropriate and still deemed current.

The following definitions apply for terms used in the risk assessment:

- Climate adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.
- Climate change: A change in the state of the climate that can be identified by statistical changes of its properties that persist for an extended period, whether due to natural variability or as a result of human activity.
- Climate change impact: Consequences of climate change on natural and human systems.
- Consequence: The effect of a hazard occurrence. Consequence is demonstrated by the impact on population, physical property (e.g., state facilities, local jurisdiction assets and general building stock, and critical facilities), responders, operations, the

environment, the economy, and public confidence in state governance. A consequence analysis meets the EMAP standard for hazards identified in state plans.

- Exposure: The extent to which something is in direct contact with natural hazards or their related climate change impacts. Exposure is often determined by examining the number of people or assets that lie within a geographic area affected by a natural hazard, or by determining the magnitude of the climate change impact. For example, measurements of flood depth outside a building or number of heat waves experienced by a county are measurements of exposure.
- Location: The area of potential or demonstrated impact within the region in which the analysis is being conducted. In some instances, the area of impact is in a geographically defined area, such as a floodplain. In other instances, such as for severe weather, there is no established geographic boundary associated with the hazard, because it can impact the entire State.
- Natural hazard: Natural hazards are natural events that threaten lives, property, and other assets. Often, natural hazards can be predicted. They tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.
- Natural resources: These are components of natural systems that exist without human involvement. For the purpose of this survey, key natural resource categories include forested ecosystems, aquatic ecosystems, coastal ecosystems, wetland ecosystems, and old field ecosystems.
- Risk: The potential for an unwanted outcome resulting from a hazard event, as determined by its likelihood and associated consequences; and expressed, when possible, in dollar losses. Risk represents potential future losses, based on assessments of probability, severity, and vulnerability. In some instances, dollar losses are based on the actual demonstrated impact, such as through the use of the Hazus model. In other cases, dollar losses are demonstrated through exposure analysis due to the inability to determine the extent to which a structure is impacted.
- Probability: Probability is used as a synonym for likelihood, or the estimated potential for an incident to occur.
- Sensitivity: Sensitivity refers to the impact on a system, service, or asset when exposed to natural hazards. For example, if a facility is exposed to storm surge, how will its ability to function be affected? The level of sensitivity indicates how much or to what extent the occurrence of a hazard would exceed a critical threshold (if known) for something such that it would disrupt the ability of the system, service, or asset to continue normal operation. If the critical threshold is not exceeded, then the sensitivity to a certain hazard is low, even if it is exposed.
- Severity/Extent: The extent or magnitude of a hazard, as measured against an established indicator (e.g., Richter Scale, Enhanced Fujita Scale, or Drought Hazard Index).
- Vulnerability: The propensity or predisposition to be adversely affected; for example, as applied to building performance (functionality), damage, or the number of people injured. Vulnerability is a function of exposure, sensitivity, and adaptive capacity.

# Section 4 - Hazard Profiles and Vulnerabilities















## 4.1 - Introduction

The primary purpose of this hazard mitigation plan is to minimize the loss of life and property in the state. To accomplish this, all relevant hazards, potential vulnerabilities and exposures have been identified. Then a strategy was developed to identify and prioritize mitigation actions to defend against these potential risks.

## 4.2 - Methodology

Each hazard that has historically, or could potentially affect the State of Arkansas is reviewed and discussed in detail. Each hazard reviews:

- Location and Extent
- Previous Occurrences
- Hazard Probability Analysis
- Vulnerability Assessments

In addition, EMAP standards require a hazard consequence analysis be conducted for each hazard covering:

- Health and Safety of the Public
- Health and Safety of Responders
- Continuity of Operations; Property, Facilities, and Infrastructure
- Environment
- Economic Conditions
- Public Confidence in the Jurisdiction's Governance

The  MPC reviewed the consequence analysis from the 2018 HMP and deliberated on changes or additions for each hazard. The MPC decided to align the consequences with the 2022 EMAP standards and only address the six subjects listed above. The impact remained the same for these six subjects as they were in the 2018 HMP.

## 4.3 Declared Federal Disasters and Emergencies

The MPC reviewed federal and state disaster declarations to assist in hazard identification. Federal declarations may be enacted when the state is unable to cope with the magnitude of an event. These federal disaster declarations may be issued through a variety of agencies based on the scale and sectors affected.

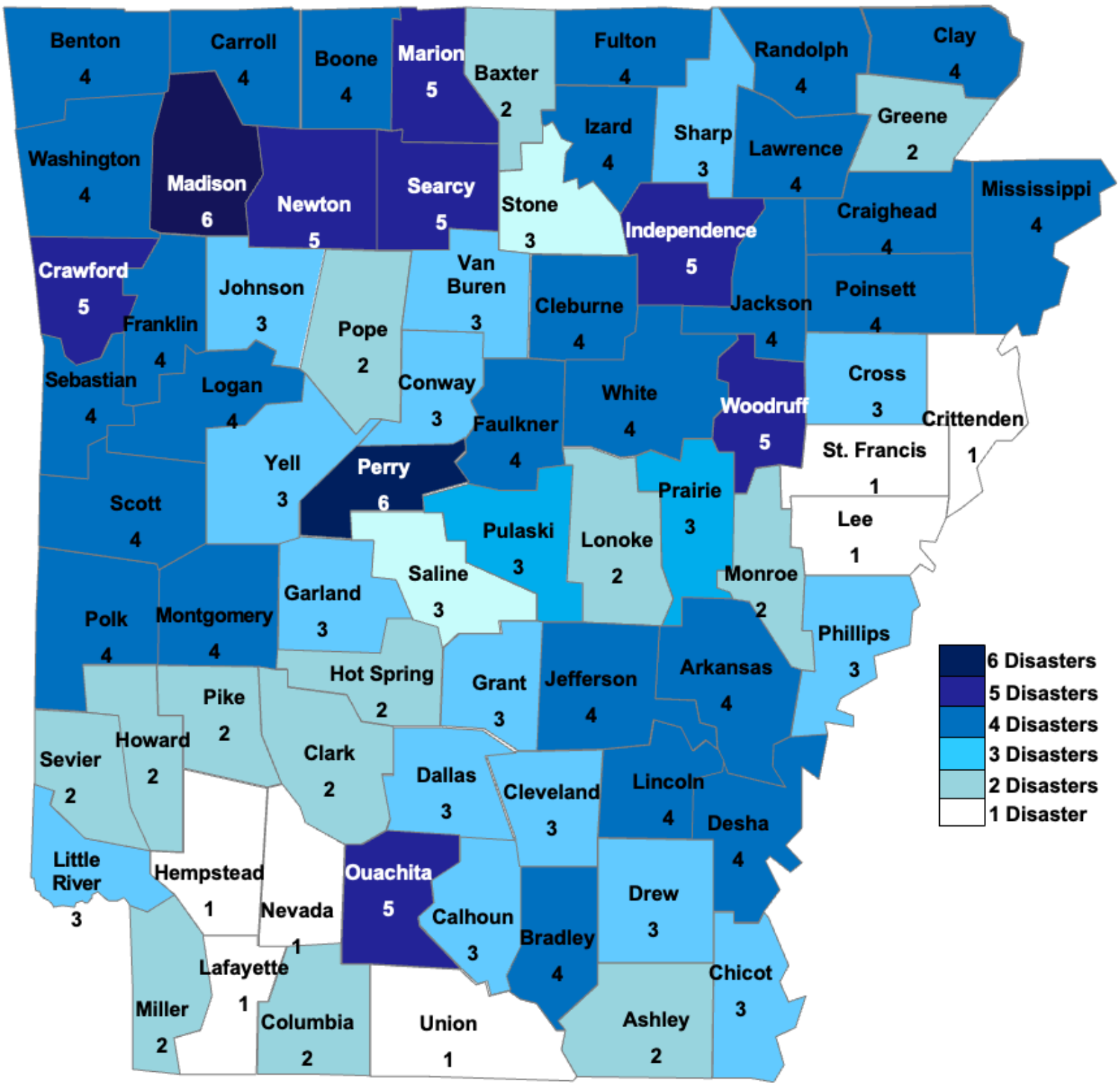
For the period from 2013 to 2023 the State of Arkansas has had 17 federal disaster declarations and three emergency declarations. In general, declarations were issued for the following occurrences:

- Flooding
- Ice Storms
- Severe storms
- Straight line winds
- Severe winter storms
- Tornados

| Declaration Number | Declaration Date | Disaster Description | Counties Impacted | Dollars Obligated | Mitigation Funds |
|---|---|---|---|---|---|
| **4700** | April 4, 2023 | Severe Winter Storm | Bradley, Calhoun, Cleveland, Dallas, Desha, Drew, Grant, Jefferson, Lincoln, Nevada, Ouachita, Searcy, Stone | | |
| **4698** | April 2, 2023 | Severe Storms and Tornadoes | Cross, Lonoke, Pulaski | | |
| **4633** | December 23, 2021 | Severe Storms and Tornadoes | Craighead, Jackson, Mississippi, Poinsett, Woodruff | $935,304.83 | $142,491.00 |
| **4556** | July 10, 2020 | Severe Storms and Straight-line Winds | Arkansas, Bradley, Cleveland, Dallas, Desha, Drew, Grant, Jefferson, Lincoln, Monroe, Ouachita, Phillips | $9,743,407.16 | $1,364,431.00 |
| **4544** | May 8, 2020 | Severe Storms, Tornadoes, and Straight-line Winds | Craighead | $3,898,006.13 | $619,512.00 |
| **4518** | April 3, 2020 | Covid-19 Pandemic | Statewide | $149,307,732.92 | $3,493,281.00 |
| **4460** | September 13, 2019 | Severe Storms, Tornadoes, Flooding, and Straight-line Winds | Madison, Newton, Washington | $5,877,299.51 | $726,726.00 |
| **4441** | June 8, 2019 | Severe Storms and Flooding | Arkansas, Chicot, Conway, Crawford, Desha, Faulkner, Franklin, Jefferson, Johnson, Lincoln, Logan, Perry, Pope, Pulaski, Sebastian, Yell | $53,507,195.44 | $7,962,944.00 |
| 4318 | June 15, 2017 | Severe Storms, Tornadoes, Straight-line Winds, and Flooding | Baxter, Benton, Boone, Carroll, Clay, Cleburne, Conway, Craighead, Cross, Faulkner, Fulton, Independence, Izard, Jackson, Lawrence, Madison, Marion, Mississippi, Montgomery, Newton, Ouachita, Perry, Poinsett, Prairie, Randolph, Saline, Searcy, Washington, White, Woodruff | $31,968,883.62 | $4,716,114.00 |
| 4270 | May 6, 2016 | Severe Storms, Tornadoes, Straight-line Winds, and Flooding | Arkansas, Ashley, Bradley, Calhoun, Chicot, Cleveland, Columbia, Desha, Lincoln, Ouachita, Phillips, Prairie | $2,511,458.74 | $408,720.00 |
| 4254 | February 5, 2016 | Severe Storms, Tornadoes, Straight-line Winds, and Flooding | Benton, Boone, Bradley, Calhoun, Carroll, Clay, Crawford, Dallas, Drew, Franklin, Greene, Independence, Izard, Lawrence, Little River, Logan, Madison, Marion, Mississippi, Montgomery, Ouachita, Perry, Pike, Polk, Randolph, Scott, Searcy, Stone, Washington, White, Woodruff, Yell | $13,364,552.27 | $1,901,112.00 |
| 4226 | June 26, 2015 | Severe Storms, Tornadoes, Straight-line Winds, and Flooding | Crawford, Garland, Howard, Jefferson, Little River, Miller, Perry, Sebastian, Sevier | $11,100,256.00 | $2,029,015.00 |

| | | | | | |
|---|---|---|---|---|---|
| 4174 | April 29, 2014 | Severe Storms, Tornadoes, and Flooding | Clay, Cleburne, Faulkner, Fulton, Independence, Izard, Jackson, Lawrence, Randolph, Sharp, White | $12,571,810.98 | $1,725,612.00 |
| 4160 | January 6, 2014 | Severe Winter Storm | Crawford, Franklin, Fulton, Johnson, Logan, Madison, Marion, Newton, Polk, Scott, Searcy, Sebastian, Sharp, Van Buren | $5,587,008.61 | $836,888.00 |
| 4143 | September 4, 2013 | Severe Storms and Flooding | Benton, Boone, Carroll, Madison, Marion, Newton | $8,183,854.08 | $677,902.00 |
| 4124 | June 25, 2013 | Severe Storms, Tornadoes, and Flooding | Cleburne, Cross, Independence, Montgomery, Poinsett, Polk, Scott, Searcy, Stone, Van Buren, Woodruff | $8,316,941.51 | $1,276,914.00 |
| 4100 | January 29, 2013 | Severe Winter Storm | Clark, Garland, Grant, Hot Spring, Lonoke, Perry, Pulaski, Saline | $8,548,088.10 | $1,413,007.00 |

The following graphic shows the amount of federal disaster declarations that each county has received from 2013-2023.



## 4.4 Identified Potential Hazards

The MPC discussed previously identified hazards and deliberated on changes or additions to the State hazard profile, based on the data above and the previous mitigation plan.  In reviewing identified hazards detailed in the 2018 HMP, one new hazards was added and  none were removed. Cyber security was added as a category of man-made hazards. Extreme heat continues to be omitted from this plan.

The MPC confirmed ten natural hazards that may affect the State of Arkansas, as listed below:

- Dam and Levee Failure
- Drought
- Earthquake
- Expansive Soils
- Flood
- Landslides
- Severe Thunderstorms
- Severe Winter Weather
- Tornado
- Wildfire

The MPC confirmed five man-made hazards that may affect the State of Arkansas, as listed below:

- Hazardous Materials Incident
- Major Disease Outbreak
- Nuclear Event
- Terrorism
- Cyber Security

Each identified hazard is profiled in the subsequent sections, with the level of detail varying based on available information.  Sources of information are cited in the detailed hazard profiles below.

With each update of this plan, new information will be incorporated to provide for better evaluation and prioritization of the hazards.

44 CFR 201.4(c)(2) Risk assessments that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments. The risk assessment shall include the following:

(i) An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;

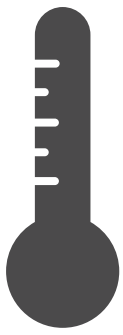
s44 CFR 201.4(c)(2)(ii): An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned or operated critical facilities located in the identified hazard areas shall also be addressed;

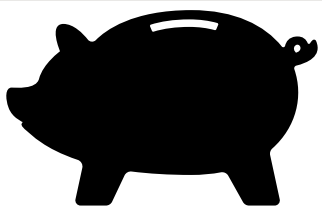
(iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas

The following hazards are presented in alphabetical order, and not by planning significance, for ease of reference. Additionally, man-made hazards are presented, again in alphabetical order, after natural hazards.

# DAM & LEVEE FAILURE

| Cause | Most At-Risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br><br>Increased rainfall or increased in precipitation upstream of a creek or river. | • Populations - people along levees or in the inundation area of a dam.<br>• Locations - Throughout Arkansas. Map is in plan of levees and dams | • Number of Occurrences<br>In the last five year 3 occurrences<br><br>• Presidential Declared Disasters<br>One |

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature  | Increased temperature upstream of major rivers resulting in snowfall melt can increase flooding downstream on the Arkansas and Mississippi River. |
| Changes in Precipitation  | Increased precipitation - increases pressure on levee and dams |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Dam failure or levee failures can displace populations within inundation area. In the immediate aftermath of a failure the most at risk populations would be individuals with disabilities, individuals not from the area, |
|  | Dam failure or levee failures can damage and or disrupt Federal, State, and local government owned facilities and operations. Operations that are most at risk are those in a levee or dam inundation area. |
|  | Built environment such as roads, bridges, power infrastructure, etc could be interrupted or damages in the inundation area for a dam or levee is failure is to occur. This applies to state as well as privately held assets. |
|  | Natural resources can be damaged or loss in the inundation area where a dam failure or levee failure occurs. |
|  | Disruptions to any of the above sectors including but not limited to government, built environment, natural resources can have an impact on the local and state economy. |

## 4.4.1 Dam and Levee Failure

A dam is a barrier across flowing water that obstructs, directs or slows down the flow, often creating a reservoir, lake or impoundments.



The most likely causes for dam failure include:

- **Overtopping** caused by water spilling over the top of a dam. A precursor of dam failure, overtopping is typically associated with inadequate spillway design, debris blockage of spillways, or settlement of the dam crest.
- **Foundation defects**, including settlement and slope instability.
- **Cracking** caused by movements like the natural settling of a dam.
- **Inadequate maintenance** and upkeep of the dam embankment, control structure, and/or spillway.
- **Piping** (internal erosion caused by seepage). Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations.



A levee is an artificial barrier, usually an earthen embankment, constructed along rivers to protect adjacent lands from flooding.  The failure mechanisms of a levee during a flood include:

- **Overtopping** occurring when floodwater exceeds the levee's designed level for flood hazard reduction.
- **Breaching** of the levee exhibited as part of the levee breaking away and leaving a large opening for water to rush through.
- **Partial failure** of the levee due to scouring of the foundation, seepage and/or piping of the levee body, or sliding of the foundation.
- **Landward flooding** due to interior drainage occurring water is effectively "trapped" behind the levee.

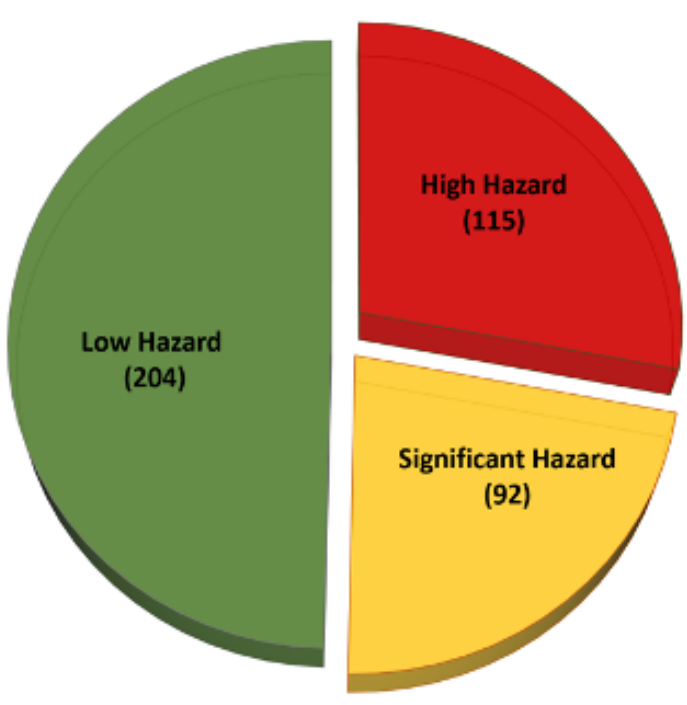
#### 4.4.1.2 - DAM LOCATION AND EXTENT

The ANRD provides regulation and supervision of dams for the health, safety, welfare, and economic well-being of the citizens of Arkansas. Rules governing design and operation of non-federal dams within the State of Arkansas are promulgated under authority of Subchapter 2 of Chapter 22 of Title 15 of the Arkansas Code of 1987.

To meet regulatory status, a dam must have a height of 25 feet or greater and contain a volume of at least 50 acre-feet of water at normal pool. Downstream owners can petition the Natural Resources Division to regulate smaller dams believed to pose a threat to life or property. Regulation assures dams are both properly designed and constructed and assures continued maintenance and monitoring.

The ANRD uses a three-tiered classification system to describe the downstream damages that would occur if a regulated dam failed:

- **High Hazard**: Failure of the dam will probably cause loss of human life. Excessive and extensive impacts to the public, industrial, commercial, or agricultural sectors are likely, in excess of $500,000.
- **Significant Hazard:** No loss of human life is expected, but appreciable economic impacts to the public, industrial, commercial, or agricultural sectors are likely, ranging from $100,000 to $500,000.
- **Low Hazard** No loss of human life is expected, and the economic impact to the public, industrial, commercial, or agricultural sectors are relatively minimal (less than $100,000).

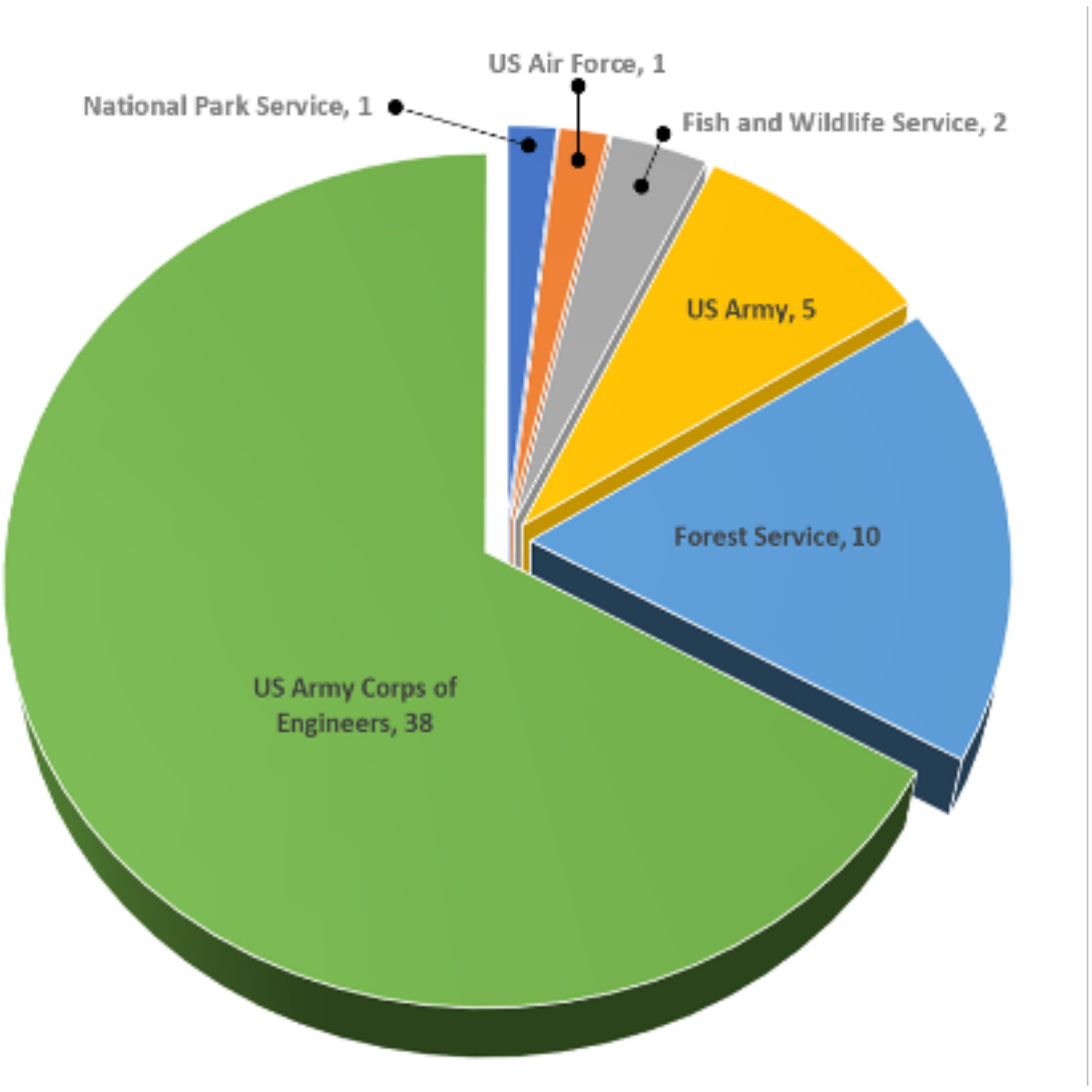



At least once per year and after each major storm event, the owners of all regulated dams must perform a visual inspection of the dam. Results of such inspections must be provided to the ANRC within 10 days of inspection. Any deterioration of the dam or appurtenances and remedial measures undertaken must be reported to the ANRC. ANRC staff may provide training or assistance in performing or interpreting inspections.

An emergency action plan (EAP) is required for all High Hazard dams and implementation must include at least one tabletop exercise per year and one test drill every three years.

According to the National Inventory of Dams and the ANRC, there are 1,257 dams in Arkansas.  Of these, 411 dams are overseen by the ANRC.  Fifty-seven dams within the state are operated by Federal Government agencies, including the Department of Defense, the Department of the Interior, the Department of Agriculture and the United States Army Corp of Engineers.  The remainder are below the regulatory threshold for state oversight.

The following table details identified dams by county and hazard classification.



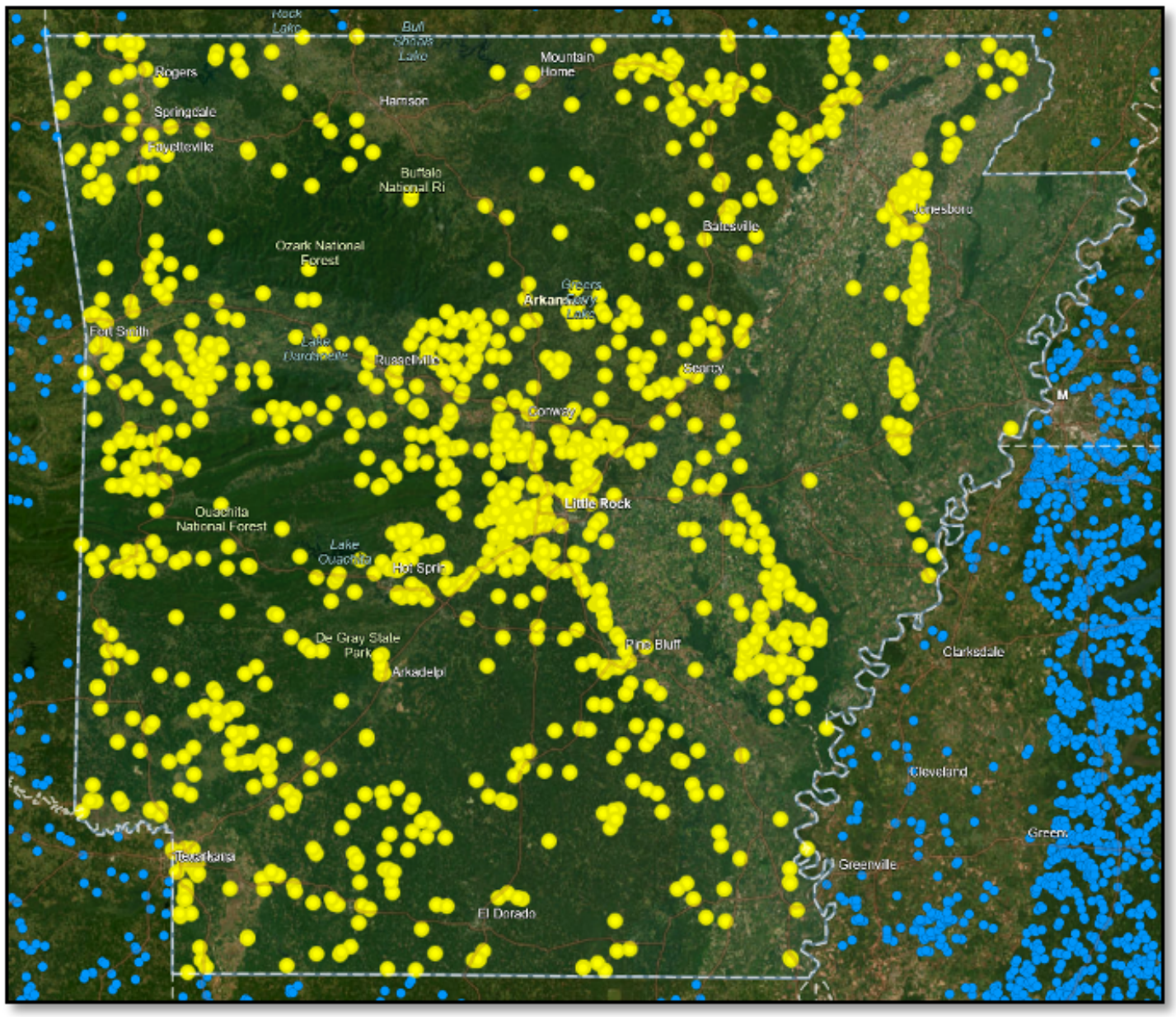

| County | State Regulated Dams | | | | Federal Dams | | | |
|---|---|---|---|---|---|---|---|---|
| | Low | Significant | High | Total Dams | Low | Significant | High | Total Dams |
| Arkansas | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 3 |
| Ashley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Baxter | 0 | 1 | 1 | 2 | 0 | 0 | 2 | 2 |
| Benton | 3 | 6 | 3 | 12 | 0 | 0 | 0 | 0 |
| Boone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bradley | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Calhoun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carroll | 2 | 0 | 2 | 4 | 0 | 0 | 2 | 2 |
| Chicot | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Clark | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 |
| Clay | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Cleburne | 4 | 0 | 0 | 4 | 0 | 0 | 3 | 3 |
| Cleveland | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Columbia | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| Conway | 13 | 7 | 2 | 22 | 0 | 1 | 0 | 1 |
| Craighead | 2 | 5 | 8 | 15 | 0 | 0 | 0 | 0 |
| Crawford | 2 | 0 | 4 | 6 | 0 | 0 | 1 | 1 |
| Crittenden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cross | 3 | 2 | 2 | 7 | 0 | 0 | 0 | 0 |
| Dallas | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Desha | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Drew | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Faulkner | 10 | 2 | 0 | 12 | 0 | 1 | 0 | 1 |
| Franklin | 7 | 2 | 0 | 9 | 1 | 2 | 0 | 3 |
| Fulton | 5 | 1 | 2 | 8 | 0 | 0 | 0 | 0 |
| Garland | 6 | 5 | 6 | 17 | 0 | 0 | 3 | 3 |
| Grant | 2 | 1 | 0 | 3 | 0 | 0 | 0 | 0 |
| Greene | 1 | 2 | 2 | 5 | 0 | 0 | 0 | 0 |
| Hempstead | 14 | 0 | 1 | 15 | 0 | 0 | 0 | 0 |
| Hot Spring | 1 | 0 | 1 | 2 | 0 | 0 | 1 | 1 |
| Howard | 3 | 1 | 0 | 4 | 0 | 0 | 2 | 2 |
| Independence | 3 | 1 | 0 | 4 | 2 | 1 | 0 | 3 |
| Izard | 4 | 1 | 0 | 5 | 0 | 0 | 0 | 0 |
| Jackson | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jefferson | 3 | 0 | 0 | 3 | 3 | 3 | 0 | 6 |
| Johnson | 1 | 0 | 2 | 3 | 0 | 0 | 0 | 0 |
| Lafayette | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| Lawrence | 10 | 4 | 1 | 15 | 0 | 0 | 0 | 0 |
| Lee | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Lincoln | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| Little River | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| Logan | 6 | 5 | 5 | 16 | 0 | 0 | 1 | 1 |
| Lonoke | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Madison | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Marion | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Miller | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Mississippi | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Monroe | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Montgomery | 2 | 3 | 1 | 6 | 1 | 0 | 0 | 1 |
| Nevada | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Newton | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Ouachita | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| Perry | 5 | 2 | 3 | 10 | 0 | 1 | 1 | 2 |
| Phillips | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Pike | 1 | 1 | 0 | 2 | 0 | 0 | 1 | 1 |
| Poinsett | 5 | 1 | 9 | 15 | 0 | 0 | 0 | 0 |
| Polk | 2 | 0 | 5 | 7 | 0 | 1 | 0 | 1 |
| Pope | 6 | 4 | 2 | 12 | 0 | 1 | 1 | 2 |
| Prairie | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Pulaski | 4 | 10 | 6 | 20 | 1 | 2 | 0 | 3 |
| Randolph | 4 | 5 | 0 | 9 | 0 | 0 | 0 | 0 |
| Saline | 13 | 6 | 4 | 23 | 0 | 0 | 0 | 0 |
| Scott | 12 | 5 | 3 | 20 | 0 | 0 | 0 | 0 |
| Searcy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sebastian | 1 | 2 | 7 | 10 | 1 | 1 | 0 | 2 |
| Sevier | 4 | 0 | 0 | 4 | 0 | 0 | 5 | 5 |
| Sharp | 3 | 0 | 12 | 15 | 0 | 0 | 0 | 0 |
| St. Francis | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Stone | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| Union | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| Van Buren | 6 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| Washington | 3 | 3 | 5 | 11 | 1 | 0 | 0 | 1 |

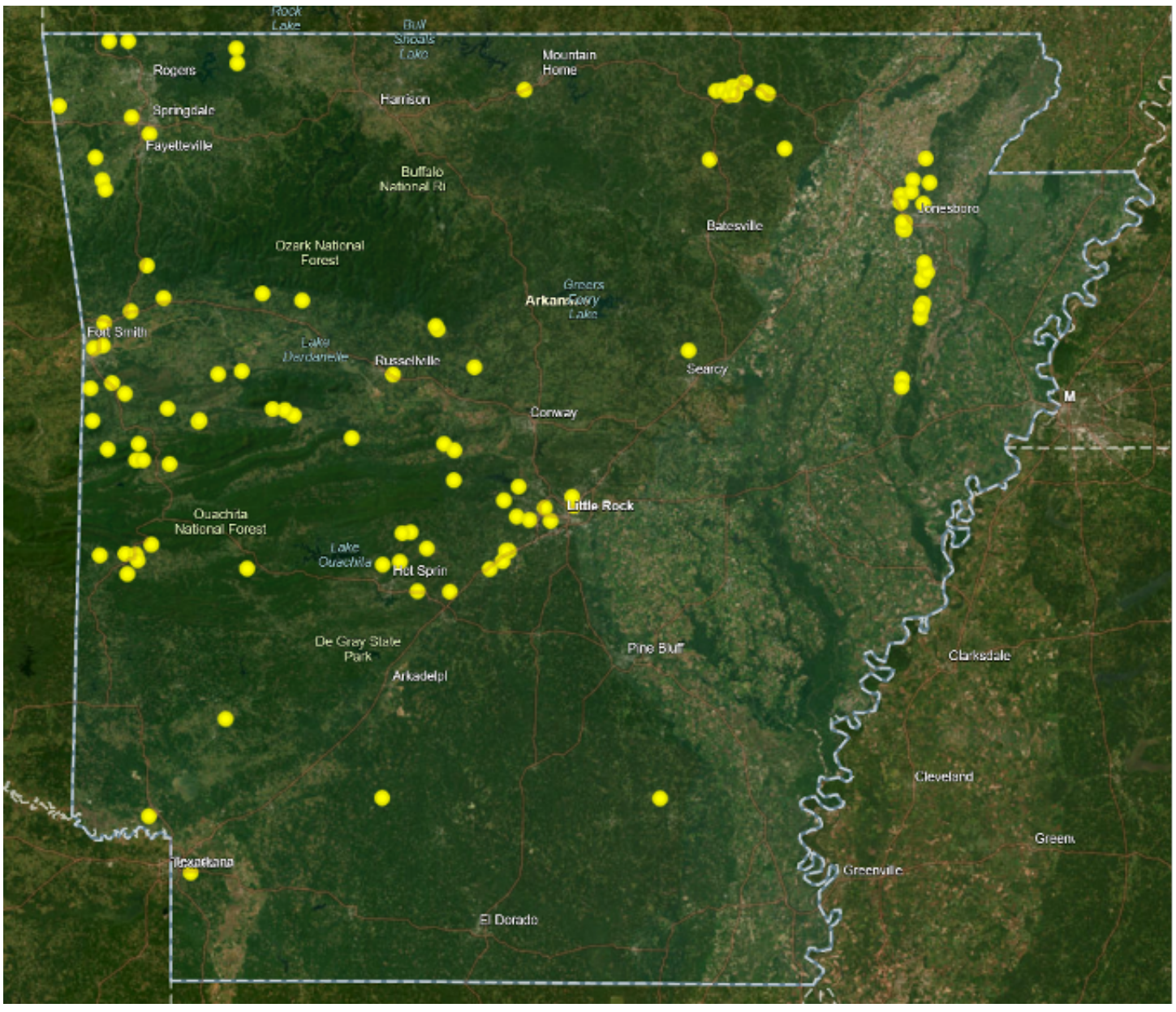
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| White | 9 | 2 | 1 | 12 | 1 | 0 | 0 | 1 |
| Woodruff | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yell | 2 | 0 | 4 | 6 | 0 | 0 | 2 | 2 |

The following maps show all identified dams within the State of Arkansas and High Hazard state regulated dams.

**All Dams in Arkansas**




**High Hazard Dams**



### 4.4.1.3 HIGH HAZARD DAMS

The Arkansas Department of Agriculture's Natural Resources Division (NRD) Dam Safety Section provides regulation and supervision of 411 dams in the state. These efforts are supported through FEMA's National Dam Safety Program, FEMA's High Hazard Potential Dam Program, and the State Dam Safety fund.

Each regulated dam is assigned a hazard classification based on damages that would occur if the dam failed. Dams are classified as either LOW, SIGNIFICANT, or HIGH. Dams assigned the high hazard potential classification are those where failure or mis-operation may cause loss of human life. The Dam Safety Section has identified 115 high hazard potential dams. Data regarding these dams, including inspection results, EAP status, and condition assessments, are collected and maintained in the State dam database.

Counties that are most at risk to a dam failures are those counties that have a high hazard dam located within them or could be impacted in the inundation area of a high hazard dam.

NRD provides an overview of high hazard dams for incorporation in the State Hazard Mitigation Plan. This overview includes mapping of the dams and a county-by-county enumeration of the dams. Federal high hazard dams are also incorporated in the mapping and tabulation to provide a full overview of high hazard potential dams in the state.

### 4.4.1.4 – LEVEE LOCATION AND EXTENT

The U.S. Army Corps of Engineers (USACE), in partnership with FEMA, works to provide a comprehensive list of levees within the state. These include levees enrolled in the USACE National Levee Safety Program (NLSP), levees identified in the 2017 National Levee Inventory Report (NLIR), and other levees as identified by state and local stakeholders. This comprehensive list is available on the National Levee Database website supported by the USACE.

**USACE Rehabilitation and Inspection Program**

Under Public Law 84-99, USACE has authority to supplement local efforts in the repair of both Federal (Corps-constructed, locally operated and maintained) and non-Federal (constructed by non-Federal interests or by the Works Projects Administration) levees damaged by flood. Repairs are limited to restoration to pre-flood levels of protection. Rehabilitation Assistance will be provided by the Corps only when the work is economically justifiable, the damage was sustained during the recent flood event, and the cost of the repairs is more than $15,000.

For a non-Federal levee to be eligible for the program, it must have been inspected, evaluated, and accepted into the program prior to the onset of the flood, and still be Active (based on the latest Continuing Eligibility Inspection) at the time of the flood.

For a Federal levee to be eligible, it must be in an Active status by having passed its last Inspection of Completed Works inspection.

Currently, 55 levees in Arkansas are enrolled in the Rehabilitation and Inspection Program (RIP). The following table provides available information on these levees.

| Congressional Districts | Levee System Name | Arkansas Counties | Number of Segments | Length (miles) | RIP Status | Area Protected by the Levee (miles$^2$) |
|---|---|---|---|---|---|---|
| Arkansas - 01 | Batesville Levee and Floodwall | Independence | 1 | 0.06 | Active | 0.07 |
| Arkansas - 02 | Bayou Meto Basin Levee and Pumping Station | Pulaski | 1 | 0.64 | Active | 0.05 |
| Arkansas - 01 | Big Gum Drainage District | Clay | 2 | 7.87 | Active | 12.47 |
| Arkansas - 01, Arkansas - 08 | Central Clay Drainage District | Butler, Clay | 1 | 12.30 | Active | 24.41 |
| Arkansas - 04 | Clarksville Levee and Floodwall | Johnson | 1 | 1.03 | Active | 0.20 |
| Arkansas - 02 | Conway County Drainage & Levee District No. 1 | Conway | 1 | 2.61 | Active | 2.11 |
| Arkansas - 02 | Conway County Levee District No. 6 | Conway | 1 | 4.39 | Active | 2.94 |

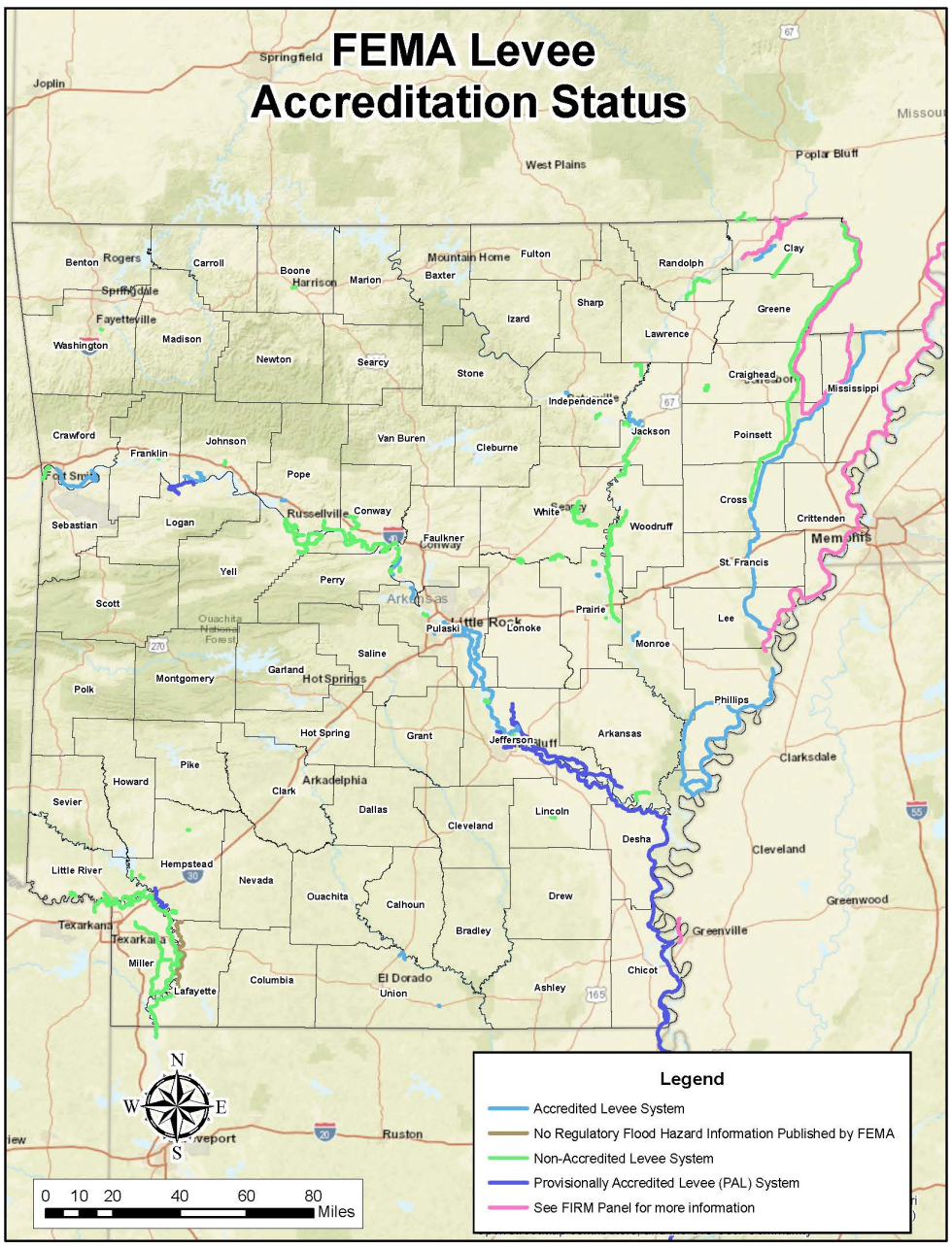
| | | | | | | |
|---|---|---|---|---|---|---|
| Arkansas - 01 | De Valls Bluff Levee System | Prairie | 1 | 0.09 | Active | 0.07 |
| Arkansas - 02 | Faulkner County Levee District No. 1 | Faulkner | 1 | 6.73 | Active | 13.32 |
| Arkansas - 03 | Fort Smith Levee District No. 1 | Sebastian | 1 | 1.06 | Active | 0.55 |
| Arkansas - 02 | Head of Fourche Island to Pennington Bayou | Pulaski | 2 | 21.30 | Active | 46.70 |
| Arkansas - 04 | Honeysuckle White Levee | Franklin | 1 | 0.50 | Active | 0.02 |
| Arkansas - 02 | Little Red River Levee District No. 1 | White | 1 | 6.52 | Active | 1.66 |
| Arkansas - 02 | Little Red River Levee District No. 2 | White | 1 | 10.81 | Active | 16.73 |
| Arkansas - 02 | Little Rock Flood Protection | Pulaski | 1 | 7.21 | Active | 0.47 |
| Arkansas - 01 | Massey Alexander Levee District | Jackson | 1 | 6.01 | Active | 4.84 |
| Arkansas - 04 | McLean Bottom | Logan | 3 | 12.29 | Active | 13.48 |
| Arkansas - 01 | Newport Levee District | Jackson | 1 | 7.57 | Active | 3.18 |
| Arkansas - 02 | North Little Rock Levee and Floodwall | Pulaski | 1 | 1.93 | Active | 0.23 |
| Arkansas - 02 | Perry County Levee District No. 1 | Perry | 1 | 2.90 | Active | 1.31 |
| Arkansas - 02 | Riverdale Private Levee | Pulaski | 1 | 2.70 | Active | 0.35 |
| Arkansas - 02 | Rock Creek Levee | Pulaski | 1 | 0.52 | Active | 0.02 |
| Arkansas - 02 | Roland Drainage District | Pulaski | 1 | 4.09 | Active | 4.51 |
| Arkansas - 01 | Running Water Levee District | Randolph | 1 | 7.64 | Active | 23.51 |
| Arkansas - 03 | Southern Enterprise Private Levee | Sebastian | 1 | 3.15 | Active | 0.29 |
| Arkansas - 03, Arkansas - 04 | Van Buren Levee District No. 1/Crawford County Levee District | Crawford | 2 | 20.75 | Active | 23.09 |
| Arkansas - 01 | Village Creek White River Mayberry Levee District | Jackson, Woodruff | 1 | 22.69 | Active | 82.60 |
| Arkansas - 02, Arkansas - 03 | West of Morrilton | Conway, Pope | 3 | 14.05 | Active | 29.63 |
| Arkansas - 01 | Bateman Levee District No. 3 | Jackson | 1 | 3.02 | Inactive | 0.75 |
| Arkansas - 04 | Calion Protection Works AR | Union | 2 | 2.93 | Inactive | 2.27 |
| Arkansas - 01 | Clarendon Levee System | Monroe | 1 | 6.18 | Inactive | 3.18 |
| Arkansas - 01 | Curia Creek Drainage District | Independence | 1 | 5.30 | Inactive | 4.38 |
| Arkansas - 04 | Dardanelle Levee/ Carden Bottom Levee | Yell | 2 | 28.68 | Inactive | 27.99 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Arkansas - 01 | Des Arc Levee System | Prairie | 1 | 1.42 | Inactive | 0.31 |
| Arkansas - 02 | East of Morrilton | Conway | 3 | 13.62 | Inactive | 21.70 |
| Arkansas - 04 | Hempstead County AR | Hempstead | 1 | 9.77 | Inactive | 7.72 |
| Arkansas - 03 | Holla Bend Drainage and Levee District No. 2 | Pope | 1 | 1.30 | Inactive | 1.59 |
| Arkansas - 03, Arkansas - 04 | Holly Bend Levee District No. 1 | Pope, Yell | 1 | 3.43 | Inactive | 5.01 |
| Arkansas - 02 | Little Private Levee | Faulkner | 1 | 2.05 | Inactive | 0.48 |
| Arkansas - 04 | Little Rock to Pine Bluff (Tucker Lake) | Jefferson | 1 | 8.76 | Inactive | 4.71 |
| Arkansas - 04 | Long Prairie AR | Bossier, Lafayette | 2 | 20.23 | Inactive | 71.64 |
| Arkansas - 04 | McKinney Bayou - Mid - North | Miller | 2 | 13.94 | Inactive | 42.66 |
| Arkansas - 04 | McKinney Bayou - South | Miller | 1 | 15.07 | Inactive | 43.61 |
| Arkansas - 02, Arkansas - 04 | North Little Rock to Gillette | Jefferson, Pulaski | 3 | 52.56 | Inactive | 188.35 |
| Arkansas - 02 | Ormand Peters Private Levee | Conway | 1 | 0.37 | Inactive | 0.06 |
| Arkansas - 01 | Padgett Island Levee District | Independence | 1 | 2.74 | Inactive | 0.65 |
| Arkansas - 02 | Point Remove Creek Drainage and Levee District | Conway | 1 | 7.18 | Inactive | 7.39 |
| Arkansas - 02 | Pulaski County Farm Private Levee | Pulaski | 1 | 1.88 | Inactive | 0.36 |
| Arkansas - 04 | Red River LB AR | Lafayette | 1 | 28.09 | Inactive | 48.27 |
| Arkansas - 04 | RR RB Miller-Garland | Bowie, Hempstead, Miller | 6 | 70.71 | Inactive | 206.25 |
| Arkansas - 02 | Sloan Private Levee | Conway | 1 | 0.91 | Inactive | 0.32 |
| Arkansas - 02 | Stalling Private Levee | Conway | 1 | 0.22 | Inactive | 0.02 |
| Arkansas - 04 | T.A. Gibson Private Levee | Jefferson | 1 | 3.88 | Inactive | 0.61 |
| Arkansas - 01, Arkansas - 08 | Western Clay Drainage District | Butler, Clay | 1 | 20.26 | Inactive | 43.01 |
| Arkansas - 01 | White River Levee System | Prairie, Woodruff | 2 | 39.31 | Inactive | 601.94 |

**FEMA Accreditation**

For the NFIP, FEMA will only recognize a levee system in its flood risk mapping effort that meet minimum design, operation, and maintenance standards as established by 44 CFR 65.10 - Mapping of Areas Protected by Levee Systems. In general, evaluated levees are assigned to one of these categories:

- Accredited Levee: Area behind the levee is mapped as a moderate-risk, with no mandatory flood insurance requirement.
- To Be Accredited: A levee system that has been approved for accreditation.
- Provisionally Accredited Levee: Area behind the levee is mapped as a moderate risk, with no mandatory flood insurance requirement, for a two-year grace period while compliance with 44 CFR 65.10 is sought
- Non-Accredited Levee: Area behind the levee is mapped according to FEMA protocols, likely resulting in a high-risk area designation and associate flood insurance requirements.
- To Be Non-Accredited: A levee system that no longer meets the requirements stipulated in 44 CFR 65.10 and is scheduled to lose accredited status.




As of March 2023, the State of Arkansas has:

- 40 counties with levees designed to provide flood protection
- 21 counties with accredited levees mapped on Effective Flood Insurance Rate Maps (FIRM)
- 109 levee systems
- 1,482 miles of levees

The 109 identified levee systems in Arkansas and their FEMA accreditation status are shown on the map above. Following is a table listing of these same levees along with FEMA accreditation status.

| Levee System Name | Arkansas Counties | Length (miles) | Area Protected by the Levee (miles²) | FEMA Accreditation Rating |
|---|---|---|---|---|
| Batesville Levee and Floodwall | Independence | 0.06 | 0.07 | Accredited Levee System |
| Big Gum Drainage District | Clay | 7.87 | 12.47 | Accredited Levee System |
| Big Lake and St. Francis Floodway East System | Cross, Lee, Mississippi, Poinsett, St. Francis | 122.47 | 1828.01 | Accredited Levee System |
| Calion Protection Works AR | Union | 2.93 | 2.27 | Accredited Levee System |
| Clarendon Levee System | Monroe | 6.18 | 3.18 | Accredited Levee System |
| Des Arc Levee System | Prairie | 1.42 | 0.31 | Accredited Levee System |
| Faulkner County Levee District No. 1 | Faulkner | 6.73 | 13.32 | Accredited Levee System |
| Head of Fourche Island to Pennington Bayou | Pulaski | 21.30 | 46.70 | Accredited Levee System |
| Laconia Circle Levee | Desha | 8.38 | 17.63 | Accredited Levee System |
| Little Rock Flood Protection | Pulaski | 7.21 | 0.47 | Accredited Levee System |
| Lower Hartman Bottom Levee | Johnson | 10.21 | 8.86 | Accredited Levee System |
| Massey Alexander Levee District | Jackson | 6.01 | 4.84 | Accredited Levee System |
| Mississippi and White Rivers Below Helena System | Desha, Monroe, Phillips | 105.55 | 390.89 | Accredited Levee System |
| Newport Levee District | Jackson | 7.57 | 3.18 | Accredited Levee System |
| North Little Rock Levee and Floodwall | Pulaski | 1.93 | 0.23 | Accredited Levee System |
| North Little Rock to Gillette | Jefferson, Pulaski | 52.56 | 188.35 | Accredited Levee System |
| Riverdale Private Levee | Pulaski | 2.70 | 0.35 | Accredited Levee System |

| | | | | |
|---|---|---|---|---|
| Rock Creek Levee | Pulaski | 0.52 | 0.02 | Accredited Levee System |
| Roland Drainage District | Pulaski | 4.09 | 4.51 | Accredited Levee System |
| Russellville Dike and Pumping Station | Pope | 1.20 | 2.25 | Accredited Levee System |
| Strong Sewage Treatment Plant System | Union | 0.86 | 0.04 | Accredited Levee System |
| Van Buren Levee District No. 1/ Crawford County Levee District | Crawford | 20.75 | 23.09 | Accredited Levee System |
| Red River LB AR | Lafayette | 28.09 | 48.27 | No Regulatory Flood Hazard Information Published by FEMA |
| Agricultural Levee | White | 4.90 | 1.19 | Non-Accredited Levee System |
| Bateman Levee District No. 3 | Jackson | 3.02 | 0.75 | Non-Accredited Levee System |
| Bayou Meto Basin Levee and Pumping Station | Pulaski | 0.64 | 0.05 | Non-Accredited Levee System |
| Cache River Levee 1 | Clay, Greene | 8.91 | 1.70 | Non-Accredited Levee System |
| Cache River Levee System | Clay, Greene | 8.96 | 5.65 | Non-Accredited Levee System |
| Central Clay Drainage District | Butler, Clay | 12.30 | 24.41 | Non-Accredited Levee System |
| Clarksville Levee and Floodwall | Johnson | 1.03 | 0.20 | Non-Accredited Levee System |
| Commerce MO - St. Francis River System | Crittenden, Lee, Mississippi, New Madrid, Pemiscot, Phillips, Scott | 276.74 | 5266.11 | Non-Accredited Levee System |
| Conway County Drainage & Levee District No. 1 | Conway | 2.61 | 2.11 | Non-Accredited Levee System |
| Conway County Levee District No. 6 | Conway | 4.39 | 2.94 | Non-Accredited Levee System |
| Crooked Creek Levee 1 | Boone | 0.42 | 0.00 | Non-Accredited Levee System |
| Crooked Creek Levee System | Boone | 0.73 | 0.04 | Non-Accredited Levee System |
| Curia Creek Drainage District | Independence | 5.30 | 4.38 | Non-Accredited Levee System |
| Dardanelle Levee/Carden Bottom Levee | Yell | 28.68 | 27.99 | Non-Accredited Levee System |
| De Valls Bluff Levee System | Prairie | 0.09 | 0.07 | Non-Accredited Levee System |
| DITCH NO. 2 LEVEE - NAYLOR 4 | Clay, Ripley | 3.25 | 0.64 | Non-Accredited Levee System |
| DITCH NO. 3 LEVEE C | Clay, Ripley | 2.17 | 0.39 | Non-Accredited Levee System |
| East of Hemstead Levee 1 | Hempstead | 1.89 | 1.26 | Non-Accredited Levee System |
| East of Hemstead Levee 2 | Hempstead | 1.69 | 0.47 | Non-Accredited Levee System |
| East of Morrilton | Conway | 13.62 | 21.70 | Non-Accredited Levee System |
| East Point Remove System | Conway | 0.68 | 0.07 | Non-Accredited Levee System |
| Faulkner-Tupelo Bayou System | Faulkner | 1.39 | 0.89 | Non-Accredited Levee System |
| Fort Smith Levee District No. 1 | Sebastian | 1.06 | 0.55 | Non-Accredited Levee System |
| Frenchtown Auburn-Arkansas River System | Lincoln | 4.81 | 3.23 | Non-Accredited Levee System |
| Greenville Harbor | Chicot, Washington | 7.86 | 16.54 | Non-Accredited Levee System |
| Holla Bend Drainage and Levee District No. 2 | Pope | 1.30 | 1.59 | Non-Accredited Levee System |
| Holly Bend Levee District No. 1 | Pope, Yell | 3.43 | 5.01 | Non-Accredited Levee System |
| Honeysuckle White Levee | Franklin | 0.50 | 0.02 | Non-Accredited Levee System |
| Hurricane Creek Levee System | Little River | 0.38 | 0.02 | Non-Accredited Levee System |
| Johnson Ditch Levee | Craighead | 4.44 | 0.79 | Non-Accredited Levee System |
| Little Private Levee | Faulkner | 2.05 | 0.48 | Non-Accredited Levee System |
| Little Red River Canal A Levee System | White | 2.02 | 0.40 | Non-Accredited Levee System |
| Little Red River Canal B Levee 2 | White | 1.35 | 0.29 | Non-Accredited Levee System |
| Little Red River Canal B Levee 3 | White | 0.75 | 0.24 | Non-Accredited Levee System |
| Little Red River Canal B Levee System | White | 1.27 | 0.79 | Non-Accredited Levee System |

| | | | | |
|---|---|---|---|---|
| Little Red River Levee District No. 1 | White | 6.52 | 1.66 | Non-Accredited Levee System |
| Little Red River Levee District No. 2 | White | 10.81 | 16.73 | Non-Accredited Levee System |
| Long Prairie AR | Bossier, Lafayette | 20.23 | 71.64 | Non-Accredited Levee System |
| Lower Red Lake Ring Levee (Hempstead) | Hempstead | 3.28 | 0.59 | Non-Accredited Levee System |
| McKinney Bayou - Mid - North | Miller | 13.94 | 42.66 | Non-Accredited Levee System |
| McKinney Bayou - South | Miller | 15.07 | 43.61 | Non-Accredited Levee System |
| Merrisach Lake Levee System | Arkansas | 6.33 | 10.40 | Non-Accredited Levee System |
| North of Hemstead Levee | Hempstead | 0.57 | 0.11 | Non-Accredited Levee System |
| Ogden Levee 6 | Little River | 1.30 | 0.23 | Non-Accredited Levee System |
| Ogden Levee 8 | Little River | 6.25 | 3.19 | Non-Accredited Levee System |
| Ogden Levee System | Little River | 11.20 | 15.69 | Non-Accredited Levee System |
| Ormand Peters Private Levee | Conway | 0.37 | 0.06 | Non-Accredited Levee System |
| Overflow Creek Levee | White | 1.36 | 0.17 | Non-Accredited Levee System |
| Padgett Island Levee District | Independence | 2.74 | 0.65 | Non-Accredited Levee System |
| Perry County Levee District No. 1 | Perry | 2.90 | 1.31 | Non-Accredited Levee System |
| Point Remove Creek Drainage and Levee District | Conway | 7.18 | 7.39 | Non-Accredited Levee System |
| Prairie Levee System 1 | Prairie | 5.27 | 1.09 | Non-Accredited Levee System |
| Prairie Levee System 2 | Prairie | 2.92 | 0.52 | Non-Accredited Levee System |
| Prairie Levee West 1 | Prairie | 3.00 | 0.59 | Non-Accredited Levee System |
| Pulaski County Farm Private Levee | Pulaski | 1.88 | 0.36 | Non-Accredited Levee System |
| Red River South Bank Diversion Canal Levee System | Bowie, Little River | 11.77 | 15.50 | Non-Accredited Levee System |
| RR RB Miller-Garland | Bowie, Hempstead, Miller | 70.71 | 206.25 | Non-Accredited Levee System |
| Running Water Levee District | Randolph | 7.64 | 23.51 | Non-Accredited Levee System |
| Sandtown-Portland Bottoms System | Conway | 5.06 | 1.59 | Non-Accredited Levee System |
| Sloan Private Levee | Conway | 0.91 | 0.32 | Non-Accredited Levee System |
| Southern Enterprise Private Levee | Sebastian | 3.15 | 0.29 | Non-Accredited Levee System |
| St. Francis East to Big Lake West System | Craighead, Dunklin, Mississippi, Poinsett | 112.75 | 696.42 | Non-Accredited Levee System |
| Stalling Private Levee | Conway | 0.22 | 0.02 | Non-Accredited Levee System |
| T.A. Gibson Private Levee | Jefferson | 3.88 | 0.61 | Non-Accredited Levee System |
| Tucker Lake System-Arkansas River System | Jefferson | 3.01 | 3.57 | Non-Accredited Levee System |
| Village Creek White River Mayberry Levee District | Jackson, Woodruff | 22.69 | 82.60 | Non-Accredited Levee System |
| Walnut Bayou Levee | Little River | 1.44 | 0.14 | Non-Accredited Levee System |
| Walnut Bayou Levee 1 | Little River | 0.23 | 0.14 | Non-Accredited Levee System |
| Walnut Bayou Levee 2 | Little River | 0.13 | 0.00 | Non-Accredited Levee System |
| West Bank St. Francis Floodway System | Clay, Craighead, Cross, Greene, Poinsett | 115.51 | 576.03 | Non-Accredited Levee System |
| West Fork White River Agricultural Levee Segment | Washington | 0.54 | 0.54 | Non-Accredited Levee System |
| West of Morrilton | Conway, Pope | 14.05 | 29.63 | Non-Accredited Levee System |
| Western Clay Drainage District | Butler, Clay | 20.26 | 43.01 | Non-Accredited Levee System |
| White River Levee System | Prairie, Woodruff | 39.31 | 601.94 | Non-Accredited Levee System |
| Woodruff Levee System | Woodruff | 1.95 | 0.59 | Non-Accredited Levee System |
| Woodruff Levee West 2 | Woodruff | 0.77 | 0.19 | Non-Accredited Levee System |
| Woodruff Levee West 3 | Woodruff | 2.25 | 1.01 | Non-Accredited Levee System |
| Woodruff Levee West 4 | Woodruff | 0.33 | 0.02 | Non-Accredited Levee System |

| | | | | |
|---|---|---|---|---|
| Woodruff Levee West 5 | Prairie, Woodruff | 5.19 | 1.44 | Non-Accredited Levee System |
| AR River North Bank | Arkansas, Jefferson | 56.16 | 372.41 | Provisionally Accredited Levee (PAL) System |
| AR-LA MS River | Chicot, Concordia, Desha, East Carroll, Jefferson, Lincoln, Madison, Tensas | 359.40 | 7533.48 | Provisionally Accredited Levee (PAL) System |
| Hempstead County AR | Hempstead | 9.77 | 7.72 | Provisionally Accredited Levee (PAL) System |
| Little Rock to Pine Bluff (Tucker Lake) | Jefferson | 8.76 | 4.71 | Provisionally Accredited Levee (PAL) System |
| McLean Bottom | Logan | 12.29 | 13.48 | Provisionally Accredited Levee (PAL) System |
| Mississippi River System - Southeast Arkansas | Chicot | 3.55 | 1.56 | Provisionally Accredited Levee (PAL) System |
| South Grand Lake Levee 2 | Chicot | 3.82 | 2.75 | Provisionally Accredited Levee (PAL) System |

#### 4.4.1.5 - PREVIOUS OCCURRENCES

There have been nine dam failures in the state:

| Dam Name | ANRC Hazard Class | County | Incident Type | Failure | Incident Date | Deaths |
|---|---|---|---|---|---|---|
| Paris Dam | High | Logan | Inflow Flood - Hydrologic Event | Yes | 1939 | None reported |
| Hughes Lake Dam | High | Clay | Inflow Flood - Hydrologic Event | Yes | 1972 | None reported |
| Tupelo Bayou Site 1 | Low | Faulkner | Piping | Yes | 1973 | None reported |
| Bragg Lake Dam | Low | Ouachita | Inflow Flood - Hydrologic Event | Yes | 1975 | None reported |
| Carpenter | High | Garland | Inflow Flood - Hydrologic Event | No | May 1994 | None reported |
| Carpenter | High | Garland | Gate misoperation | No | March 2000 | None reported |
| Boy Scouts Lake Dam | Low | Logan | Piping | Yes | 2014 | None reported |
| Crown Lake Dam | Significant | Izard | Clogged outflow pipe | No | April 2021 | One - repair diver |
| Lake Bella Vista Dam | Significant | Benton | Inflow Flood - Hydrologic Event | Yes | April 2021 | None reported |

In the last fifteen years, there have been six levee failures in the state.

- **Black River Levee, near the town of Pocahontas, Randolph County:** In March Of 2008 a breach in the levee along the Black River near Pocahontas resulted in the flooding of an apartment complex and surrounding areas.
- **Black River Levee, near the town of Pocahontas, Randolph County:** On April 26, 2011 a large breach in the levee along the Black River near Pocahontas resulted in mandatory evacuations and damages to residences and businesses.
- **Black River Levee, near the town of Pocahontas, Randolph County**: On May 3, 2017, a 29-foot levee developed a hole in the foundation resulting in flood waters that damaged 50 homes. In addition, over 150 homes, dozens of businesses and an assisted living facility were evacuated. Numerous deaths were reported as a result of the storms and flooding that caused this breach.
- **Conway County Levee, near the town of Morrilton, Conway County:** Levee was damaged and had a failed culvert during the May/June 2019 flood.
- **Yell County levee, near the town of Dardanelle, Yell County:** Levee failed during the May/June 2019 flood.
- **Desha County Levee, near Dumas, Desha County:** Levee was breached morning of June 10, 2021. Only farmland was directly affected by this failure.

#### 4.4.1.6 - HAZARD PROBABILITY ANALYSIS

Historically, there have been nine reported dam failure events in Arkansas over an 88-year period.  There have been six reported levee failure events in Arkansas over a 15-year period. Using the binomial probability equation, this would give a 10 percent probability for a dam failure in a given year. The State of Arkansas will be monitoring the potential impacts of climate change on the various levee systems throughout the state.

#### 4.4.1.7 - VULNERABILITY ASSESSMENT

Facilities located within five miles of significant and high hazard dams were determined to be most vulnerable to potential dam failures as they would be within potential failure inundation zones. The following table indicates the number of state-owned facilities and bridges, by county, within five miles of a significant or high hazard dam, and the value of those facilities. Using the binomial probability this would result in a 40 percent chance of a levee failure in a given year. Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential failure event.

| State-Owned Facilities and Bridges Within Five Miles of Significant or High Hazard Dams | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Value** | **State-Owned Critical Facilities** | **Value** | **State-Owned Bridges** |
| Arkansas | 0 | $0 | 0 | $0 | 17 |
| Baxter | 6 | $52,004,086 | 6 | $52,004,086 | 26 |
| Benton | 4 | $75,797,981 | 4 | $75,797,981 | 115 |
| Calhoun | 0 | $0 | 0 | $0 | 9 |
| Carroll | 0 | $0 | 0 | $0 | 8 |
| Clark | 15 | $184,157,089 | 15 | $184,157,089 | 47 |
| Clay | 0 | $0 | 0 | $0 | 9 |
| Cleburne | 2 | $23,781,633 | 2 | $23,781,633 | 15 |
| Cleveland | 0 | $0 | 0 | $0 | 4 |
| Columbia | 0 | $0 | 0 | $0 | 6 |
| Conway | 2 | $17,587,250 | 2 | $17,587,250 | 52 |
| Craighead | 35 | $696,125,909 | 35 | $696,125,909 | 106 |
| Crawford | 0 | $0 | 0 | $0 | 154 |
| Cross | 1 | $5,092,398 | 1 | $5,092,398 | 40 |
| Dallas | 0 | $0 | 0 | $0 | 10 |
| Desha | 0 | $0 | 0 | $0 | 8 |
| Drew | 0 | $0 | 0 | $0 | 22 |
| Faulkner | 40 | $626,549,203 | 40 | $626,549,203 | 66 |
| Franklin | 1 | $7,361,419 | 1 | $7,361,419 | 60 |
| Fulton | 0 | $0 | 0 | $0 | 16 |
| Garland | 4 | $37,084,464 | 4 | $37,084,464 | 121 |
| Grant | 0 | $0 | 0 | $0 | 21 |
| Greene | 1 | $6,886,216 | 1 | $6,886,216 | 50 |
| Hempstead | 0 | $0 | 0 | $0 | 8 |
| Hot Spring | 1 | $16,902,314 | 1 | $16,902,314 | 56 |
| Howard | 0 | $0 | 0 | $0 | 23 |
| Independence | 0 | $0 | 0 | $0 | 40 |
| Izard | 0 | $0 | 0 | $0 | 7 |
| Jackson | 0 | $0 | 0 | $0 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| Jefferson | 9 | $105,878,028 | 9 | $105,878,028 | 103 |
| Johnson | 0 | $0 | 0 | $0 | 52 |
| Lafayette | 0 | $0 | 0 | $0 | 10 |
| Lawrence | 1 | $6,905,290 | 1 | $6,905,290 | 23 |
| Lee | 0 | $0 | 0 | $0 | 3 |
| Lincoln | 0 | $0 | 0 | $0 | 12 |
| Little River | 0 | $0 | 0 | $0 | 7 |
| Logan | 3 | $65,308,841 | 3 | $65,308,841 | 50 |
| Lonoke | 0 | $0 | 0 | $0 | 49 |
| Marion | 1 | $6,349,013 | 1 | $6,349,013 | 2 |
| Miller | 1 | $85,128,428 | 1 | $85,128,428 | 85 |
| Montgomery | 0 | $0 | 0 | $0 | 36 |
| Nevada | 0 | $0 | 0 | $0 | 13 |
| Ouachita | 2 | $15,239,343 | 2 | $15,239,343 | 41 |
| Perry | 0 | $0 | 0 | $0 | 63 |
| Phillips | 0 | $0 | 0 | $0 | 5 |
| Pike | 0 | $0 | 0 | $0 | 12 |
| Poinsett | 0 | $0 | 0 | $0 | 40 |
| Polk | 1 | $6,756,549 | 1 | $6,756,549 | 65 |
| Pope | 21 | $283,229,787 | 21 | $283,229,787 | 82 |
| Prairie | 0 | $0 | 0 | $0 | 11 |
| Pulaski | 74 | $1,793,916,540 | 74 | $1,793,916,540 | 363 |
| Randolph | 3 | $26,176,489 | 3 | $26,176,489 | 47 |
| St. Francis | 3 | $22,272,436 | 3 | $22,272,436 | 67 |
| Saline | 6 | $98,449,015 | 6 | $98,449,015 | 87 |
| Scott | 0 | $0 | 0 | $0 | 50 |
| Searcy | 0 | $0 | 0 | $0 | 11 |
| Sebastian | 2 | $19,715,120 | 2 | $19,715,120 | 149 |
| Sevier | 0 | $0 | 0 | $0 | 15 |
| Sharp | 0 | $0 | 0 | $0 | 33 |
| Stone | 0 | $0 | 0 | $0 | 2 |
| Union | 0 | $0 | 0 | $0 | 2 |
| Van Buren | 0 | $0 | 0 | $0 | 17 |
| Washington | 2 | $12,450,737 | 2 | $12,450,737 | 107 |
| White | 1 | $7,232,966 | 1 | $7,232,966 | 142 |
| Yell | 0 | $0 | 0 | $0 | 58 |

Source: ADEM and Arkansas Insurance Department

Facilities located within FEMA designated levee protected areas were determined to be most vulnerable to potential failures as they would be within potential failure inundation zones. The following table indicates the number of state-owned facilities and bridges, by county, within levee protected areas, and the value of those facilities.  Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential failure event.

| State Owned Facilities and Bridges Within Levee Protected Area | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Value** | **State-Owned Critical Facilities** | **Value** | **State Owned Bridges** |

| | | | | | |
|---|---|---|---|---|---|
| Ashley | 0 | $0 | 0 | $0 | 1 |
| Chicot | 2 | $4,268,922 | 2 | $4,268,922 | 39 |
| Conway | 0 | $0 | 0 | $0 | 1 |
| Crawford | 0 | $0 | 0 | $0 | 1 |
| Desha | 0 | $0 | 0 | $0 | 12 |
| Drew | 0 | $0 | 0 | $0 | 0 |
| Faulkner | 40 | $626,549,203 | 40 | $626,549,203 | 66 |
| Greene | 0 | $0 | 0 | $0 | 0 |
| Hempstead | 0 | $0 | 0 | $0 | 2 |
| Independence | 0 | $0 | 0 | $0 | 0 |
| Jefferson | 2 | $65,721,234 | 2 | $65,721,234 | 21 |
| Johnson | 0 | $0 | 0 | $0 | 0 |
| Lincoln | 0 | $0 | 0 | $0 | 2 |
| Logan | 0 | $0 | 0 | $0 | 0 |
| Poinsett | 1 | $849,665 | 1 | $849,665 | 32 |
| Pope | 0 | $0 | 0 | $0 | 0 |
| Pulaski | 4 | $62,810,960 | 4 | $62,810,960 | 1 |

Due to the latest version of the Census Bureau data missing the population estimate per census block an accurate population per square mile analysis is not possible. Additionally, other resources such as HAZUS, TigerLine data, and datasets from the State of Arkansas do not have population estimates per square mile. As such, for each dam a determination of the number of structures within a potential five-mile inundation zone were determined. Counties with a higher number of structures within this five-mile area are to be considered to have a potentially greater vulnerability. Additionally, cities within five miles of a high or significant hazard dam were plotted and 2020 populations calculated to give theoretical potentially vulnerable population. These assumed vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a potential failure event and data limitations.

**County Vulnerability Data for Population and Structures Within Five Miles of Significant and High Hazard Dams**

| County | Number of Significant Hazard Dams | Number of High Hazard Dams | Structures within Five Miles of Dams | Estimated Population within Five Miles of Dams |
|---|---|---|---|---|
| Arkansas | 1 | 0 | 0 | - |
| Baxter | 0 | 2 | 0 | - |
| Benton | 6 | 4 | 32 | 263,325 |
| Carroll | 0 | 2 | 5 | 2,173 |
| Clark | 0 | 3 | 0 | - |
| Clay | 0 | 0 | 0 | - |
| Cleburne | 0 | 1 | 0 | - |
| Columbia | 1 | 0 | 0 | - |
| Conway | 8 | 2 | 0 | 781 |
| Craighead | 5 | 9 | 274 | 72,788 |
| Crawford | 0 | 5 | 20 | 10,366 |
| Cross | 2 | 3 | 70 | 8,367 |
| Dallas | 0 | 0 | 0 | - |
| Desha | 0 | 0 | 0 | 4,794 |
| Drew | 0 | 1 | 1 | - |

| | | | | |
|---|---|---|---|---|
| Faulkner | 3 | 0 | 0 | - |
| Franklin | 3 | 1 | 0 | - |
| Fulton | 1 | 2 | 0 | 2,608 |
| Garland | 6 | 9 | 167 | 503 |
| Grant | 1 | 0 | 0 | - |
| Greene | 2 | 2 | 41 | - |
| Hempstead | 0 | 1 | 0 | 68 |
| Hot Spring | 1 | 2 | 1 | 46,468 |
| Howard | 1 | 2 | 6 | 4,627 |
| Independence | 1 | 0 | 0 | - |
| Izard | 1 | 0 | 0 | - |
| Jefferson | 0 | 3 | 0 | - |
| Johnson | 0 | 2 | 19 | 3,354 |
| Lafayette | 1 | 0 | 0 | - |
| Lawrence | 4 | 1 | 0 | - |
| Lincoln | 1 | 0 | 0 | 2,249 |
| Little River | 0 | 2 | 10 | 5,097 |
| Logan | 6 | 5 | 139 | 4,104 |
| Lonoke | 0 | 0 | 0 | - |
| Miller | 0 | 0 | 0 | 29,919 |
| Montgomery | 1 | 1 | 0 | - |
| Nevada | 0 | 0 | 2 | 124 |
| Ouachita | 1 | 1 | 3 | - |
| Perry | 3 | 3 | 13 | 1,730 |
| Pike | 1 | 1 | 0 | - |
| Poinsett | 1 | 9 | 25 | - |
| Polk | 1 | 5 | 18 | 5,737 |
| Pope | 4 | 2 | 40 | 30,758 |
| Prairie | 0 | 0 | 0 | - |
| Pulaski | 13 | 7 | 511 | 254,748 |
| Randolph | 5 | 0 | 0 | - |
| St. Francis | 0 | 0 | 0 | - |
| Saline | 4 | 4 | 136 | 21,165 |
| Scott | 5 | 3 | 40 | 3,618 |
| Searcy | 0 | 0 | 0 | - |
| Sebastian | 3 | 6 | 38 | 101,812 |
| Sharp | 0 | 13 | 16 | 7,411 |
| Union | 0 | 0 | 0 | - |
| Van Buren | 0 | 0 | 0 | - |
| Washington | 3 | 5 | 88 | 81,955 |
| White | 2 | 1 | 0 | - |
| Yell | 2 | 6 | 4 | 5,561 |

To determine a county by county vulnerability to levee failure, those counties with levees enrolled in the USACE Rehabilitation and Inspection Program were analyzed. For each area, a determination of the population and number of structures within levee protected areas was made.  Counties with a higher identified population and number of structures within levee protected areas have a potentially greater vulnerability. However, these vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a potential failure event.

| Levee System Name | Arkansas Counties | Population Behind Levee | Buildings Behind Levee | Property Value |
|---|---|---|---|---|
| Batesville Levee and Floodwall | Independence | 14 | 4 | $5.57 million |
| Bayou Meto Basin Levee and Pumping | Pulaski | 0 | 1 | $663,000 |
| Big Gum Drainage | Clay | 342 | 342 | $47.9 million |
| Central Clay Drainage District | Butler, Clay | 79 | 67 | $9.66 million |
| Clarksville Levee and Floodwall | Johnson | 1082 | 289 | $57.8 million |
| Conway County Drainage & Levee | Conway | 3 | 4 | $642,000 |
| Conway County Levee District No. 6 | Conway | 11 | 14 | $2.3 million |
| De Valls Bluff Levee | Prairie | 98 | 76 | $8.03 million |
| Faulkner County Levee District No. 1 | Faulkner | 254 | 30 | $77.9 million |
| Fort Smith Levee District No. 1 | Sebastian | 355 | 317 | $74.2 million |
| Head of Fourche Island to Pennington | Pulaski | 2828 | 176 | $266 million |
| Honeysuckle White | Franklin | 212 | 1 | $50 million |
| Little Red River Levee District No. 1 | White | 9 | 6 | $900,000 |
| Little Red River Levee District No. 2 | White | 24 | 20 | $1.66 million |
| Little Rock Flood Protection | Pulaski | 26 | 14 | $5.68 million |
| Massey Alexander Levee District | Jackson | 368 | 189 | $44.3 million |
| McLean Bottom | Logan | 23 | 11 | $2.56 million |
| Newport Levee | Jackson | 3548 | 1476 | $568 million |
| North Little Rock Levee and Floodwall | Pulaski | 368 | 116 | $44 million |
| Perry County Levee District No. 1 | Perry | 143 | 63 | $24.8 million |
| Riverdale Private | Pulaski | 2046 | 249 | $223 million |
| Rock Creek Levee | Pulaski | 115 | 49 | $11.1 million |
| Roland Drainage | Pulaski | 101 | 45 | $12.4 million |
| Running Water Levee District | Randolph | 239 | 127 | $26 million |
| Southern Enterprise Private Levee | Sebastian | 30 | 6 | $2.9 million |

| | | | | |
|---|---|---|---|---|
| Van Buren Levee District No. 1/Crawford County Levee District | Crawford | 4538 | 697 | $291 million |
| Village Creek White River Mayberry Levee | Jackson, Woodruff | 656 | 405 | $63 million |
| West of Morrilton | Conway, Pope | 59 | 81 | $18.2 million |
| Bateman Levee District No. 3 | Jackson | 0 | 0 | 0 |
| Calion Protection Works AR | Union | 405 | 273 | $88.7 million |
| Clarendon Levee | Monroe | 1902 | 1232 | $200 million |
| Curia Creek Drainage District | Independence | 2 | 2 | $316,000 |
| Dardanelle Levee/ Carden Bottom Levee | Yell | 117 | 62 | $10.3 million |
| Des Arc Levee System | Prairie | 767 | 538 | $67.7 million |
| East of Morrilton | Conway | 123 | 65 | $10.4 million |
| Hempstead County AR | Hempstead | 161 | 85 | $28.6 million |
| Holla Bend Drainage and Levee District No. | Pope | 8 | 5 | $5.76 million |
| Holly Bend Levee District No. 1 | Pope, Yell | 0 | 0 | 0 |
| Little Private Levee | Faulkner | 0 | 0 | 0 |
| Little Rock to Pine Bluff (Tucker Lake) | Jefferson | 69 | 36 | $20.3 million |
| Long Prairie AR | Bossier, Lafayette | 697 | 194 | $43.2 million |
| McKinney Bayou - Mid - North | Miller | 120 | 24 | $7.7 million |
| McKinney Bayou - | Miller | 90 | 59 | $17.2 million |
| North Little Rock to | Jefferson, Pulaski | 7842 | 3799 | $921 million |
| Ormand Peters Private Levee | Conway | 6 | 5 | $941,000 |
| Padgett Island Levee District | Independence | 5 | 4 | $630,000 |
| Point Remove Creek Drainage and Levee District | Conway | 12 | 17 | $3.32 million |
| Pulaski County Farm Private Levee | Pulaski | 0 | 0 | 0 |
| Red River LB AR | Lafayette | 77 | 100 | $13.3 million |
| RR RB Miller-Garland | Bowie, Hempstead, | 848 | 550 | $358 million |
| Sloan Private Levee | Conway | 0 | 0 | 0 |
| Stalling Private Levee | Conway | 0 | 0 | 0 |
| T.A. Gibson Private | Jefferson | 0 | 1 | $1.4 million |
| Western Clay Drainage District | Butler, Clay | 3670 | 2207 | $461 million |
| White River Levee | Prairie, Woodruff | 15,498 | 8,716 | $1.04 billion |

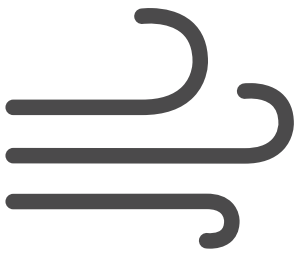
#### 4.4.1.8 - IMPACT AND CONSEQUENCE ANALYSIS

As per EMAP standards, the information in the following table provides the Consequence Analysis.

| Dam and Levee Failure Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Dam and Levee Failure** |
| Health and Safety of the Public | In areas of inundation, the impact to the public is expected to be severe. Impacts to the public in adjacent or minimally impacted areas is expected to be minimal to moderate. |
| Health and Safety of Responders | Impact to responders is expected to be minimal with proper training. Impact could be severe if there is lack of training. |
| Continuity of Operations | Temporary relocation may be necessary if facilities or infrastructure is damaged. |
| Property, Facilities, and | In areas of inundation, impacts could be severe to facilities and infrastructure. . |
| Environment | In areas of inundation, impact to the environment are expected to be severe. Impact will lessen as distance increases. |
| Economic Conditions | In areas of inundation, impacts to the economy will depend on the scope of the inundation and the time it takes for the water to recede. |
| Public Confidence in the Jurisdiction's Governance | Perception of whether the failure could have been prevented, warning time, and response and recovery time will greatly impact the public's confidence. |

# DROUGHT

| Cause | Most At-risk | Past Events |
|---|---|---|
| Abnormally dry periods in Arkansas | • Populations<br>• Elderly<br><br>- Locations<br>• Agricultural Communities | • Number of Occurrences<br>  • 160 between 2018-23<br>• Presidential Declared Disasters<br>  • NA |

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature  | Changes in temperature increases the risk of Drought.<br><br>Projected to increase in the spring and summer months here in Arkansas.<br><br>All areas of Arkansas are vulnerable to drought. |
| Changes in Precipitation  | Decreased precipitation increase the risk of drought.<br><br>Decreased precipitation can result in crop damage and or loss. |
| Extreme Weather  | Extreme heat and decreased precipitation can expedite the drought impact.<br><br>Drought conditions mixed with a thunderstorm involving lightning can increase the risk if wildfires. |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Population most at risk are those with disabilities, industries and workers reliant on agriculture. |
|  | Government can be impacted due to economic consequences from drought, food shortages, or increased cost due to impacts on supplies/operations. |
|  | Agriculture and water are the most at risk natural resources due to drought. |
|  | Economy can be impacted due to decreased agricultural production, disruptions of intermodal transportation such as river transportation. |

## 4.4.2 Drought



Drought is an abnormally dry period lasting months or years when an area has a deficiency of water and precipitation in its surface and/or underground water supply. The hydrological imbalance can be grouped into the following non-exclusive categories.

- ***Agricultural:*** When the amount of moisture in the soil no longer meets the needs of previously grown crops.
- ***Hydrological:*** When surface and subsurface water levels are significantly below their normal levels.
- ***Meteorological:*** When there is a significant departure from the normal levels of precipitation.
- ***Socio-Economic:*** When the water deficiency begins to significantly affect the population.

### 4.4.2.1 - LOCATION AND EXTENT

While the whole state is vulnerable to drought, it is most disastrous in the east of the I-40 corridor of the state where the majority of agricultural businesses are located.  The most commonly used drought index that is used to determine the onset and the severity of a drought is the Palmer Drought Severity Index.

### 4.4.2.2 PREVIOUS OCCURRENCES

One of the best indicators of historic drought periods is provided by the U.S. Drought Monitor, which lists weekly drought conditions for the State of Arkansas. The following table details the U.S. Drought Monitor categories.

| Category | Historically observed impacts |
|---|---|
| **D0** | Fire danger increases |
| **D1** | Forage crops are stunted |
| | River levels decline |
| | More wildfires occur than normal |
| **D2** | Crops are negatively impacted; some crops are not planted; hay yield is low; farmers begin feeding cattle early |
| | Burn bans begin |
| | Reservoirs decline; rivers are very low; rivers are dredged |
| **D3** | Pastures are depleted; hay is short; cattle are sold |
| | There are more insects than normal; trees show drought stress; wildlife seek food and water |
| | Water shortages are noted; water table is low; stock ponds are dry |
| | There is not enough water to fight fires |
| **D4** | Crops have little or no yield; cattle weights are low; milk production is low |
| | Trees and wildlife are dying |
| | Daily life is impacted for outdoor workers |
| | Voluntary water conservation is implemented; water is expensive |

| Rating | Described Condition |
|---|---|
| None | No drought conditions |
| D0 | Abnormally Dry |
| D1 | Moderate Drought |
| D2 | Severe Drought |
| D3 | Extreme Drought |
| D4 | Exceptional Drought |

Source U.S. Drought Monitor

Historical data was gathered from the U.S. Drought Monitor weekly reports from the year 2000 through March 2023. This data was compiled and aggregated to provide a yearly estimate of the percentage of the State in each Drought Monitor category.

| Percentage Arkansas in U.S. Drought Monitor Category | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **None** | **D0-D4** | **D1-D4** | **D2-D4** | **D3-D4** | **D4** |
| 2023 | 89.74 | 10.26 | 0.54 | 0 | 0 | 0 |
| 2022 | 41.33 | 58.67 | 43.88 | 22.3 | 3.04 | 0 |
| 2021 | 76.86 | 23.14 | 5.1 | 0.76 | 0 | 0 |
| 2020 | 90.02 | 9.98 | 1.45 | 0.06 | 0 | 0 |
| 2019 | 95.39 | 6.53 | 1.49 | 0.28 | 0 | 0 |
| 2018 | 67.04 | 32.96 | 18.75 | 5.52 | 0.36 | 0 |
| 2017 | 54.69 | 45.31 | 27.47 | 12.08 | 2.60 | 0.00 |
| 2016 | 71.16 | 28.84 | 14.83 | 3.05 | 0.06 | 0.00 |
| 2015 | 70.80 | 29.20 | 11.19 | 4.57 | 1.28 | 0.11 |
| 2014 | 76.37 | 23.63 | 3.42 | 0.00 | 0.00 | 0.00 |
| 2013 | 56.07 | 42.04 | 20.52 | 7.32 | 1.32 | 0.00 |
| 2012 | 39.57 | 60.43 | 51.43 | 39.54 | 23.98 | 6.75 |
| 2011 | 23.87 | 74.24 | 58.03 | 31.04 | 9.88 | 0.60 |
| 2010 | 58.24 | 41.76 | 25.39 | 12.51 | 1.16 | 0.00 |
| 2009 | 97.43 | 2.57 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2008 | 91.91 | 6.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2007 | 64.23 | 35.77 | 8.90 | 2.52 | 0.34 | 0.00 |
| 2006 | 17.79 | 82.21 | 50.99 | 23.27 | 6.39 | 1.24 |
| 2005 | 38.91 | 61.09 | 44.48 | 20.08 | 3.93 | 0.25 |
| 2004 | 86.88 | 13.12 | 1.98 | 0.00 | 0.00 | 0.00 |
| 2003 | 80.62 | 19.38 | 2.01 | 0.00 | 0.00 | 0.00 |
| 2002 | 83.43 | 14.68 | 1.38 | 0.00 | 0.00 | 0.00 |
| 2001 | 67.33 | 32.67 | 11.49 | 2.74 | 0.00 | 0.00 |
| 2000 | 28.84 | 71.17 | 39.36 | 17.21 | 6.72 | 0.31 |

Source: U.S. Drought Monitor

Another good indicator of historical droughts is USDA Disaster Declarations. The following table details USDA Drought Declarations during the period 2012 through 2021 for the State of Arkansas. During that period all 75 Arkansas Counties has at least one Secretarial Drought Declaration.

| State of Arkansas Secretarial Drought Declarations, 2012 - 2021 | | |
|---|---|---|
| **Year** | **Number of Secretarial Drought Disaster Declarations** | **Designation Numbers and (Number of Counties Included in Designation)** |
| 2022 | | |
| 2021 | 0 | 0 |
| 2020 | 3 | S4839 (2), S4847 (4), S4849 (1) |
| 2019 | 0 | 0 |
| 2018 | 10 | S4278 (69), S4282 (6), S4283 (1), S4284 (1), S4286 (8), S4287 (2), S4370 (1), S4378 (1), S4394 (1), S4421 (11) |
| 2017 | 5 | S4143 (29), S4149 (3), S4152 (8), S 4155 (2), and S4162 (22) |
| 2016 | 5 | S 4143 (29), S4149 (3), S4152 (8), S4155 (2), and S4162 (22) |
| 2015 | 10 | S3888 (10), S3889 (4), S3899 (3), S 3907 (15), S 3909 (10), S 3915 (17), S 3916 (1), S3917 (3), S 3922 (37), and S 3923 (1) |
| 2014 | 1 | S3625 (15) |
| 2013 | 9 | S3452 (61), S3460 (4), S3462 (8), S3465 (2), S3570 (1), S3608 (27), S3610 (6), S3615 (3), and S2681 (2) |
| 2012 | 18 | S3261 (30), S3266 (68), S3278 (4), S3279 (11), S3284 (5), S3287 (1), S3288 (2), S3291 (28), S 3294 (3), S3296 (2), S3299 (5), S3309 (5), S3316 (4), S3318 (1), S3323 (6), S3329 (2), S3336 (9), and S3340 (3) |

Source: USDA Farm Service Agency

Available crop loss data from the USDA Risk Management Agency detailing cause of loss was researched to determine the financial impacts of drought on the State's agricultural base. Crop loss data for the years 2022- 2019 indicate $8,003,239 in crop loss due to drought on 54,084 acres.

| USDA Risk Management Agency Cause of Loss Indemnities, Drought | | | |
|---|---|---|---|
| **Year** | **Number of Reported Claims** | **Acres Lost** | **Total Amount of Loss** |
| 2022 | 288 | 39,460 | $6,530,969 |
| 2021 | 82 | 8,332 | $904,939 |
| 2020 | 52 | 6,292 | $567,330 |
| 2019 | - | - | - |

Source: USDA Farm Service Agency

#### 4.4.2.3 - HAZARD PROBABILITY ANALYSIS

Reviewing historical data from the U.S. Drought Monitor weekly reports from the year 2000 through October 2023 a yearly average can be created indicating the percentage of the State in each Drought Monitor category. This average can be used to extrapolate the potential likelihood of future drought conditions.

| Estimated Probability of Being in U.S. Drought Monitor Category, Calendar Year | | | | | |
|---|---|---|---|---|---|
| **None** | **D0-D4** | **D1-D4** | **D2-D4** | **D3-D4** | **D4** |
| 64.29% | 35.46% | 19.28% | 8.9% | 2.65% | 0.4% |

#### 4.4.2.4 VULNERABILITY ANALYSIS

State owned structures are not directly vulnerable to losses as a result of drought. There is a small potential that state-owned bridges could be impacted by shrinking soil as a result of drought conditions that could cause foundational or support damages. Bridges that could be impacted due to drought conditions can be found in the areas of the state that have expansive soil. Please see expansive soil section for list of countries identified.

| USDA Risk Management Agency Drought Data, 2019 - 2022 | | | |
|---|---|---|---|
| **County** | **Acres Planted** | **Acres Lost** | **Dollar Loss Amount** |
| State of Arkansas | 54,084 | 54,084 | $8,003,239 |
| Arkansas | 71 | 71 | 7,952 |
| Ashley | 34 | 34 | 8,956 |
| Baxter | - | - | - |
| Benton | 227 | 227 | 42,501 |
| Boone | 21 | 21 | 53,330 |
| Bradley | - | - | - |
| Calhoun | - | - | - |
| Carroll | - | - | - |
| Chicot | 2,023 | 1,856 | 294,543 |
| Clark | 599 | 599 | 143,684 |
| Clay | 602 | 702 | 128,101 |
| Cleburne | - | - | - |
| Cleveland | - | - | - |
| Columbia | - | - | - |
| Conway | 452 | 452 | 80,245 |
| Craighead | 1831 | 1880 | 451,703 |

| | | | |
|---|---|---|---|
| Crawford | 1721 | 1642 | 191,965 |
| Crittenden | 2,000 | 1911 | 217,711 |
| Cross | 1436 | 1353 | 135,879 |
| Dallas | - | - | - |
| Desha | 196 | 196 | 41,391 |
| Drew | | | |
| Faulkner | 179 | 179 | 17,691 |
| Franklin | - | - | - |
| Fulton | - | - | - |
| Garland | - | - | - |
| Grant | - | - | - |
| Greene | 1,281 | 1,281 | 267,894 |
| Hempstead | 197 | 197 | 19,778 |
| Hot Spring | - | - | - |
| Howard | - | - | - |
| Independence | 270 | 306 | 39,503 |
| Izard | - | - | - |
| Jackson | 1,926 | 1,926 | 130,456 |
| Jefferson | 677 | 677 | 153,690 |
| Johnson | 95 | 95 | 15,644 |
| Lafayette | 852 | 930 | 122,750 |
| Lawrence | 1318 | 1162 | 108,770 |
| Lee | 4127 | 4063 | 303,932 |
| Lincoln | 18 | 18 | 2583.50 |
| Little River | 2345 | 2351 | 431,888 |
| Logan | 1642 | 1815 | 154,946 |
| Lonoke | 588 | 898 | 133,274 |
| Madison | - | - | - |
| Marion | - | - | - |
| Miller | 5187 | 5147 | 723,857 |
| Mississippi | 3307 | 3307 | 380,521 |
| Monroe | 1945 | 1945 | 406,811 |
| Montgomery | - | - | - |
| Nevada | - | - | - |
| Newton | - | - | - |
| Ouachita | - | - | - |
| Perry | 601 | 601 | 47,861 |
| Phillips | 4287 | 4287 | 978,000 |
| Pike | - | - | - |
| Poinsett | 602 | 602 | 63,842 |
| Polk | - | - | - |
| Pope | 956 | 956 | 210,576 |
| Prairie | 633 | 633 | 138,665 |

| | | | |
|---|---|---|---|
| Pulaski | 548 | 548 | 38,909 |
| Randolph | 376 | 324 | 89,442 |
| St. Francis | 1245 | 2145 | 260,737 |
| Saline | - | - | - |
| Scott | - | - | - |
| Searcy | - | - | - |
| Sebastian | 707 | 697 | 150,326 |
| Sevier | 608 | 608 | 29,998 |
| Sharp | - | - | - |
| Stone | - | - | - |
| Union | - | - | - |
| Van Buren | - | - | - |
| Washington | 157 | 157 | 31,046 |
| White | 757 | 757 | 62,827 |
| Woodruff | 2764 | 2764 | 547,598 |
| Yell | 778 | 778 | 141,464 |

Multiple factors can come into play when assessing drought vulnerability and loss analysis. However, for purposes of this estimate three major factors are being utilized to aid in the assessment:

- Acres Planted: The amount of agricultural crops planted
- Acres Lost: Historical losses from drought events
- Dollars Lost Amount: Amount of agricultural crops lost to drought over the given period

#### 4.4.2.5 - IMPACT AND CONSEQUENCE ANALYSIS

As per EMAP standards, the following table provides the consequence analysis for drought conditions.

| Drought Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Drought** |
| Health and Safety of the Public | Drought impact tends to be agricultural but water supply disruptions which affect people can occur.  Impact is expected to be minimal. |
| Health and Safety of Responders | Impact to responders is expected to be minimal. |
| Continuity of Operations | Minimal expectation for utilization of the COOP. |
| Property, Facilities, and Infrastructure | Impact to property, facilities, and infrastructure could be minimal to severe, depending on the length and intensity of the drought.  Structural integrity of buildings, and buckling of roads could occur. |
| Environment | The impact to the environment could be severe.  Drought can severely affect farming, ranching, wildlife and plants. |
| Economic Conditions | Impacts to the economy will be dependent on how extreme the drought is. Communities that depend on an agricultural economic engine will likely be severely stressed. |
| Public Confidence in the Jurisdiction's Governance | Confidence could be an issue during periods of extreme drought if planning is not in place to address intake needs and loss of crops. |

# EARTHQUAKE

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br><br>Tectonic Plates, Natural | • Populations<br>  • Citizens in NE Arkansas<br>• Locations<br>  • NE Arkansas | • Number of Occurrences<br>  • 3,740 between 1811 - 2023<br>• Presidential Declared Disasters<br>  • NA |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Populations most at risk are those that are in Clay, Craighead, Crittenden, cross, Greene, Jackson, Lee, Mississippi, Monroe, Phillips, Poinsett, prairie, St. Francis, and Woodruff Counties. |
|  | Government buildings and infrastructure in Northeast Arkansas along and near the New Madrid fault are most at risk. A major earthquake along the New Madrid fault could have an impact on state and local operations in that area. |
|  | Infrastructure that is not built to seismic standards or have been retrofitted to seismic standards are most at risk. This would include but not limited too roads, bridges, power systems, water/waste water systems etc. |
|  | Natural resources that are most at risk would be oil and gas pipelines as well as water lines. |
|  | Earthquake could have a negative and wide spread impact on the state economy. |

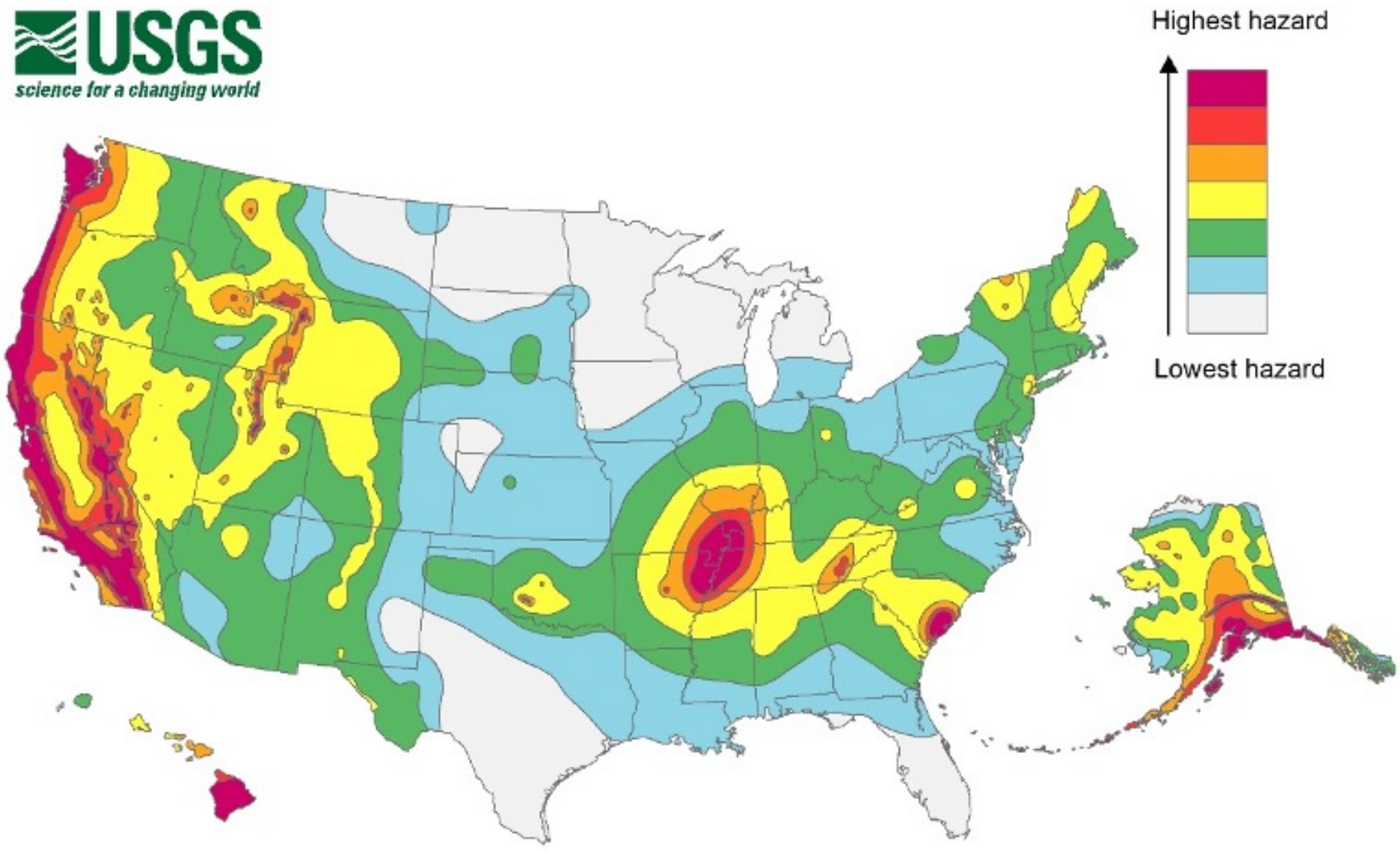
## 4.4.3 Earthquake



An earthquake is the sudden release of energy in the earth's crust that creates seismic waves that are typically caused by the rupturing of geological faults.

### 4.4.3.1 LOCATION AND EXTENT

The New Madrid Seismic Zone (NMSZ) stretches from northeast Arkansas to southern Illinois, passing through Missouri, western Tennessee, and western Kentucky, and is one-of the most active earthquake zones in the eastern United States. Most earthquakes in the NMSZ are small and are detected only with instruments. The USGS estimates that earthquakes as large as magnitude 7.5 are possible along NMSZ. The following map, from the Mid-America Earthquake Center (MAEC), illustrates the location of the NMSZ.




### 4.4.3.2 PREVIOUS OCCURRENCES

The Arkansas Geological Survey Earthquake Archive 1699 - 2023 is a list that was made from a selection of seismic events that occurred from 1699 to the present in Arkansas. The seismic data have been cited from publications of the Center for Earthquake Research and Information at the University of Memphis, the Department of Earth and Atmospheric Sciences at Saint Louis University, the USGS, the Eastern Section of the Seismological Society of America and the University of Arkansas at Little Rock. According to this archive, Arkansas has had 3,592 earthquakes since 1811.

The following table details the earthquake magnitudes of these events.

**Number of Earthquakes by Magnitude, 1811-2023**

| 0.1 -3.9 | 4.0 – 4.9 | 5.0 – 5.9 | 6.0 – 6.9 | 7.0- 7.9 | 8.0 + |
|---|---|---|---|---|---|
| 3,592 | 87 | 54 | 4 | 2 | 1 |

**Number of Earthquakes by Richter Scale Magnitude, 1811-2023**

From the archive data, the table below represents selected events that had earthquake magnitudes above 4.0 after 1947.

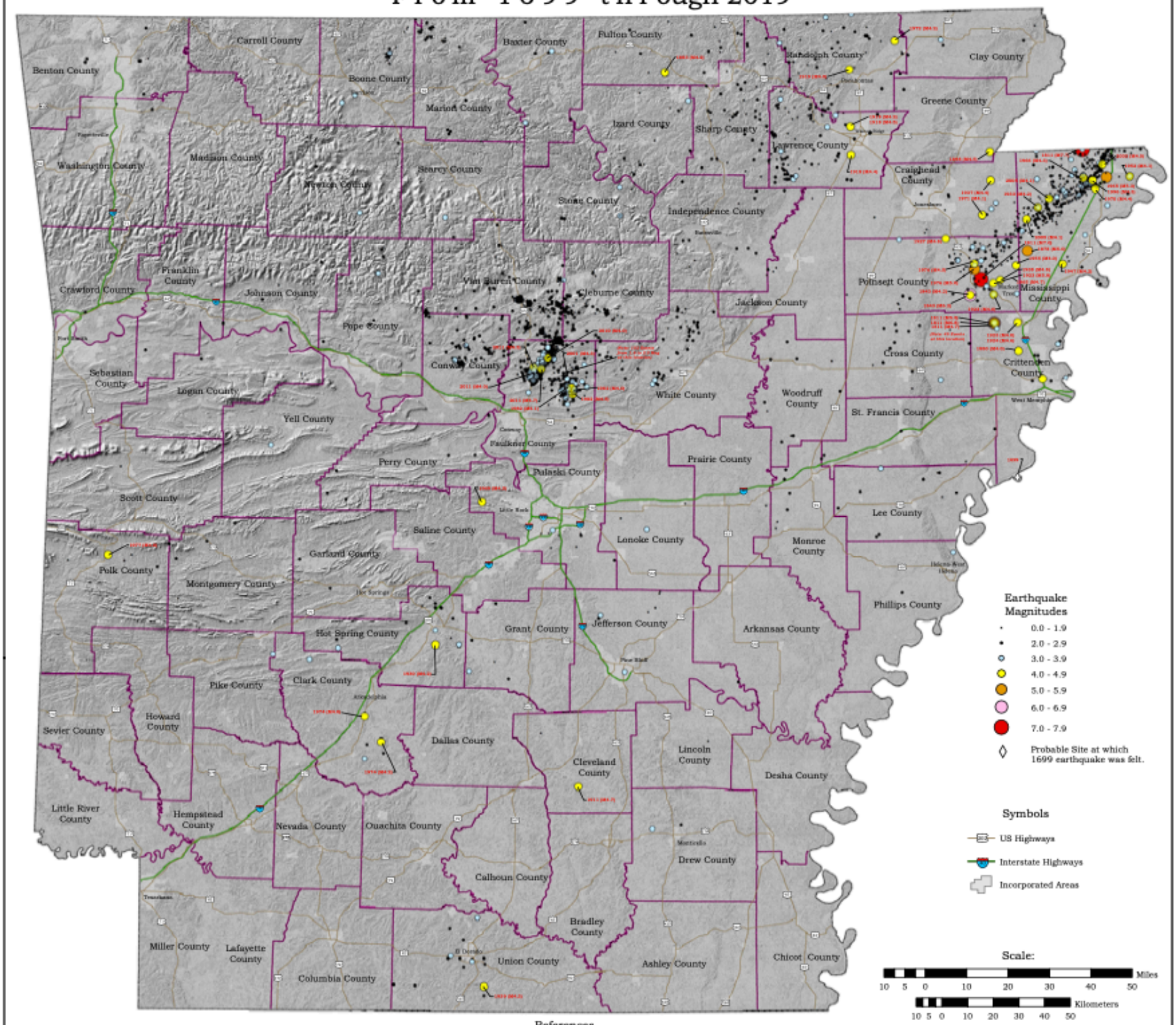
| State of Arkansas Historic Earthquake Events above Magnitude 4.0, 1947-2023 | | | |
|---|---|---|---|
| **Date** | **Earthquake Magnitude Scale** | **County** | **Incident Remarks** |
| 12/15/1947 | 4.2 | Mississippi | Felt area approximately 15,000 km^2 |
| 12/25/1952 | 4.1 | Mississippi | none |
| 4/26/1954 | 4.4 | Crittenden | Felt area approximately 40,000 km^2 |
| 1/25/1955 | 4.7 | Poinsett | Felt area approximately 90,000 km^2 |
| 12/19/1965 | 5.3 | Mississippi | none |
| 2/12/1966 | 4.3 | Mississippi | Felt area approximately 2,500 km^2 |
| 1/1/1969 | 4.2 | Pulaski | Felt area approximately 62,000 km^2 |
| 11/17/1970 | 4.4 | Mississippi | Felt area approximately 92,000 km^2; magnitude 4.4 assigned by Nuttli; location assigned by Bakun |
| 10/1/1971 | 4.1 | Craighead | Felt area approximately 62,000 km^2 |
| 2/1/1972 | 4.2 | Randolph | Felt area approximately 27,000 km^2 |
| 2/15/1974 | 4.0 | Clark | Arkadelphia swarm |
| 2/15/1974 | 4.2 | Clark | Arkadelphia swarm |
| 3/25/1976 | 4.2 | Poinsett | none |
| 3/25/1976 | 4.6 | Poinsett | Reported to have been felt in six states (Arkansas Gazette). |
| 6/2/1977 | 4.0 | Polk | Nuttli assigned location = N34.610 and W-94.190 |
| 1/20/1982 | 4.5 | Faulkner | Enola swarm - Largest event - Felt area ~75,000 km2 - Damage reported |
| 1/23/1982 | 4.1 | Faulkner | Enola swarm - Second largest event - Felt area ~ 43,500 km2 |
| 2/28/1982 | 4.0 | Faulkner | Enola swarm - Third largest event - Felt in Naylor & Vilonia (MMI=V); Enola, Greenbrier, Mt. Vernon, Rosebud, & Weldon (MMI=IV) |
| 11/28/1996 | 4.3 | Mississippi | none |
| 5/4/2001 | 4.3 | Faulkner | Enola swarm; largest event since 1982; 2nd largest to date; felt area ~1,000 km2 - Damage reported |
| 4/29/2003 | 4.0 | Mississippi | none |
| 2/10/2005 | 4.1 | Mississippi | none |
| 5/1/2005 | 4.1 | Mississippi | none |
| 10/11/2010 | 4.0 | Faulkner | Probable triggered event |
| 2/18/2011 | 4.1 | Faulkner | Probable triggered event |
| 2/27/2011 | 4.7 | Faulkner | Probable triggered event; felt over large area of Arkansas and surrounding states; damage reported near epicenter. |

Of historical note to the State of Arkansas is the sequence of large earthquakes that occurred in 1811 and 1812, the New Madrid earthquakes. These quakes caused damage to an area of approximately 600,000 square kilometers and were felt over an area of 5,000,000 square kilometers. Because there were no seismographs at that time, and few people in the New Madrid region, the estimated magnitudes of these quakes vary considerably and depend on modern interpretation. However, it is generally agreed that these quakes had magnitudes of approximately 7.5 - 8.0.

The Arkansas Geological Survey (AGS) website (www.geology.arkansas.gov) can provide more information on historic earthquake activity in the state under the geohazards section of the site.

Arkansas Geological Survey
Bekki White, Director and State Geologist

# Three Centuries of Earthquakes In Arkansas
## From 1699 through 2019




### About the Map

This map illustrates the location and magnitude of reported earthquakes that have occurred in Arkansas from 1699 to 2019. The data source for the earthquakes depicted on this map was derived from the Arkansas Geological Survey (AGS) earthquake catalog. This catalog has been compiled from various sources and publications and includes date, time, latitude, longitude, magnitude or intensity and depth information. Some event records may contain incomplete data due to their date and/or source. The AGS earthquake catalog is dynamic and continually updated as event parameters are modified, new events are added and occasionally events are deleted.

### Acknowledgments

We extend our appreciation to John David McFarland III for compiling the original earthquake database used to make this map and for sharing his knowledge of Arkansas Seismicity. We also thank Buddy Schweig, USGS and Center for Earthquake Research and Information (CERI) at the University of Memphis and Russell Wheeler for their advice regarding the earthquake database.

### References

Advanced National Seismic System (ANSS) earthquake database web page: URL: http://earthquake.usgs.gov/monitoring/anss/

Arkansas Gazette newspaper (Ceased publication in 1991).

Bakun, W.H. and R.C. Hopper, 2004, Catalog of significant historical earthquakes in the Central United States: U.S. Geological Survey Open -File Report 2004-1086, 142 p.

Branner, G.C., and J.M. Hansell, 1937, Earthquake risk s in Arkansas: Arkansas Geological Survey (AGS) Information Circular 4, 16 p, 1 plate.

Center for Earthquake Rese arch and Information (CERI) - New Madrid Earthquake Catalog: URL: http://folkworm.ceri.memphis.edu/catalogs/html/cat_nm.html

Cox, R. T., 1991, Possible triggering of earthquakes by underground waste disposal in the El Dorado, Arkansas area: Seismological Research Letters, V. 62, N. 2, p.113-122.

Haar, L. C., J.B. Fletcher, and C.S. Mueller, 1984, The 1982 Enola, Arkansas swarm and scaling of ground motion in the eastern United States: Bulletin of the S eismological Society of America V. 74, N. 6, p. 2463-2482.

Jackson, K.C., 1979, Earthquakes and earthquake history of A rkansas, Arkansas Geological Commission ( AGC) Information Circular 26, 70 p.

Johnston[1], A.C. and E.S. Schweig, 1996, The enigma of the New Madrid earthquakes of 1811-1812, Annual Review of Earth and Planetary Sciences, p. 339-394.

Johnston[2], A.C. and A. Metzger, 1982, TEIC Special Report # 8: The central Arkansas earthquake swarm parts 1 & 2 , Tennessee Earthquake Information Center.

Metzger, A., oral comm unications with John David McFarland, 1989, Center for Earthquake Research and Information (CERI), University of Memphis.

National Center for Ea rthquake Engineering Research (NCEER) – earthquake catalog for the central and eastern United States, 1627 -1985. URL: http://folkworm.ceri.memphis.edu/catalogs/html/cat_nceer.html

National Earthquake Information Center (NEIC) – Preliminary Determination of Epicenters (PDE) earthquake catalog for M2.5 and greater U.S. earthquakes and M4.5 and greater Worldwide earthquakes. URL: http://earthquake.usgs.gov/earthquakes/eqarchives/epic/

Nuttli, O.W., 1979, The seismicity of the central United States, in geology in the siting of nuclear power plants: Geological Society of America , Reviews in Engineering Geology, V olume 4, p. 67-93.

Oklahoma Geological Survey (OGS) URL: http://www.ogs.ou.edu/homepage.php

St. Louis University (SLU) Earthquake Center web page: URL: http://www.eas. slu.edu/eqc/

Stover, C.W., B.G. Reagor, and S.T. Algermissen, 1979, Seismicity map of the state of Arkansas: USGS Map MF-1154, 1 map.

Tennessee Earthquake Information Center (TEIC) – succeeded by University of Memphis Center for Earthquake Research and Information (CERI) – taken from CERI New Madrid Earthquake Catalog . URL: http://www.ceri.memphis.edu/seismic/catalogs/cat_nm.html

United S tates Geological Su rvey USGS) Earthquake Notification Service (ENS).

The basemap was acquired at the Spatial Analysis Laboratory, University of Arkansas at Monticello. The feature class data was acquired at http://www.geostor. arkansas.gov

### Disclaimer

Although this map was compiled from digital data that was successfully processed on a com puter system using ESRI ArcGIS 10 .x software of the Arkansas Geological Survey (AGS), no warranty, expressed or implied, is made by the AGS regarding the usefu lness of the data on any other system, nor shall the act of distribution constitute any such warranty. The AGS does not guarantee this map or digital data to be free of errors or assume liability for interpretations from this map or digital data, or decisions based thereon.

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Arkansas Geological Survey.

Scott M. Ausbrooks
David H. Johnston
2011

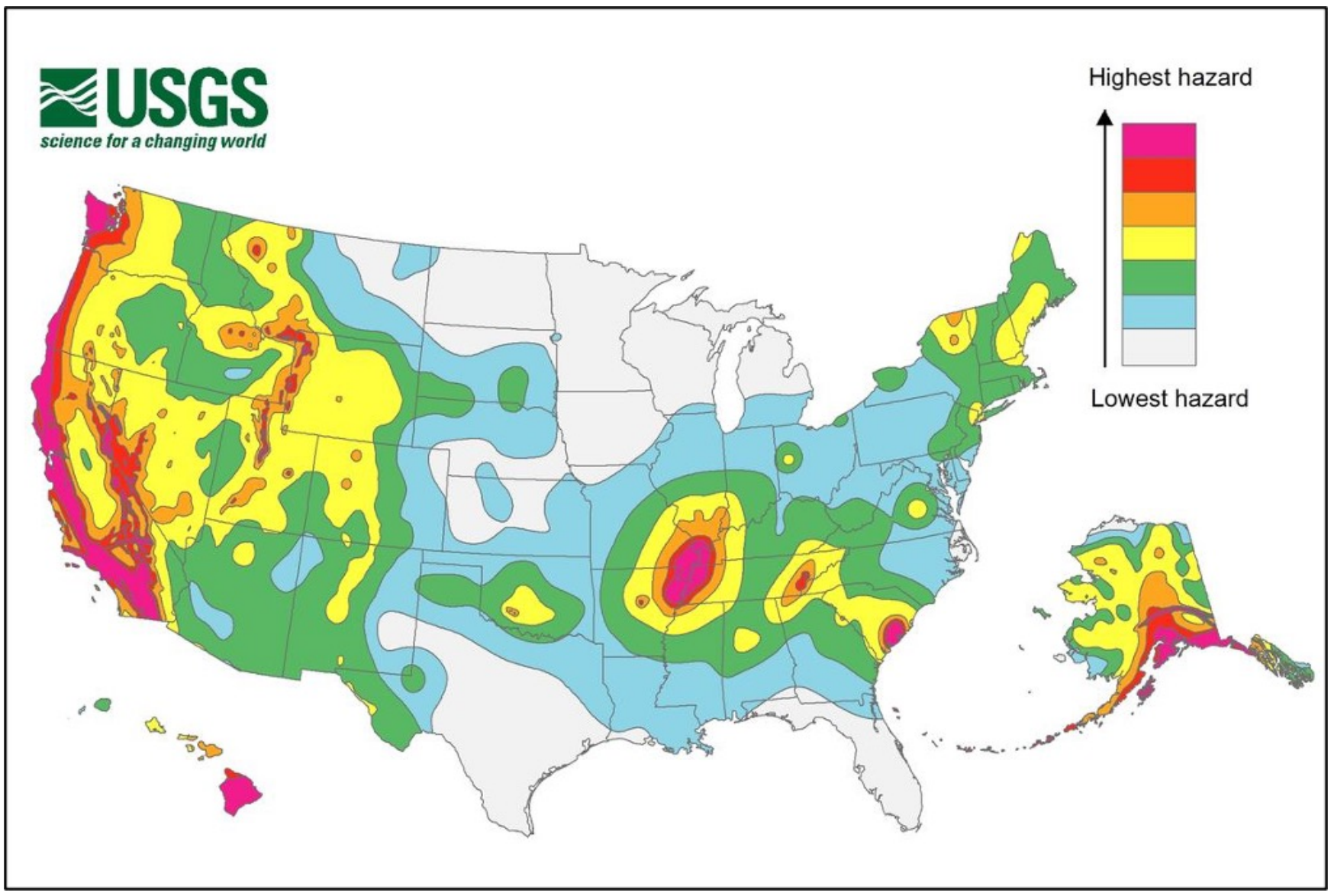
| Revised Date: | Scale: | Digital compilation: |
|---|---|---|
| 02 July 2020 | 1 : 500,000 | Jerry W. Clark |

### 4.4.3.3 HAZARD PROBABILITY ANALYSIS

In 2009 the USGS published a study on the past, present, and future state of the NMSZ. Included in this study was a scientific prediction on the future probability of an earthquake event.

In summary, the study predicts the NMSZ will produce the following affecting Arkansas:

- A Magnitude 6 earthquake at a probability of 25% - 50% in the next 50 years.
- An earthquake sequence similar to the 1811-12 earthquakes at a probability of 7% - 10% in the next 50 years.




The USGS study on the NMSZ states:

- “It was the consensus of this broad group of scientists that (1) the evidence indicates that we can expect large earthquakes similar to the 1811-12 earthquakes to occur in the future with an average recurrence time of 500 years and that (2) magnitude 6 earthquakes, which can also cause serious damage, can be expected more frequently”

The USGS is currently developing an updated Seismic Hazard Map which will update the 2018 Seismic Risk Map. It is anticipated this map will be published later in 2023. It is also anticipated that this information will become an updated dataset within HAZUS.

While predicting the probability of an earthquake occurrence is not possible with any scientific certainty, based on the above data it is very likely that the State of Arkansas will experience earthquakes in the coming years.

### 4.4.3.4 VULNERABILITY ANALYSIS

Counties located within the northeast corner of the state near the New Madrid Fault were determined to be most vulnerable to potential earthquakes. The previous map from USGS map show highest hazard area from an earthquake.

The following table indicates the number of state-owned facilities within those counties, the value of those facilities, and the number of bridges.  Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential earthquake event.

| County | State-Owned Properties valued | Total Valuation | Critical Facilities | Critical Facility Values | State-Owned Bridges |
|---|---|---|---|---|---|
| Arkansas | 18 | $8,188,582.03 | 8 | $4,632,718.64 | 75 |
| Chicot | 64 | $80,475,656.77 | 6 | $43,713,906.99 | |
| Clay | 16 | $10,077,262.01 | 4 | $987,511.15 | 85 |

| | | | | | |
|---|---|---|---|---|---|
| Craighead | 227 | $1,319,922,341.64 | 10 | $9,154,672.74 | 174 |
| Crittenden | 35 | $127,719,120.92 | 8 | $3,690,430.15 | 163 |
| Cross | 65 | $36,051,200.33 | 6 | $3,375,873.26 | 93 |
| Desha | 13 | $4,733,763.86 | 4 | $1,564,467.00 | |
| Fulton | 24 | $12,583,989.23 | 5 | $2,214,766.13 | |
| Greene | 47 | $31,323,797.11 | 6 | $4,320,196.19 | 93 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 | 97 |
| Izard | 34 | $107,021,175.39 | 6 | $3,530,254.70 | |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 | 111 |
| Lawrence | 32 | $21,602,740.78 | 4 | $1,656,152.26 | 98 |
| Lee | 36 | $147,668,860.84 | 8 | $124,325,081.05 | 54 |
| Mississippi | 53 | $136,317,546.13 | 6 | $2,876,716.16 | 182 |
| Monroe | 5 | $2,343,993.15 | 5 | $2,343,993.15 | 78 |
| Phillips | 25 | $24,218,066.63 | 4 | $1,994,460.34 | 58 |
| Poinsett | 31 | $26,949,937.41 | 6 | $3,192,391.42 | 127 |
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 | 66 |
| Randolph | 39 | $88,255,338.41 | 4 | $2,624,642.63 | 84 |
| Sharp | 11 | $11,336,228.20 | 5 | $1,969,885.73 | |
| St. Francis | 51 | $79,811,432.22 | 8 | $8,784,795.86 | 154 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 | 203 |
| Woodruff | 4 | $1,249,134.83 | 4 | $1,249,134.83 | 62 |

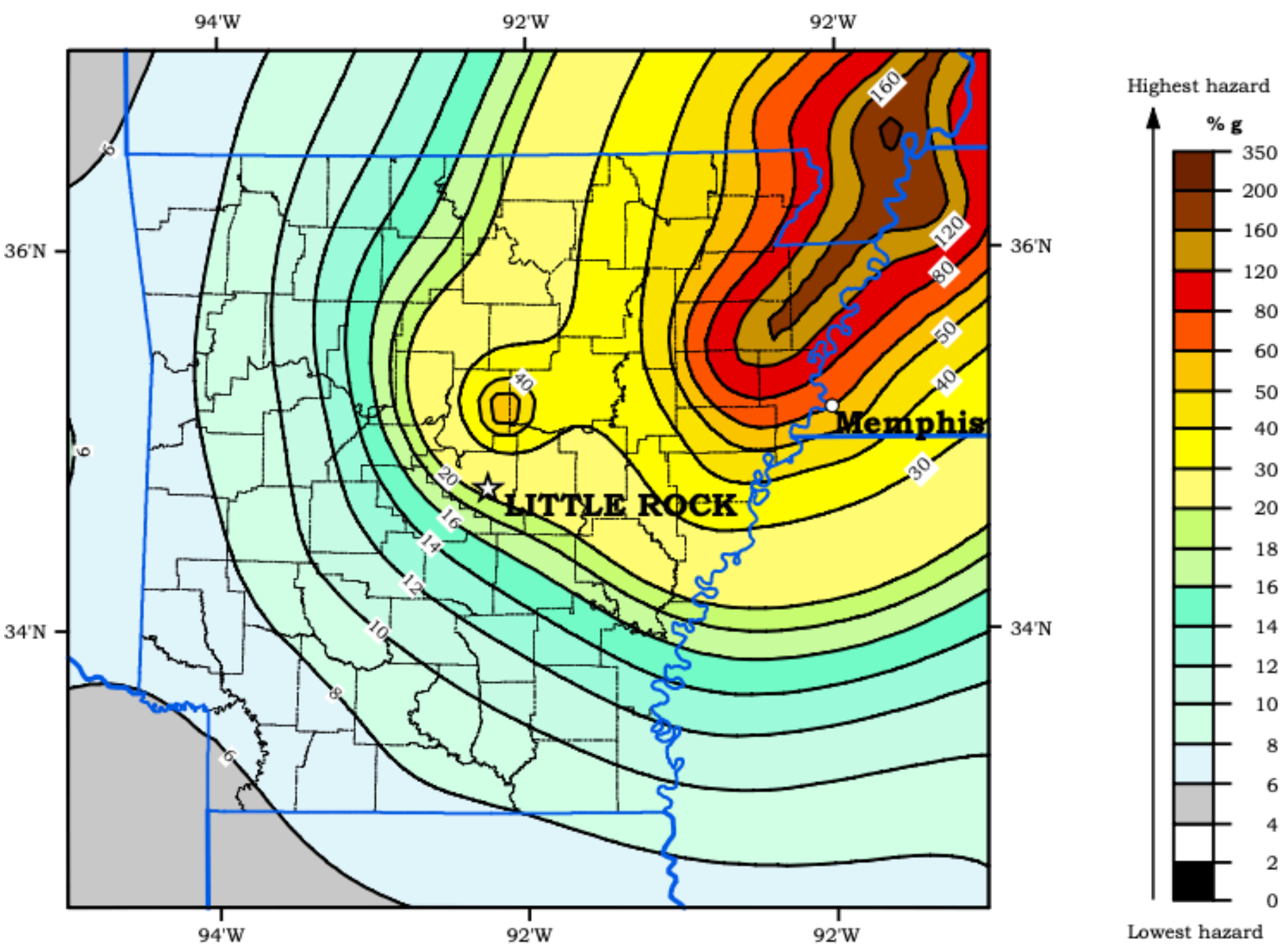
Source: ADEM and Arkansas Insurance Department

Based on data presented in the hazard analysis section, the following is a table of Arkansas counties where the impacts of an earthquake along the New Madrid Seismic Zone would be most severe, along with the current population and housing figures and the percentage change from the year 2000. Counties with a higher identified population and number of structures within these areas, and counties in a higher hazard area are to be considered to have a potentially greater vulnerability. However, these assumed vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a potential earthquake event.

| Arkansas Earthquake County Vulnerability Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| **County** | **Population 2020** | **Percentage Change in Population 2010-2020** | **Housing Units 2020** | **Percentage Change in Housing Units 2010 -** | **State-Owned Facility Valuation** | **Critical Facility Total Valuation** | **State-Owned Bridges** |
| Arkansas | 17,149 | -9.8% | 8,671 | -8.1% | $8,188,582.03 | $4,632,718.64 | 75 |
| Chicot | 10,208 | -13.5% | 5,104 | -5.8% | $80,475,656.77 | $43,713,906.99 | 57 |
| Clay | 14,552 | -9.5% | 7,470 | -7.0% | $10,077,262.01 | $987,511.15 | 85 |
| Craighead | 111,231 | 15.3% | 46,739 | 15.4% | $1,319,922,341.64 | $9,154,672.74 | 175 |
| Crittenden | 48,163 | -5.4% | 21,291 | -0.9% | $127,719,120.92 | $3,690,430.15 | 163 |
| Cross | 16,833 | -5.8% | 7,585 | -3.4% | $36,051.200.33 | $3,375,873.26 | 93 |
| Desha | 11,395 | -12.4% | 5,795 | -7.4% | $4,733,763.86 | $1,564,467.00 | 50 |
| Greene | 45,736 | 8.7% | 19,159 | 7.1% | $31,323,797.11 | $4,320,196.19 | 93 |
| Independence | 37,938 | 3.5% | 16,667 | 3.0% | $15,735,541.79 | $3,225,844.00 | 97 |
| Jackson | 16,755 | -6.9% | 7,079 | -6.9% | $228,406,869.70 | $88,337,243.72 | 111 |
| Lawrence | 16,216 | -6.9% | 7,489 | -6.4% | $21,602,740.78 | $1,656,152.26 | 99 |
| Lee | 8,600 | -17.5% | 3,695 | -15.2% | $147,668,860.84 | $124,325,081.05 | 54 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mississippi | 40,685 | -12.5% | 19,075 | -6.8% | $136,317,546.13 | $2,876,716.16 | 182 |
| Monroe | 6,799 | -16.6% | 3,828 | -14.1% | $2,343,993.15 | $2,343,993.15 | 78 |
| Phillips | 16,568 | -23.8% | 8,315 | -17.9% | $24,218,066.63 | $1,994,460.34 | 59 |
| Poinsett | 22,965 | -6.6% | 10,327 | -5.5% | $26,949,937.41 | $3,192,391.42 | 127 |
| Prairie | 8,282 | -5.0% | 4,071 | -9.6% | $7,844,861.42 | $1,418,153.96 | 66 |
| Randolph | 18,571 | 3.4% | 8,562 | 0.6% | $88,255,338.41 | $2,624,642.63 | 84 |
| Sharp | 17,271 | 0.0 | 9,499 | -3.3% | $11,336,228.20 | $1,969,885.73 | 154 |
| St. Francis | 23,090 | -18.3% | 9,565 | -12.3% | $79,811,432.22 | $8,784,795.86 | 100 |
| White | 76,822 | -0.3% | 33,270 | 2.4% | $149,862,444.12 | $2,645,017.47 | 205 |
| Woodruff | 6,269 | -13.7% | 3,250 | -16.5% | $1,249,134.83 | $1,249,134.83 | 62 |

Source: US Census and HAZUS




In order to determine estimated losses, the Mid-America Earthquake Center's 2009 report "New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, Impact of New Madrid Seismic Zone Earthquakes on the Central USA" was used. The hazard employed in this investigation includes ground shaking for a single scenario event representing the rupture of all three New Madrid fault segments. Each segment is assumed to generate a deterministic magnitude 7.7 earthquake caused by a rupture over the entire length of the segment. While the data in this report is illustrative of 2009 planning conditions, the rationale and results are still indicative of potential losses. The following is a summary of the report, with data specific to Arkansas.

#### 4.4.3.5 POPULATIONS IMPACTS

| Casualties at 2:00AM for Arkansas | | | | | |
|---|---|---|---|---|---|
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Total** |
| Casualties at 2:00AM | 11,245 | 3,075 | 344 | 641 | 15,305 |

Of note for injuries and deaths:

- Nearly 75% of all casualties are minor injuries that do not require hospitalization
- 650 deaths are expected
- Crittenden, Mississippi, and Craighead Counties are most severely impacted as each county is estimated to incur 2,000 to 3,000 total casualties
- Approximately 27,000 households will be displaced as a result of the earthquake

| Shelter Needs | |
|---|---|
| Displaced Households as a Result of the Earthquake | Persons Seeking Temporary Public Shelter |
| 26, 480 | 16,139 |

#### 4.4.3.6 ESSENTIAL FACILITIES IMPACT

| Essential Facilities Damage for Arkansas | | | |
|---|---|---|---|
| **Essential Facility** | **Total Facilities** | **At Least Moderate Damage** | **Complete Damage** |
| Schools | 1,328 | 219 | 56 |
| Fire Stations | 1,330 | 179 | 65 |
| Police Stations | 515 | 107 | 48 |
| Hospitals | 125 | 24 | 18 |
| EOCs | 113 | 25 | 8 |

Source: Mid-America Earthquake Center's "New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, Impact of New Madrid Seismic Zone Earthquakes on the Central USA"

Of note for essential facility damages:

- Clay, Craighead, Crittenden, Cross, Greene, Jackson, Lee, Mississippi, Monroe, Phillips, Poinsett, Prairie, St. Francis, and Woodruff Counties are dramatically impacted, and most essential facilities, medical services, law enforcement and firefighting services are nearly non-existent immediately after the event.

#### UTILITY IMPACTS

| Utility Facilities Damage for Arkansas | | | |
|---|---|---|---|
| **Utility Facility** | **Total Facilities** | **At Least Moderate Damage** | **Complete Damage** |
| Potable Water | 69 | 6 | 0 |
| Waste Water | 2,107 | 349 | 0 |
| Natural Gas | 422 | 47 | 0 |
| Oil | 96 | 14 | 0 |
| Electric | 800 | 147 | 0 |
| Communications | 4,626 | 633 | 0 |

Source: Mid-America Earthquake Center's "New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, Impact of New Madrid Seismic Zone Earthquakes on the Central USA"

Of note for utility systems:

- Approximately 264,000 households are without power and potable water on the day of the earthquake (not verified yet)
- Clay, Crittenden, Craighead, Cross, Greene, Independence, Jackson, Lawrence, Lee, Mississippi, Phillips, Poinsett, Randolph, St. Francis, White, and Woodruff Counties incur the majority of damage to wastewater, communication, and other utility facilities.

| Expected Potable Water and Electric Power System Performance | | | | | | |
|---|---|---|---|---|---|---|
| Utility | Total # of Households | Number of Households without Service | | | | |
| | | At Day 1 | At Day 3 | At Day 7 | At Day 30 | At Day 90 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Potable Water | 1,199,395 | 168,116 | 118,034 | 67,433 | 9,192 | 8,584 |
| Electric Power | | 96,009 | 73,621 | 42,139 | 6,457 | 118 |

## BUILDING IMPACTS

**Building Impacts by Occupancy Type**

| Occupancy Type | Moderate | Extensive | Complete |
|---|---|---|---|
| | Count | Count | Count |
| Agriculture | 2706.51 | 2031.63 | 2709.10 |
| Commercial | 14451.44 | 11052.33 | 13418.09 |
| Education | 287.24 | 214.07 | 230.02 |
| Government | 1426.70 | 1199.56 | 1327.16 |
| Industrial | 2070.73 | 1625.71 | 1816.31 |
| Other Residential | 25568.53 | 21865.26 | 23699.32 |
| Religion | 953.26 | 640.96 | 776.96 |
| Single Family | 49583.37 | 11010.46 | 10163.02 |
| Total | 97,048 | 49,640 | 54,140 |

**Source: HAZUS 2023 run**

**Building Damage by Building Type (Precode Design)**

| Building Type | Moderate | Extensive | Complete |
|---|---|---|---|
| | Count | Count | Count |
| Wood | 42,474 | 6,316 | 3,397 |
| Steel | 6,209 | 7,795 | 11,040 |
| Concrete | 1,714 | 1,617 | 1,890 |
| Precast | 1,817 | 1,371 | 1,460 |
| RM | 706 | 510 | 328 |
| URM | 23,190 | 11,591 | 13,545 |
| MH | 20,937 | 20,440 | 22,481 |
| Total | 97,048 | 49,640 | 54,140 |

Source: HAZUS run 2023

## TRANSPORTATION IMPACTS

| Essential Facilities Damage for Arkansas | | | |
|---|---|---|---|
| **Transportation Lifeline** | **Total Facilities** | **At Least Moderate Damage** | **Complete Damage** |
| Highway Bridges | 14,060 | 1,083 | 336 |
| Railway Bridges | 68 | 11 | 0 |
| Railway Facilities | 69 | 14 | 0 |
| Bus Facilities | 18 | 1 | 0 |
| Port Facilities | 103 | 17 | 0 |
| Airport Facilities | 335 | 37 | 0 |

Source: Mid-America Earthquake Center's "New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, Impact of New Madrid Seismic Zone Earthquakes on the Central USA"

Of note for transportation lifelines:

- Craighead, Crittenden, Mississippi, and Poinsett Counties incur the largest numbers of damaged bridges.
- The Harahan, Frisco, and Memphis/Arkansas bridges are damaged and impassible after the event.

- Most damage to rail, air and water transport facilities is located in Clay, Crittenden, Craighead, Cross, Greene, Mississippi, and Poinsett Counties.

### PIPELINE SYSTEM IMPACTS

| Utility Pipeline Damage for Arkansas | | | | |
|---|---|---|---|---|
| **Pipeline System** | **Total Miles** | **Leaks** | **Breaks** | **Total Repairs** |
| Potable Water Local | 118,700 | 19,532 | 27,649 | 47,181 |
| Waste Water Local | 71,200 | 15,448 | 21,868 | 37,316 |
| Natural Gas Local | 47,500 | 16,513 | 23,376 | 39,889 |
| Natural Gas Interstate | 9,700 | 340 | 1,092 | 1,432 |
| Oil Interstate | 2,200 | 62 | 214 | 276 |

Source: Mid-America Earthquake Center's "New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, Impact of New Madrid Seismic Zone Earthquakes on the Central USA"

Of note for pipeline systems:

- Approximately 190,000 households are without water after the event.

### OTHER CRITICAL INFRASTRUCTURE IMPACTS

| Essential Facilities Damage for Arkansas | | |
|---|---|---|
| **Essential Facility** | **Total Facilities** | **Damaged** |
| Dams | 1,228 | 55 |
| Levees | 124 | 20 |
| Hazardous Materials | 1,834 | 69 |

Source: Mid-America Earthquake Center's "New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, Impact of New Madrid Seismic Zone Earthquakes on the Central USA"

Of note for other critical infrastructure:

- All dams damaged are in Poinsett County
- All levees damaged are in Craighead, Greene, Mississippi, and Poinsett Counties
- All fixed hazardous materials facilities damaged are in Mississippi County

### DEBRIS IMPACTS

- Infrastructure damage for the above listed NMSZ counties generates 14,097,000 tons of debris
- Nearly 3.6 million tons of debris is created in Craighead County, with another 1.6 million tons in Mississippi County and 1.3 million tons in Crittenden County. Poinsett (1 million tons) and Greene Counties (716k tons) have increased also have debris estimates.
- It would take approximately 613,000 truckloads to remove all debris generated by this event
- It would take approximately 981,320 truckloads to remove all the debris statewide by this event

| Earthquake Generated Debris | | | |
|---|---|---|---|
| **Region** | **Brick & Wood** | **Concrete & Steel** | **Total** |
| Statewide | 8 | 16 | 25 |
| NMSZ | 5 | 9 | 14 |
| Statewide - 981,320 truckloads @25 tons/truck | | | |

### 4.4.3.7 DIRECT ECONOMIC LOSSES

**Direct Economic Losses**

- $39,029,000,000 in total direct economic losses
- $18,167,000,000 in building losses

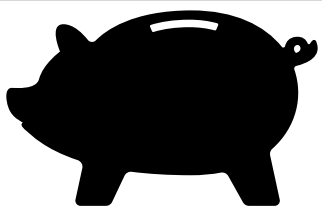
- $2,347,000,000 billion in transportation losses
- $18,515,000,000 in utility losses

#### 4.4.3.8 CONSEQUENCE ANALYSIS

| Earthquake Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Earthquake** |
| Health and Safety of the Public | Severity and location dependent. Impacts on persons near the epicenter are expected to be severe. |
| Health and Safety of Responders | Severity and location dependent. Impacts on persons near the epicenter are expected to be severe. |
| Continuity of Operations | Severity and location dependent. Event will likely require relocation, essential function prioritization based on capabilities and severe disruption of services. |
| Property, Facilities, and Infrastructure | Impact to property, facilities, and infrastructure could be minimal to severe, depending on the location of the facility and the severity of the event. Loss of structural integrity of buildings and infrastructure could occur. |
| Environment | The impact to the environment could be severe, including topological changes and severe destruction. |
| Economic Conditions | Impacts to the economy will be dependent on the severity of the earthquake and proximity to the epicenter. Impacts will likely be long lasting and possibly permanent for most severely impacted businesses. |
| Public Confidence in the Jurisdiction's Governance | Confidence could be an issue if planning is not in place to address the needs of the affected population. |

# EXPANSIVE SOIL

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Soil composition and changes in moisture. | • Populations<br>  • See following map<br>• Locations<br>  • See following Map | • Number of Occurrences<br>  • NA<br>• Presidential Declared Disasters<br>  • NA |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Polulations most at risk are those that live in areas the experience expansive soil geography. |
|  | Minimal impact is expected to government when dealing with expansive soil. |
|  | Expansive soil can have an impact on the built environment especially when dealing with roads, bridges, and other infrastructure managed by the state. |
|  | Minimal impact is expected to natural resources when dealing with expansive soil. |
|  | There is not enough data available to quantify an economic impact for the state of Arkansas relating to expansive soil. |

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature<br> | Data deficiency exist on what the exact impact could be for Arkansas |
| Changes in Precipitation<br> | Data deficiency exist on what the exact impact could be for Arkansas |

## 4.4.4 Expansive Soil



Expansive soils are slow to develop and do not usually pose a risk to public safety. The slow expansion and contraction of the clays and soils places pressure on structural foundations and subsurface dwellings. This pressure can become so great it damages foundations, cracks walls, and deforms structures.

### LOCATION AND EXTENT

Expansive soils risk is measured by quantifying the soils ability to swell and shrink from water content. The quality used to quantify the swelling capacity is called “linear extensibility.” It is an expression of the length of change between water content 1/3 to 1/10 bar tension (33 kPascal to 10 kPascal) and oven dryness multiplied by the thickness of the soil layer.  The Natural Resources Conservation Service (NRCS) uses four risk categories, from low to very high, measuring the change in the soils’ volume expressed as a percent value of linear extensibility.

| NRCS Soil Linear Extensibility Risk Categories | | |
|---|---|---|
| **Ranking** | **Linear Extensibility %** | **Clay %** |
| Low | 0.0% - 3.0% | < 25 |
| Moderate | 3.0% - 6.0% | 25 - 35 |
| High | 6.0% - 9.0% | 35 - 45 |
| Very High | > 9.0% | > 45 |

Source:  NRCS

Each increase in linear extensibility increases the potential level of damage structures could incur.

The following map, from the USDA’s Digital General Soil Map of the United States, illustrates expansive properties of soils in Arkansas.

Of particular concern for the state, the clays of the Porter’s Creek Clay of the Midway Group are highly expansive. Researchers (Larsen, Ashe & Gustavson, 2015, Mineralogy and petrology of the Paleocene Clayton and Porters Creek Formations, Missouri, USA: Influence of Cretaceous-Paleogene impact debris and diagenesis | Paying Attention to Mudrocks: Priceless! | GeoScienceWorld Books | GeoScienceWorld) have determined that the Porter’s Creek Formation contains expandable minerals including smectite and illite. The Porters Creek Clay outcrops in a narrow but continuous belt along the Fall Line from just south of Hope to near Arkadelphia and intermittently from Malvern to near Batesville. The following maps, provided by the Arkansas Geological Survey, indicate the locations of the Midway Group.

### 4.4.4.2 – PREVIOUS OCCURRENCES

According to the AGS, there are no expansive soil case studies reported at this time.  While expansive soils known to be present in the southeast part of the state, no reports of damage have been documented, nor is there a central AGS database of expansive soils events as the magnitude of each event is often low. The Arkansas Geological Survey will begin mapping specific expansive soils within town/city limits to more closely identify the extent and characteristics of the soils.

### 4.4.4.3 – HAZARD PROBABILITY ANALYSIS

Expansive soils are one of the nation’s most prevalent causes of damage to buildings and construction. Annual losses are estimated into the billions of dollars. The losses include severe structural damage, cracked driveways, sidewalks, and basement floors, heaving of roads and highway structures, condemnation of buildings, and disruption of pipelines and sewer lines. The destructive forces may be upward, horizontal, or both (Colorado Geological Survey, 2023). As expansive soils cause damage over extended periods of time, damages caused may be attributed to other factors such as extended drought or heavy periods of moisture, both of which may exacerbate the hazard. These minerals can expand up to 20% by volume when exposed to water and exert a force of up to 30,000 pounds-per-square-foot, more than enough to break up any structure they encounter.

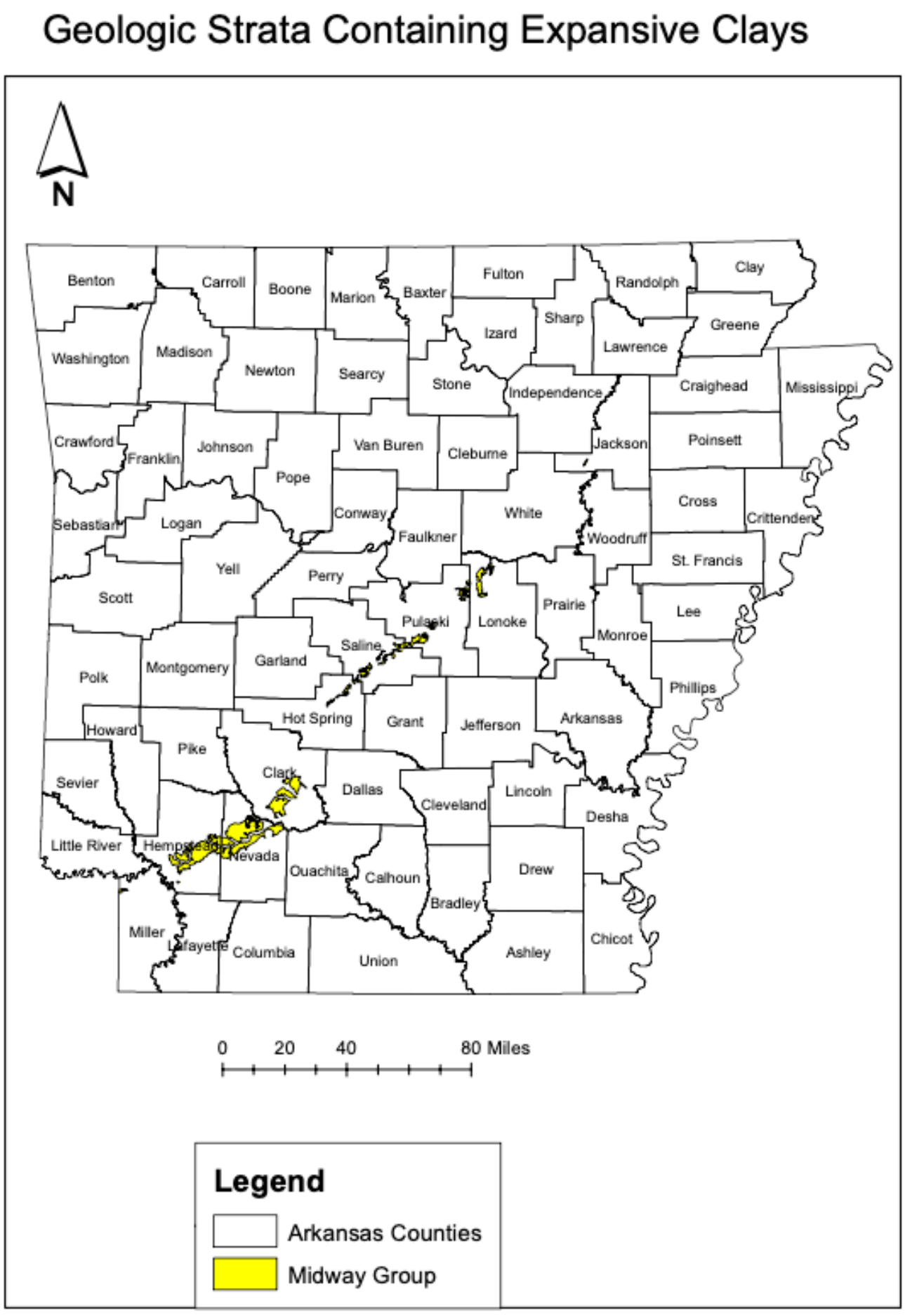
Because there is abundant high clay content, high swell soils in the state, the probability of shrink/swell occurrence is 100%, especially in areas with Porter’s Creek Clay of the Midway Group. However, the probability of damage is so poorly documented that is presently not possible to quantify the potential occurrence of a major damaging expansive soils event within the state.

### 4.4.4.4 - VULNERABILITY ANALYSIS

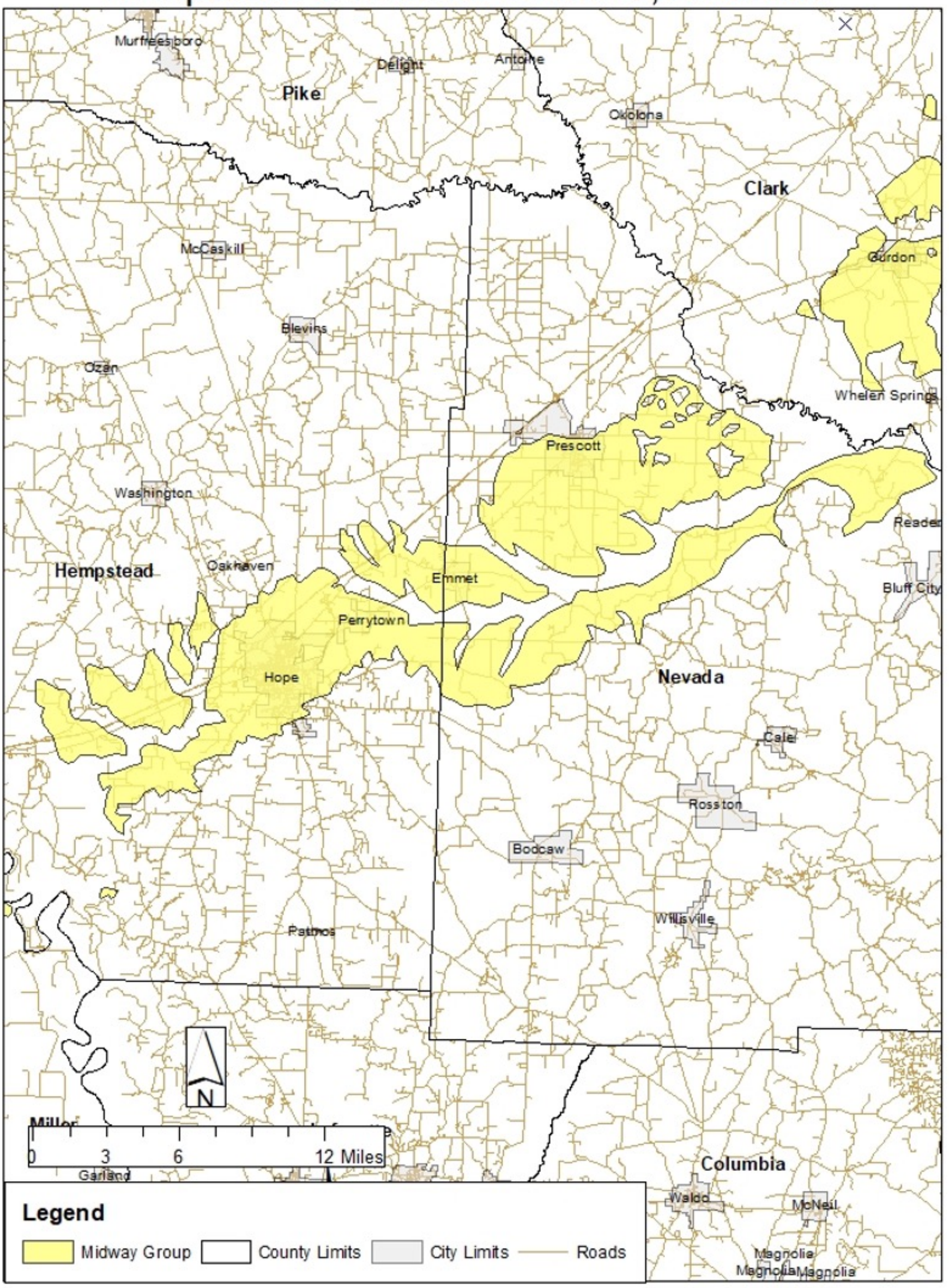
Counties containing highly expansive soil were determined to be most vulnerable. The following table indicates the number and value of state-owned facilities and bridges within expansive soil areas for each identified county, and the value of those facilities. The Porter's Creek Clay of the Midway Group crops within the following counties: Clark, Hempstead, Hot Spring, Jackson, Lonoke, Miller, Nevada, Pulaski, and Saline.

| State-Owned Facilities in Highly Expansive Soil Groups | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Value** | **State-Owned Critical Facilities** | **Value** | **State Owned Bridges** |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 | 153 |
| Hempstead | 73 | $76,583,328.98 | 10 | $8,713,511.18 | 47 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 | 49 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 | 26 |
| Pulaski | 445 | $2,676,770,640.25 | 104 | $1,247,800,470.37 | 150 |
| Saline | 68 | $158,283,776.17 | 5 | $1,795,505 | 123 |

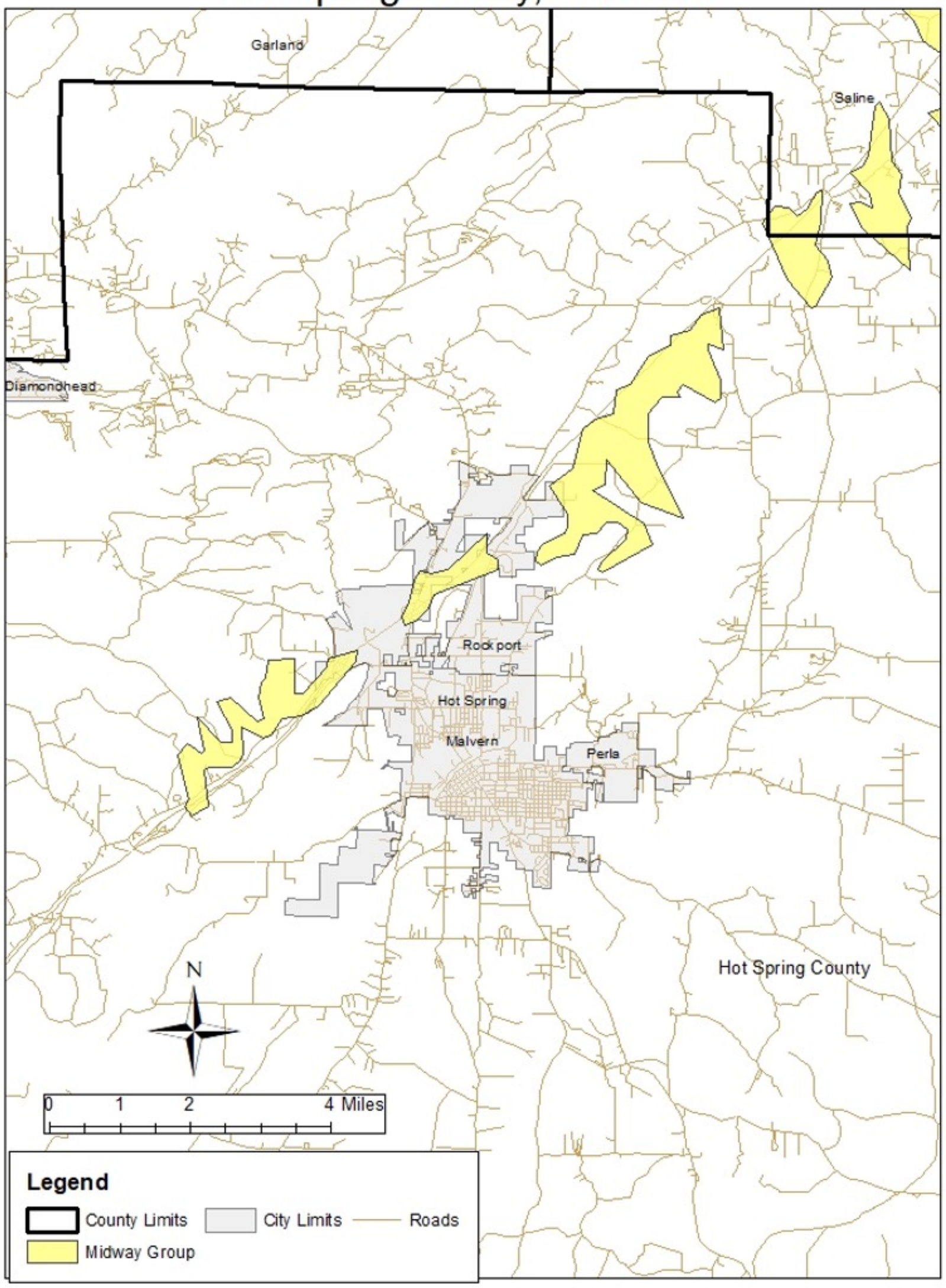
Counties containing highly expansive soil, as detailed in previous sections, were determined to be most vulnerable. The following table indicates the percentage area impacted by expansive soils for each vulnerable county, and the number and value of potentially impacted structures.



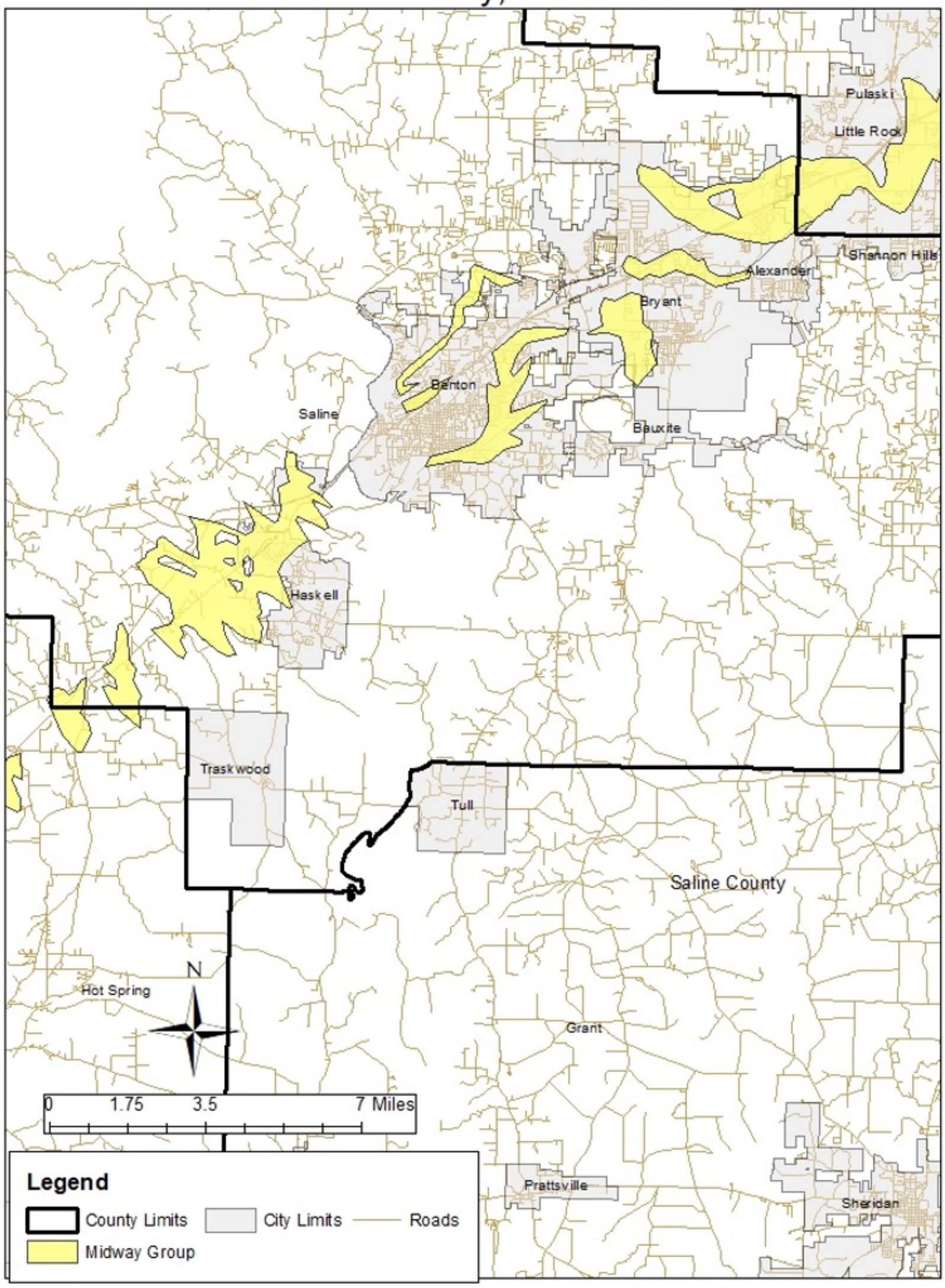
# Geologic Strata Containing Expansive Clays
# Hempstead & Nevada Counties, Arkansas



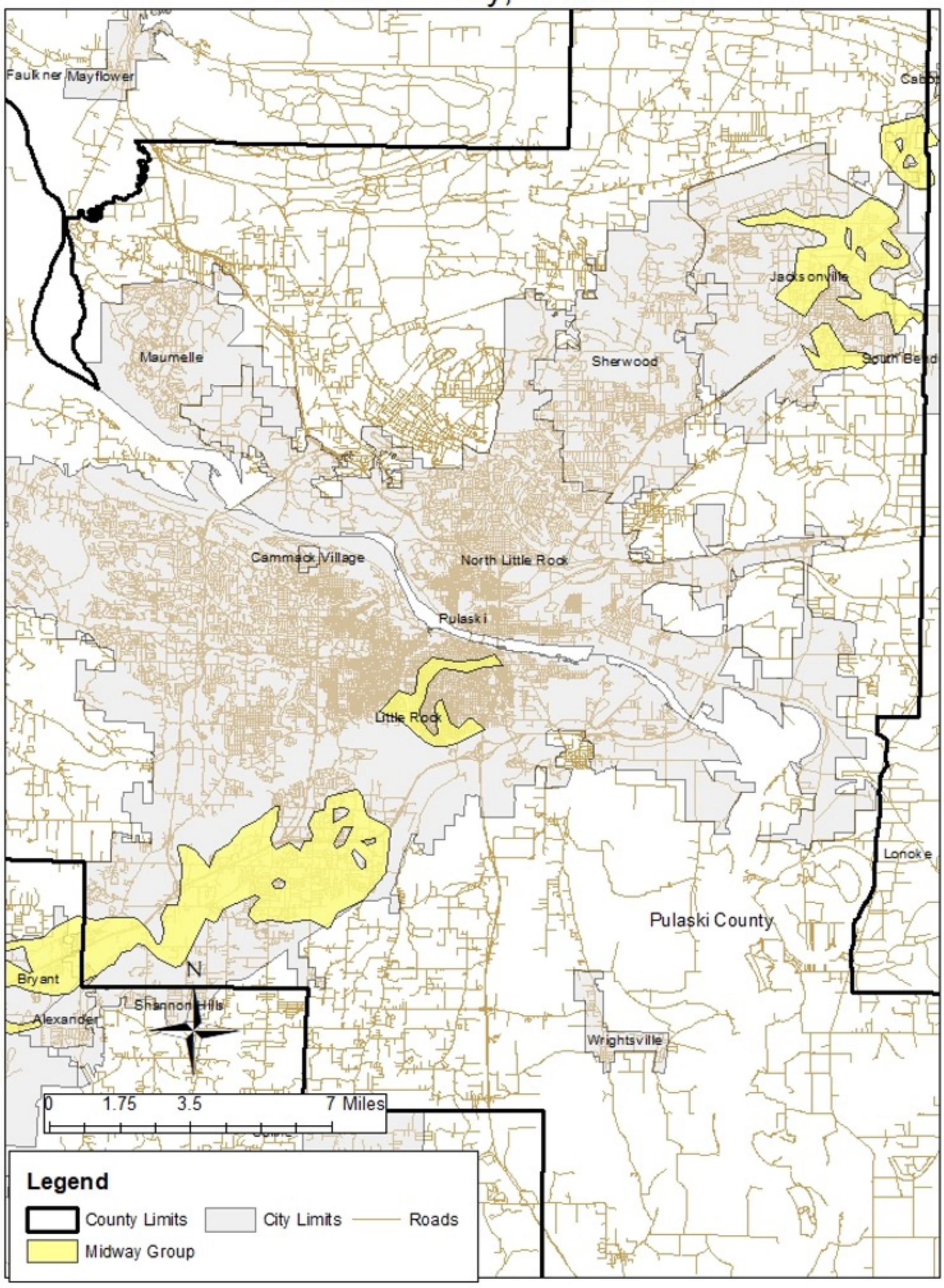
# Geologic Strata Containing Expansive Clays
# Hot Spring County, Arkansas



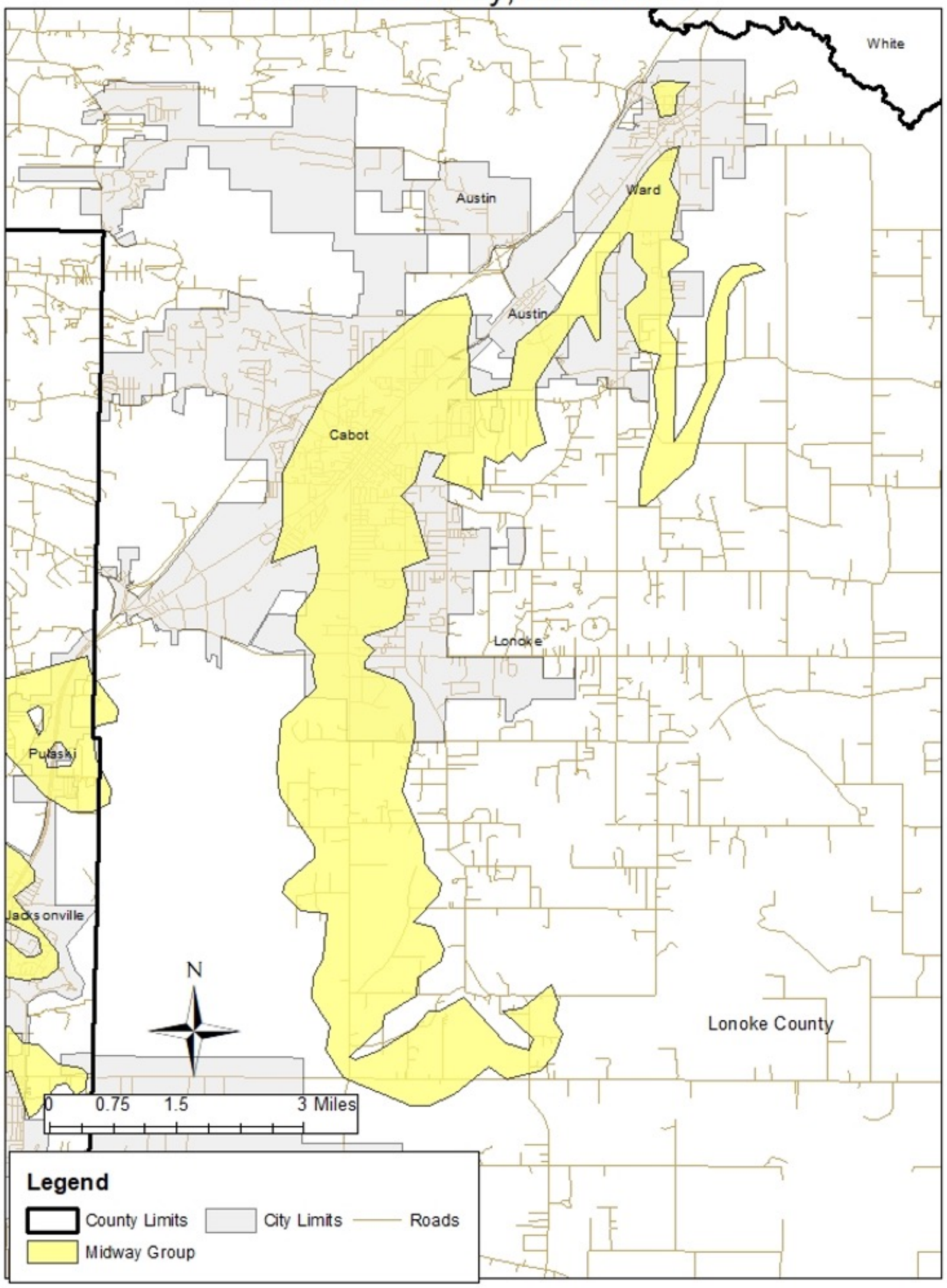
# Geologic Strata Containing Expansive Clays
# Saline County, Arkansas



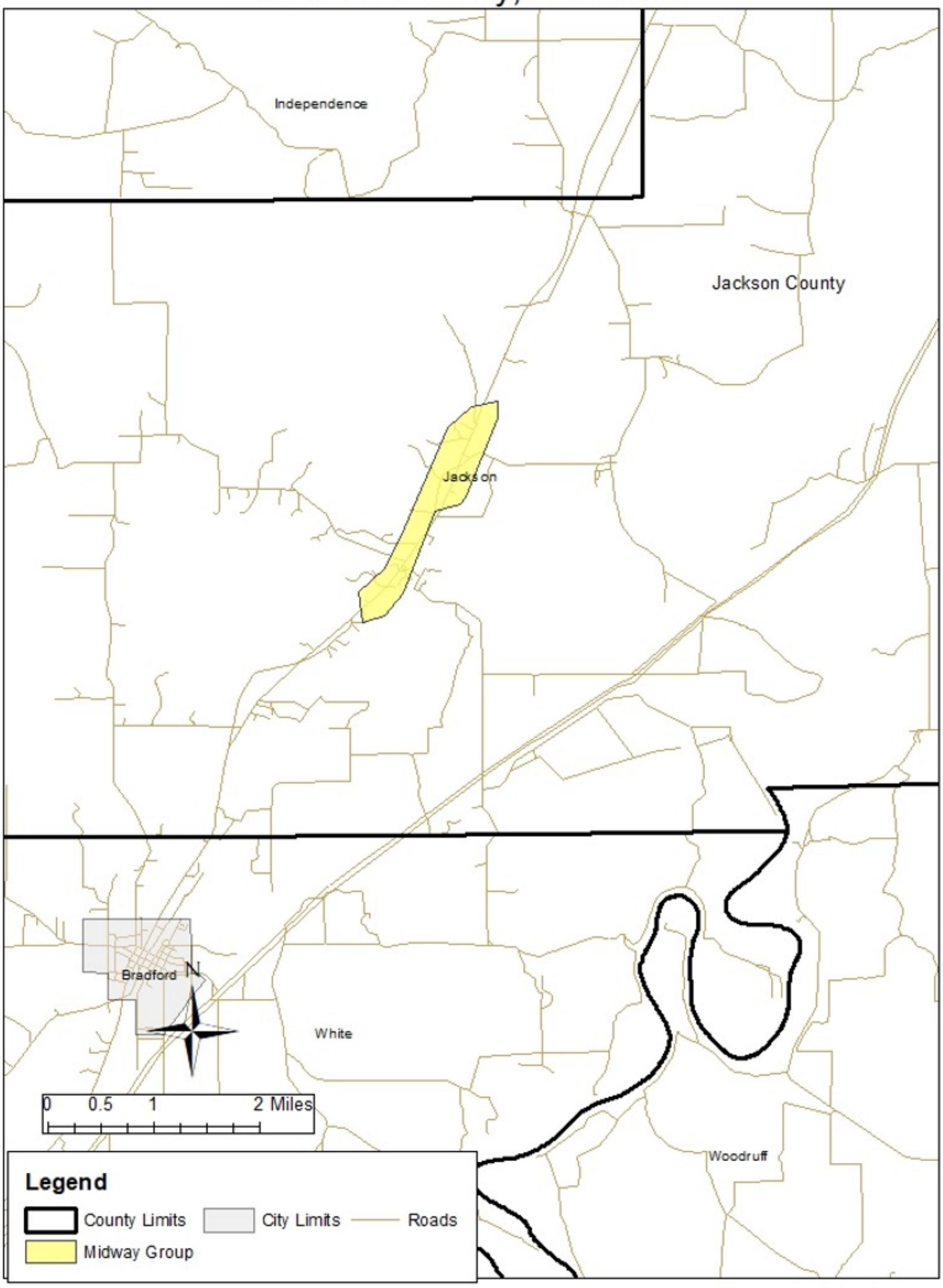
# Geologic Strata Containing Expansive Clays
# Pulaski County, Arkansas



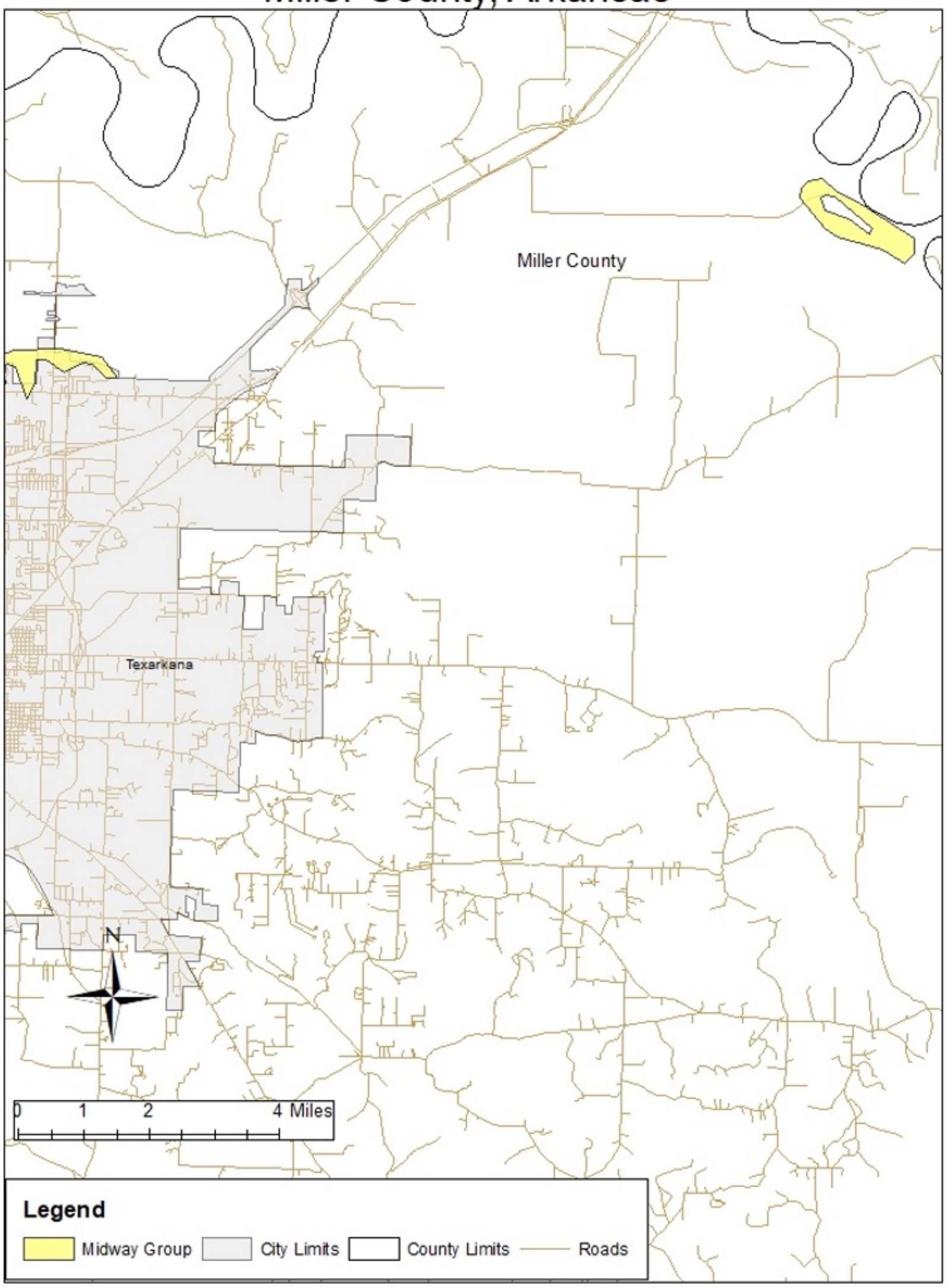
# Geologic Strata Containing Expansive Clays
# Lonoke County, Arkansas



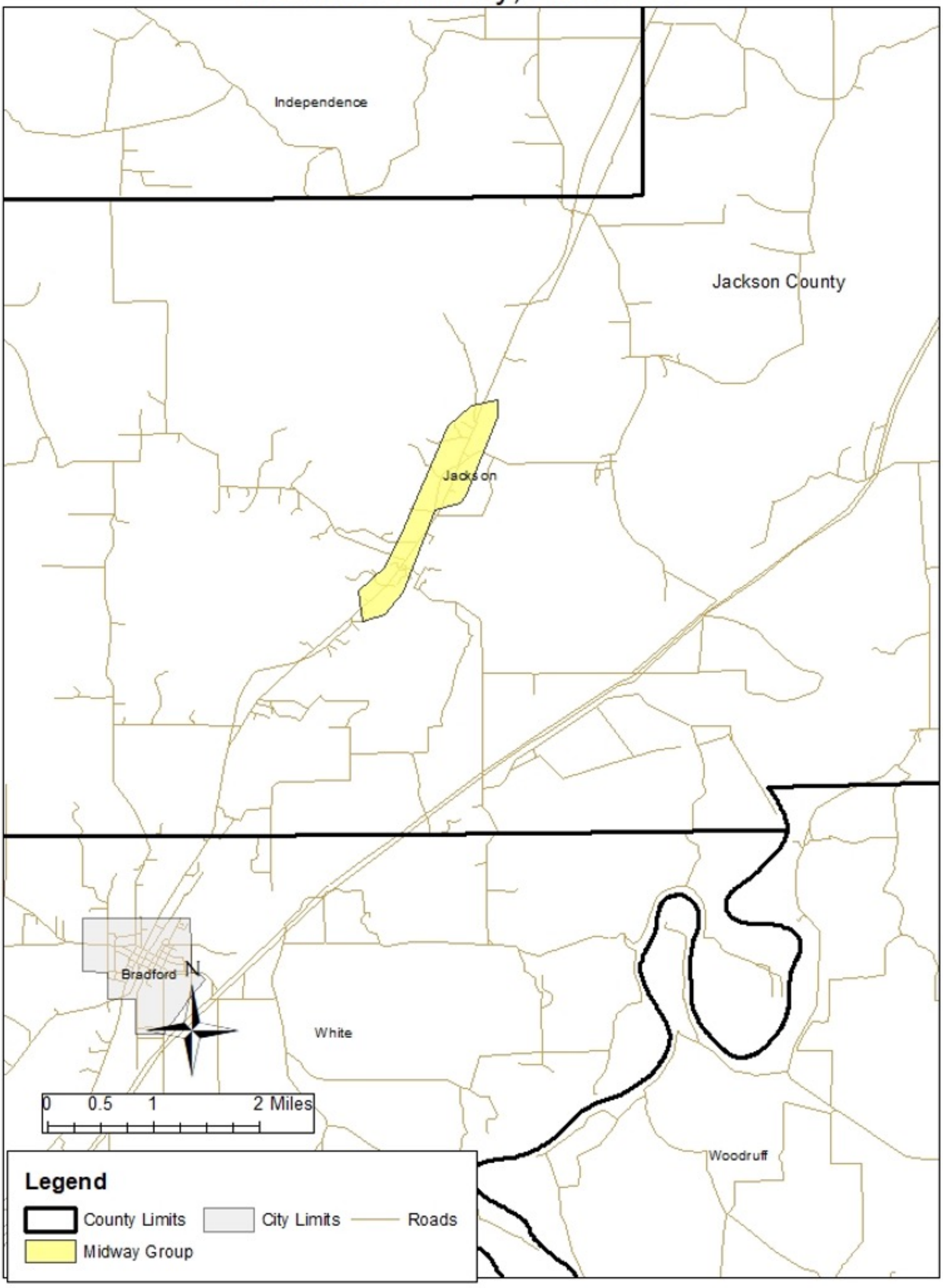
# Geologic Strata Containing Expansive Clays
# Jackson County, Arkansas



# Geologic Strata Containing Expansive Clays
# Miller County, Arkansas



# Geologic Strata Containing Expansive Clays
# Jackson County, Arkansas



#### 4.4.4.5 - CONSEQUENCE ANALYSIS

As per EMAP requirements, the following table provides the Consequence Analysis.

| Expansive Soils Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Expansive Soils** |
| Health and Safety of the Public | Minimal impact. |
| Health and Safety of Responders | Minimal impact. |
| Continuity of Operations | Minimal expectation for utilization of COOP unless structures have extensive damage. |
| Property, Facilities, and Infrastructure | Localized impact could be moderate, including structural integrity to be lost, and roadways, railways to buckle. |
| Environment | Expansive soils could cause moderate damage to dams, levees, watersheds. |
| Economic Conditions | Economic impacts include rebuilding of the properties and infrastructure. Drought and extreme rain events could increase impact. |
| Public Confidence in the Jurisdiction's Governance | Confidence will be dependent on development trends and mitigation efforts at reducing the effect of expansive soils on new construction. |

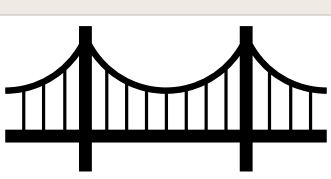
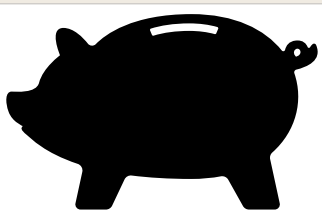
# FLOOD

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>• Excess Precipitation in the Arkansas region.<br>• Excess precipitation upstream of major rivers | • Populations<br>Population in inundation areas of rivers and or levees<br>• Locations<br>Areas of Arkansas along waterways, or areas that can experience flash flooding | • Number of Occurrences<br>  • 500+ between 2018 - 2023<br>• Presidential Declared Disasters<br>  • 2 between 2018 - 2023 |

## Potential Effects of Climate Change

| | |
|---|---|
| **Changes in Temperature**<br> | Colder temperatures upstream that leads to increased snowfall then melting.<br><br>Unusually warmer temperatures up north that lead to snowfall and ice melting that drains into tributaries that effect Arkansas waterways. |
| **Changes in Precipitation**<br> | Increased precipitation in Arkansas or areas upstream of Arkansas waterways |

## Key Sectors Vulnerability and Exposure

| | |
|---|---|
|  | Populations that are most at risk to flooding are those located in flood prone areas. There are areas of the state that have a higher chance of flooding and impact on the residents. |
|  | Government operations in areas that are prone to flooding can be impacted by flooding. Services may be disrupted or lost for a time period if flooding is sever enough, |
|  | Built environment such as roads, bridges, levees, dams, etc can be impacted and or destroyed by flooding. Reviewing flood maps at the local levels as well as conducting HAZUS runs can best determine infrastructure that will be impacted. |
|  | Natural resources such as agriculture are most at risk of disruption and or loss due to flooding. |
|  | Flooding in Arkansas can have a significant impact on the economy. This may be directly or indirectly due to flooding that either occurs in Arkansas or upstream. |

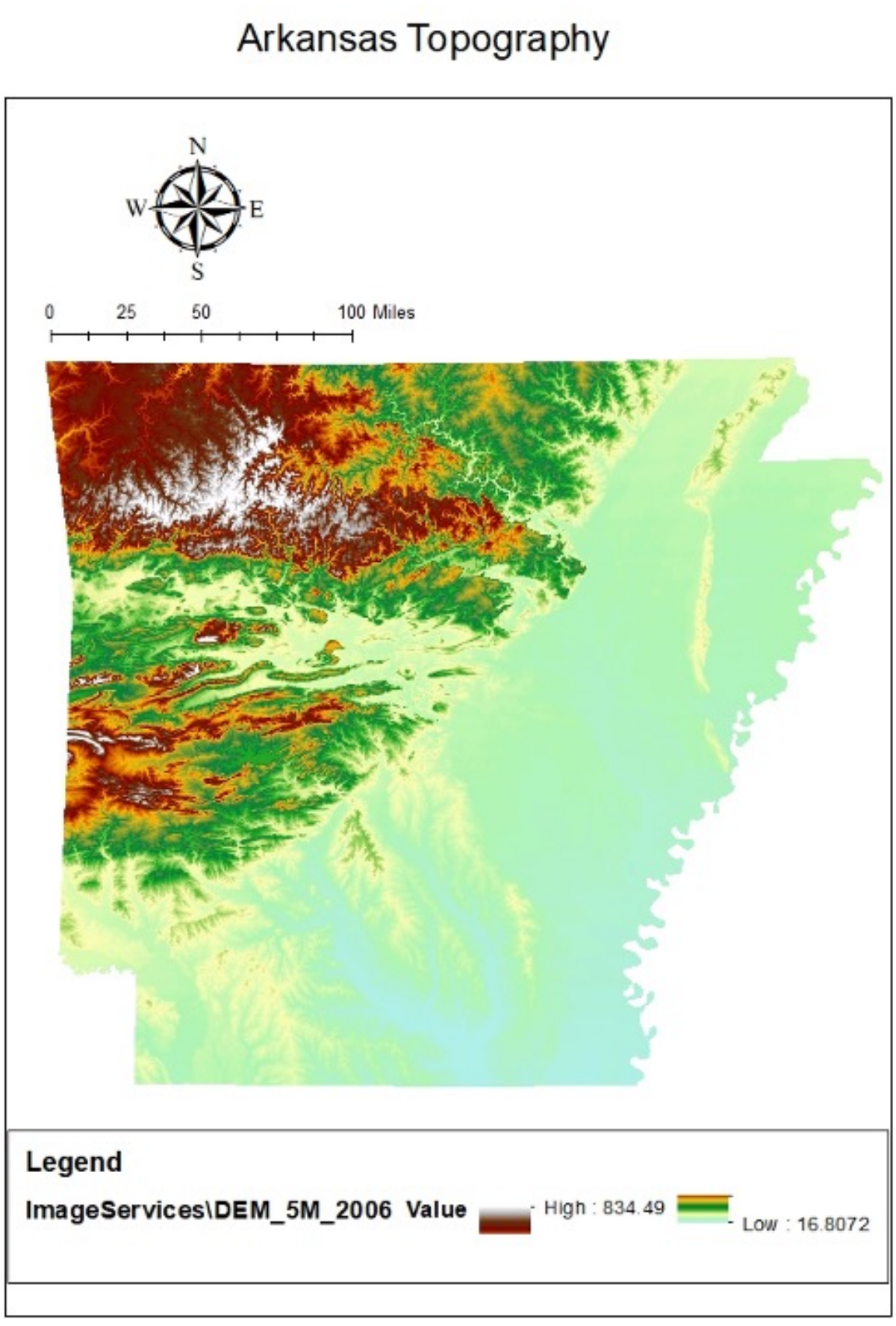
## 4.4.5 Flood



Floods are most common in seasons of rain and thunderstorms. Floods that threaten Arkansas can be generally classified under two categories:

•**Flash Flood:** The product of heavy, localized precipitation in a short time period over a given location
•**Riverine Flood:** Occurs when precipitation over a given river basin for a long period of time causes the overflow of rivers, streams, lakes and drains

### 4.4.5.1 - LOCATION AND EXTENT




**Flash Flooding**

History indicates that flash floods in Arkansas are more typical of the Interior Highlands Region. This is due to its large number of smaller drainage basins and steep stream gradients when compared to the Gulf Coastal Plain Region. The following map details State of Arkansas elevations.
The National Weather Service (NWS) provides the following definitions of warnings for actual and potential flood conditions for Flash Floods:

- **Flash Flood Watch**: Issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain or imminent.
- **Flash Flood Warning**: Issued to inform the public, emergency management and other cooperating agencies that flash flooding is in progress, imminent, or highly likely.
- ·**Flash Flood Statement**: In hydrologic terms, a statement by the NWS which provides follow-up information on flash flood watches and warnings.

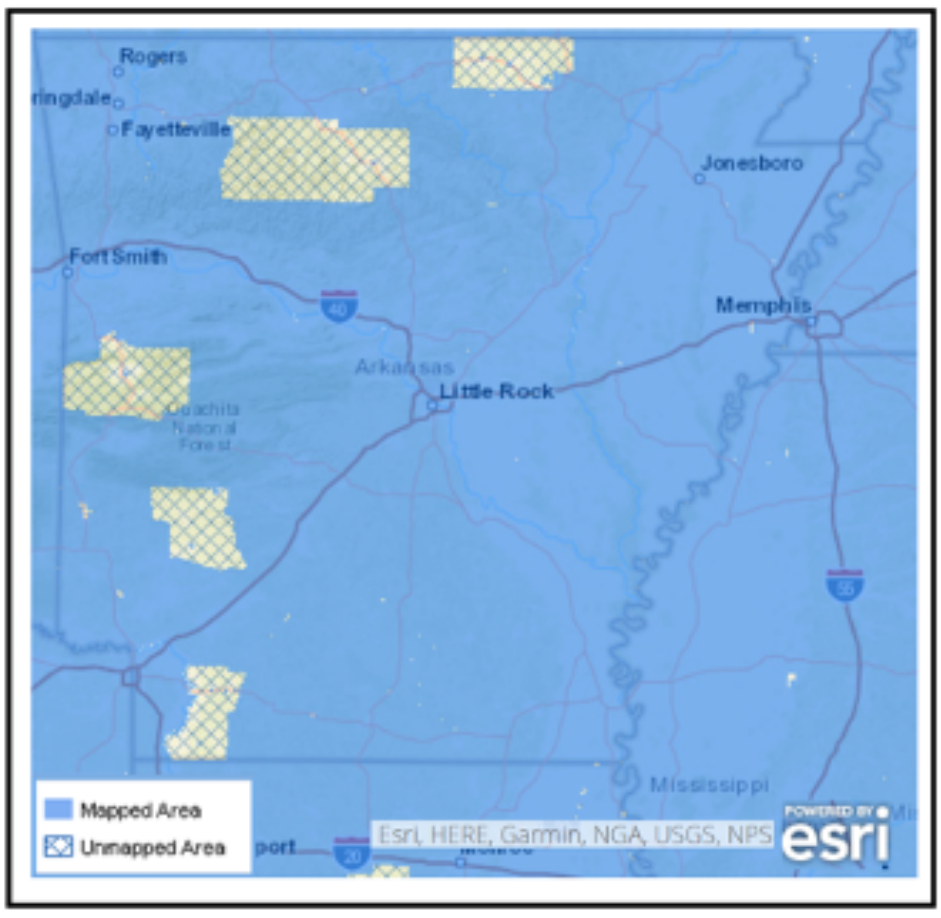
**Riverine Flooding**

In general, riverine flooding occurs from the overflow of rivers, streams, drains, and lakes due to excessive rainfall.  The following map details the locations of both identified river basins, the land drained by a river and its branches, and major rivers in the state.

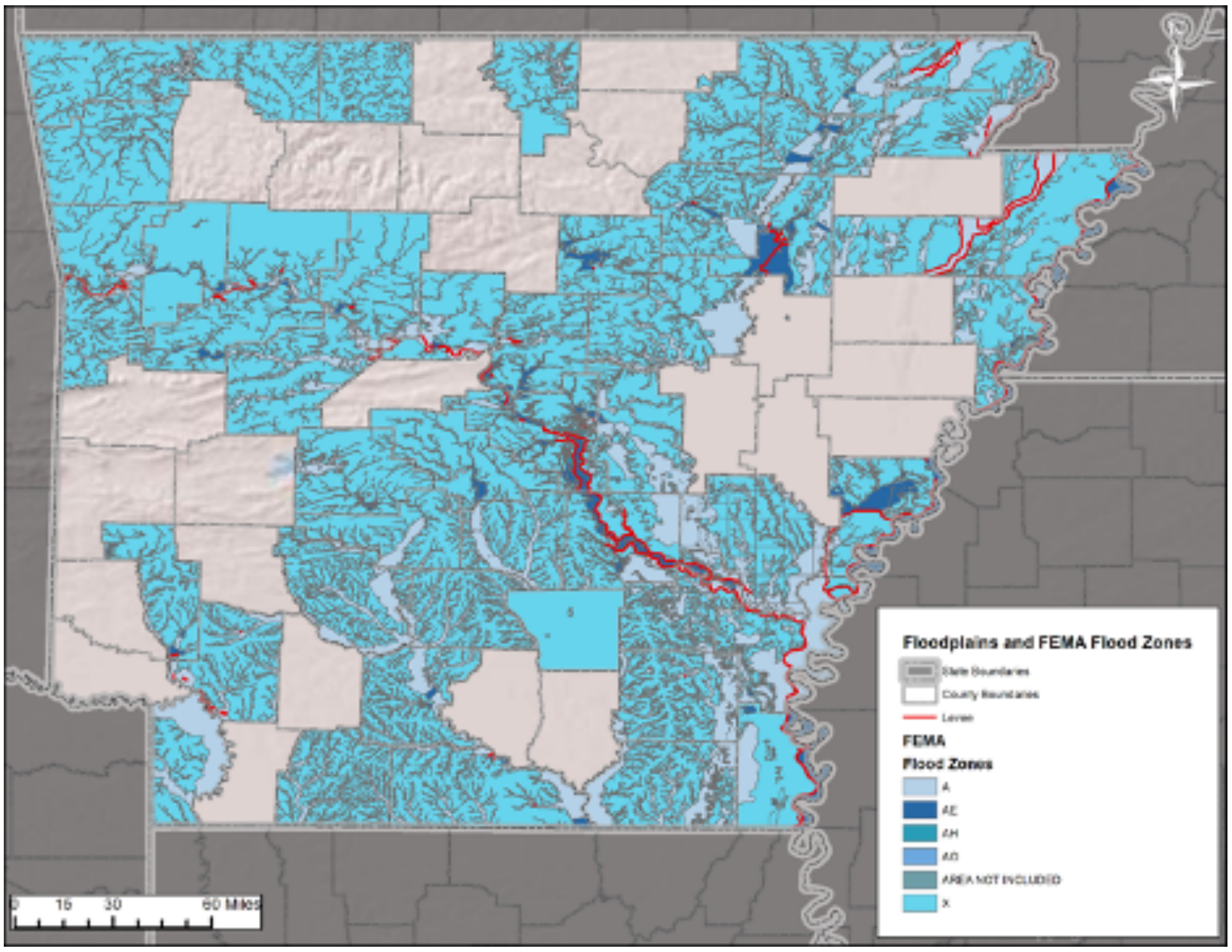
To help classify and map potential flood areas FEMA has identified flood zones for defined geographic areas according to varying levels of risk.  These zones are show on Flood Insurance Rate Maps (FIRMs), that reflect the potential severity of flooding in an identified zone. The following table show the most common FIRM classifications for the State of Arkansas. Although FEMA designates many more floodplain classifications, these represent most of the flood zoning in the state.

| Primary State of Arkansas Flood Zone Classifications | |
|---|---|
| **Zone Class** | **Description** |
| A | An area inundated by 1% annual chance flooding, for which no BFEs have been determined. (100 Year Floodplain) |
| AE | An area inundated by 1% annual chance flooding, for which BFEs have been determined. (100 Year Floodplain) |
| B | Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood. An area inundated by 0.2% annual chance flooding. |
| X (Shaded) | Between the limits of the 100-year and 500-year Floodplain, area with a 0.2% (or 1 in 500 chance) annual chance of flooding. This zone is also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile |
| X (Unshaded) | 500-year Floodplain, area of minimal flood hazard. |

The following maps, from the FEMA Flood Map Service Center, shows flood mapped Arkansas counties and FEMA flood zones



**Areas of state with Digital Flood Maps**




The NWS provides the following definitions of warnings for actual and potential flood conditions for riverine flooding:

- **Flood Potential Outlook:** In hydrologic terms, a NWS outlook that is issued to alert the public of potentially heavy rainfall that could send rivers and streams into flood or aggravate an existing flood.
- **Flood Watch:** Issued to inform the public and cooperating agencies that current and developing hydro meteorological conditions are such that there is a threat of flooding, but the occurrence is neither certain nor imminent.
- **Flood Warning:** In hydrologic terms, a release by the NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage (level) forecasts.
- **Flood Statement:** In hydrologic terms, a statement issued by the NWS to inform the public of flooding along major streams in which there is not a serious threat to life or property. It may also follow a flood warning to give later information.

While there are approximately 87,617 miles of streams and rivers in Arkansas, riverine floods tend to be most prevalent along the major rivers including the Arkansas River, Mississippi River, Black River, Ouachita River, Red River, St. Francis River, and White River.

### 4.4.5.2 – PREVIOUS OCCURRENCES

Since 2018, there have been two Presidential Disaster Declarations for the State of Arkansas for floods (along with other associates hazard events such as tornados or severe storms). The following 21-year information on past declared disasters is presented to provide a historical perspective on flood events that have impacted the State of Arkansas.  Declaration numbers in bold indicate declared disaster that have occurred since the previous mitigation plan update in 2018.

| FEMA Flood Disaster and Emergency Declarations, 2002 - 2023 | | | | |
|---|---|---|---|---|
| **Declaration Number** | **Incident Period** | **Disaster Description** | **Regional Counties Involved** | **Dollars Obligated** |
| 1400 | December 12, 2001 - January 30, 2002 | Severe Storms and Flooding | Ashley, Clay, Cleburne, Columbia, Crittenden, Franklin, Jackson, Lincoln, Little River, Logan, Monroe, Poinsett, Prairie, Scott, Stone and Woodruff | $2,225,097 |

| | | | | |
|---|---|---|---|---|
| 1472 | May 2 - June 10, 2003 | Severe Storms, Tornados, and Flooding | Benton, Chicot, Cleburne, Columbia, Conway, Craighead, Crittenden, Cross, Faulkner, Fulton, Jackson, Lonoke, Nevada, Perry, Poinsett, Phillips, St. Francis, White and Woodruff | $5,303,785 |
| 1516 | April 19 - May 18, 2004 | Severe Storms, Flooding and Landslides | Washington, Madison, Franklin, Johnson, Carroll, Newton, Boone, Marion, Searcy, Baxter, Stone, Independence, Jackson and Woodruff | $7,052,634 |
| 1528 | May 30 - July 9, 2004 | Severe Storms and Flooding | Bradley, Calhoun, Clark, Columbia, Hempstead, Howard, Lafayette, Little River, Nevada, Ouachita, Pike and Sevier | $3,303,678 |
| 1744 | February 5-12, 2008 | Severe Storms, Tornados, and Flooding | Baxter, Conway, Izard, Marion, Pope, Randolph, Sharp, Stone, Union and Van Buren | $5,020,005 |
| 1751 | March 18 - April 28, 2008 | Severe Storms, Tornados, and Flooding | Arkansas, Baxter, Benton, Boone, Carroll, Clay, Cleburne, Conway, Craighead, Crawford, Cross, Desha, Franklin, Fulton, Garland, Greene, Hempstead, Hot Spring, Independence, Izard, Jackson, Jefferson, Lawrence, Lee, Logan, Lonoke, Madison, Marion, Miller, Monroe, Newton, Perry, Phillips, Poinsett, Pope, Prairie, Pulaski, Randolph, Saline, Scott, Searcy, Sebastian, Sharp, St. Francis, Stone, Van Buren, Washington, White, Woodruff and Yell | $41,085,016 |
| 1758 | May 02-12, 2008 | Severe Storms, Flooding, and Tornados | Arkansas, Benton, Cleburne, Conway, Crittenden, Grant, Lonoke, Mississippi, Phillips, Pulaski, Saline and Van Buren | $2,676,958 |
| 1793 | September 02- 08, 2008 | Severe Storms and Flooding associated with Hurricane Gustav | Ashley, Bradley, Calhoun, Chicot, Clark, Cleveland, Conway, Dallas, Drew, Garland, Grant, Hot Spring, Lincoln, Montgomery, Perry, Prairie, Saline and Van Buren | $3,895,660 |
| 1845 | April 27 - May 23, 2009 | Severe Storms, Tornados, and Flooding | Arkansas, Bradley, Calhoun, Chicot, Clark, Cleveland, Conway, Dallas, Drew, Fulton, Grant, Greene, Hempstead, Hot Spring, Howard, Jackson, Jefferson, Lafayette, Lee, Lincoln, Little River, Marion, Miller, Monroe, Nevada, Ouachita, Perry, Phillips, Pike, Poinsett, Polk, Pope, Prairie, Saline, Searcy, St. Francis, Stone and Union | $9,425,734 |
| 1861 | October 29 - November 08, 2009 | Severe Storms, Tornados, and Flooding | Boone, Bradley, Calhoun, Carroll, Cleburne, Cleveland, Columbia, Conway, Cross, Dallas, Franklin, Fulton, Grant, Izard, Jackson, Johnson, Lafayette, Lawrence, Lincoln, Logan, Marion, Monroe, Nevada, Newton, Ouachita, Poinsett, Prairie, Pulaski, Randolph, Saint Francis, Scott, Sharp, Stone, Union, Van Buren, White and Woodruff | $15,536,008 |
| 1872 | December 23, 2009 - January 02, 2010 | Severe Storms and Flooding | Bradley, Calhoun, Clark, Clay, Cleveland, Craighead, Dallas, Drew, Grant, Greene, Hempstead, Jackson, Jefferson, Lafayette, Lincoln, Lonoke, Miller, Monroe, Nevada, Ouachita, Poinsett, Prairie, Pulaski, White and Woodruff | $9,792,672 |

| | | | | |
|---|---|---|---|---|
| 1975 | April 14 - June 03, 2011 | Severe Storms, Tornados, and associated Flooding | Arkansas, Benton, Boone, Carroll, Chicot, Clark, Clay, Crawford, Crittenden, Cross, Dallas, Desha, Faulkner, Garland, Greene, Hot Spring, Independence, Jackson, Jefferson, Lawrence, Lee, Lincoln, Lonoke, Madison, Mississippi, Monroe, Montgomery, Phillips, Poinsett, Prairie, Pulaski, Randolph, Saline, St. Francis, Washington, White, Woodruff | $50,596,048 |
| 4000 | May 24-26, 2011 | Severe Storms, Tornados, and Flooding | Franklin, Johnson | $2,701,536 |
| 4124 | May 30 - June 3, 2013 | Severe Storms, Tornados, and Flooding | Cleburne, Cross, Garland, Independence, Montgomery, Poinsett, Polk, Scott, Searcy, Stone, Van Buren and Woodruff | $8,395,922 |
| 4143 | August 08-14, 2013 | Severe Storms and Flooding | Benton, Boone, Carroll, Madison Marion and Newton | $8,184,460 |
| 4174 | April 27 -28, 2014 | Severe Storms, Tornados, and Flooding | Faulkner, Pulaski, Randolph and White | $10,053,785 |
| 4226 | May 7 - June 15, 2015 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Crawford, Garland, Howard, Jefferson, Little River, Miller, Perry, Sebastian and Sevier | $11,100,256 |
| 4254 | December 26, 2015 - January 22, 2016 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Benton, Carroll, Crawford, Faulkner, Jackson, Jefferson, Lee, Little River, Perry, Sebastian and Sevier | $11,367,572 |
| 4270 | March 8-13, 2016 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Columbia, Ouachita, Calhoun, Bradley, Ashley, Chicot, Cleveland, Lincoln, Desha, Arkansas, Philips and Prairie | $2,299,510 |
| 4318 | April 26 - May 19, 2017 | Arkansas Severe Storms, Tornados, Straight-line Winds, and Flooding | Benton, Boone, Carroll, Clay, Faulkner, Fulton, Jackson, Lawrence, Prairie, Pulaski, Randolph, Saline, Washington, White, Woodruff and Yell | $3,911,764 |
| **4441** | **June 8, 2019** | **Severe Storms and Flooding** | **Arkansas, Chicot, Conway, Crawford, Desha, Faulkner, Franklin, Jefferson, Johnson, Lincoln, Logan, Perry, Pope, Pulaski, Sebastian, Yell** | **$53,507,195.44** |
| **4460** | **September 13, 2019** | **Severe Storms, Tornadoes, Flooding, and Straight-line Winds** | **Madison, Newton, Washington** | **$5,877,299.51** |

### 4.4.5.3 - NFIP COMMUNITIES

The NFIP is a federal program, managed by FEMA, that exists to provide flood insurance for property owners in participating communities, to improve floodplain management practices, and to develop maps of flood hazard areas. The following map presents the number of NFIP participating communities in each county.




### 4.4.5.4 - FEMA FLOOD POLICY AND LOSS DATA

Arkansas flood-loss information was pulled from FEMA's "Policy and Loss Data by Community with County and State Data," which documents losses from 1978 through March 31, 2023. There are several limitations to this data, including:

- Only losses to participating NFIP communities are represented
- Communities joined the NFIP at various times since 1978
- The number of flood insurance policies in effect may not include all structures at risk to flooding
- Some of the historical loss areas have been mitigated with property buyouts

Some properties are under-insured. The flood insurance purchase requirement is for flood insurance in the amount of federally-backed mortgages, not the entire value of the structure. Additionally, contents coverage is not required.

### 4.4.5.5 - REPETITIVE LOSS PROPERTIES

As of March 31, 2023, the State of Arkansas had 1,242 total RL properties accounting for 3,561 losses with total (contents and structure) payments of $101,007,133.91, according to FEMA BureauNet data. In the previous plan, the State of Arkansas had 1,092 total RLs; this is an increase of 150 RL properties. Based on the continuing and increasing claims we anticipate the dollar losses to equal or exceed the average payments.

One hundred twenty-seven (127) of the 1,242 RLs have been mitigated and are not currently counted as subject to repetitive flooding leaving 1,115 non-mitigated RLs. Mitigated means that the building has been elevated, acquired, floodproofed, or otherwise protected from flood damage, or the building has been destroyed by some natural disaster or human-caused event.

The 1,115 active non-mitigated RLs are spread over 63 counties as well as 180 non-mitigated SRL properties within those counties (data as of March 2023). Only 336 out of the 1,235 identified non-mitigated RLs in Arkansas or approximately 27 percent are currently insured by the NFIP. The City of Little Rock has the highest number of unmitigated RLs with 65 followed by the City of West Memphis with 62. The table below shows the number of non-mitigated RL properties by community.

A high priority to Arkansas is the reduction of losses to Repetitive Loss and Severe Repetitive Loss structures.  A full discussion of these may be found in Section 6.9, Repetitive Flood Loss Strategy.

#### 4.4.5.6 - HAZARD PROBABILITY ANALYSIS

In general, flood probability can be expressed by recurrence interval, the average period for a flood that equals or exceeds a given magnitude, expressed as a period of years. The probability of occurrence of a given flood can also be expressed as the odds of recurrence of one or more similar or bigger floods in a certain number of years. Large, catastrophic floods have a very low frequency or probability of occurrence, whereas smaller floods occur more often. The larger the number of years in a recurrence interval, the smaller the chances of experiencing that flood in a year. However, the odds are never zero, even very large, uncommon floods always have a very small chance of recurring every year. When reviewing flood probability, it is important to note that once a flood occurs its chance of recurring the next year remains the same.

| Flood Recurrence Interval Probability | | |
|---|---|---|
| **Recurrence interval, in years** | **Probability of occurrence in any given year** | **Percent chance of occurrence in any given year** |
| 100 | 1 in 100 | 1 |
| 50 | 1 in 50 | 2 |
| 25 | 1 in 25 | 4 |
| 10 | 1 in 10 | 10 |
| 5 | 1 in 5 | 20 |
| 2 | 1 in 2 | 50 |

Source: FEMA

The following table summarizes flood event data for the State of Arkansas for the period 2018 through May 1, 2023 using available information from the National Climatic Data Center (NCDC).

| State of Arkansas Flood Data Summary | |
|---|---|
| **Data** | **Recorded Impact** |
| Number of Days with NCDC Reported Event (2018-May 1, 2023) | 229 |
| Average Events per Year | 46 |
| Number of Days with Event and Death or Injury: | 4 |
| Number of Days with Event and Property Damage: | 14 |
| Total Reported NCDC Property Damage (2018-May 1, 2023) | $11,210,000.00 |
| Average Property Damage per Year | $2,242,000.00 |
| Number of Days with Event and Crop Damage | 4 |
| Total Reported NCDC Crop Damage (2018-may 1, 2023) | $3,000,000.00 |
| Average Crop Damage per Year | $600,000.00 |

Source: NCDC

The following table summarizes flash flood event data for the State of Arkansas for the period 2018 through May 1, 2023.

| State of Arkansas Flash Flood Data Summary | |
|---|---|
| **Data** | **Recorded Impact** |
| Number of Days with NCDC Reported Event (2018-May 1, 2023) | 105 |
| Average Events per Year | 21 |
| Number of Days with Event and Death or Injury: | 2 |
| Number of Days with Event and Property Damage | 30 |
| Total Reported NCDC Property Damage (2018 - May 1, 2023) | $2,502,000.00 |
| Average Property Damage per Year | $500,400 |
| Number of Days with Event and Crop Damage: | 0 |
| Total Reported NCDC Crop Damage (2018 - May 1, 2023) | $0 |
| Average Crop Damage per Year | $0 |

Source: NCDC

### 4.4.5.8 - VULNERABILITY ANALYSIS

Counties with state owned facilities within a FEMA identified 100-year floodplain were identified. The following table indicates the number and valuation of state owned facilities and bridges within the 100-year floodplains.  Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential failure event.

| State Owned Facilities within FEMA Identified 100-Year Floodplain | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Value** | **State Owned Critical Facilities** | **Value** | **State Owned Bridges** |
| Arkansas | 0 | $0 | 0 | $0 | 58 |
| Ashley | 0 | $0 | 0 | $0 | 60 |
| Baxter | 0 | $0 | 0 | $0 | 17 |
| Benton | 0 | $0 | 0 | $0 | 80 |
| Boone | 0 | $0 | 0 | $0 | 28 |
| Carroll | 0 | $0 | 0 | $0 | 30 |
| Chicot | 1 | $3,450,150 | 1 | $3,450,150 | 56 |
| Clark | 0 | $0 | 0 | $0 | 82 |
| Cleburne | 0 | $0 | 0 | $0 | 17 |
| Columbia | 0 | $0 | 0 | $0 | 66 |
| Conway | 0 | $0 | 0 | $0 | 41 |
| Craighead | 2 | $985,547 | 2 | $985,547 | 0 |
| Crawford | 0 | $0 | 0 | $0 | 83 |
| Crittenden | 0 | $0 | 0 | $0 | 50 |
| Cross | 1 | $676,229 | 1 | $676,229 | 0 |
| Dallas | 0 | $0 | 0 | $0 | 63 |
| Desha | 0 | $0 | 0 | $0 | 50 |
| Drew | 0 | $0 | 0 | $0 | 77 |
| Faulkner | 1 | $2,754,000 | 1 | $2,754,000 | 84 |
| Franklin | 0 | $0 | 0 | $0 | 12 |
| Garland | 0 | $0 | 0 | $0 | 64 |
| Greene | 0 | $0 | 0 | $0 | 64 |

| | | | | | |
|---|---|---|---|---|---|
| Hempstead | 0 | $0 | 0 | $0 | 95 |
| Hot Spring | 2 | $8,195,629 | 2 | $8,195,629 | 63 |
| Howard | 0 | $0 | 0 | $0 | 42 |
| Independence | 0 | $0 | 0 | $0 | 74 |
| Jefferson | 4 | $4,795,386 | 4 | $4,795,386 | 107 |
| Johnson | 0 | $0 | 0 | $0 | 50 |
| Lawrence | 0 | $0 | 0 | $0 | 71 |
| Lee | 1 | $2,677,868 | 1 | $2,677,868 | 0 |
| Lincoln | 2 | $2,730,527 | 2 | $2,730,527 | 50 |
| Logan | 0 | $0 | 0 | $0 | 58 |
| Lonoke | 0 | $0 | 0 | $0 | 78 |
| Miller | 0 | $0 | 0 | $0 | 96 |
| Mississippi | 0 | $0 | 0 | $0 | 58 |
| Ouachita | 0 | $0 | 0 | $0 | 60 |
| Phillips | 0 | $0 | 0 | $0 | 41 |
| Poinsett | 0 | $0 | 0 | $0 | 102 |
| Pope | 1 | $287,513 | 1 | $287,513 | 52 |
| Pulaski | 2 | $12,580,167 | 2 | $12,580,167 | 126 |
| Randolph | 0 | $0 | 0 | $0 | 70 |
| Saline | 0 | $0 | 0 | $0 | 41 |
| Sebastian | 0 | $0 | 0 | $0 | 94 |
| Sharp | 0 | $0 | 0 | $0 | 34 |
| Union | 1 | $1,690,574 | 1 | $1,690,574 | 73 |
| Washington | 0 | $0 | 0 | $0 | 85 |
| White | 0 | $0 | 0 | $0 | 146 |
| Yell | 0 | $0 | 0 | $0 | 68 |

To determine a county by county vulnerability to flooding, those counties with a significant or high hazard dam were analyzed. For each dam, a determination of the population and number of structures within a potential five-mile inundation zone were determined.  Counties with a higher identified population and number of structures within this five-mile area, and those counties with a greater percentage of structure damage, are to be considered to have a potentially greater vulnerability. However, these assumed vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a potential flood event.

| County Vulnerability Data, FEMA Designated Floodplains | | | | | | | |
|---|---|---|---|---|---|---|---|
| **County** | **FEMA Flood Zone** | **Population in FEMA Floodplain** | **Number of Essential Structures FEMA Floodplain** | **Structure Valuation in FEMA Floodplain** | **NCDC Structure Damage, Flood 2012-2017** | **Number of Displaced People** | **Number of People Needing Short Term Shelter** |
| Arkansas | X/A/AE | 19,019 | 30 | $2,245,118 | $0 | 18 | 0 |
| Ashley | X/A/AE/AH | 21,853 | 30 | $2,153,005 | $316,000 | 55 | 21 |
| Baxter | X/A/AH | 41,513 | 35 | $4,332,225 | $0 | 85 | 10 |
| Benton | X/A/AE | 221,339 | 109 | $23,138,113 | $5,060,000 | 515 | 318 |
| Boone | X/A/AE | 36,903 | 42 | $3,623,910 | $675,000 | 127 | 8 |
| Bradley | - | - | - | - | $20,000 | 14 | 4 |
| Calhoun | - | 5,368 | 6 | $441,614 | $50,000 | 113 | 26 |
| Carroll | X/A/AE | - | - | - | $200,000 | 356 | 29 |
| Chicot | X/A/AE | 11,800 | 12 | $960,945 | $1,354,000 | 19 | 10 |
| Clark | X/A/AE | 22,995 | 27 | $2,174,219 | $20,000 | 793 | 513 |
| Clay | - | - | - | - | $1,785,000 | - | - |
| Cleburne | X/A/AE | 25,970 | 27 | $2,958,415 | $285,000 | 739 | 442 |
| Cleveland | X | 8,689 | 12 | $715,852 | $5,000 | 173 | 32 |
| Columbia | X/A/AE | 24,552 | 28 | $2,428,944 | $50,000 | 821 | 631 |
| Conway | X/A/AE | 21,273 | 27 | $1,772,070 | $5,000 | 376 | 180 |
| Craighead | X | 96,443 | 62 | $9,706,620 | $3,165,000 | 2,910 | 1471 |
| Crawford | X/A/AE | 61,948 | 40 | $5,637,326 | $135,000 | 519 | 154 |
| Crittenden | X/A/AE | 50,902 | 47 | $4,446,547 | $500,000 | 3,297 | 1,369 |
| Cross | X/A | 17,870 | 17 | $1,540,067 | $914,000 | 226 | 176 |
| Dallas | X/A/AE | 8,116 | 13 | $809,241 | $100,000 | 20 | 1 |
| Desha | X/A | 13,008 | 18 | $1,270,217 | $200,000 | 22 | 8 |
| Drew | X/A/AE | 18,509 | 17 | $1,772,431 | $146,000 | 197 | 122 |
| Faulkner | X/A/AE | 113,237 | 61 | $10,585,204 | $140,000 | 877 | 552 |
| Franklin | X | 18,125 | 24 | $1,580,874 | $365,000 | 185 | 136 |
| Fulton | X/A/AE | 12,245 | 16 | $1,140,556 | $120,000 | 482 | 36 |
| Garland | X/A/AE | 96,024 | 50 | $10,514,638 | $371,000 | 4,839 | 3,207 |
| Grant | X/A/AE | 17,853 | 14 | $1,638,303 | $25,000 | 318 | 103 |
| Greene | X/A/AE | 42,090 | 28 | $3,655,535 | $40,000 | - | - |
| Hempstead | X/A/AE | 22,609 | 24 | $2,046,291 | $770,000 | 987 | 653 |
| Hot Spring | X/A/AE | 32,923 | 33 | $2,678,074 | $125,000 | 1,022 | 721 |
| Howard | X/A/AE | 13,789 | 24 | $1,317,939 | $0 | 233 | 51 |
| Independence | X/A/AE | 36,647 | 39 | $3,539,724 | $1,852,000 | - | - |
| Izard | X/A | 13,696 | 19 | $1,278,217 | $200,000 | 122 | 14 |
| Jackson | X/A/AE/AO | 17,997 | 26 | $1,602,932 | $360,000 | 116 | 49 |
| Jefferson | X/A/AE | 77,435 | 69 | $7,229,943 | $5,915,000 | 153 | 217 |
| Johnson | X/A/AE | 25,540 | 18 | $2,067,446 | $120,000 | 1,244 | 782 |
| Lafayette | X | 7,645 | 18 | $628,441 | $500,000 | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lawrence | X/A/AE | 17,415 | 28 | $1,546,741 | $8,593,000 | - | - |
| Lee | - | 10,424 | 11 | $774,691 | $0 | 48 | 10 |
| Lincoln | X/A/AE | 14,134 | 13 | $829,167 | $68,000 | 26 | 10 |
| Little River | - | 13,171 | 22 | $1,205,775 | $1,020,000 | - | - |
| Logan | X/A/AE | 22,353 | 36 | $2,154,977 | $5,000 | 640 | 184 |
| Lonoke | X | 68,356 | 40 | $6,235,092 | $127,000 | 564 | 1,096 |
| Madison | X | 15,717 | 17 | $1,378,253 | $450,000 | 302 | 28 |
| Marion | X | 16,653 | 21 | $1,643,767 | $645,000 | 327 | 186 |
| Miller | X/A | 43,462 | 27 | $3,929,656 | $191,000 | - | - |
| Mississippi | A/AE | - | - | - | $111,000 | - | - |
| Monroe | A | 8,149 | 16 | $849,898 | $1,425,000 | - | - |
| Montgomery | X/A | 9,487 | 15 | $906,505 | $645,000 | 647 | 115 |
| Nevada | X/A | 8,997 | 14 | $847,214 | $0 | - | - |
| Newton | A | - | - | - | $630,000 | 0 | 0 |
| Ouachita | X/A | 26,120 | 35 | $2,417,782 | $81,000 | 120 | 244 |
| Perry | X/A | 10,445 | 12 | $855,949 | $42,000 | 689 | 290 |
| Phillips | X/A/AE/AO | 21,757 | 29 | $1,995,535 | $0 | 573 | 136 |
| Pike | X/A | 11,291 | 21 | $1,034,531 | $0 | 425 | 116 |
| Poinsett | X/A | 24,583 | 28 | $2,304,298 | $474,000 | - | - |
| Polk | A | 20,662 | 30 | $1,929,575 | $2,775,000 | 509 | 98 |
| Pope | X/A/AE | - | - | - | $355,000 | 827 | 353 |
| Prairie | A | 8,715 | 17 | $823,342 | $105,000 | 34 | 6 |
| Pulaski | X/A/AE/AH | - | - | - | $2,431,000 | 1,653 | 1,402 |
| Randolph | X/A/AE | 17,969 | 23 | $1,683,514 | $19,770,000 | 121 | 18 |
| St. Francis | X | 28,258 | 26 | $2,137,870 | $500,000 | 137 | 171 |
| Saline | X/AE | 107,118 | 56 | $10,250,451 | $72,000 | 3,659 | 2,922 |
| Scott | X | 11,233 | 16 | $1,025,120 | $9,250,000 | 672 | 126 |
| Searcy | X | - | - | - | $258,000 | 204 | 130 |
| Sebastian | X/A/AE | 125,744 | 83 | $13,612,411 | $320,000 | 996 | 525 |
| Sevier | A/AE | 17,058 | 19 | $1,299,583 | $5,000 | 136 | 87 |
| Sharp | X/A/AE | 17,264 | 25 | $1,817,097 | $1,602,000 | 421 | 83 |
| Stone | X/A | 12,394 | 15 | $1,148,959 | $740,000 | 175 | 46 |
| Union | X/A | 41,639 | 26 | $4,563,530 | $0 | 101 | 57 |
| Van Buren | X/A | 17,295 | 24 | $1,676,374 | $400,000 | 650 | 249 |
| Washington | X/A/AE | - | - | - | $315,000 | 1,788 | 852 |
| White | X/A/AE | 77,076 | 61 | $6,808,909 | $290,000 | 744 | 432 |
| Woodruff | A/AE | 7,260 | 13 | $706,982 | $2,434,000 | 510 | 133 |
| Yell | X/A/AE | 22,185 | 31 | $1,874,859 | $190,000 | 532 | 190 |

The following table presents data from the United States Department of Agriculture (USDA) Risk Management Agency's annualized insured crop insurance payments for flood-related crop damages for the five-year period from 2019 to 2023. Using these figures, a determination of crop damage per county due to flooding can be compiled. In general, those counties with a higher amount of crop damage can be considered more vulnerable to flooding. *Counties that have no data is due to no losses being reported by USDA Farm Risk Agency.

| USDA Crop Data for Flooding, 2019-2023 | | | |
|---|---|---|---|
| **County** | **Acres Planted** | **Acres Lost** | **Loss Amount** |
| State of Arkansas | 111,130 | 95,274 | 17,559,637 |
| Arkansas | 181 | 181 | $15,227 |
| Ashley | 2,935 | 2,195 | $656,043 |
| Baxter | - | - | - |
| Benton | - | - | - |
| Boone | - | - | - |
| Bradley | - | - | - |
| Calhoun | - | - | - |
| Carroll | - | - | - |
| Chicot | 16,698 | 7,111 | $912,111 |
| Clark | - | - | - |
| Clay | 174 | 174 | $45,106 |
| Cleburne | - | - | - |
| Cleveland | - | - | - |
| Columbia | - | - | - |
| Conway | 4,742 | 4,396 | 431,071 |
| Craighead | 1,208 | 1,208 | $90,288 |
| Crawford | 5,623 | 5,623 | $527,148 |
| Crittenden | 3,447 | 3,447 | $439,395 |
| Cross | 280 | 185 | $79,371 |
| Dallas | - | - | - |
| Desha | 8,511 | 5,397 | $863,864 |
| Drew | 1,299 | 530 | $140,240 |
| Faulkner | 1,538 | 1,538 | $349,434 |
| Franklin | 1,015 | 892 | $115,984 |
| Fulton | - | - | - |
| Garland | - | - | - |
| Grant | - | - | - |
| Greene | 2,151 | 2,000 | $732,848 |
| Hempstead | - | - | - |
| Hot Spring | - | - | - |
| Howard | - | - | - |
| Independence | 169 | 169 | $38,869 |
| Izard | - | - | - |
| Jackson | 4,690 | 4,690 | $1,588,205 |
| Jefferson | 4,791 | 4,791 | $2,437,354 |
| Johnson | 370 | 370 | $78,887 |
| Lafayette | - | - | - |
| Lawrence | 2,820 | 2,478 | $734,895 |
| Lee | 7,160 | 4,806 | $473,947 |
| Lincoln | 633 | 633 | $81,074 |

| | | | |
|---|---|---|---|
| Little River | 199 | 199 | $27,296 |
| Logan | 6,968 | 6,968 | $858,570 |
| Lonoke | - | - | - |
| Madison | - | - | - |
| Marion | - | - | - |
| Miller | - | - | - |
| Mississippi | 2,572 | 2,572 | $556,299 |
| Monroe | 1,451 | 1,451 | $283,302 |
| Montgomery | - | - | - |
| Nevada | - | - | - |
| Newton | - | - | - |
| Ouachita | - | - | - |
| Perry | 1,672 | 1,672 | $385,749 |
| Phillips | 5,017 | 4,267 | $573,113 |
| Pike | - | - | - |
| Poinsett | 1,099 | 1,079 | $45,063 |
| Polk | - | - | - |
| Pope | 4,471 | 4,471 | $566,776 |
| Prairie | 895 | 895 | $141,360 |
| Pulaski | 586 | 586 | $42,543 |
| Randolph | 1,950 | 1,501 | $477,615 |
| St. Francis | 3,152 | 2,382 | $103,127 |
| Saline | - | - | - |
| Scott | - | - | - |
| Searcy | - | - | - |
| Sebastian | 3,113 | 3,085 | $310,378 |
| Sevier | - | - | - |
| Sharp | - | - | - |
| Stone | - | - | - |
| Union | - | - | - |
| Van Buren | - | - | - |
| Washington | - | - | - |
| White | 5,325 | 5,325 | $1,916,549 |
| Woodruff | 444 | 444 | $118,745 |
| Yell | 1,797 | 1,797 | $321,793 |

Flood risk can also change over time because of new building and development, weather patterns and other factors. Although the frequency or severity of impacts cannot be changed, FEMA is working with federal, state, tribal and local partners across the nation to identify flood risk and promote informed planning and development practices to help reduce that risk through the Risk Mapping, Assessment and Planning (Risk MAP) program. Risk MAP uses the watershed boundaries to conduct studies. This watershed approach allows communities to come together to develop partnerships, combine resources, share flood risk information with FEMA, and identify broader opportunities for mitigation action.

**RISKMAP**

Flood risk changes over time because of new building and development, weather patterns and other factors. Although the frequency or severity of impacts cannot be changed, FEMA is working with federal, state, tribal and local partners across the nation to identify

flood risk and promote informed planning and development practices to help reduce that risk through the Risk Mapping, Assessment and Planning (RiskMAP) program.

The goals and objectives of the RiskMAP program are supported and implemented through the Cooperating Technical Partners (CTP) Program. The CTP Program leverages partnerships between FEMA and NFIP communities to deliver high-quality hazard identification and risk assessment products. In Arkansas, NRD is the recognized CTP Partner, creating updated flood risk mapping, providing outreach support, and empowering communities to take action to reduce risk based on informed, multi hazard-based data and resources.

| CTP Program Mission | Risk MAP Mission |
|---|---|
| Strengthening the effectiveness of the National Flood Insurance Program (NFIP) and supporting FEMA's mitigation objectives by leveraging partnerships. | Leveraging partnerships, Risk MAP focuses on collaboration with state, tribal and local entities. |
| Delivering high-quality hazard identification and risk assessment products (and data). | Delivering quality data. |
| Providing outreach support and empowering communities to take action to reduce risk based on informed multi-hazard-based data and resources. | Increasing public awareness, which leads to action that reduces risk to life and property. |

Since 2018, NRD has produced a variety of products and conducted a series of community outreach activities to enhance utilization of flood risk data in floodplain development management and hazard mitigation activities. The majority of these activities are categorized as either Discovery or Base Level Engineering. These activities are deployed on a HUC-8 watershed basis, supporting a watershed -level approach to flood risk reduction and mitigation.

- Discovery activities include developing a Project Stakeholder engagement plan, gathering data and information, developing a new or updated Areas of Mitigation Interest (AoMI) dataset, and engaging Project Stakeholders at the Discovery Meeting(s). Discovery activities may also include engaging with communities regarding expected changes to flood hazard information, defining the scope of the Flood Risk Project, and outlining the expected next steps with Project Stakeholders (e.g., products and services to be provided, timeline, outcomes, roles/responsibilities, and data sources).
- Base Level Engineering (BLE) generates watershed-wide flood hazard information built from foundation level hydrologic and hydraulic engineering models - providing floodplain boundaries, flood depth and water surface elevation grids. BLE is developed using high resolution ground elevation, using the latest modeling software to create modeling in agreement with FEMA's Standards for Flood Risk Projects. While this data does not immediately replace a community's Flood Insurance Rate Map (FIRM), the analysis provides information to support for local communities to determination Base Flood Elevations (BFEs) for Zone A and newly identified flood prone areas identified by the BLE analysis.

Since 2015, NRD has developed (or is in the process of developing) BLE for 26 watersheds. NRD is also partnering with FEMA Region 6 to develop BLE in an additional five watersheds. FEMA Region 6 has developed (or is in the process of developing) BLE for 28 watersheds, focusing on many of the 36 watersheds that cross state lines.

NRD has also conducted Discovery activities in 27 watersheds. A summary of activities implemented since 2015 is presented in the following table.

| RiskMAP Activities in Arkansas Since 2015 | | |
|---|---|---|
| HUC-8 Watershed | Project Type | Responsible Party |
| Bayou Bartholomew | Discovery | NRD |
| | BLE | FEMA |
| Bayou D'Arbonne | BLE | FEMA |
| Bayou Macon | BLE | NRD/FEMA |
| Bayou Meto | BLE | FEMA |
| Beaver Reservoir | Discovery | NRD |
| | BLE | NRD |
| Big | BLE | FEMA |
| Bodcau Bayou | BLE | FEMA |

| | | |
|---|---|---|
| Boeuf | BLE | FEMA |
| Buffalo | Discovery | NRD |
| | BLE | NRD |
| Bull Shoals Lake | BLE | NRD |
| Cache | Discovery | NRD |
| | BLE | FEMA |
| Cadron | Discovery | NRD |
| | BLE | NRD |
| Cross Bayou | BLE | FEMA |
| Current | BLE | NRD |
| Dardanelle Reservoir | Discovery | NRD |
| | BLE | FEMA |
| Eleven Point | Discovery | NRD |
| | BLE | FEMA |
| Elk | BLE | NRD |
| Fourche La Fave | Discovery | NRD |
| | BLE | NRD |
| Frog-Mulberry | Discovery | NRD |
| | BLE | NRD |
| Illinois | BLE | FEMA |
| Kiamichi | BLE | FEMA |
| Lake Conway-Point Remove | BLE | FEMA |
| Lake O' The Cherokees | BLE | FEMA |
| L'Anguille | Discovery | NRD |
| | BLE | FEMA |
| Little Missouri | Discovery | NRD |
| | BLE | NRD |
| Little Red | Discovery | NRD |
| | BLE | NRD |
| Little River Ditches | BLE | FEMA |
| Loggy Bayou | BLE | NRD/FEMA |
| Lower Arkansas | Discovery | NRD |
| | BLE | NRD |
| Lower Arkansas Maumelle | BLE | NRD |
| Lower Black | BLE | FEMA |
| | Discovery | NRD |
| Lower Little | BLE | NRD |
| Lower Mississippi-Greenville | BLE | FEMA |
| Lower Mississippi-Helena | BLE | FEMA |
| Lower Mississippi-Memphis | BLE | FEMA |
| Lower Neosho | BLE | FEMA |
| Lower Ouachita-Bayou De Loutre | BLE | FEMA |
| Lower Ouachita-Smackover | Discovery | NRD |

| | | |
|---|---|---|
| | BLE | NRD |
| Lower Saline | Discovery | NRD |
| | BLE | NRD |
| Lower St. Francis | Discovery | NRD |
| | BLE | FEMA |
| Lower Sulphur | BLE | FEMA |
| Lower White | Discovery | NRD |
| | BLE | NRD |
| Lower White - Bayou Des Arc | Discovery | NRD |
| | BLE | NRD |
| McKinney Posten | Discovery | NRD |
| | BLE | NRD |
| Middle White | Discovery | NRD |
| | BLE | NRD |
| Mountain Fork | BLE | FEMA |
| North Fork White | BLE | FEMA |
| Ouachita Headwaters | Discovery | NRD |
| | BLE | NRD |
| Pecan-Waterhole | BLE | NRD/FEMA |
| Petit Jean | BLE | NRD |
| Poteau | BLE | NRD/FEMA |
| Robert S. Kerr Reservoir | BLE | NRD/FEMA |
| Spring | BLE | FEMA |
| | Discovery | NRD |
| Strawberry | Discovery | NRD |
| | BLE | NRD |
| Upper Black | BLE | NRD |
| Upper Ouachita | Discovery | NRD |
| | BLE | NRD |
| Upper Saline | Discovery | NRD |
| | BLE | NRD |
| Upper White | Discovery | NRD |
| | BLE | NRD |
| Upper White-Village | BLE | FEMA |

**BASE LEVEL ENGINEERING FLOOD RISK DATA**

Base Level Engineering expands the availability of flood risk data to communities and residents. Included are skeleton engineering models that can be further refined by engineering firms and local communities to analyze current and future flood risk. Specific information provided includes:

- Estimated floodplain extent for the 1%, 10%, and 0.2% annual chance events
- Estimated flood depths associated with the 1%, 10%, and 0.2% annual chance events
- Estimated water surface elevations for the 1%, 10%, and 0.2% annual chance events

Base Level Engineering (BLE) data is freely available to the public on the interactive viewer at: https://webapps.usgs.gov/infrm/EstBFE.  Through this portal, users can:

- Access all BLE data without GIS software;
- Determine base flood elevations and run site specific flood risk reports; and
- Download engineering models, model inputs (cross-sections, stream centerlines) and results (floodplains, water surface and flood depth grids).

Not all completed BLE projects are available on the Viewer as there is a three-to-six-month backlog with respect to uploading BLE data. Data available on the Viewer as of March 2023 is shown in Figure 1. Completed data not currently posted is available upon request from NRD. Figure 2 shows the full availability of BLE data -both posted and unposted - and BLE studies currently in progress.

**FIGURE 1:**
**POSTED BASE LEVEL ENGINEERING DATA AS OF MARCH 2023**

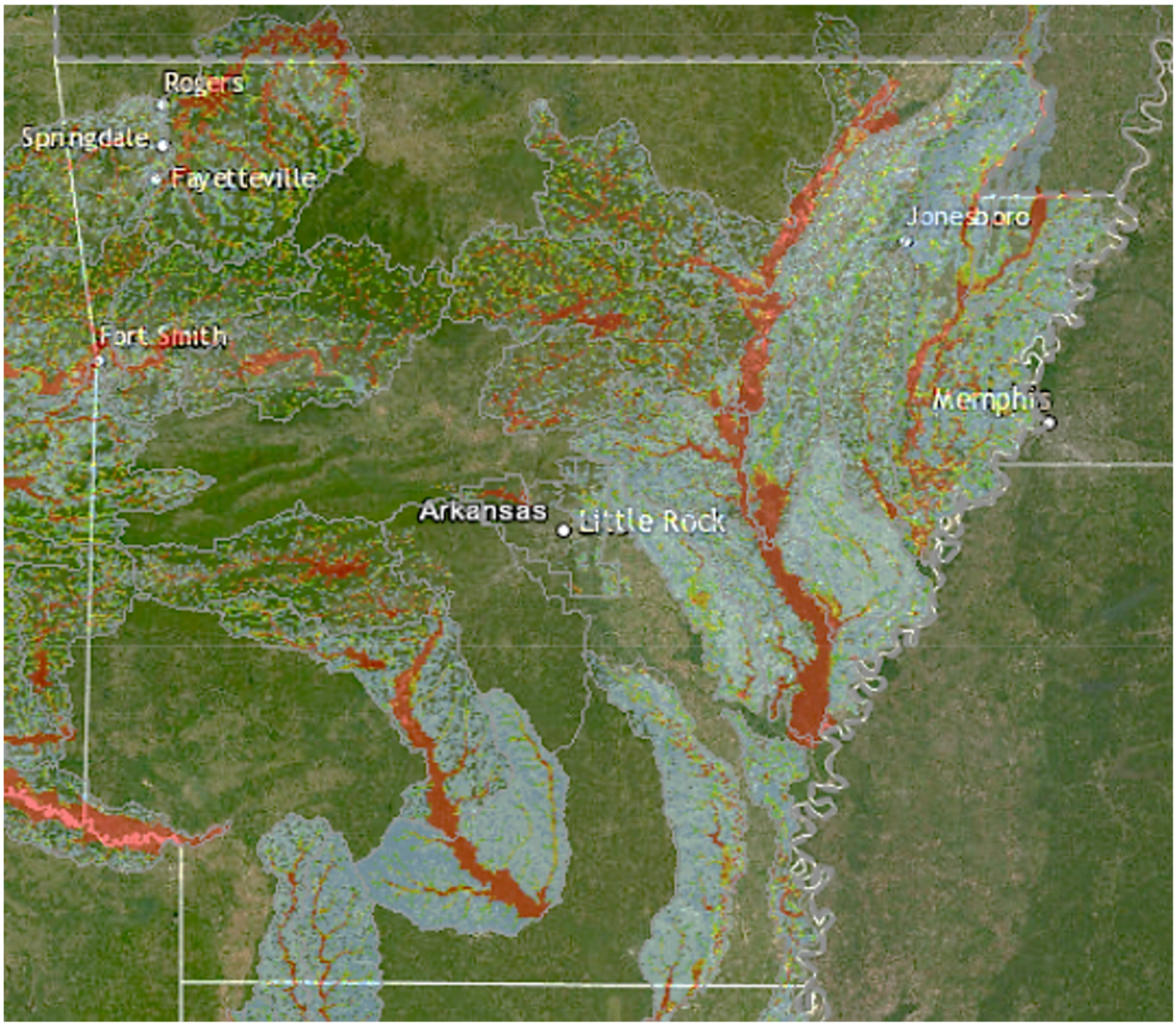
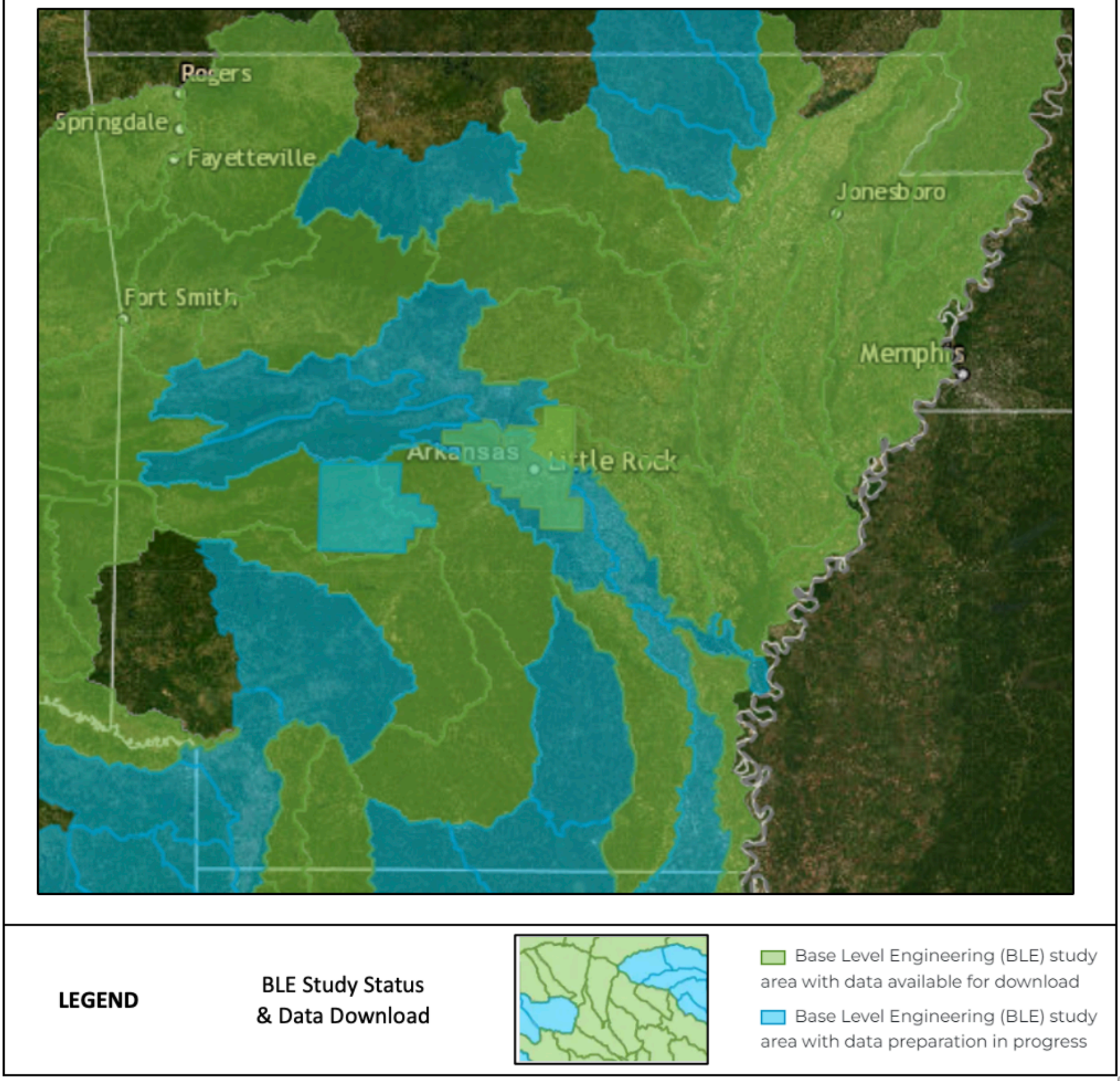


**FIGURE 2:**
**STATUS OF BASE LEVEL ENGINEERING DATA AS OF MARCH 2023**




**USE OF BLE DATA FOR MITIGATION**

BLE data provides flood risk information that may be immediately used for community floodplain management activities, local land use discussions, all hazard mitigation planning, and identification of mitigation strategies, as well as providing a basis for more informed community development. The datasets may be used to inform future land use decisions, support grant submissions, generate flood vulnerability assessments, prioritize flood risk reduction projects, evaluate; design and prioritize capital improvement projects. The approach ultimately will allow Arkansas to build a more robust network of flood risk information, an expedited process to update regulatory products and enable future expansion to risk-based analysis and future risk scenario modeling opportunities.

Specific mitigation uses of BLE data include:

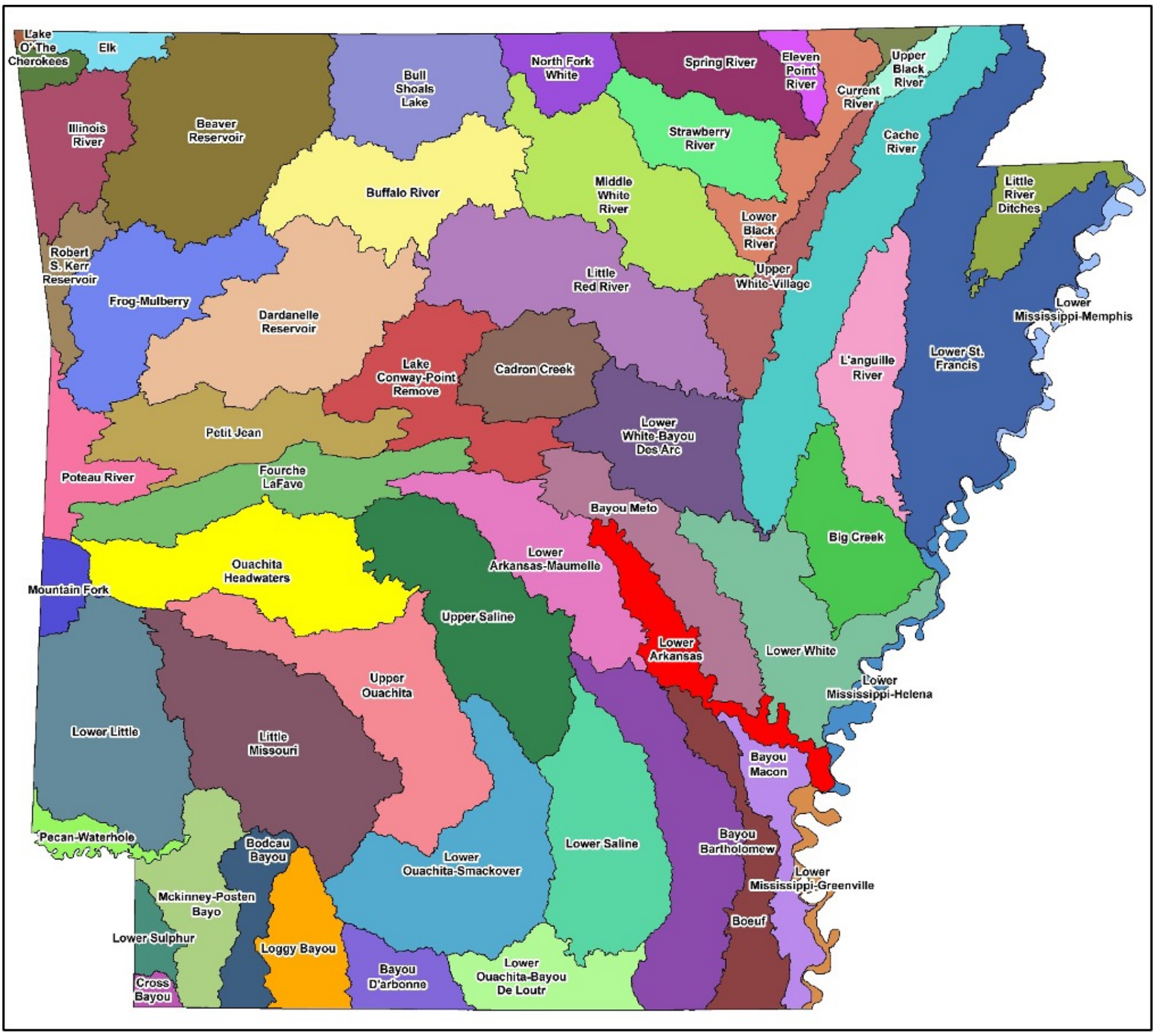
- Use hydraulic models from a watershed-scale BLE assessment to look at mitigation project design alternatives.
- Use flood depth grids to prioritize road, bridge, and other capital improvements.
- Inform the site layout and design for projects (such as drainage).
- Support land use and development regulations, like open space preservation and building and zoning changes to reduce risk.
- Confirm access to critical facilities or community lifelines during a flood.
- Promote mitigation projects that involve elevation, floodproofing or property buyouts.
- Provide data to support a Benefit-Cost Analysis.
- Provide the water surface elevation required in some FEMA grant applications or post-disaster Advisory Base Flood Elevations.

The Flood Risk Products and datasets present information that can enhance hazard mitigation planning activities, especially the risk and vulnerability assessment portion of a hazard mitigation plan, and the development of risk-based mitigation strategies. Risk MAP can also help guide land use and development decisions and help individuals take mitigation action by highlighting areas of highest risk, areas in need of mitigation, and areas of floodplain change.

The following Arkansas watersheds have had completed Risk MAP studies:

- Lower Arkansas Maumelle Watershed
- Illinois Watershed
- Lower Black Watershed
- Bayou Bartholomew Watershed
- Boeuf Watershed

The following are the available Risk MAPs for the State of Arkansas.



# Flood Risk Map: Lower Arkansas Maumelle Watershed, 11110207



Lake Maumelle and characterization of the upper portion of the watershed.



Little Rock downtown area with levees on either side of the Arkansas River.



David C. Terry Lock and Dam
Arkansas River - USACE Structure.



## MAP SYMBOLOGY

**Base Data**
- Interstate
- US Highway
- State Highway
- County Boundary
- Corporate Limits
- Watershed Boundary

**Flood Data**
- Rivers and Streams
- Restudy Area

**Flood Risk**
- Very Low
- Low
- Medium
- High
- Very High

**Areas of Mitigation Interest**
- Accredited Levees
- Non-Accredited Levees
- Dams
- Stream Flow Constrictions
- Past Claims Hot Spot
- Key Emergency Routes Overtopped During Frequent Flooding Events
- At-Risk Essential Facilities
- Other
- Individual Assistance (IA) & Public Assistance (PA) Data
- Significant Land Use Changes (within the past 5 years and looking forward 5 years)
- Areas of Significant Riverine Erosion
- Non-Levee Embankments
- Other Flood Risk Areas
- Areas of Mitigation Success

**WATERSHED LOCATOR**



Risk Mapping, Assessment, and Planning (Risk MAP)

FRM FLOOD RISK MAP

LOWER ARKANSAS MAUMELLE WATERSHED, USA

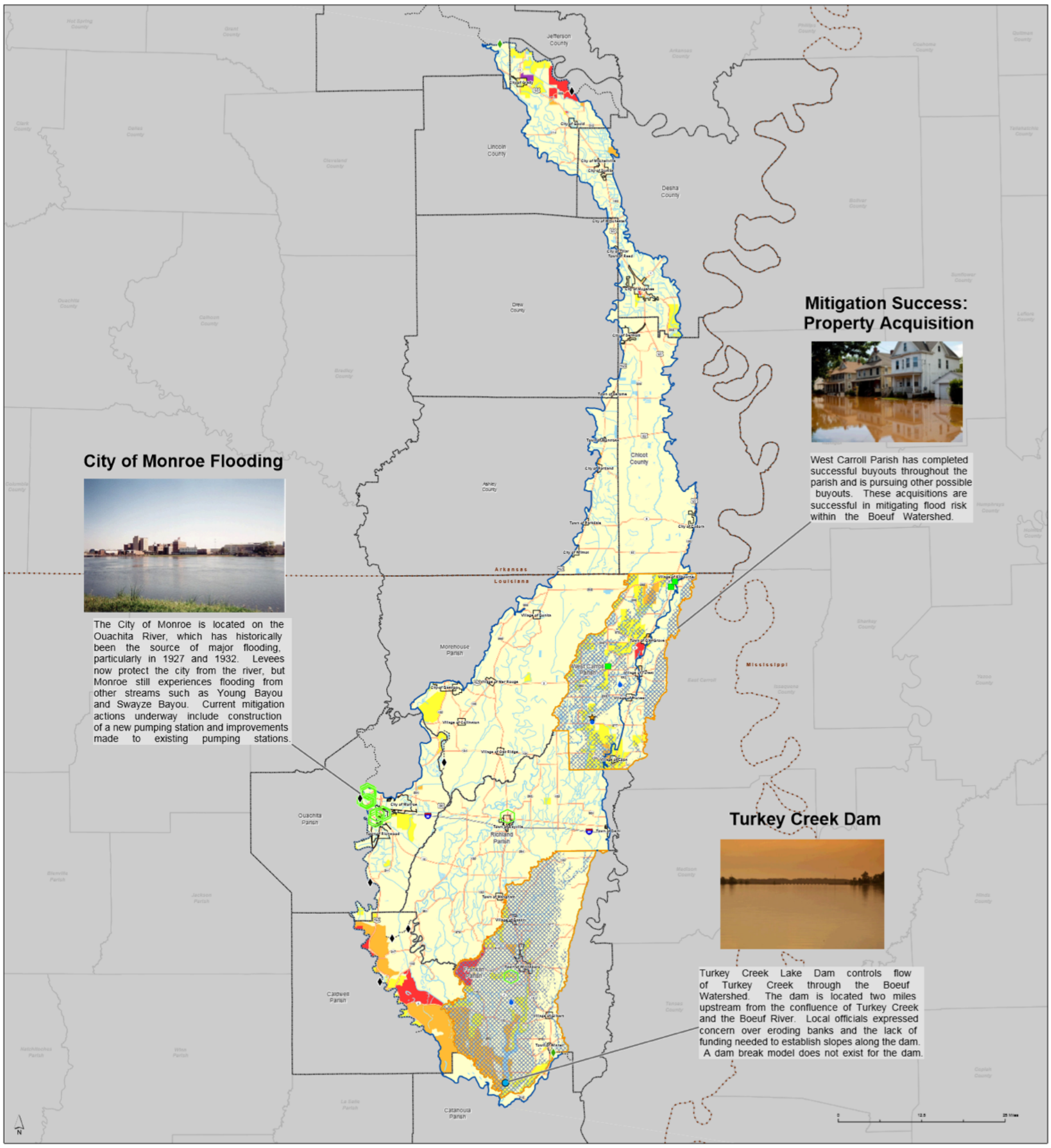
FEMA

For more information of data used for this non-regulatory map, please consult the Lower Arkansas Maumelle Watershed USA Flood Risk Database and Flood Risk Report.

HUC-8 Code 11110207

RELEASE DATE 12/21/2015

# Flood Risk Map: *Boeuf Watershed, 08050001*




## MAP SYMBOLOGY

**Base Data**
- Corporate Limits
- Major Roads
- Interstates
- Watershed Boundary
- State Boundary

**Flood Data**
- Rivers and Streams
- Restudy Area
- New SFHA
- Levee

**Flood Risk**
- Very Low
- Low
- Medium
- High
- Very High

**Areas of Mitigation Interest**
- Accredited Levees
- Non-Accredited Levees
- Dams
- Stream Flow Constrictions
- Past Claims Hot Spot
- Other Flood Risk Areas
- Other

**WATERSHED LOCATOR**




Risk Mapping, Assessment, and Planning (Risk MAP)

FRM FLOOD RISK MAP

BOEUF WATERSHED

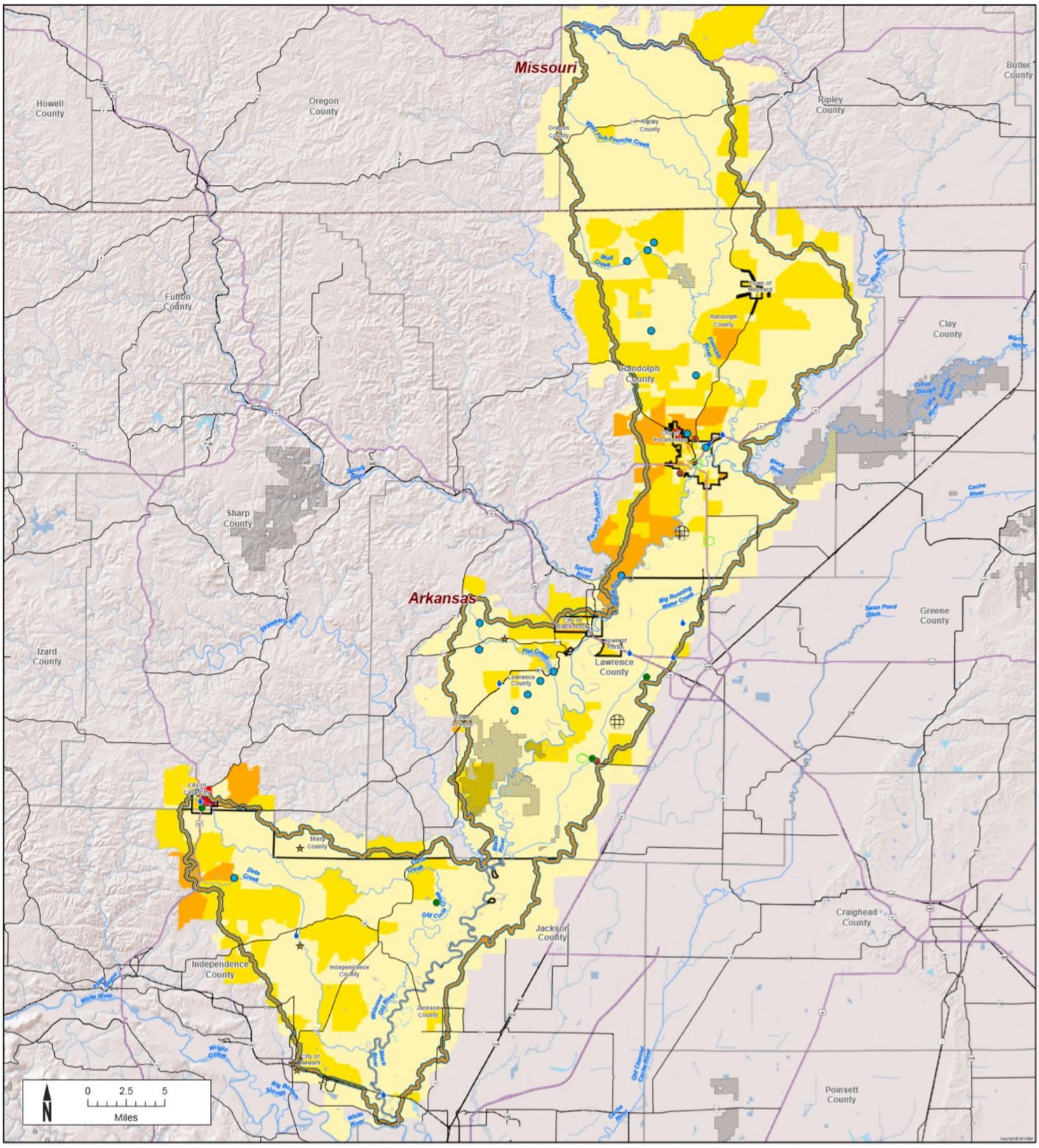
FEMA

HUC-8 Code 08050001

RELEASE DATE 10/6/2014

For more information of data used for this non-regulatory map, please consult the Boeuf Watershed USA Flood Risk Database and Flood Risk Report.

# Flood Risk Map: Lower Black Watershed, 11010009




## MAP SYMBOLOGY

**Base Data**
- Interstate
- US Highway
- State Highway
- Corporate Limits
- County Boundary
- Watershed Boundary
- State Boundary
- Wildlife Management Area
- Lake / Pond

**Flood Data**
- Rivers and Streams
- Restudy Area

**Flood Risk**
- Very Low
- Low
- Medium
- High
- Very High

**Areas of Mitigation Interest**
- Accredited Levees
- Non-Accredited Levees
- Dams
- Stream Flow Constrictions
- Past Claims Hot Spot
- Routes Overtopped During Frequent Flooding Events
- At-Risk Essential Facilities
- Other
- Individual Assistance (IA) & Public Assistance (PA) Data
- Significant Land Use Changes (within the past 5 years and looking forward 5 years)
- Areas of Significant Riverine or Coastal Erosion
- Non-Levee Embankments
- Other Flood Risk Areas
- Areas of Mitigation Success

**WATERSHED LOCATOR**



Risk Mapping, Assessment, and Planning (Risk MAP)

FRM FLOOD RISK MAP

LOWER BLACK WATERSHED

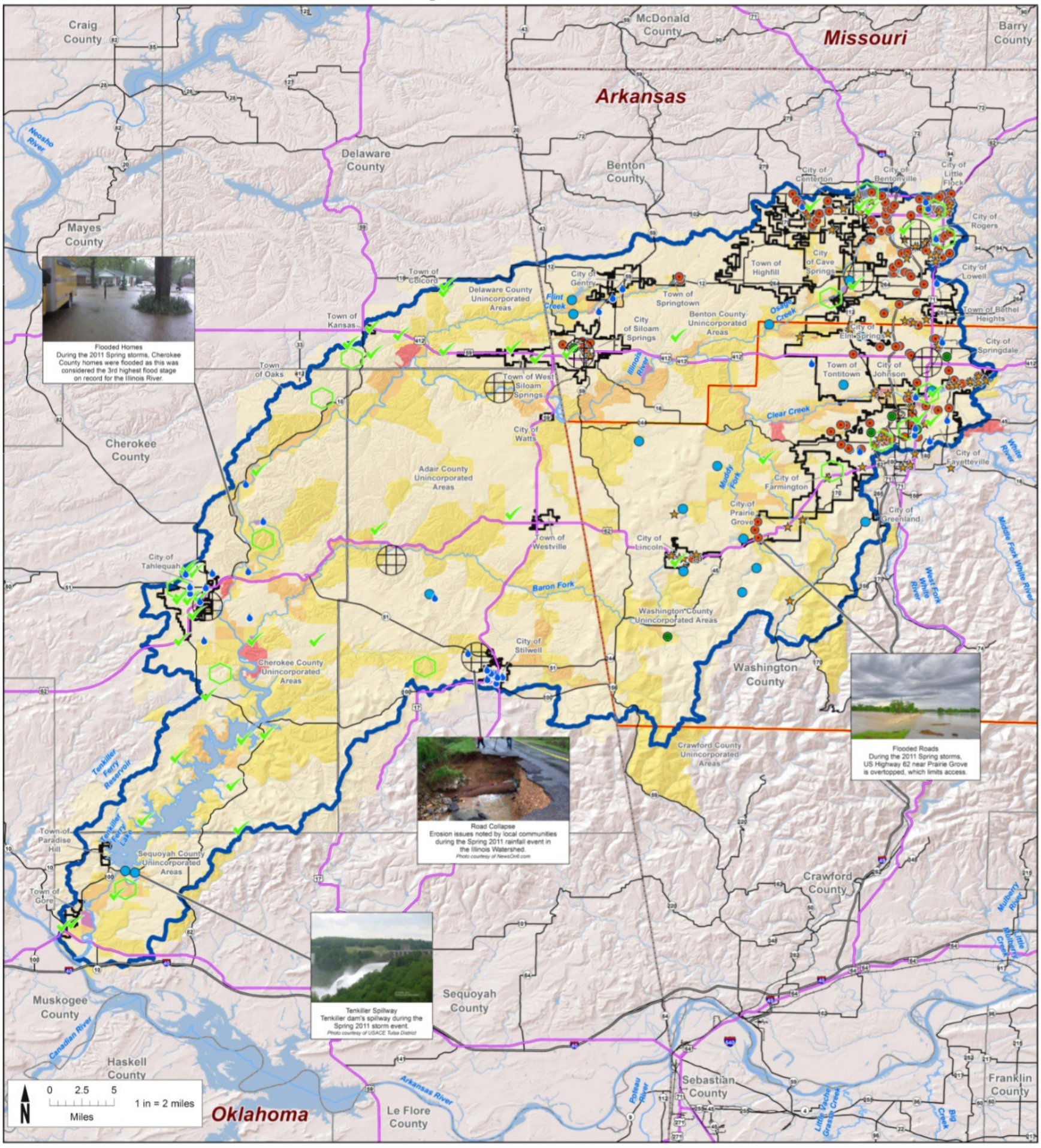
FEMA

For more information of data used for this non-regulatory map, please consult the Lower Black Watershed Flood Risk Database and Flood Risk Report.

HUC-8 Code 11010009

RELEASE DATE 9/15/2015

# Flood Risk Map:Illinois Watershed, 11110103






Flooded Homes
During the 2011 Spring storms, Cherokee County homes were flooded as this was considered the 3rd highest flood stage on record for the Illinois River.



Road Collapse
Erosion issues noted by local communities during the Spring 2011 rainfall event in the Illinois Watershed.
*Photo courtesy of NewsOn6.com*



Flooded Roads
During the 2011 Spring storms, US Highway 62 near Prairie Grove is overtopped, which limits access.



Tenkiller Spillway
Tenkiller dam's spillway during the Spring 2011 storm event.
*Photo courtesy of USACE Tulsa District*

## MAP SYMBOLOGY

**Base Data**
- Interstates
- US Highways
- State Highways
- State Boundary
- Corporate Limits
- Watershed Boundary

**Flood Data**
- Rivers and Streams
- Restudy Area
- New SFHA

**Flood Risk**
- Very Low
- Low
- Medium
- High
- Very High

**Areas of Mitigation Interest**
- Accredited Levees
- Non-Accredited Levees
- Dams
- Stream Flow Constrictions
- Past Claims Hot Spot
- Key Emergency Routes Overtopped During Frequent Flooding Events
- At-Risk Essential Facilities
- Individual Assistance (IA) & Public Assistance (PA) Data
- Significant Land Use Changes (within the past 5 years and looking forward 5 years)
- Areas of Significant Riverine or Coastal Erosion
- Non-Levee Embankments
- Other Flood Risk Areas
- Areas of Mitigation Success
- Other

**WATERSHED LOCATOR**



Risk Mapping, Assessment, and Planning (Risk MAP)

FRM FLOOD RISK MAP

ILLINOIS WATERSHED

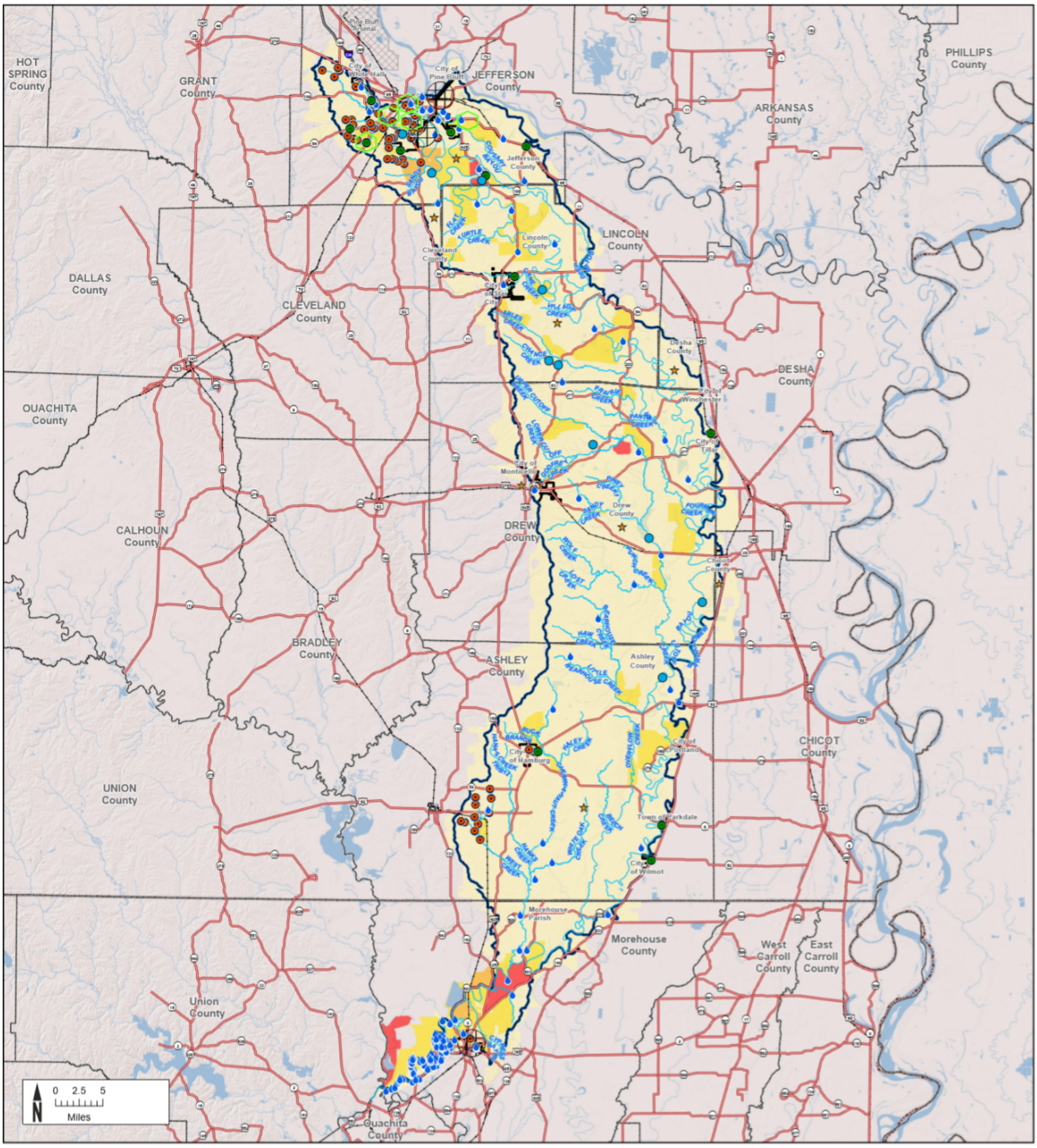
FEMA

For more information of data used for this non-regulatory map, please consult the Illinois Watershed Flood Risk Database and Flood Risk Report.

HUC-8 Code
11110103

RELEASE DATE
12/8/2015

# Flood Risk Map:Bayou Bartholomew Watershed, 08040205




## MAP SYMBOLOGY

**Base Data**
- Corporate Limits
- Major Roads
- Interstates
- Watershed Boundary
- Wildlife Management Areas / Federally Owned Lands
- County
- State

**Flood Data**
- Rivers and Streams

**Flood Risk**
- Very Low
- Low
- Medium
- High
- Very High

**Areas of Mitigation Interest**
- Accredited Levees
- Non-Accredited Levees
- Dams
- Coastal Structures
- Stream Flow Constrictions
- Past Claims Hot Spot
- Key Emergency Routes Overtopped During Frequent Flooding Events
- At-Risk Essential Facilities
- Individual Assistance (IA) & Public Assistance (PA) Data
- Significant Land Use Changes (within the past 5 years and looking forward 5 years)
- Areas of Significant Riverine or Coastal Erosion
- Non-Levee Embankments
- Other Flood Risk Areas
- Areas of Mitigation Success
- Other

## WATERSHED LOCATOR



## Risk Mapping, Assessment, and Planning (Risk MAP)

FRM FLOOD RISK MAP

BAYOU BARTHOLOMEW WATERSHED

FEMA

For more information of data used for this non-regulatory map, please consult the Bayou Meto Watershed Flood Risk Database and Flood Risk Report.

HUC-8 Code 08040205

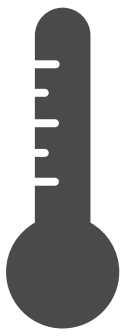
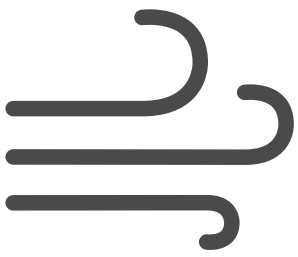
RELEASE DATE 9/30/2016

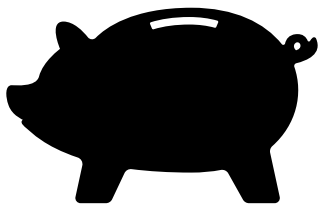
### 4.4.5.9 - CONSEQUENCE ANALYSIS

As per EMAP requirements, the following table provides the Consequence Analysis.

| Flood Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Flood** |
| Health and Safety of the Public | Impact dependent on the level of flood waters. Individuals further away from the incident area are at a lower risk. Casualties are dependent on warning time. |
| Health and Safety of Responders | Impact to responders is expected to be minimal unless responders live within the affected area. |
| Continuity of Operations | Temporary relocation may be necessary if inundation affects government facilities. |
| Property, Facilities, and Infrastructure | Localized impact could be severe in the inundation area of the incident to facilities and infrastructure. The further away from the incident area the damage lessens. |
| Environment | Impact will be severe for impacted area. Impact will lessen with distance. |
| Economic Conditions | Impacts to the economy depend on the area flooded, depth of water, and the amount of time it takes for the water to recede. |
| Public Confidence in the Jurisdiction's Governance | Perception of whether the flood could have been prevented, warning time, and response and recovery time will greatly impact the public's confidence. |

# LANDSLIDE

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature  | There is not enough data available for the State of Arkansas on what the impacts of climate change could be relating to landslides. |
| Changes in Precipitation  | There is not enough data available for the State of Arkansas on what the impacts of climate change could be relating to landslides. |
| Extreme Weather  | There is not enough data available for the State of Arkansas on what the impacts of climate change could be relating to landslides. |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Populations most at risk are those that live or work in areas that are prone to landslides or have geography that could lead to landslides. |
|  | Government employees and offices/infrastruture located in areas that are prone to landslides are most at risk. Currently the State of Arkansas is conducting HAZUS runs to gather more information on what is at risk. |
|  | Infrastruture located in areas that are prone to landslides are most at risk. Currently the State of Arkansas is conducting HAZUS runs to gather more information on what is at risk. |
|  | There is not enough data available on what natural resources could be impacted most by landslides. Currently it expected that the impact would be minimal. |
|  | There is not enough data available on economic consequences could be from landslides. Currently it expected that the impact would be minimal. |

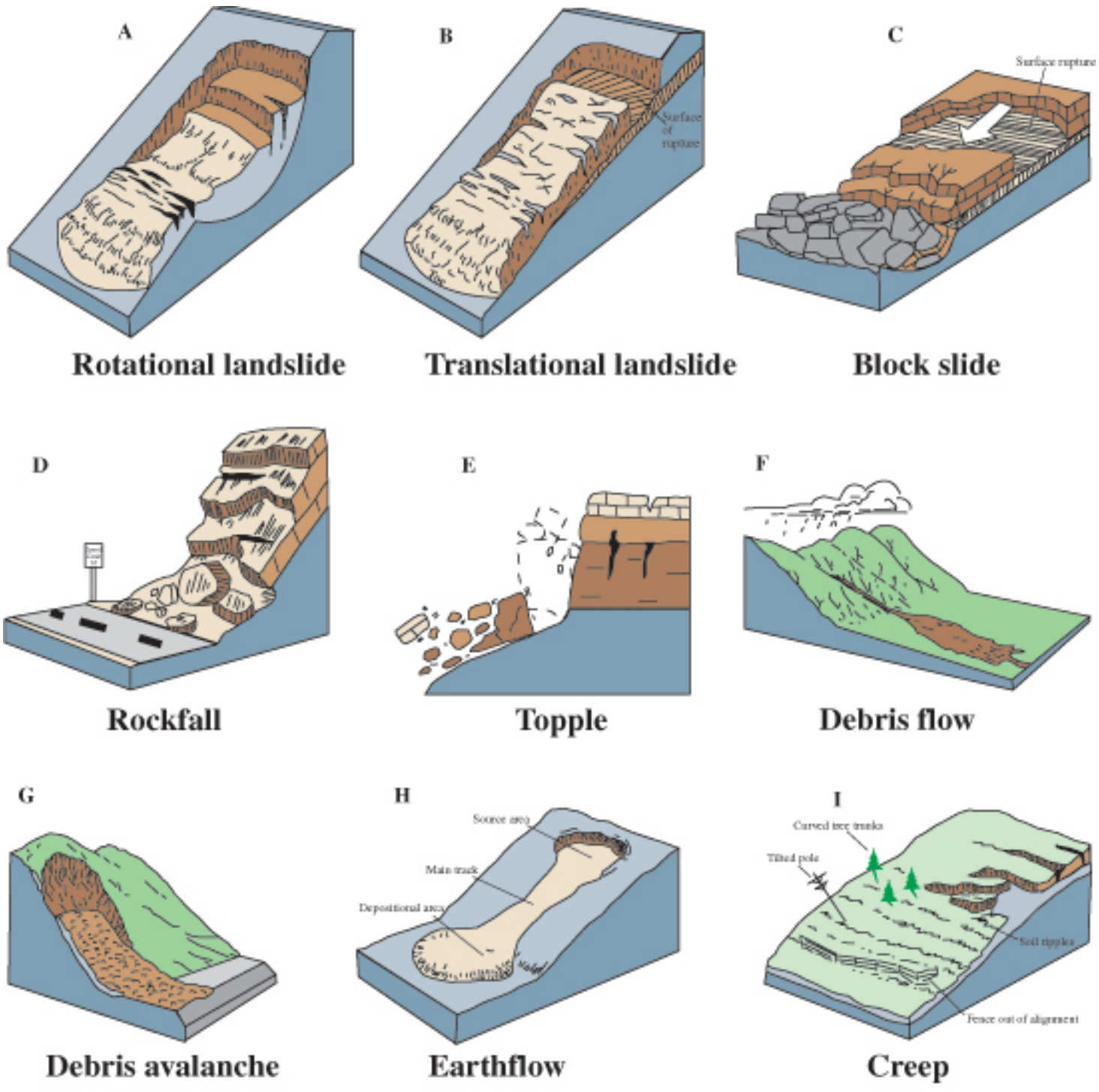
## 4.4.6 Landslide



A Landslide is a gravity-driven process whereby earth materials move down a slope. The downslope movement may be triggered in Arkansas by a number of factors including earthquake shaking, blasting, wave or stream erosion, intense rainfall, freeze/thaw cycles, human (slope construction, adding weight, irrigation/pumping, timber harvest, steep slopes, lack of vegetation, or a combination of the above.) While the potential for a landslide generally increases with increasing slope angle, landslides are a complex function of multiple conditions. Landslides often occur naturally, but slope movement can be made worse by construction/ development activities into hillsides. Increased, rerouting/concentrating runoff or the placement of fill material can all lead to an increase in landslides. Whether in natural or altered slopes, earth movement can be destructive when people or structures are involved.

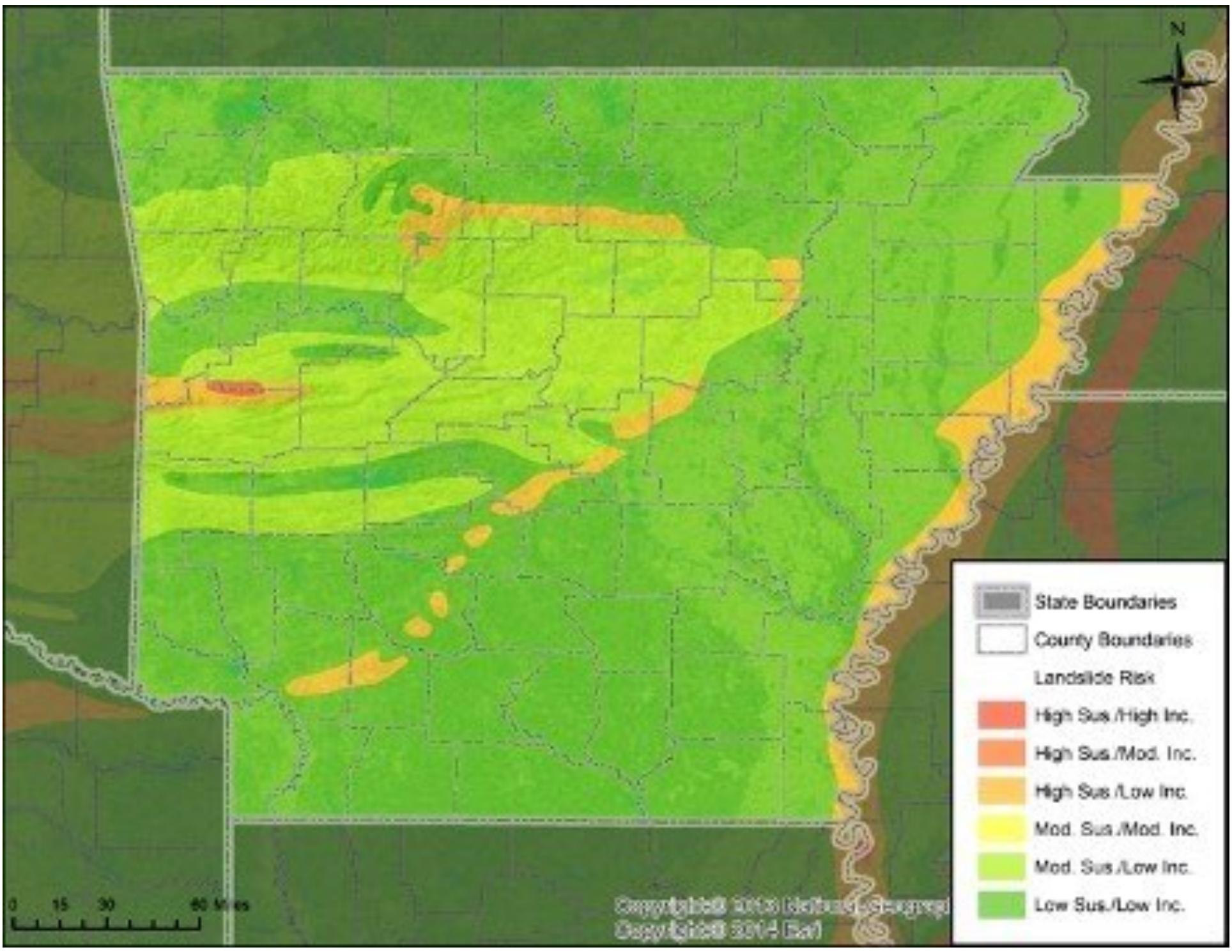
### 4.4.6.1 - LOCATION AND EXTENT

Different types of landslides have different frequencies of movements, triggering conditions, and very different resulting hazards. All landslides can be classified into six types of movement:  1) falls, 2) topples, 3) slides, 4) spreads, 5) flows, and 6) complex. Most slope failures are complex combinations of these distinct types (modified from Highland, 2004 - see the diagram below).



Due to the geology as well as other factors listed above, certain regions (identified in red, orange and yellow colors) of the state are more susceptible to landslides (refer to the USGS map). “The Arkansas Geological Survey is currently developing a landslide inventory of the state.

The State of Arkansas has identified areas in the Ozark-Ouachita mountainous region, due to local soil conditions, to be particularly susceptible to landslides, especially during periods of heavy rains.




#### 4.4.6.2 - PREVIOUS OCCURRENCES

Since 2002, there has been one Presidential Disaster Declarations for the State of Arkansas for landslides (along with other associates hazard events such as flooding or severe storms). The following information is presented to provide a historical perspective on landslide events that have impacted the State of Arkansas.

**FEMA Landslide Disaster and Emergency Declarations 2002 -2023**

| Declaration Number | Incident Period | Disaster Description | Regional Counties Involved | Dollars Obligated |
|---|---|---|---|---|
| 1516 | April 19 - May 18, 2004 | Severe Storms, Flooding and Landslides | Washington, Madison, Franklin, Johnson, Carroll, Newton, Boone, Marion, Searcy, Baxter, Stone, Independence, Jackson and | $7,052,634 |

At present there is no centralized and complete database containing historical records for landslides in Arkansas. The following landslides and/or landslide repair projects, were researched from local news reports and available case studies provided by the Arkansas Geological Survey.

- **October 26, 2017:** Nearly three miles of Arkansas highway damaged from heavy rainfall in 2015 and 2016 are slated for repairs, according to a news release. The Arkansas State Highway Commission approved $5,000,000 in improvements to repair a .05-mile stretch of Arkansas 23 in Franklin and Madison counties, as well as 1.7 miles of Arkansas 59 in Crawford and Washington counties. Both roadways sustained landslide damage during severe storms in 2015 and 2016.

- **October 26, 2015:** A $1,880,000 project was conducted to repair landslide damage to two highways, Highway 7 and Highway 74, in Newton County.
- **May 10, 2015:** Heavy rains cause a landslide near Interstate 40 in Johnson County. One westbound lane of the interstate near Coal Hill is closed due to debris in the roadway.
- **June 11, 2010:** Excessive rains produced flash flooding in parts of western Arkansas, especially in southern Montgomery and northern Pike counties. This caused a landslide on Arkansas Highway 369 one-quarter mile southeast of Albert. Rocks and trees slid down onto the highway.
- **December 23-24, 2009**: in Boone and Conway Counties a strong but slow-moving storm resulted in 7-10 inches of rain. This resulted in a landslide on Gaither Mountain in Boone County. Water lines separated in the shifting ground and power outages occurred. Ridge Court developed a large crack and Blackjack Lane had large mounds develop. In Conway County this heavy rainfall led to a landslide on Petit Jean Mountain. Mud flowed down onto Arkansas Highway 154. Approximately 200 truckloads of mud, topsoil and fallen trees had to be removed.

#### 4.4.6.3 - HAZARD PROBABILITY ANALYSIS

Landslides with the potential to affect the State of Arkansas are incredibly difficult to quantify at the present time and to forecast. Compounding the difficulty, landslides occur due to triggering events such as earthquake shaking, blasting, wave or stream erosion, intense rainfall, freeze/thaw cycles, human (slope construction, adding weight, irrigation/pumping, timber harvest, steep slopes, lack of vegetation, or a combination of the above. Based on limited available data, and that as compared to the geology of other regions of the US (Washington, California, Oregon), it is not likely that a major landslide will impact the state. Since there have been 5 events since 2000 there is a 23% chance of a landslide occurring in any given year.

#### 4.4.6.4 VULNERABILITY ANALYSIS

Counties located within areas mapped by the United States Geological Survey, (based on the USGS map) as having high susceptibility and high incidence of landslides and of having high susceptibility and low incidence of landslides were determined to be most vulnerable. The following table indicates the number and valuation of state owned facilities and the number of bridges within those counties. This assumes an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential landslide event.

| County | State-Owned Properties valued over $100,000 | Total Valuation | Critical Facilities | Critical Facility Values |
|---|---|---|---|---|
| Benton | 42 | $187,483,529.72 | 9 | $20,793,432.56 |
| Boone | 34 | $88,586,892.96 | 8 | $9,303,386.12 |
| Carroll | 7 | $2,073,119.30 | 4 | $1,545,985.64 |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 |
| Cleburne | 11 | $36,847,548.25 | 4 | $2,061,124.38 |
| Conway | 76 | $55,626,364.83 | 4 | $1,627,388.29 |
| Crawford | 38 | $25,365,272.07 | 5 | $3,640,863.16 |
| Faulkner | 295 | $1,217,867,581.07 | 8 | $7,761,135.06 |
| Franklin | 17 | $34,387,533.73 | 3 | $842,906.65 |
| Garland | 120 | $170,275,197.06 | 9 | $9,311,635.69 |
| Grant | 8 | $4,117,068.71 | 7 | $4,001,568.71 |
| Hot Spring | 84 | $301,854,794.31 | 10 | $193,799,059.91 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 |
| Johnson | 16 | $8,150,351.06 | 6 | $2,998,316.49 |
| Lafayette | 15 | $6,608,475.68 | 6 | $1,878,830.68 |
| Logan | 87 | $136,349,990.20 | 4 | $1,116,877.63 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 |
| Madison | 17 | $7,116,437.26 | 5 | $2,583,642.97 |
| Miller | 17 | $112,750,921.68 | 4 | $2,136,754.03 |
| Montgomery | 6 | $1,786,277.98 | 4 | $1,506,992.51 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 |
| Newton | 8 | $2,973,644.76 | 5 | $2,186,847.15 |
| Ouachita | 67 | $132,961,321.03 | 9 | $4,729,918.11 |
| Perry | 7 | $2,365,119.68 | 3 | $675,236.80 |
| Pike | 33 | $16,250,267.73 | 4 | $1,567,310.07 |
| Polk | 18 | $19,618,252.24 | 4 | $1,736,600.40 |
| Pope | 127 | $549,329,560.19 | 10 | $5,326,204.73 |
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 |
| Scott | 8 | $2,665,524.39 | 5 | $1,638,971.22 |
| Searcy | 6 | $2,813,373.71 | 4 | $1,927,101.02 |
| Sebastian | 50 | $80,970,807.10 | 14 | $21,570,578.51 |

| | | | | |
|---|---|---|---|---|
| Sevier | 4 | $1,311,098.72 | 4 | $1,311,098.72 |
| Stone | 40 | $37,290,337.17 | 5 | $1,869,090.84 |
| Union | 50 | $131,527,527.57 | 6 | $3,765,195.32 |
| Van Buren | 7 | $2,434,162.08 | 4 | $1,700,450.94 |
| Washington | 108 | $111,752,738.51 | 12 | $6,780,582.89 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 |
| Yell | 39 | $16,311,150.68 | 7 | $4,149,915.87 |

Source: ADEM and Arkansas Insurance Department

**County Landslide Vulnerability**

| County | Percentage of County Within High Potential Slide Area | Number of Structures Within High Potential Slide Area | Building and Content Valuation |
|---|---|---|---|
| Benton | 0.30% | 76 | $14,831,000 |
| Boone | 1.70% | 105 | $18,658,000 |
| Carroll | 1.70% | 54 | $9,224,000 |
| Clark | 0.30% | 56 | $9,619,000 |
| Cleburne | 13.50% | 1,020 | $209,200,000 |
| Conway | 3.20% | 114 | $29,747,000 |
| Crawford | 44.30% | 4,223 | $814,467,000 |
| Faulkner | 3.70% | 965 | $172,081,000 |
| Franklin | 15.90% | 402 | $72,714,000 |
| Garland | 14.20% | 1,870 | $480,317,000 |
| Grant | 5.40% | 306 | $58,231,000 |
| Hot Spring | 2.00% | 64 | $9,183,000 |
| Independence | 5.90% | 712 | $154,517,000 |
| Jackson | 0.70% | 48 | $8,317,000 |
| Johnson | 29.80% | 571 | $89,223,000 |
| Lafayette | 0.40% | 4 | $604,000 |
| Logan | 24.00% | 1,025 | $171,912,000 |
| Lonoke | 0.80% | 467 | $135,874,000 |
| Madison | 21.60% | 1,129 | $171,484,000 |
| Miller | 3.80% | 262 | $47,212,000 |
| Montgomery | 15.70% | 254 | $37,551,000 |
| Nevada | 4.70% | 110 | $13,194,000 |
| Newton | 27.90% | 853 | $112,330,000 |
| Ouachita | 1.10% | 181 | $46,504,000 |
| Perry | 4.90% | 100 | $13,767,000 |
| Pike | 2.60% | 69 | $10,221,000 |
| Polk | 17.30% | 299 | $37,440,000 |
| Pope | 23.50% | 722 | $153,154,000 |
| Scott | 13.40% | 213 | $41,557,000 |
| Searcy | 9.40% | 252 | $35,915,000 |
| Sebastian | 16.80% | 4,706 | $1,420,635,000 |
| Sevier | 0.30% | 2 | $447,000 |

| | | | |
|---|---|---|---|
| Stone | 17.80% | 769 | $106,950,000 |
| Union | 3.00% | 165 | $36,288,000 |
| Van Buren | 25.90% | 2,047 | $328,198,000 |
| Washington | 17.20% | 3,205 | $722,538,000 |
| White | 8.70% | 1,492 | $290,985,000 |
| Yell | 6.20% | 301 | $52,743,000 |

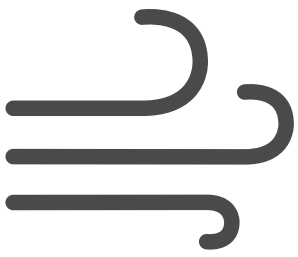
#### 4.4.6.5 - IMPACT AND CONSEQUENCE ANALYSIS

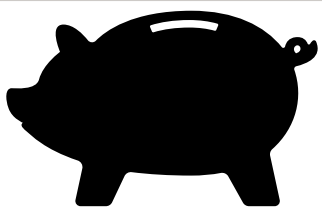
As per EMAP requirements, the following table provides the Consequence Analysis.

| **Landslide Consequence Analysis** | |
|---|---|
| **Subject** | **Impacts of Landslide** |
| Health and Safety of the Public | Severity and location dependent. Impacts on persons in the path of the slide are expected to be severe. |
| Health and Safety of Responders | Impacts are expected to be minimal. |
| Continuity of Operations | Minimal expectation of execution of the COOP, unless a facility is impacted. |
| Property, Facilities, and Infrastructure | Impact to property, facilities, and infrastructure could be minimal to severe, depending on the location of the facility in relation to the slide. Loss of structural integrity of buildings and infrastructure could occur. |
| Environment | Impact to the area would be minimal other than the immediate area. |
| Economic Conditions | Impacts to the economy will be dependent severity of landslide and the impact on structures and infrastructure. Impacts could be severe if roads/utilities are affected. Otherwise impact would be non-existent to minimal. |
| Public Confidence in the Jurisdiction's Governance | Confidence could be an issue if local development policies are questioned. |

# SEVERE STORMS

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>• Natural | • Populations - ALL<br>• Locations - All | • Number of Occurrences - 500+<br>• Presidential Declared Disasters<br>  • 5 between 2018-2023 |

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature  | Increased temperatures can lead to more severe weather in the State of Arkansas.<br><br>Data is limited on the direct impact of climate change and severe storms within the state. |
| Changes in Precipitation  | Data is limited for the state on how changes in precipitation effects severe storms such as thunderstorms. |
| Extreme Weather  | Data is limited for the State of Arkansas and the relationship between extreme weather and climate change. Overall data does show that frequency of sever storms has increased overtime. |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | All populations in Arkansas are venerable and can experience sever storms. |
|  | All government building in Arkansas are vulnerable and can be impacted by severe storms. |
|  | Roads and overhead power lines are most at risk to sever storms when concerning the built environment. |
|  | Agriculture is the most at risk natural resource when concerning sever storms. |
|  | Depending on the magnitude of sever storms determined the impact on the local and state economies. |

## 4.4.7 Severe Storms



A severe storm is a thunderstorm that produces a tornado, winds of at least 58 mph and/or hail at least 1 inch in diameter. According to the National Weather Service at Little Rock while severe storms can hit any time of day and any time of year in Arkansas, they are most likely between 2:00 pm and 10:00 pm (afternoon and evening) from March through May and also in November/ December. These are the months when air masses from Canada and the Gulf Coast clash the most.

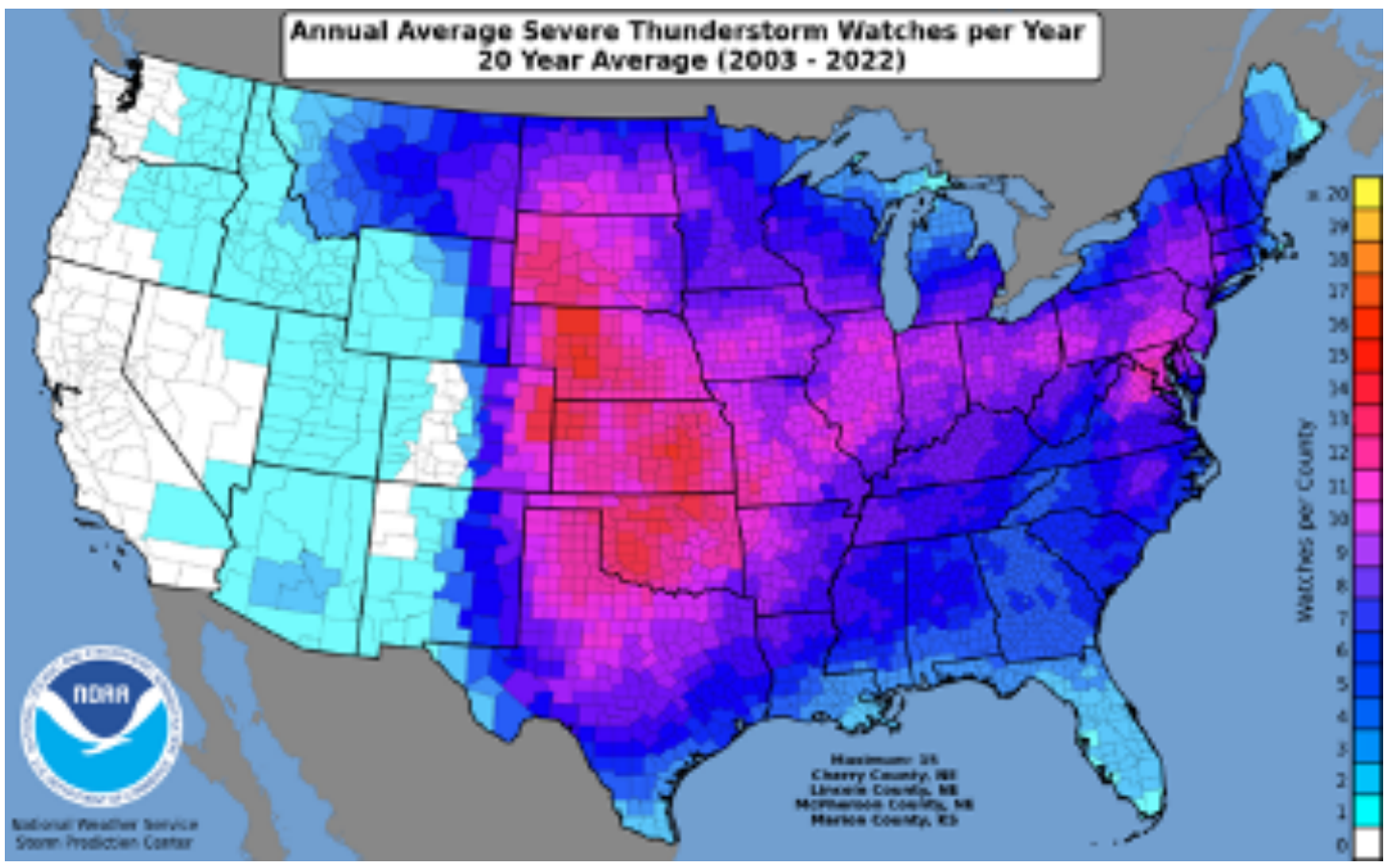
### 4.4.7.1 - LOCATION AND EXTENT

The entire state is susceptible to severe weather as Arkansas is in a temperate climate zone.

The NWS classifies thunderstorms using the following categories:

- **Marginal:** Isolated severe thunderstorms, limited in duration and/or coverage and/or intensity
- **Slight:** Scattered severe storms possible, Short-lived and/or not widespread, isolated intense storms possible
- **Enhanced:** Numerous severe storms possible, more persistent and/or widespread, a few intense
- **Moderate:** Widespread severe storms likely, long-lived, widespread and intense
- **High:** Widespread severe storms expected, long-lived, very widespread and particularly intense

The following map, generated by National Oceanic and Atmospheric Administration (NOAA), indicates the severe thunderstorm watches per year.




### 4.4.7.2 - PREVIOUS OCCURRENCES

Since 2002, there have been 28 Presidential Disaster Declarations for the State of Arkansas for severe storms (along with other associates hazard events such as flooding or tornados) The following information is presented to provide a historical perspective on severe storm events that have impacted the State of Arkansas.  Declaration numbers in bold indication declared disaster that have occurred since the previous mitigation plan update in 2018.

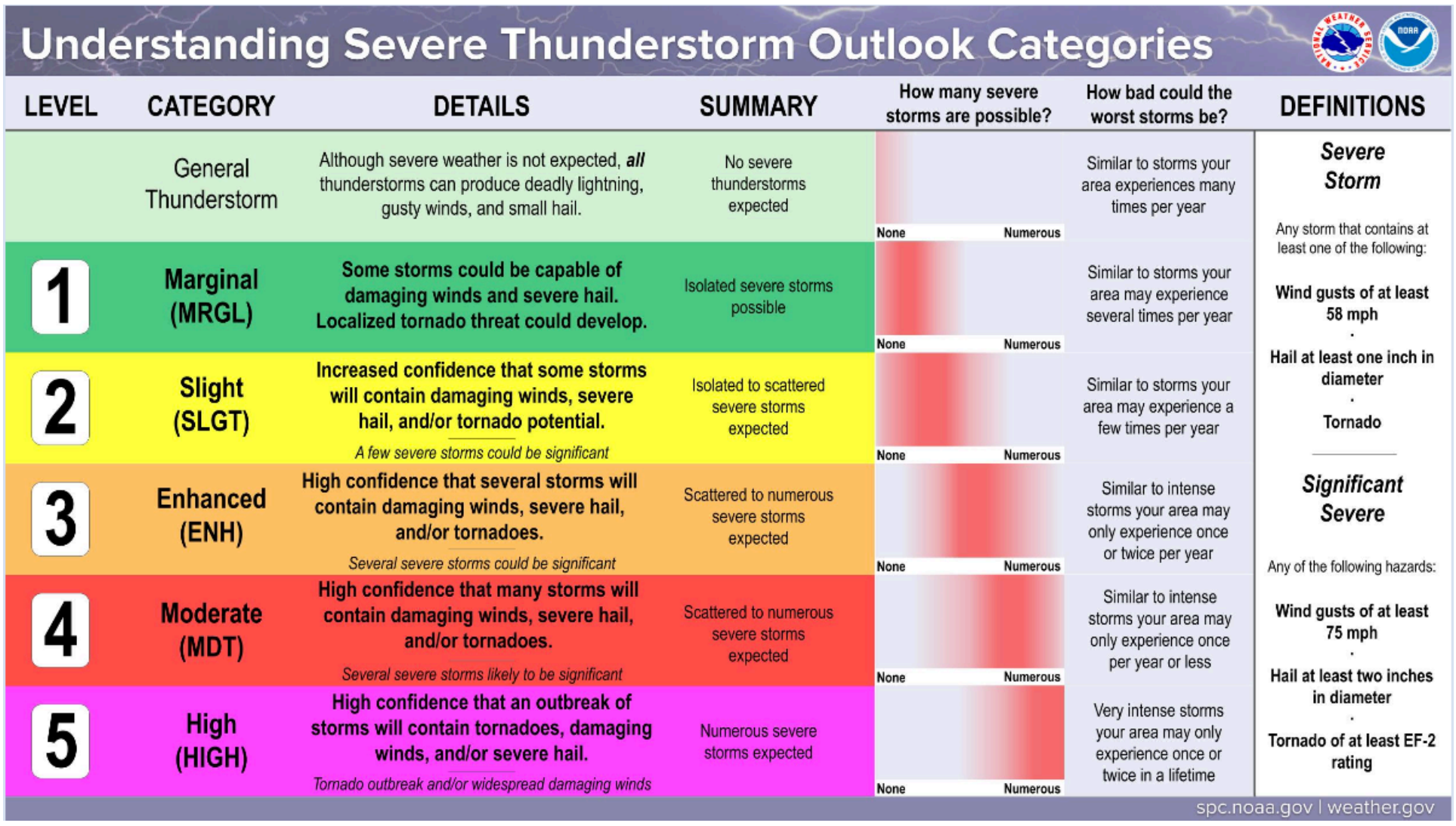
**FEMA Disaster and Emergency Declarations 2002 -2023**

| Declaration Number | Incident Period | Disaster Description | Regional Counties Involved | Dollars Obligated |
|---|---|---|---|---|
| 1400 | December 12, 2001 - January 30, 2002 | Severe Storms and Flooding | Ashley, Clay, Cleburne, Columbia, Crittenden, Franklin, Jackson, Lincoln, Little River, Logan, Monroe, Poinsett, Prairie, Scott, Stone and Woodruff | $2,225,097 |

| | | | | |
|---|---|---|---|---|
| 1472 | May 2 - June 10, 2003 | Severe Storms, Tornados, and Flooding | Benton, Chicot, Cleburne, Columbia, Conway, Craighead, Crittenden, Cross, Faulkner, Fulton, Jackson, Lonoke, Nevada, Perry, Poinsett, Phillips, St. Francis, White and Woodruff | $5,303,785 |
| 1516 | April 19 - May 18, 2004 | Severe Storms, Flooding and Landslides | Washington, Madison, Franklin, Johnson, Carroll, Newton, Boone, Marion, Searcy, Baxter, Stone, Independence, Jackson and Woodruff | $7,052,634 |
| 1528 | May 30 - July 9, 2004 | Severe Storms and Flooding | Bradley, Calhoun, Clark, Columbia, Hempstead, Howard, Lafayette, Little River, Nevada, Ouachita, Pike and Sevier | $3,303,678 |
| 1636 | April 1-3, 2006 | Severe Storms and Tornados | Conway, Cross, Fulton, Greene, Lawrence, Randolph and White | $2,286,579 |
| 1744 | February 5-12, 2008 | Severe Storms, Tornados, and Flooding | Baxter, Conway, Izard, Marion, Pope, Randolph, Sharp, Stone, Union and Van Buren | $5,020,005 |
| 1751 | March 18 - April 28, 2008 | Severe Storms, Tornados, and Flooding | Arkansas, Baxter, Benton, Boone, Carroll, Clay, Cleburne, Conway, Craighead, Crawford, Cross, Desha, Franklin, Fulton, Garland, Greene, Hempstead, Hot Spring, Independence, Izard, Jackson, Jefferson, Lawrence, Lee, Logan, Lonoke, Madison, Marion, Miller, Monroe, Newton, Perry, Phillips, Poinsett, Pope, Prairie, Pulaski, Randolph, Saline, Scott, Searcy, Sebastian, Sharp, St. Francis, Stone, Van Buren, Washington, White, Woodruff and Yell | $41,085,016 |
| 1758 | May 02-12, 2008 | Severe Storms, Flooding, and Tornados | Arkansas, Benton, Cleburne, Conway, Crittenden, Grant, Lonoke, Mississippi, Phillips, Pulaski, Saline and Van Buren | $2,676,958 |
| 1793 | September 02- 08, 2008 | Severe Storms and Flooding associated with Hurricane Gustav | Ashley, Bradley, Calhoun, Chicot, Clark, Cleveland, Conway, Dallas, Drew, Garland, Grant, Hot Spring, Lincoln, Montgomery, Perry, Prairie, Saline and Van Buren | $3,895,660 |
| 1804 | September 13-23, 2008 | Tropical Storm Ike | Carroll, Clark, Clay, Craighead, Greene, Hempstead, Howard, Izard, Lafayette, Lawrence, Little River, Madison, Miller, Montgomery, Nevada, Newton, Pike, Randolph, Sharp and Van Buren | $2,543,368 |
| 1834 | April 09, 2009 | Severe Storms and Tornados | Ashley, Howard, Miller, Polk and Sevier | $4,894,361 |
| 1845 | April 27 - May 23, 2009 | Severe Storms, Tornados, and Flooding | Arkansas, Bradley, Calhoun, Chicot, Clark, Cleveland, Conway, Dallas, Drew, Fulton, Grant, Greene, Hempstead, Hot Spring, Howard, Jackson, Jefferson, Lafayette, Lee, Lincoln, Little River, Marion, Miller, Monroe, Nevada, Ouachita, Perry, Phillips, Pike, Poinsett, Polk, Pope, Prairie, Saline, Searcy, St. Francis, Stone and Union | $9,425,734 |
| 1861 | October 29 - November 08, 2009 | Severe Storms, Tornados, and Flooding | Boone, Bradley, Calhoun, Carroll, Cleburne, Cleveland, Columbia, Conway, Cross, Dallas, Franklin, Fulton, Grant, Izard, Jackson, Johnson, Lafayette, Lawrence, Lincoln, Logan, Marion, Monroe, Nevada, Newton, Ouachita, Poinsett, Prairie, Pulaski, Randolph, Saint Francis, Scott, Sharp, Stone, Union, Van Buren, White and Woodruff | $15,536,008 |

| | | | | |
|---|---|---|---|---|
| 1872 | December 23, 2009 - January 02, 2010 | Severe Storms and Flooding | Bradley, Calhoun, Clark, Clay, Cleveland, Craighead, Dallas, Drew, Grant, Greene, Hempstead, Jackson, Jefferson, Lafayette, Lincoln, Lonoke, Miller, Monroe, Nevada, Ouachita, Poinsett, Prairie, Pulaski, White and Woodruff | $9,792,672 |
| 1975 | April 14 - June 03, 2011 | Severe Storms, Tornados, and associated Flooding | Arkansas, Benton, Boone, Carroll, Chicot, Clark, Clay, Crawford, Crittenden, Cross, Dallas, Desha, Faulkner, Garland, Greene, Hot Spring, Independence, Jackson, Jefferson, Lawrence, Lee, Lincoln, Lonoke, Madison, Mississippi, Monroe, Montgomery, Phillips, Poinsett, Prairie, Pulaski, Randolph, Saline, St. Francis, Washington, White, Woodruff | $50,596,048 |
| 4000 | May 24-26, 2011 | Severe Storms, Tornados, and Flooding | Franklin, Johnson | $2,701,536 |
| 4124 | May 30 - June 3, 2013 | Severe Storms, Tornados, and Flooding | Cleburne, Cross, Garland, Independence, Montgomery, Poinsett, Polk, Scott, Searcy, Stone, Van Buren and Woodruff | $8,395,922 |
| 4143 | August 08-14, 2013 | Severe Storms and Flooding | Benton, Boone, Carroll, Madison Marion and Newton | $8,184,460 |
| 4174 | April 27 -28, 2014 | Severe Storms, Tornados, and Flooding | Faulkner, Pulaski, Randolph and White | $10,053,785 |
| 4226 | May 7 - June 15, 2015 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Crawford, Garland, Howard, Jefferson, Little River, Miller, Perry, Sebastian and Sevier | $11,100,256 |
| 4254 | December 26, 2015 - January 22, 2016 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Benton, Carroll, Crawford, Faulkner, Jackson, Jefferson, Lee, Little River, Perry, Sebastian and Sevier | $11,367,572 |
| 4270 | March 8-13, 2016 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Columbia, Ouachita, Calhoun, Bradley, Ashley, Chicot, Cleveland, Lincoln, Desha, Arkansas, Philips and Prairie | $2,299,510 |
| 4318 | April 26 - May 19, 2017 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Benton, Boone, Carroll, Clay, Faulkner, Fulton, Jackson, Lawrence, Prairie, Pulaski, Randolph, Saline, Washington, White, Woodruff and Yell | $3,911,764 |
| **4441** | **June 8, 2019** | **Severe Storms and Flooding** | **Arkansas, Chicot, Conway, Crawford, Desha, Faulkner, Franklin, Jefferson, Johnson, Lincoln, Logan, Perry, Pope, Pulaski, Sebastian, Yell** | **$53,507,195.44** |
| **4460** | **September 13, 2019** | **Severe Storms, Tornadoes, Flooding, and Straight-line Winds** | **Madison, Newton, Washington** | **$5,877,299.51** |
| **4544** | **May 8, 2020** | **Severe Storms, Tornadoes, and Straight-line Winds** | **Craighead** | **$3,898,006.13** |
| **4556** | **July 10, 2020** | **Severe Storms ans Straight-line Winds** | **Arkansas, Bradley, Cleveland, Dallas, Desha, Drew, Grant, Jefferson, Lincoln, Monroe, Ouachita, Phillips** | **$9,743,407.16** |
| **4633** | **December 23, 2021** | **Severe Storms and Tornadoes** | **Craighead, Jackson, Mississippi, Poinsett, Woodruff** | **$935,304.83** |

Source: FEMA




#### 4.4.7.3 - HAZARD PROBABILITY ANALYSIS

Severe storms that create hail, lightning, and high wind events are a common occurrence throughout Arkansas. For probability purposes, each component of severe storms, including hail, lightning and high winds, were examined separately.

The following table summarizes hail event data for the State of Arkansas for the period 2018 through May 1, 2023, using available information from the NCDC.

| State of Arkansas Hail Data Summary | |
|---|---|
| **Data** | **Recorded Impact** |
| Number of Days with NCDC Reported Event | 110 |
| Average Events per Year | 22 |
| Number of Days with Event and Death or Injury: | 0 |
| Number of Days with Event and Property Damage | 16 |
| Total Reported NCDC Property Damage | $2,062,000.00 |
| Average Property Damage per Year | $412,400 |
| Number of Days with Event and Crop Damage: | 1 |
| Total Reported NCDC Crop Damage | $5,000.00 |
| Average Crop Damage per Year | $1,000.00 |

The following table summarizes recorded NCDC lightning events for the State of Arkansas for the period 2018 through May 1, 2023.

| State of Arkansas Lightning Data Summary | |
|---|---|
| **Data** | **Recorded Impact** |
| Number of Days with NCDC Reported Event | 20 |
| Average Events per Year | 4 |
| Number of Days with Event and Death or Injury: | 2 |

| | |
|---|---|
| Number of Days with Event and Property Damage | 17 |
| Total Reported NCDC Property Damage | 1,367,000.00 |
| Average Property Damage per Year | 273,400.00 |
| Number of Days with Event and Crop Damage: | 0 |
| Total Reported NCDC Crop Damage | $0 |
| Average Crop Damage per Year | $0 |

Source: NCDC

The following table summarizes recorded NCDC wind events, including high, strong and thunderstorm winds, for the State of Arkansas for the period 2018 through May 1, 2023.

| **State of Arkansas Wind Data Summary** | |
|---|---|
| **Data** | **Recorded Impact** |
| Number of Days with NCDC Reported Event | 76 |
| Average Events per Year | 15 |
| Number of Days with Event and Death or Injury: | 2 |
| Number of Days with Event and Property Damage | 55 |
| Total Reported NCDC Property Damage | $11,227,000.00 |
| Average Property Damage per Year | $2,245,400 |
| Number of Days with Event and Crop Damage: | 2 |
| Total Reported NCDC Crop Damage | $30,000.00 |
| Average Crop Damage per Year | $6,000.00 |

Source: NCDC

As indicated in the tables above, on average the State of Arkansas can expect between 11 and 43 severe storm impact events (hail and/or lightning and/or high wind events) per year.

#### 4.4.7.4 - VULNERABILITY ANALYSIS

For purposes of this assessment, all state-owned facilities within the state were determined to be at equal risk to severe storm events. The following table indicates the number and valuation of state owned facilities and the number of bridges within all Arkansas counties.  Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential severe storm event.

| **State-Owned Facilities Susceptible to Severe Storms** | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Total Valuation** | **Critical Facilities** | **Critical Facility Total Valuation** | **State-Owned Bridges** |
| State of Arkansas | 3792 | $10,898,646,452.31 | 576 | $2,361,260,565.35 | 7,303 |
| Arkansas | 18 | $8,188,582.03 | 8 | $4,632,718.64 | 75 |
| Ashley | 6 | $2,687,791.08 | 6 | $2,687,791.08 | 69 |
| Baxter | 45 | $91,766,282.09 | 5 | $2,219,240.82 | 35 |
| Benton | 42 | $187,483,529.72 | 9 | $20,793,432.56 | 156 |
| Boone | 34 | $88,586,892.96 | 8 | $9,303,386.12 | 55 |
| Bradley | 50 | $34,148,922.88 | 6 | $7,137,451.50 | 50 |
| Calhoun | 4 | $1,419,567.33 | 3 | $1,174,960.59 | 66 |
| Carroll | 7 | $2,073,119.30 | 4 | $1,545,985.64 | 67 |
| Chicot | 64 | $80,475,656.77 | 6 | $43,713,906.99 | 57 |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 | 113 |

| | | | | | |
|---|---|---|---|---|---|
| Clay | 16 | $10,077,262.01 | 4 | $987,511.15 | 85 |
| Cleburne | 11 | $36,847,548.25 | 4 | $2,061,124.38 | 28 |
| Cleveland | 3 | $705,243.86 | 3 | $705,243.86 | 61 |
| Columbia | 115 | $445,672,715.10 | 3 | $1,028,401.23 | 75 |
| Conway | 76 | $55,626,364.83 | 4 | $1,627,388.29 | 76 |
| Craighead | 227 | $1,319,922,341.64 | 10 | $9,154,672.74 | 175 |
| Crawford | 38 | $25,365,272.07 | 5 | $3,640,863.16 | 176 |
| Crittenden | 35 | $127,719,120.92 | 8 | $3,690,430.15 | 163 |
| Cross | 65 | $36,051,200.33 | 6 | $3,375,873.26 | 93 |
| Dallas | 6 | $2,111,608.88 | 4 | $1,554,408.18 | 81 |
| Desha | 13 | $4,733,763.86 | 4 | $1,564,467.00 | 50 |
| Drew | 17 | $7,416,013.74 | 9 | $4,664,369.45 | 85 |
| Faulkner | 295 | $1,217,867,581.07 | 8 | $7,761,135.06 | 124 |
| Franklin | 17 | $34,387,533.73 | 3 | $842,906.65 | 83 |
| Fulton | 24 | $12,583,989.23 | 5 | $2,214,766.13 | 65 |
| Garland | 120 | $170,275,197.06 | 9 | $9,311,635.69 | 152 |
| Grant | 8 | $4,117,068.71 | 7 | $4,001,568.71 | 96 |
| Greene | 47 | $31,323,797.11 | 6 | $4,320,196.19 | 93 |
| Hempstead | 73 | $76,583,328.98 | 10 | $8,713,511.18 | 132 |
| Hot Spring | 84 | $301,854,794.31 | 10 | $193,799,059.91 | 126 |
| Howard | 16 | $11,098,640.33 | 6 | $3,048,527.15 | 60 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 | 97 |
| Izard | 34 | $107,021,175.39 | 6 | $3,530,254.70 | 42 |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 | 111 |
| Jefferson | 161 | $393,195,391.16 | 27 | $219,978,530.97 | 151 |
| Johnson | 16 | $8,150,351.06 | 6 | $2,998,316.49 | 108 |
| Lafayette | 15 | $6,608,475.68 | 6 | $1,878,830.68 | 47 |
| Lawrence | 32 | $21,602,740.78 | 4 | $1,656,152.26 | 99 |
| Lee | 36 | $147,668,860.84 | 8 | $124,325,081.05 | 54 |
| Lincoln | 134 | $294,072,621.01 | 22 | $194,270,813.56 | 59 |
| Little River | 15 | $5,330,273.81 | 4 | $1,881,746.22 | 49 |
| Logan | 87 | $136,349,990.20 | 4 | $1,116,877.63 | 81 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 | 135 |
| Madison | 17 | $7,116,437.26 | 5 | $2,583,642.97 | 92 |
| Marion | 10 | $12,118,168.36 | 6 | $2,829,428.22 | 39 |
| Miller | 17 | $112,750,921.68 | 4 | $2,136,754.03 | 161 |
| Mississippi | 53 | $136,317,546.13 | 6 | $2,876,716.16 | 182 |
| Monroe | 5 | $2,343,993.15 | 5 | $2,343,993.15 | 78 |
| Montgomery | 6 | $1,786,277.98 | 4 | $1,506,992.51 | 88 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 | 101 |
| Newton | 8 | $2,973,644.76 | 5 | $2,186,847.15 | 41 |
| Ouachita | 67 | $132,961,321.03 | 9 | $4,729,918.11 | 90 |
| Perry | 7 | $2,365,119.68 | 3 | $675,236.80 | 81 |

| | | | | | |
|---|---|---|---|---|---|
| Phillips | 25 | $24,218,066.63 | 4 | $1,994,460.34 | 59 |
| Pike | 33 | $16,250,267.73 | 4 | $1,567,310.07 | 63 |
| Poinsett | 31 | $26,949,937.41 | 6 | $3,192,391.42 | 127 |
| Polk | 18 | $19,618,252.24 | 4 | $1,736,600.40 | 102 |
| Pope | 127 | $549,329,560.19 | 10 | $5,326,204.73 | 101 |
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 | 66 |
| Pulaski | 445 | $2,676,770,640.25 | 104 | $1,247,800,470.37 | 381 |
| Randolph | 39 | $88,255,338.41 | 4 | $2,624,642.63 | 84 |
| St. Francis | 68 | $158,283,776.17 | 5 | $1,795,505.00 | 100 |
| Saline | 8 | $2,665,524.39 | 5 | $1,638,971.22 | 123 |
| Scott | 6 | $2,813,373.71 | 4 | $1,927,101.02 | 44 |
| Searcy | 50 | $80,970,807.10 | 14 | $21,570,578.51 | 171 |
| Sebastian | 4 | $1,311,098.72 | 4 | $1,311,098.72 | 72 |
| Sevier | 11 | $11,336,228.20 | 5 | $1,969,885.73 | 54 |
| Sharp | 51 | $79,811,432.22 | 8 | $8,784,795.86 | 154 |
| Stone | 40 | $37,290,337.17 | 5 | $1,869,090.84 | 55 |
| Union | 50 | $131,527,527.57 | 6 | $3,765,195.32 | 124 |
| Van Buren | 7 | $2,434,162.08 | 4 | $1,700,450.94 | 50 |
| Washington | 108 | $111,752,738.51 | 12 | $6,780,582.89 | 171 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 | 205 |
| Woodruff | 4 | $1,249,134.83 | 4 | $1,249,134.83 | 62 |
| Yell | 39 | $16,311,150.68 | 7 | $4,149,915.87 | 128 |

Multiple factors can come into play when assessing vulnerability and loss analysis. However, for purposes of this plan, three major factors are being utilized to aid in the assessment:

- **Exposure Data:** The amount of agricultural crops and building stock at risk
- **Loss Data:** Historical losses from severe storm events
- **Percentage Loss:** Percent of agricultural crops and building stock lost over the given period

For vulnerability and loss estimation purposes all counties were considered at equal risk to severe storms and were evaluated. Counties with a higher identified population and number of structures are to be considered to have a potentially greater vulnerability. However, these assumed vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a potential severe storm event. The below information uses the latest data at this time.

| County Structural Vulnerability Data for Severe Storms | | | | | | | |
|---|---|---|---|---|---|---|---|
| **County** | **HAZUS Building Valuation** | **NCDC Structure Damage, Hail 2012-2017** | **Percentage of Building Valuation Damaged by Hail** | **NCDC Structure Damage, Lightning 2012-2017** | **Percentage of Building Valuation Damaged by Lightning** | **NCDC Structure Damage, Wind 2012-2017** | **Percentage of Building Valuation Damaged by Wind** |
| State of Arkansas | $12,168,205,000 | $1,129,300 | 0.009% | $3,093,000 | 0.025% | $24,304,287 | 0.200% |
| Arkansas | $2,245,000 | $5,000 | 0.223% | $0 | 0.000% | $196,000 | 8.731% |
| Ashley | $2,153,000 | $158,300 | 7.353% | $0 | 0.000% | $553,000 | 25.685% |
| Baxter | $4,332,000 | $0 | 0.000% | $0 | 0.000% | $287,000 | 6.625% |
| Benton | $23,138,000 | $225,000 | 0.972% | $200,000 | 0.864% | $192,000 | 0.830% |
| Boone | $3,624,000 | $0 | 0.000% | $0 | 0.000% | $75,000 | 2.070% |
| Bradley | $1,108,000 | $0 | 0.000% | $0 | 0.000% | $697,000 | 62.906% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Calhoun | $442,000,000 | $0 | 0.000% | $0 | 0.000% | $105,000 | 0.024% |
| Carroll | $2,754,000 | $30,000 | 1.089% | $0 | 0.000% | $77,000 | 2.796% |
| Chicot | $961,000,000 | $46,000 | 0.005% | $0 | 0.000% | $1,059,000 | 0.110% |
| Clark | $2,174,000 | $0 | 0.000% | $25,000 | 1.150% | $691,050 | 31.787% |
| Clay | $1,532,000 | $0 | 0.000% | $0 | 0.000% | $420,000 | 27.415% |
| Cleburne | $2,958,000 | $0 | 0.000% | $0 | 0.000% | $260,000 | 8.790% |
| Cleveland | $761,000,000 | $0 | 0.000% | $0 | 0.000% | $570,000 | 0.075% |
| Columbia | $2,429,000 | $0 | 0.000% | $0 | 0.000% | $100,000 | 4.117% |
| Conway | $1,772,000 | $0 | 0.000% | $0 | 0.000% | $323,000 | 18.228% |
| Craighead | $9,707,000 | $2,000 | 0.021% | $0 | 0.000% | $411,000 | 4.234% |
| Crawford | $5,637,000 | $125,000 | 2.217% | $0 | 0.000% | $111,000 | 1.969% |
| Crittenden | $4,447,000 | $0 | 0.000% | $150,000 | 3.373% | $399,000 | 8.972% |
| Cross | $1,540,000 | $0 | 0.000% | $0 | 0.000% | $280,000 | 18.182% |
| Dallas | $809,000,000 | $0 | 0.000% | $0 | 0.000% | $265,000 | 0.033% |
| Desha | $1,270,000 | $0 | 0.000% | $0 | 0.000% | $72,000 | 5.669% |
| Drew | $1,772,000 | $0 | 0.000% | $25,000 | 1.411% | $338,000 | 19.074% |
| Faulkner | $10,585,000 | $0 | 0.000% | $15,000 | 0.142% | $298,000 | 2.815% |
| Franklin | $1,581,000 | $30,000 | 1.898% | $0 | 0.000% | $161,000 | 10.183% |
| Fulton | $1,141,000 | $0 | 0.000% | $0 | 0.000% | $627,000 | 54.952% |
| Garland | $10,515,000 | $0 | 0.000% | $143,000 | 1.360% | $1,050,000 | 9.986% |
| Grant | $1,638,000 | $0 | 0.000% | $0 | 0.000% | $455,000 | 27.778% |
| Greene | $3,656,000 | $1,000 | 0.027% | $150,000 | 4.103% | $20,000 | 0.547% |
| Hempstead | $2,046,000 | $0 | 0.000% | $0 | 0.000% | $350,000 | 17.107% |
| Hot Spring | $2,678,000 | $0 | 0.000% | $0 | 0.000% | $616,000 | 23.002% |
| Howard | $1,381,000 | $0 | 0.000% | $0 | 0.000% | $70,000 | 5.069% |
| Independence | $3,540,000 | $0 | 0.000% | $0 | 0.000% | $166,000 | 4.689% |
| Izard | $1,278,000 | $0 | 0.000% | $0 | 0.000% | $1,827,000 | 142.958% |
| Jackson | $1,603,000 | $0 | 0.000% | $0 | 0.000% | $503,000 | 31.379% |
| Jefferson | $7,230,000 | $0 | 0.000% | $50,000 | 0.692% | 1,365,000 | 18.880% |
| Johnson | $2,067,000 | $0 | 0.000% | $0 | 0.000% | $434,300 | 21.011% |
| Lafayette | $628,000,000 | $0 | 0.000% | $0 | 0.000% | $175,000 | 0.028% |
| Lawrence | $1,547,000 | $1,000 | 0.065% | $0 | 0.000% | $462,000 | 29.864% |
| Lee | $775,000,000 | $0 | 0.000% | $0 | 0.000% | $0 | 0.000% |
| Lincoln | $829,000,000 | $0 | 0.000% | $0 | 0.000% | $20,000 | 0.002% |
| Little River | $1,206,000 | $0 | 0.000% | $0 | 0.000% | $30,000 | 2.488% |
| Logan | $2,155,000 | $0 | 0.000% | $0 | 0.000% | $301,200 | 13.977% |
| Lonoke | $6,235,000 | $0 | 0.000% | $601,000 | 9.639% | $185,000 | 2.967% |
| Madison | $1,378,000 | $0 | 0.000% | $0 | 0.000% | $5,000 | 0.363% |
| Marion | $1,644,000 | $1,000 | 0.061% | $0 | 0.000% | $170,000 | 10.341% |
| Miller | $3,930,000 | $0 | 0.000% | $10,000 | 0.254% | $120,000 | 3.053% |
| Mississippi | $4,421,000 | $0 | 0.000% | $25,000 | 0.565% | $425,000 | 9.613% |
| Monroe | $850,000,000 | $0 | 0.000% | $0 | 0.000% | $181,000 | 0.021% |
| Montgomery | $907,000,000 | $0 | 0.000% | $0 | 0.000% | $325,000 | 0.036% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Nevada | $847,000,000 | $0 | 0.000% | $0 | 0.000% | $50,000 | 0.006% |
| Newton | $842,000,000 | $0 | 0.000% | $0 | 0.000% | $223,000 | 0.026% |
| Ouachita | $2,418,000 | $0 | 0.000% | $0 | 0.000% | $3,687 | 0.152% |
| Perry | $856,000,000 | $0 | 0.000% | $0 | 0.000% | $238,000 | 0.028% |
| Phillips | $1,996,000 | $0 | 0.000% | $0 | 0.000% | $0 | 0.000% |
| Pike | $1,035,000 | $0 | 0.000% | $0 | 0.000% | $353,000 | 34.106% |
| Poinsett | $2,304,000 | $0 | 0.000% | $0 | 0.000% | $223,000 | 9.679% |
| Polk | $1,930,000 | $0 | 0.000% | $132,000 | 6.839% | $465,000 | 24.093% |
| Pope | $5,743,000 | $0 | 0.000% | $0 | 0.000% | $384,050 | 6.687% |
| Prairie | $823,000,000 | $0 | 0.000% | $0 | 0.000% | $50,000 | 0.006% |
| Pulaski | $48,464,000 | $25,000 | 0.052% | $887,000 | 1.830% | $1,000,000 | 2.063% |
| Randolph | $1,684,000 | $0 | 0.000% | $0 | 0.000% | $132,000 | 7.838% |
| St. Francis | $2,138,000 | $0 | 0.000% | $0 | 0.000% | $80,000 | 3.742% |
| Saline | $10,250,000 | $0 | 0.000% | $0 | 0.000% | $535,000 | 5.220% |
| Scott | $1,025,000 | $0 | 0.000% | $0 | 0.000% | $133,000 | 12.976% |
| Searcy | $852,000,000 | $0 | 0.000% | $0 | 0.000% | $428,000 | 0.050% |
| Sebastian | $13,612,000 | $385,000 | 2.828% | $0 | 0.000% | $331,000 | 2.432% |
| Sevier | $1,300,000 | $0 | 0.000% | $0 | 0.000% | $205,000 | 15.769% |
| Sharp | $1,817,000 | $0 | 0.000% | $0 | 0.000% | $561,000 | 30.875% |
| Stone | $1,149,000 | $0 | 0.000% | $0 | 0.000% | 401,000 | 34.900% |
| Union | $4,564,000 | $0 | 0.000% | $290,000 | 6.354% | $292,000 | 6.398% |
| Van Buren | $1,676,000 | $0 | 0.000% | $0 | 0.000% | $203,000 | 12.112% |
| Washington | $19,369,000 | $95,000 | 0.490% | $130,000 | 0.671% | $144,000 | 0.743% |
| White | $6,809,000 | $0 | 0.000% | $110,000 | 1.616% | $946,000 | 13.893% |
| Woodruff | $707,000,000 | $0 | 0.000% | $150,000 | 0.021% | $145,000 | 0.021% |
| Yell | $1,875,000 | $0 | 0.000% | $0 | 0.000% | $722,000 | 38.507% |

Source: NCDC and HAZUS

At potentially increased risk to severe storm events may be mobile homes. It is worth highlighting the following counties may have increased vulnerability to severe storm events due to the percentage of mobile homes:

- **Counties with 20%-25% of housing stock as mobile homes:** Ashley, Clark, Cleburne, Fulton, Hempstead, Independence, Izard, Lafayette, Madison, Nevada, Polk, Prairie, Saline, Searcy, Union and White
- **Counties with greater than 25% of housing stock as mobile homes:** Calhoun, Cleveland, Drew, Grant, Hot Spring, Lincoln, Perry, Pike, Sevier, Stone and Van Buren

Population vulnerability for each county is a function of the following component parts:

- Population changes over time
- Vulnerable populations
- Population density

In general:

- Counties with a high population are at increased risk
- Counties with growing populations are at increased risk
- Counties with a high population of children under 5 or adults over the age of 65 may be at increased risk.

It is worth highlighting the following counties may have increased vulnerability to severe storm events due to population factors:

- **Counties with a large population increase:** Benton, Craighead, Faulkner, Lonoke, Pulaski, Sebastian, Washington and White

- Counties with a population gain of over 1,000 children under the age of 5: Benton, Craighead Faulkner, Lonoke, Pulaski, Saline and Washington
- **Counties with a population gain of over 1,000 adults over the age of 65:** Baxter, Benton, Boone, Cleburne, Craighead, Crawford, Faulkner, Garland, Greene, Independence, Lonoke, Marion, Miller, Pope, Randolph, Saline, Sebastian, Washington and White

Available crop loss data from the USDA Risk Management Agency detailing cause of loss was researched to determine the financial impacts of flooding on the State's agricultural base. Crop loss data for the years 2023- 2019 indicate $945,984,040 in crop loss due to severe storms on 5,803,944 acres.

| USDA Risk Management Agency Cause of Loss Indemnities, Severe Storms | | | |
|---|---|---|---|
| **Year** | **Number of Reported Claims** | **Acres Lost** | **Total Amount of Loss** |
| 2023 | 61 | 8,464 | $827,406 |
| 2022 | 7,047 | 904,549 | $210,714,070 |
| 2021 | 7,804 | 1,195,045 | $179,186,422 |
| 2020 | 10,011 | 1,639,873 | $254,849,796 |
| 2019 | 12,174 | 2,056,012 | $300,406,347 |

The USDA Risk management Agency provides data on the crop exposure value, the total dollar value of all crops, for each Arkansas county.  USDA Risk Management Agency crop loss data allows us to quantify the monetary impact of severe storm conditions of the agricultural sector. In general, the higher the economic loss, the higher the vulnerability of the county to severe storm event components.

| USDA Risk Management Agency Severe Thunderstorm Data, 2019 - 2023 | | | |
|---|---|---|---|
| **County** | **Acres Planted** | **Acres Lost** | **Dollar Loss Amount** |
| State of Arkansas | 6,605,232.15 | 5,803,944.16 | $945,984,040.28 |
| Arkansas | 171,973.87 | 105,309.90 | $10,305,445.19 |
| Ashley | 132,795.54 | 115,845.62 | $16,411,826.90 |
| Baxter | - | - | - |
| Benton | 496.70 | 496.70 | $69,568.00 |
| Boone | - | - | - |
| Bradley | 927.35 | 942.65 | $5,160,072.06 |
| Calhoun | - | - | - |
| Carroll | - | - | - |
| Chicot | 283,560.81 | 196,741.68 | $25,175,956.69 |
| Clark | 16,229.20 | 16,732.75 | $2,730,254.50 |
| Clay | 157,329.60 | 149,993.91 | $30,112,338.33 |
| Cleburne | - | - | - |
| Cleveland | - | - | - |
| Columbia | - | - | - |
| Conway | 20,375.56 | 17,726.56 | $2,046,219.50 |
| Craighead | 184,124.73 | 175,315.17 | $36,234,981.67 |
| Crawford | 16,618.34 | 13,947.97 | $972,984.20 |
| Crittenden | 362,428.32 | 251,741.87 | $29,403,950.16 |
| Cross | 346,075.97 | 279,653.09 | $47,806,670.85 |
| Dallas | - | - | - |
| Desha | 348,343.23 | 298,314.54 | $36,664,005.42 |
| Drew | 80,738.18 | 71,900.40 | $9,948,170.89 |
| Faulkner | 17,331.32 | 17,213.31 | $2,402,732.00 |

| | | | |
|---|---|---|---|
| Franklin | 5,418.87 | 5,011.43 | $533,458.00 |
| Fulton | - | - | - |
| Garland | - | - | - |
| Grant | - | - | - |
| Greene | 201,958.95 | 206,760.93 | $48,206,320.57 |
| Hempstead | 160.40 | 160.40 | $27,023.00 |
| Hot Spring | 3,766.25 | 3,906.01 | $701,391.00 |
| Howard | 31.00 | 31.00 | $37,690.00 |
| Independence | 68,145.01 | 58,315.49 | $10,467,953.64 |
| Izard | - | - | - |
| Jackson | 393,318.67 | 390,419.34 | $105,491,846.17 |
| Jefferson | 313,970.64 | 309,197.44 | $52,635,731.92 |
| Johnson | 4,954.75 | 4,893.44 | $285,410.00 |
| Lafayette | 56,987.35 | 56,320.76 | $10,525,797.85 |
| Lawrence | 229,990.92 | 229,364.67 | $71,383,417.58 |
| Lee | 215,396.50 | 179,615.51 | $22,936,695.77 |
| Lincoln | 206,201.39 | 185,174.84 | $28,056,200.10 |
| Little River | 60,648.12 | 57,838.58 | $7,166,492.00 |
| Logan | 7,567.70 | 5,960.98 | $448,662.50 |
| Lonoke | 143,509.80 | 147,933.29 | $26,280,487.36 |
| Madison | - | - | - |
| Marion | - | - | - |
| Miller | 158,008.45 | 156,230.95 | $22,661,755.55 |
| Mississippi | 363,162.49 | 279,664.17 | $28,623,934.41 |
| Monroe | 275,414.75 | 250,292.54 | $39,082,058.28 |
| Montgomery | - | - | - |
| Nevada | 47.91 | 71.50 | $7,261.00 |
| Newton | - | - | - |
| Ouachita | - | - | - |
| Perry | 10,942.40 | 11,371.28 | $2,036,865.00 |
| Phillips | 580,136.47 | 506,224.42 | $49,070,639.33 |
| Pike | - | - | - |
| Poinsett | 289,520.68 | 269,178.67 | $43,107,483.73 |
| Polk | - | - | - |
| Pope | 11,344.71 | 12,968.68 | $1,978,219.50 |
| Prairie | 115,634.01 | 93,700.01 | $13,317,855.35 |
| Pulaski | 49,459.44 | 49,731.03 | $7,094,565.59 |
| Randolph | 76,373.26 | 77,264.91 | $20,095,921.10 |
| St. Francis | 228,838.07 | 183,840.37 | $19,194,560.01 |
| Saline | - | - | - |
| Scott | - | - | - |
| Searcy | - | - | - |
| Sebastian | 5,515.89 | 5,246.25 | $363,933.50 |

| | | | |
|---|---|---|---|
| Sevier | 2,417.99 | 2,417.99 | $242,358.50 |
| Sharp | - | - | - |
| Stone | - | - | - |
| Union | - | - | - |
| Van Buren | - | - | - |
| Washington | - | - | - |
| White | 96,864.46 | 92,569.92 | $18,761,319.80 |
| Woodruff | 280,018.00 | 250,487.08 | $38,634,057.61 |
| Yell | 10,158.16 | 9,904.15 | $1,081,498.20 |

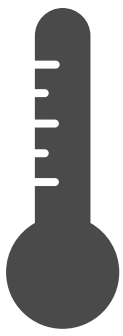
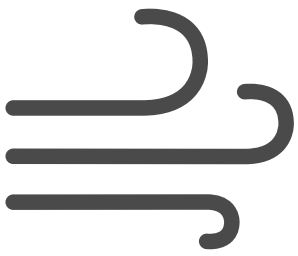
#### 4.4.7.5 - IMPACT AND CONSEQUENCE ANALYSIS

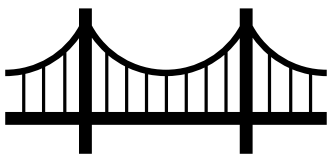
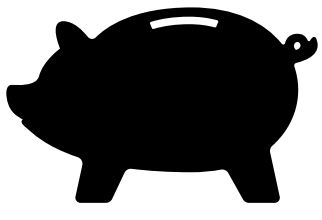
As per EMAP requirements, the following table provides the Consequence Analysis.

| Severe Storm Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Severe Storm** |
| Health and Safety of the Public | Severity and location dependent. Impacts on persons in the areas of hail, lightning and severe winds are expected to be severe if caught without proper shelter. |
| Health and Safety of Responders | Impacts will be predicated on the severity of the event. Damaged infrastructure will likely result in hazards such as downed utility lines, pipeline breaks and debris on roadways. . |
| Continuity of Operations | Temporary relocation may be necessary if government facilities experience damage. Services may be limited to essential tasks if utilities are impacted. |
| Property, Facilities, and Infrastructure | Impact to property, facilities, and infrastructure could be minimal to severe, depending on the location and structural capacity of the facility. Loss of structural integrity of buildings and infrastructure could occur. Utility lines, roads, residential and business properties will be affected. |
| Environment | Impact could be severe for the immediate impacted area, depending on the size of the event. Impact will lessen as distance increases from the immediate incident area |
| Economic Conditions | Impacts to the economy will depend on the severity of the event and the impact on structures and infrastructure. Impacts could be severe if roads/utilities are affected. |
| Public Confidence in the Jurisdiction's Governance | Public confidence could be eroded if response and recovery are not timely and effective. Warning systems in place and the timeliness of those warnings could affect confidence in government. |

# SEVERE WINTER STORMS

| Cause | Most At-risk | Past Events |
|---|---|---|
| Natural | • Populations - Entire State<br>• Locations - Entire State | • Number of Occurrences<br>  • 294 between 2018-2023<br>• Presidential Declared Disasters - 1 18-23 |

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature  | Changes in temerprature can impact the frequency of severe storm events.<br><br>Changes in temperature can impact the severity of severe winter storms. |
| Changes in Precipitation  | Increased precipitation can increase the magnitude of a severe winter storm. Data regarding this for Arkansas is very limited. |
| Extreme Weather  | Data regarding extreme weather such as ice storms is limited when dealing with climate change. |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | All populations of Arkansas can be impacted by severe winter storms. |
|  | All government building and operations can be impacted due to severe winter storms. Impact normally come in the form of delays or closure for a few hours to days. |
|  | The power grid, roads, and bridges are most at risk and can experience impacts during severe winter storms especially during ice storms. |
|  | Agriculture is most likely to be impacted all other impacts are expected to be minimal |
|  | The economic impact can be wide spread during a sever winters storm due to the amount of the state that can be impacted at one time during a severe winter storm. |

## 4.4.8 Severe Winter Storms



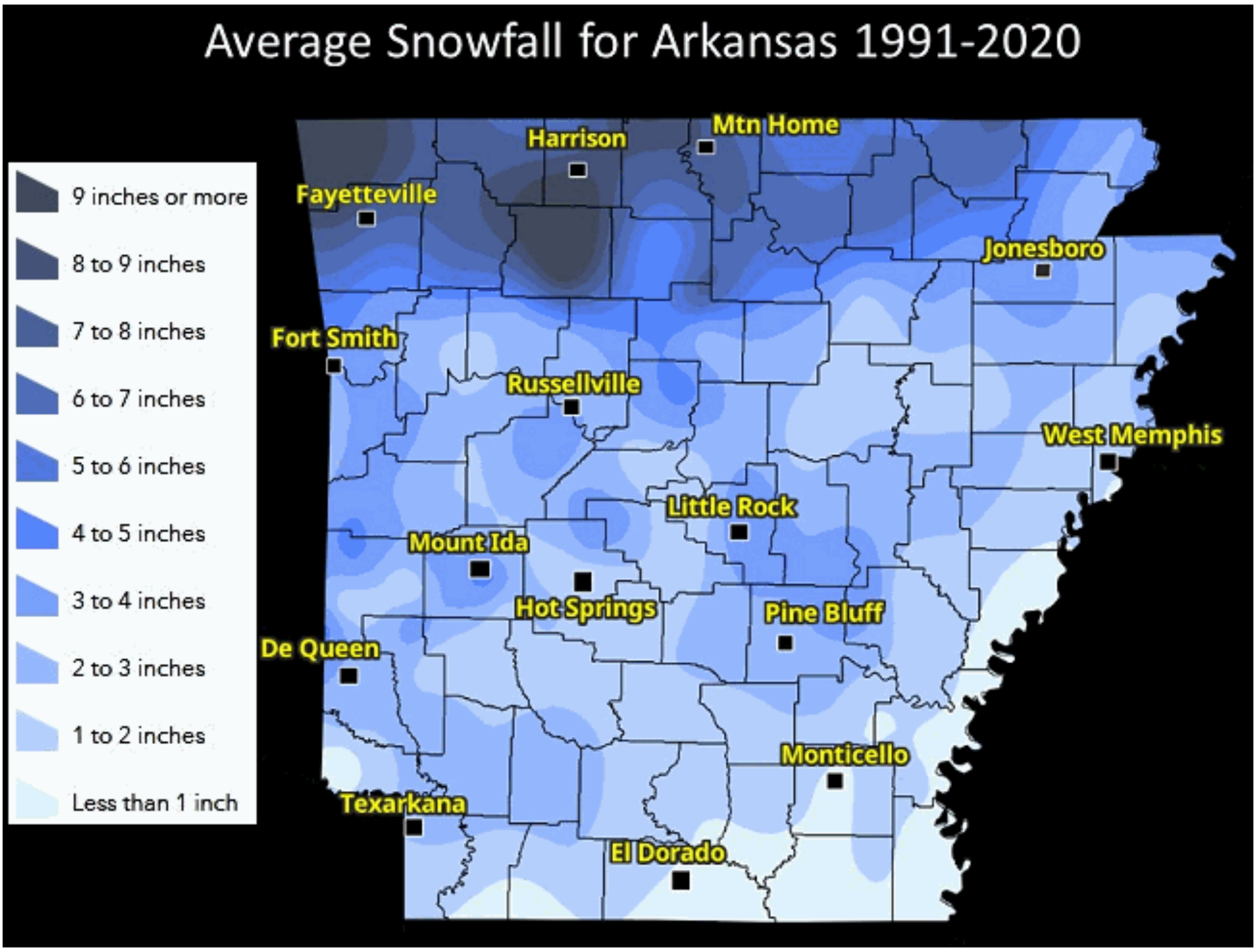
Winter weather in Arkansas usually comes in the form of light snow or freezing rain.  A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. Heavy accumulations of ice, often the result of freezing rain, can bring down trees, utility poles, and communications towers and disrupt communications and power for days.

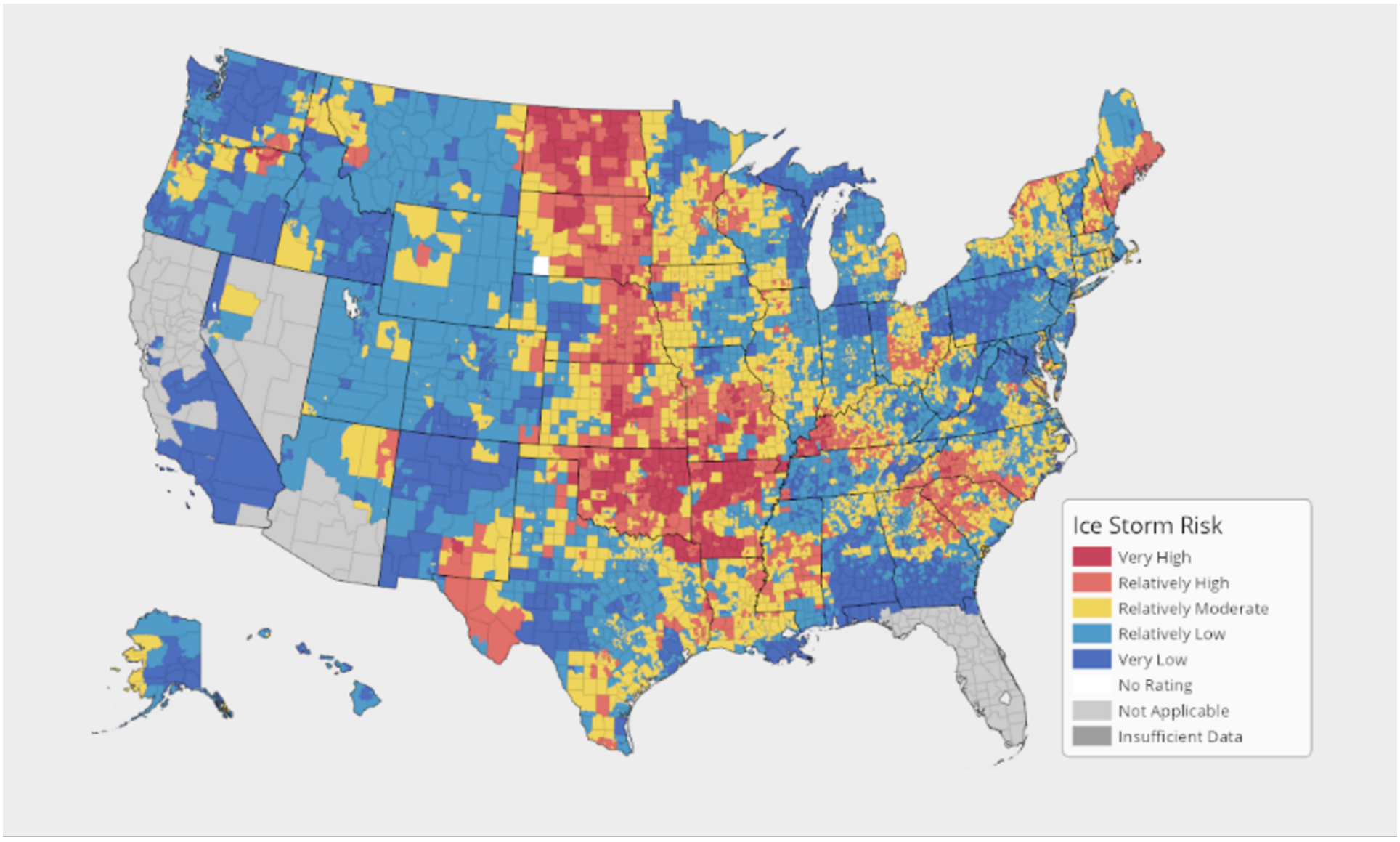
### 4.4.8.1 - LOCATION AND EXTENT

The entire state is susceptible to severe winter weather. The NWS describes the different types of events as follows:

- **Blizzard:** Winds of 35 mph or more with snow and blowing snow reducing visibility to less than 1/4 mile for at least three hours.
- **Blowing Snow:** Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls:** Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers:** Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain:** Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces forming a coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet:** Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

The following map, generated by NOAA, indicates the mean average snowfall for Arkansas for a given year.






#### 4.4.8.2 - PREVIOUS OCCURRENCES

Since 2002, there have been four Presidential Disaster Declarations for the State of Arkansas for severe winter storms. The following information is presented to provide a historical perspective on severe winter storm events that have impacted the State of Arkansas. Declaration numbers in bold indicate declared disasters that have occurred since the previous mitigation plan update in 2018.

| Declaration Number | Incident Period | Disaster Description | Regional Counties Involved | Dollars Obligated |
|---|---|---|---|---|
| 1450 | December 3-4, 2002 | Severe Ice Storm | Baxter, Clay, Cleburne, Craighead, Fulton, Greene, Independence, Izard, Jackson, Lawrence, Newton, Poinsett, Randolph, Searcy, Sharp, Stone, Van Buren and White | $9,548,872 |
| 3301 (Emergency) | January 26-30, 2009 | Severe Winter Storm | - | - |
| 1819 | January 26-30, 2009 | Severe Winter Storm | Baxter, Benton, Boone, Carroll, Clay, Craighead, Franklin, Fulton, Greene, Independence, Izard, Jackson, Johnson, Lawrence, Madison, Marion, Mississippi, Newton, Searcy, Sharp, Stone, Van Buren and Washington | $227,131,473 |
| 4100 | December 25 -26, 2012 | Severe Winter Storm | Clark, Garland, Grant, Hot Spring, Perry, Pulaski, Lonoke and Saline, | $8,549,244 |
| 4160 | December 05-07, 2013 | Severe Winter Storm | Crawford, Franklin, Fulton, Johnson, Logan, Madison, Marion, Newton, Polk, Scott, Searcy, Sebastian, Sharp and Van Buren | $5,586,404 |
| **4700** | **April 4, 2023** | **Severe Winter Storm** | **Bradley, Calhoun, Cleveland, Dallas, Desha, Drew, Grant, Jefferson, Lincoln, Nevada, Ouachita, Searcy, Stone** | **-** |

### 4.4.8.3 - HAZARD PROBABILITY ANALYSIS

Severe winter storms (including blizzard, ice storm and winter storm events) occur sporadically throughout Arkansas. For probability purposes, each component of severe winter storms, were examined and combined. The following table summarizes recorded NCDC winter storm events for the State of Arkansas for the period 2018 through May 1, 2023.

| State of Arkansas Severe Winter Storm Data Summary | |
|---|---|
| Data | Recorded Impact |
| Number of NCDC Reported Events | 294 |
| Number of Days with NCDC Reported Event | 26 |
| Average Events per Year | 5 |
| Number of Days with Event and Death or Injury: | 0 |
| Number of Days with Event and Property Damage | 4 |
| Total Reported NCDC Property Damage | $1,291,000.00 |
| Average Property Damage per Year | $258,200.00 |
| Number of Days with Event and Crop Damage: | 0 |
| Total Reported NCDC Crop Damage | $0 |
| Average Crop Damage per Year | $0 |

Source: NCDC

As indicated in the tables above, on average the State of Arkansas can expect five severe winter storm impact events (blizzard, ice storm, or winter storm events) per year.

### 4.4.8.4 - VULNERABILITY ANALYSIS

For purposes of this assessment, all state-owned facilities within the state were determined to be at equal risk to severe winter storm events. The following table indicates the number and valuation of state owned facilities and the number of bridges within all Arkansas counties. Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential severe storm event.

| State-Owned Facilities Susceptible to Severe Winter Storms | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Total Valuation** | **Critical Facilities** | **Critical Facility Total Valuation** | **State-Owned Bridges** |
| State of Arkansas | 3792 | $10,898,646,452.31 | 576 | $2,361,260,565.35 | 7,303 |
| Arkansas | 18 | $8,188,582.03 | 8 | $4,632,718.64 | 75 |
| Ashley | 6 | $2,687,791.08 | 6 | $2,687,791.08 | 69 |
| Baxter | 45 | $91,766,282.09 | 5 | $2,219,240.82 | 35 |
| Benton | 42 | $187,483,529.72 | 9 | $20,793,432.56 | 156 |
| Boone | 34 | $88,586,892.96 | 8 | $9,303,386.12 | 55 |
| Bradley | 50 | $34,148,922.88 | 6 | $7,137,451.50 | 50 |
| Calhoun | 4 | $1,419,567.33 | 3 | $1,174,960.59 | 66 |
| Carroll | 7 | $2,073,119.30 | 4 | $1,545,985.64 | 67 |
| Chicot | 64 | $80,475,656.77 | 6 | $43,713,906.99 | 57 |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 | 113 |
| Clay | 16 | $10,077,262.01 | 4 | $987,511.15 | 85 |
| Cleburne | 11 | $36,847,548.25 | 4 | $2,061,124.38 | 28 |
| Cleveland | 3 | $705,243.86 | 3 | $705,243.86 | 61 |
| Columbia | 115 | $445,672,715.10 | 3 | $1,028,401.23 | 75 |

| | | | | | |
|---|---|---|---|---|---|
| Conway | 76 | $55,626,364.83 | 4 | $1,627,388.29 | 76 |
| Craighead | 227 | $1,319,922,341.64 | 10 | $9,154,672.74 | 175 |
| Crawford | 38 | $25,365,272.07 | 5 | $3,640,863.16 | 176 |
| Crittenden | 35 | $127,719,120.92 | 8 | $3,690,430.15 | 163 |
| Cross | 65 | $36,051,200.33 | 6 | $3,375,873.26 | 93 |
| Dallas | 6 | $2,111,608.88 | 4 | $1,554,408.18 | 81 |
| Desha | 13 | $4,733,763.86 | 4 | $1,564,467.00 | 50 |
| Drew | 17 | $7,416,013.74 | 9 | $4,664,369.45 | 85 |
| Faulkner | 295 | $1,217,867,581.07 | 8 | $7,761,135.06 | 124 |
| Franklin | 17 | $34,387,533.73 | 3 | $842,906.65 | 83 |
| Fulton | 24 | $12,583,989.23 | 5 | $2,214,766.13 | 65 |
| Garland | 120 | $170,275,197.06 | 9 | $9,311,635.69 | 152 |
| Grant | 8 | $4,117,068.71 | 7 | $4,001,568.71 | 96 |
| Greene | 47 | $31,323,797.11 | 6 | $4,320,196.19 | 93 |
| Hempstead | 73 | $76,583,328.98 | 10 | $8,713,511.18 | 132 |
| Hot Spring | 84 | $301,854,794.31 | 10 | $193,799,059.91 | 126 |
| Howard | 16 | $11,098,640.33 | 6 | $3,048,527.15 | 60 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 | 97 |
| Izard | 34 | $107,021,175.39 | 6 | $3,530,254.70 | 42 |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 | 111 |
| Jefferson | 161 | $393,195,391.16 | 27 | $219,978,530.97 | 151 |
| Johnson | 16 | $8,150,351.06 | 6 | $2,998,316.49 | 108 |
| Lafayette | 15 | $6,608,475.68 | 6 | $1,878,830.68 | 47 |
| Lawrence | 32 | $21,602,740.78 | 4 | $1,656,152.26 | 99 |
| Lee | 36 | $147,668,860.84 | 8 | $124,325,081.05 | 54 |
| Lincoln | 134 | $294,072,621.01 | 22 | $194,270,813.56 | 59 |
| Little River | 15 | $5,330,273.81 | 4 | $1,881,746.22 | 49 |
| Logan | 87 | $136,349,990.20 | 4 | $1,116,877.63 | 81 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 | 135 |
| Madison | 17 | $7,116,437.26 | 5 | $2,583,642.97 | 92 |
| Marion | 10 | $12,118,168.36 | 6 | $2,829,428.22 | 39 |
| Miller | 17 | $112,750,921.68 | 4 | $2,136,754.03 | 161 |
| Mississippi | 53 | $136,317,546.13 | 6 | $2,876,716.16 | 182 |
| Monroe | 5 | $2,343,993.15 | 5 | $2,343,993.15 | 78 |
| Montgomery | 6 | $1,786,277.98 | 4 | $1,506,992.51 | 88 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 | 101 |
| Newton | 8 | $2,973,644.76 | 5 | $2,186,847.15 | 41 |
| Ouachita | 67 | $132,961,321.03 | 9 | $4,729,918.11 | 90 |
| Perry | 7 | $2,365,119.68 | 3 | $675,236.80 | 81 |
| Phillips | 25 | $24,218,066.63 | 4 | $1,994,460.34 | 59 |
| Pike | 33 | $16,250,267.73 | 4 | $1,567,310.07 | 63 |
| Poinsett | 31 | $26,949,937.41 | 6 | $3,192,391.42 | 127 |
| Polk | 18 | $19,618,252.24 | 4 | $1,736,600.40 | 102 |

| | | | | | |
|---|---|---|---|---|---|
| Pope | 127 | $549,329,560.19 | 10 | $5,326,204.73 | 101 |
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 | 66 |
| Pulaski | 445 | $2,676,770,640.25 | 104 | $1,247,800,470.37 | 381 |
| Randolph | 39 | $88,255,338.41 | 4 | $2,624,642.63 | 84 |
| St. Francis | 68 | $158,283,776.17 | 5 | $1,795,505.00 | 100 |
| Saline | 8 | $2,665,524.39 | 5 | $1,638,971.22 | 123 |
| Scott | 6 | $2,813,373.71 | 4 | $1,927,101.02 | 44 |
| Searcy | 50 | $80,970,807.10 | 14 | $21,570,578.51 | 171 |
| Sebastian | 4 | $1,311,098.72 | 4 | $1,311,098.72 | 72 |
| Sevier | 11 | $11,336,228.20 | 5 | $1,969,885.73 | 54 |
| Sharp | 51 | $79,811,432.22 | 8 | $8,784,795.86 | 154 |
| Stone | 40 | $37,290,337.17 | 5 | $1,869,090.84 | 55 |
| Union | 50 | $131,527,527.57 | 6 | $3,765,195.32 | 124 |
| Van Buren | 7 | $2,434,162.08 | 4 | $1,700,450.94 | 50 |
| Washington | 108 | $111,752,738.51 | 12 | $6,780,582.89 | 171 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 | 205 |
| Woodruff | 4 | $1,249,134.83 | 4 | $1,249,134.83 | 62 |
| Yell | 39 | $16,311,150.68 | 7 | $4,149,915.87 | 128 |

Source: HAZUS, Arkansas Insurance Department and ADEM

Multiple factors can come into play when assessing vulnerability and loss analysis. However, for purposes of this plan, three major factors are being utilized to aid in the assessment:

- **Exposure Data:** The amount of agricultural crops and building stock at risk
- **Loss Data:** Historical losses from winter storm events
- **Percentage Loss:** Percent of agricultural crops and building stock lost over the given period

For vulnerability and loss estimation purposes all counties were considered at equal risk of severe winter storms. Counties with a higher identified population and number of structures have a potentially greater vulnerability. However, these vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a severe winter storm event. Note, only counties with recorded NCDC damages are listed in the table below.

**County Structure Vulnerability Data for Severe Winter Storms**

| County | HAZUS Building Valuation | NCDC Structure Damage, Winter Storm 2018-2023 | Percentage of Building Valuation Damaged by Winter Storm |
|---|---|---|---|
| State of Arkansas | $12,168,205,000 | $30,560,000 | 0.251% |
| Ashley | $2,153,000 | $3,590,000 | 166.744% |
| Benton | $23,138,000 | $175,000 | 0.756% |
| Chicot | $961,000,000 | $50,000 | 0.005% |
| Clay | $1,532,000 | $170,000 | 11.097% |
| Cleburne | $2,958,000 | $10,000 | 0.338% |
| Columbia | $2,429,000 | $170,000 | 6.999% |
| Cross | $1,540,000 | $10,000 | 0.649% |
| Drew | $1,772,000 | $230,000 | 12.980% |
| Franklin | $1,581,000 | $880,000 | 55.661% |
| Fulton | $1,141,000 | $55,000 | 4.820% |

| | | | |
|---|---|---|---|
| Garland | $10,515,000 | $55,000 | 0.523% |
| Hempstead | $2,046,000 | $45,000 | 2.199% |
| Howard | $1,381,000 | $370,000 | 26.792% |
| Independence | $3,540,000 | $255,000 | 7.203% |
| Izard | $1,278,000 | $720,000 | 56.338% |
| Jackson | $1,603,000 | $70,000 | 4.367% |
| Jefferson | $7,230,000 | $1,350,000 | 18.672% |
| Little River | $1,206,000 | $2,025,000 | 167.910% |
| Logan | $2,155,000 | $245,000 | 11.369% |
| Lonoke | $6,235,000 | $70,000 | 1.123% |
| Madison | $1,378,000 | $10,100,000 | 732.946% |
| Mississippi | $4,421,000 | $280,000 | 6.333% |
| Monroe | $850,000,000 | $125,000 | 0.015% |
| Nevada | $847,000,000 | $330,000 | 0.039% |
| Newton | $842,000,000 | $10,000 | 0.001% |
| Ouachita | $2,418,000 | $145,000 | 5.997% |
| Poinsett | $2,304,000 | $1,525,000 | 66.189% |
| Polk | $1,930,000 | $350,000 | 18.135% |
| Pope | $5,743,000 | $150,000 | 2.612% |
| Prairie | $823,000,000 | $260,000 | 0.032% |
| St. Francis | $2,138,000 | $160,000 | 7.484% |
| Saline | $10,250,000 | $3,025,000 | 29.512% |
| Scott | $1,025,000 | $380,000 | 37.073% |
| Sevier | $1,300,000 | $1,430,000 | 110.000% |
| Sharp | $1,817,000 | $230,000 | 12.658% |
| Union | $4,564,000 | $195,000 | 4.273% |
| Washington | $19,369,000 | $330,000 | 1.704% |
| White | $6,809,000 | $630,000 | 9.252% |
| Woodruff | $707,000,000 | $250,000 | 0.035% |
| Yell | $1,875,000 | $110,000 | 5.867% |

Population vulnerability for each county is a function of the following component parts:

- Population change over time
- Vulnerable populations
- Population density

In general:

- Counties with a high population are at increased risk
- Counties with growing populations are at increasing risk
- Counties with a high population of children under 5 or adults over the age of 65 may be at increased risk.

The following counties may have increased vulnerability to severe storm events due to population factors:

- **Counties with a large population increase:** Benton, Craighead, Faulkner, Lonoke, Pulaski, Sebastian, Washington and White
- Counties with a population gain of over 1,000 children under the age of 5: Benton, Craighead Faulkner, Lonoke, Pulaski, Saline and Washington

- **Counties with a population gain of over 1,000 adults over the age of 65:** Baxter, Benton, Boone, Cleburne, Craighead, Crawford, Faulkner, Garland, Greene, Independence, Lonoke, Marion, Miller, Pope, Randolph, Saline, Sebastian, Washington and White

Available crop loss data from the USDA Risk Management Agency detailing cause of loss was researched to determine the financial impacts of drought on the State's agricultural base. Crop loss data for the years 2019 -2022 indicate $1,045,608 in crop loss due to severe winter storms on 3,490 acres.

| USDA Risk Management Agency Cause of Loss Indemnities, Severe Winter Storms | | | |
|---|---|---|---|
| **Year** | **Number of Reported Claims** | **Acres Lost** | **Total Amount of Loss** |
| 2022 | 7 | 1,515 | $207,804 |
| 2021 | 17 | 431 | $423,800 |
| 2020 | 13 | 1,217 | $301,344 |
| 2019 | 7 | 328 | $112,661 |

Source: USDA Risk Management Agency

The USDA Risk Management Agency provides data on the crop exposure value, the total dollar value of all crops, for each Arkansas county. USDA Risk Management Agency crop loss data allows us to quantify the monetary impact of severe winter storm conditions of the agricultural sector. In general, the higher the monetary loss, the higher the vulnerability of the county to severe storm event components Please note that only counties that had crop loss data reported to the USDA are detailed below.

| County Agricultural Vulnerability Data for Severe Winter Storms | | | |
|---|---|---|---|
| **County** | **Acres Planted** | **Acres Lost** | **Dollar Amount** |
| State of Arkansas | 3,624 | 3,490 | $1,045,608 |
| Ashley | 3 | 3 | $16,591 |
| Benton | 65 | 65 | $87,455 |
| Boone | 149 | 149 | $360,812 |
| Bradley | 12 | 10 | $6,196 |
| Chicot | 727 | 727 | $183,570 |
| Clay | 24 | 24 | $3,534 |
| Craighead | 90 | 90 | $15,890 |
| Crawford | 24 | 24 | $1,466 |
| Cross | 204 | 100 | $3,480 |
| Howard | 16 | 16 | $40,500 |
| Independence | 75 | 75 | $1,840 |
| Jefferson | 303 | 303 | $56,061 |
| Johnson | 16 | 16 | $24,433 |
| Lafayette | 378 | 378 | $62,105 |
| Lee | 204 | 204 | $21,623 |
| Logan | 49 | 21 | $753 |
| Lonoke | 88 | 88 | $3,557 |
| Miller | 1132 | 1132 | $142,566 |
| Phillips | 65 | 65 | $11,728 |
| Washington | 1 | 1 | $1,450 |

#### 4.4.8.5 - IMPACT AND CONSEQUENCE ANALYSIS

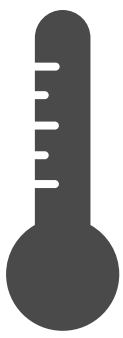
As per EMAP requirements, the following table provides the Consequence Analysis.

| **Severe Winter Storm Consequence Analysis** | |
|---|---|
| Subject | Impacts of Severe Winter Storm |
| Health and Safety of the Public | Severity and location dependent. Impacts on persons in the areas of snow and ice are expected to be severe if they are without proper shelter. |
| Health and Safety of Responders | Impacts will be predicated on the severity of the event. Damaged infrastructure will likely result in hazards such as downed utility lines, main breakages and debris on roadways. . |
| Continuity of Operations | Temporary relocation may be necessary if government facilities experience damage. Services may be limited to essential tasks if utilities are impacted. |
| Property, Facilities, and Infrastructure | Impact to property, facilities, and infrastructure could be minimal to severe, depending on the location and structural capacity of the facility. Loss of structural integrity of buildings and infrastructure could occur. Utility lines, roads, residential and business properties will be affected. |
| Environment | Impact could be severe for the immediate impacted area, depending on the size of the event. Impact will lessen as distance increases from the immediate incident area |
| Economic Conditions | Impacts to the economy will depend on the severity of the event and the impact on structures and infrastructure. Impacts could be severe if roads/utilities are affected. |
| Public Confidence in the Jurisdiction's Governance | Public confidence could be eroded if response and recovery are not timely and effective. Warning systems in place and the timeliness of those warnings could affect confidence in government. |

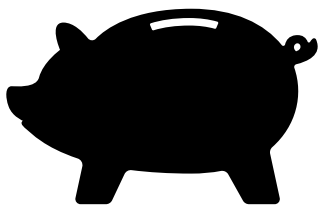
# TORNADO

| Cause | Most At-risk | Past Events |
|---|---|---|
| Natural | • Populations - Entire State<br>• Locations - Entire State | • Number of Occurrences<br>  • 234 between 2018-2023<br>• Presidential Declared Disasters - 4 |

## Potential Effects of Climate Change

| | |
|---|---|
| **Changes in Temperature**  | Tornadoes have happened throughout Arkansas at anytime of the year especially when there is a warm spell and then a cold front moves in.<br><br>Warmer Winters and Fall months have resulted in expanded tornado season in Arkansas. |
| **Extreme Weather**  | Extreme weather events can cause increases in tornadoes in Arkansas especially with warm fall months and winter months |

## Key Sectors Vulnerability and Exposure

| | |
|---|---|
|  | All populations in Arkansas are at risk of experiencing a tornado. Populations that are homeless or living in mobile homes can be more at risk of being impacted if a tornado occurs in an area. |
|  | All government offices and can be impacted by a tornado in Arkansas. A few government building have reinforced structures that may reduce the likelihood of damage however this is limited statewide. |
|  | The built environment in the entire state can be impacted by a tornado where they occur. Power lines and above ground utilities are most at risk where is concerns the built environment. |
|  | Natural resources that are most at risk would be agriculture. |
|  | The economic impact could be limited to a community level or felt statewide. The impact is determined by the community impacted and the scope of damage that comes as a result of the storm. |

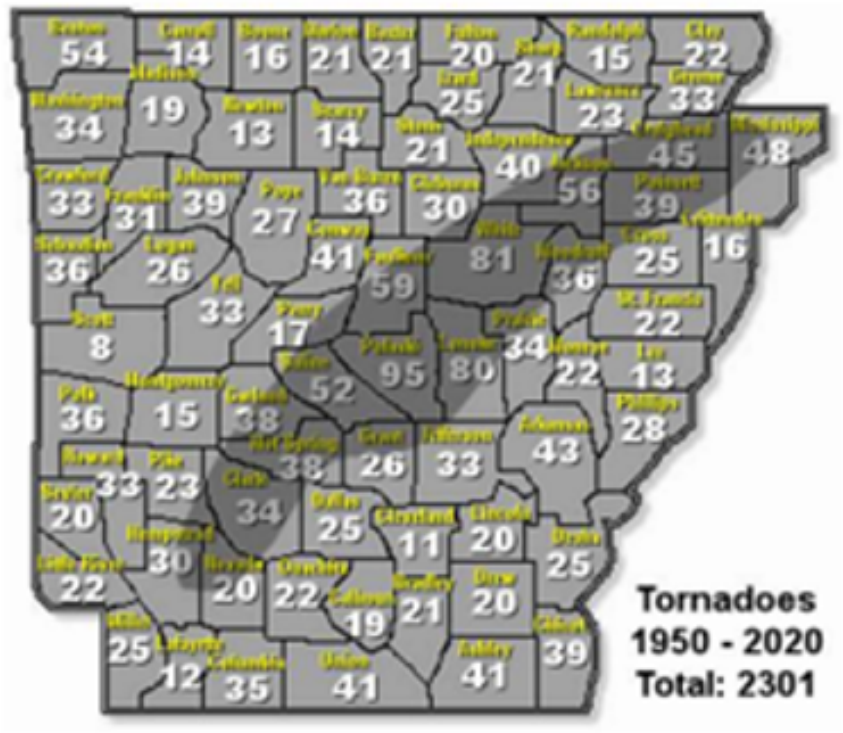
## 4.4.9 Tornado

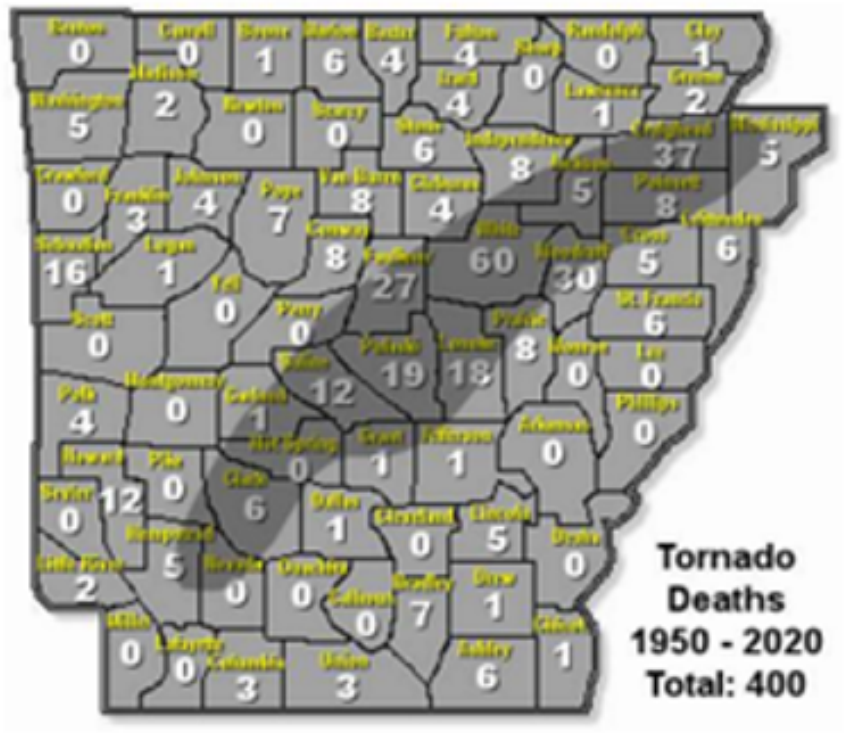


A tornado is a violently rotating column of air in contact with the ground.  Often referred to as a twister or a cyclone, they can strike anywhere and with little warning. Tornados come in many shapes and sizes but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris and dust.

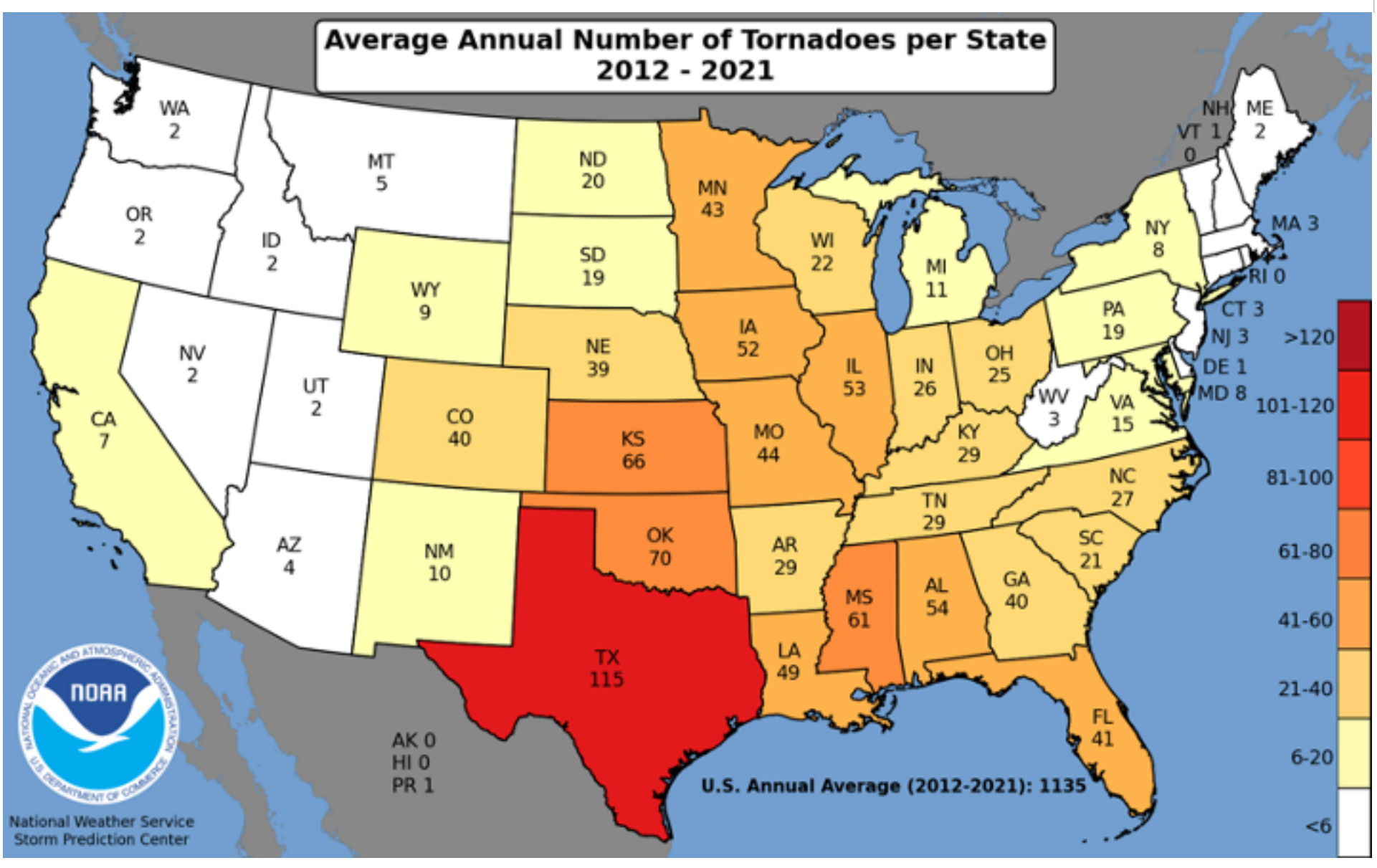
### 4.14.1 - LOCATION AND EXTENT

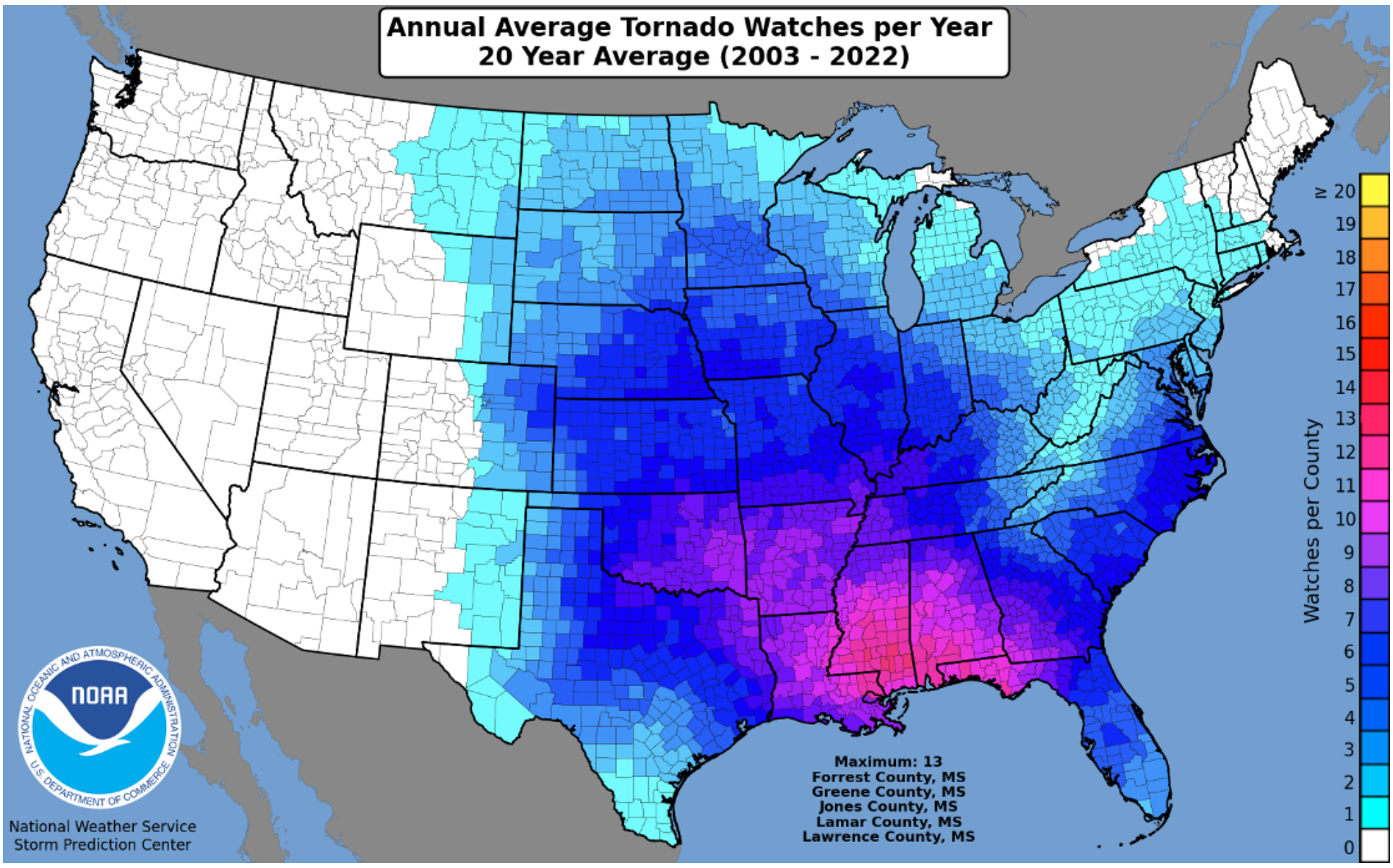
Due to vast amount of hills and trees, tornadoes are less visible in Arkansas making it part of "Tornado Fatality Alley."  In Arkansas, there is a higher likelihood of killer tornadoes and severe storms due to a couple of factors: (1) the highest percentage of manufactured/mobile homes compared with any other region east of the Continental Divide, and (2) a close proximity to the Gulf of Mexico and a feed of warmth/moisture to sustain storms long after sunset.




In the pictures: The shaded regions are where the most tornadoes and tornado fatalities have occurred in Arkansas since 1950.






### 4.4.9.2 - PREVIOUS OCCURRENCES

Since 2002, there have been 20 Presidential Disaster Declarations for the State of Arkansas for tornados (along with other associates hazard events such as flooding or severe storms) The following information is presented to provide a historical perspective on tornado events that have impacted the State of Arkansas.  Declaration numbers in bold indicate declared disaster that have occurred since the previous mitigation plan update in 2018.

**FEMA Tornado Disaster and Emergency Declarations 2002 -2023**

| Declaration Number | Incident Period | Disaster Description | Regional Counties Involved | Dollars Obligated |
|---|---|---|---|---|
| 1472 | May 2 - June 10, 2003 | Severe Storms, Tornados, and Flooding | Benton, Chicot, Cleburne, Columbia, Conway, Craighead, Crittenden, Cross, Faulkner, Fulton, Jackson, Lonoke, Nevada, Perry, Poinsett, Phillips, St. Francis, White and Woodruff | $5,303,785 |
| 1636 | April 1-3, 2006 | Severe Storms and Tornados | Conway, Cross, Fulton, Greene, Lawrence, Randolph and White | $2,286,579 |
| 1744 | February 5-12, 2008 | Severe Storms, Tornados, and Flooding | Baxter, Conway, Izard, Marion, Pope, Randolph, Sharp, Stone, Union and Van Buren | $5,020,005 |
| 1751 | March 18 - April 28, 2008 | Severe Storms, Tornados, and Flooding | Arkansas, Baxter, Benton, Boone, Carroll, Clay, Cleburne, Conway, Craighead, Crawford, Cross, Desha, Franklin, Fulton, Garland, Greene, Hempstead, Hot Spring, Independence, Izard, Jackson, Jefferson, Lawrence, Lee, Logan, Lonoke, Madison, Marion, Miller, Monroe, Newton, Perry, Phillips, Poinsett, Pope, Prairie, Pulaski, Randolph, Saline, Scott, Searcy, Sebastian, Sharp, St. Francis, Stone, Van Buren, Washington, White, Woodruff and Yell | $41,085,016 |

| | | | | |
|---|---|---|---|---|
| 1758 | May 02-12, 2008 | Severe Storms, Flooding, and Tornados | Arkansas, Benton, Cleburne, Conway, Crittenden, Grant, Lonoke, Mississippi, Phillips, Pulaski, Saline and Van Buren | $2,676,958 |
| 1834 | April 09, 2009 | Severe Storms and Tornados | Ashley, Howard, Miller, Polk and Sevier | $4,894,361 |
| 1845 | April 27 - May 23, 2009 | Severe Storms, Tornados, and Flooding | Arkansas, Bradley, Calhoun, Chicot, Clark, Cleveland, Conway, Dallas, Drew, Fulton, Grant, Greene, Hempstead, Hot Spring, Howard, Jackson, Jefferson, Lafayette, Lee, Lincoln, Little River, Marion, Miller, Monroe, Nevada, Ouachita, Perry, Phillips, Pike, Poinsett, Polk, Pope, Prairie, Saline, Searcy, St. Francis, Stone and Union | $9,425,734 |
| 1861 | October 29 - November 08, 2009 | Severe Storms, Tornados, and Flooding | Boone, Bradley, Calhoun, Carroll, Cleburne, Cleveland, Columbia, Conway, Cross, Dallas, Franklin, Fulton, Grant, Izard, Jackson, Johnson, Lafayette, Lawrence, Lincoln, Logan, Marion, Monroe, Nevada, Newton, Ouachita, Poinsett, Prairie, Pulaski, Randolph, Saint Francis, Scott, Sharp, Stone, Union, Van Buren, White and Woodruff | $15,536,008 |
| 1975 | April 14 - June 03, 2011 | Severe Storms, Tornados, and associated Flooding | Arkansas, Benton, Boone, Carroll, Chicot, Clark, Clay, Crawford, Crittenden, Cross, Dallas, Desha, Faulkner, Garland, Greene, Hot Spring, Independence, Jackson, Jefferson, Lawrence, Lee, Lincoln, Lonoke, Madison, Mississippi, Monroe, Montgomery, Phillips, Poinsett, Prairie, Pulaski, Randolph, Saline, St. Francis, Washington, White, Woodruff | $50,596,048 |
| 4000 | May 24-26, 2011 | Severe Storms, Tornados, and Flooding | Franklin, Johnson | $2,701,536 |
| 4124 | May 30 - June 3, 2013 | Severe Storms, Tornados, and Flooding | Cleburne, Cross, Garland, Independence, Montgomery, Poinsett, Polk, Scott, Searcy, Stone, Van Buren and Woodruff | $8,395,922 |
| 4174 | April 27 -28, 2014 | Severe Storms, Tornados, and Flooding | Faulkner, Pulaski, Randolph and White | $10,053,785 |
| 4226 | May 7 - June 15, 2015 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Crawford, Garland, Howard, Jefferson, Little River, Miller, Perry, Sebastian and Sevier | $11,100,256 |
| 4254 | December 26, 2015 - January 22, 2016 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Benton, Carroll, Crawford, Faulkner, Jackson, Jefferson, Lee, Little River, Perry, Sebastian and Sevier | $11,367,572 |
| 4270 | March 8-13, 2016 | Severe Storms, Tornados, Straight-line Winds, and Flooding | Columbia, Ouachita, Calhoun, Bradley, Ashley, Chicot, Cleveland, Lincoln, Desha, Arkansas, Philips and Prairie | $2,299,510 |
| 4318 | April 26 - May 19, 2017 | Arkansas Severe Storms, Tornados, Straight-line Winds, and Flooding | Benton, Boone, Carroll, Clay, Faulkner, Fulton, Jackson, Lawrence, Prairie, Pulaski, Randolph, Saline, Washington, White, Woodruff and Yell | $3,911,764 |

| | | | | |
|---|---|---|---|---|
| **4460** | **September 13, 2019** | **Severe Storms, Tornadoes, Flooding, and Straight-line Winds** | **Madison, Newton, Washington** | **$5,877,299.51** |
| **4544** | **May 8, 2020** | **Severe Storms, Tornadoes, and Straight-line Winds** | **Craighead** | **$3,898,006.13** |
| **4633** | **December 23, 2021** | **Severe Storms and Tornadoes** | **Craighead, Jackson, Mississippi, Poinsett, Woodruff** | **$935,304.83** |
| **4698** | **April 2, 2023** | **Severe Storms and Tornadoes** | **Cross, Lonoke, Pulaski** | **-** |

### 4.4.9.3 - HAZARD PROBABILITY ANALYSIS

The following table summarizes recorded NCDC tornado events for the State of Arkansas for the period 2018 through May 1, 2023.

| **State of Arkansas Tornado Storm Data Summary** | |
|---|---|
| **Data** | Recorded Impact |
| **Number of NCDC Reported Events** | 219 |
| **Number of Days with NCDC Reported Event** | 67 |
| **Average Event Days per Year** | 13 |
| **Number of Days with Event and Death or Injury:** | 18 |
| **Number of Days with Event and Property Damage** | 54 |
| **Total Reported NCDC Property Damage** | $381,662,000.00 |
| **Average Property Damage per Year** | $76,332,400.00 |
| **Number of Days with Event and Crop Damage:** | 13 |
| **Total Reported NCDC Crop Damage** | $2,598,000 |
| **Average Crop Damage per Year** | $519,600.00 |

As indicated in the tables above, on average the State of Arkansas can expect 13 tornado events per year.

### 4.4.9.4 - VULNERABILITY ANALYSIS

For purposes of this assessment, all state-owned facilities within the state were determined to be at equal risk to tornados. The following table indicates the number and valuation of state owned facilities and the number of bridges within all Arkansas counties. Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential severe storm event.

| **State-Owned Facilities Susceptible to Tornadoes** | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Total Valuation** | **Critical Facilities** | **Critical Facility Total Valuation** | **State-Owned Bridges** |
| State of Arkansas | 3792 | $10,898,646,452.31 | 576 | $2,361,260,565.35 | 7,303 |
| Arkansas | 18 | $8,188,582.03 | 8 | $4,632,718.64 | 75 |
| Ashley | 6 | $2,687,791.08 | 6 | $2,687,791.08 | 69 |
| Baxter | 45 | $91,766,282.09 | 5 | $2,219,240.82 | 35 |
| Benton | 42 | $187,483,529.72 | 9 | $20,793,432.56 | 156 |
| Boone | 34 | $88,586,892.96 | 8 | $9,303,386.12 | 55 |
| Bradley | 50 | $34,148,922.88 | 6 | $7,137,451.50 | 50 |
| Calhoun | 4 | $1,419,567.33 | 3 | $1,174,960.59 | 66 |

| | | | | | |
|---|---|---|---|---|---|
| Carroll | 7 | $2,073,119.30 | 4 | $1,545,985.64 | 67 |
| Chicot | 64 | $80,475,656.77 | 6 | $43,713,906.99 | 57 |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 | 113 |
| Clay | 16 | $10,077,262.01 | 4 | $987,511.15 | 85 |
| Cleburne | 11 | $36,847,548.25 | 4 | $2,061,124.38 | 28 |
| Cleveland | 3 | $705,243.86 | 3 | $705,243.86 | 61 |
| Columbia | 115 | $445,672,715.10 | 3 | $1,028,401.23 | 75 |
| Conway | 76 | $55,626,364.83 | 4 | $1,627,388.29 | 76 |
| Craighead | 227 | $1,319,922,341.64 | 10 | $9,154,672.74 | 175 |
| Crawford | 38 | $25,365,272.07 | 5 | $3,640,863.16 | 176 |
| Crittenden | 35 | $127,719,120.92 | 8 | $3,690,430.15 | 163 |
| Cross | 65 | $36,051,200.33 | 6 | $3,375,873.26 | 93 |
| Dallas | 6 | $2,111,608.88 | 4 | $1,554,408.18 | 81 |
| Desha | 13 | $4,733,763.86 | 4 | $1,564,467.00 | 50 |
| Drew | 17 | $7,416,013.74 | 9 | $4,664,369.45 | 85 |
| Faulkner | 295 | $1,217,867,581.07 | 8 | $7,761,135.06 | 124 |
| Franklin | 17 | $34,387,533.73 | 3 | $842,906.65 | 83 |
| Fulton | 24 | $12,583,989.23 | 5 | $2,214,766.13 | 65 |
| Garland | 120 | $170,275,197.06 | 9 | $9,311,635.69 | 152 |
| Grant | 8 | $4,117,068.71 | 7 | $4,001,568.71 | 96 |
| Greene | 47 | $31,323,797.11 | 6 | $4,320,196.19 | 93 |
| Hempstead | 73 | $76,583,328.98 | 10 | $8,713,511.18 | 132 |
| Hot Spring | 84 | $301,854,794.31 | 10 | $193,799,059.91 | 126 |
| Howard | 16 | $11,098,640.33 | 6 | $3,048,527.15 | 60 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 | 97 |
| Izard | 34 | $107,021,175.39 | 6 | $3,530,254.70 | 42 |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 | 111 |
| Jefferson | 161 | $393,195,391.16 | 27 | $219,978,530.97 | 151 |
| Johnson | 16 | $8,150,351.06 | 6 | $2,998,316.49 | 108 |
| Lafayette | 15 | $6,608,475.68 | 6 | $1,878,830.68 | 47 |
| Lawrence | 32 | $21,602,740.78 | 4 | $1,656,152.26 | 99 |
| Lee | 36 | $147,668,860.84 | 8 | $124,325,081.05 | 54 |
| Lincoln | 134 | $294,072,621.01 | 22 | $194,270,813.56 | 59 |
| Little River | 15 | $5,330,273.81 | 4 | $1,881,746.22 | 49 |
| Logan | 87 | $136,349,990.20 | 4 | $1,116,877.63 | 81 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 | 135 |
| Madison | 17 | $7,116,437.26 | 5 | $2,583,642.97 | 92 |
| Marion | 10 | $12,118,168.36 | 6 | $2,829,428.22 | 39 |
| Miller | 17 | $112,750,921.68 | 4 | $2,136,754.03 | 161 |
| Mississippi | 53 | $136,317,546.13 | 6 | $2,876,716.16 | 182 |
| Monroe | 5 | $2,343,993.15 | 5 | $2,343,993.15 | 78 |
| Montgomery | 6 | $1,786,277.98 | 4 | $1,506,992.51 | 88 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 | 101 |

| | | | | | |
|---|---|---|---|---|---|
| Newton | 8 | $2,973,644.76 | 5 | $2,186,847.15 | 41 |
| Ouachita | 67 | $132,961,321.03 | 9 | $4,729,918.11 | 90 |
| Perry | 7 | $2,365,119.68 | 3 | $675,236.80 | 81 |
| Phillips | 25 | $24,218,066.63 | 4 | $1,994,460.34 | 59 |
| Pike | 33 | $16,250,267.73 | 4 | $1,567,310.07 | 63 |
| Poinsett | 31 | $26,949,937.41 | 6 | $3,192,391.42 | 127 |
| Polk | 18 | $19,618,252.24 | 4 | $1,736,600.40 | 102 |
| Pope | 127 | $549,329,560.19 | 10 | $5,326,204.73 | 101 |
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 | 66 |
| Pulaski | 445 | $2,676,770,640.25 | 104 | $1,247,800,470.37 | 381 |
| Randolph | 39 | $88,255,338.41 | 4 | $2,624,642.63 | 84 |
| St. Francis | 68 | $158,283,776.17 | 5 | $1,795,505.00 | 100 |
| Saline | 8 | $2,665,524.39 | 5 | $1,638,971.22 | 123 |
| Scott | 6 | $2,813,373.71 | 4 | $1,927,101.02 | 44 |
| Searcy | 50 | $80,970,807.10 | 14 | $21,570,578.51 | 171 |
| Sebastian | 4 | $1,311,098.72 | 4 | $1,311,098.72 | 72 |
| Sevier | 11 | $11,336,228.20 | 5 | $1,969,885.73 | 54 |
| Sharp | 51 | $79,811,432.22 | 8 | $8,784,795.86 | 154 |
| Stone | 40 | $37,290,337.17 | 5 | $1,869,090.84 | 55 |
| Union | 50 | $131,527,527.57 | 6 | $3,765,195.32 | 124 |
| Van Buren | 7 | $2,434,162.08 | 4 | $1,700,450.94 | 50 |
| Washington | 108 | $111,752,738.51 | 12 | $6,780,582.89 | 171 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 | 205 |
| Woodruff | 4 | $1,249,134.83 | 4 | $1,249,134.83 | 62 |
| Yell | 39 | $16,311,150.68 | 7 | $4,149,915.87 | 128 |

Multiple factors can come into play when assessing vulnerability and loss analysis. However, for purposes of this plan, three major factors are being utilized to aid in the assessment:

- **Exposure Data:** The amount of agricultural crops and building stock at risk
- **Loss Data:** Historical losses from severe storm events
- **Percentage Loss:** Percent of agricultural crops and building stock lost to drought over the given period

For vulnerability and loss estimation purposes all counties were considered at equal risk to tornados and were evaluated. Counties with a higher identified population and number of structures are to be considered to have a potentially greater vulnerability. However, these vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a tornado event.

**County Structural Vulnerability Data for Tornados**

| County | HAZUS Building Valuation | NCDC Structure Damage, Tornados, 2013-2017 | Percentage of Building Valuation Damaged by Tornados |
|---|---|---|---|
| State of Arkansas | $12,168,205,000 | $248,269,000 | 2.040% |
| Arkansas | $2,245,000 | $8,000 | 0.356% |
| Ashley | $2,153,000 | $23,000 | 1.068% |
| Baxter | $4,332,000 | $0 | 0.000% |
| Benton | $23,138,000 | $405,000 | 1.750% |
| Boone | $3,624,000 | $980,000 | 27.042% |

| | | | |
|---|---|---|---|
| Bradley | $1,108,000 | $75,000 | 6.769% |
| Calhoun | $442,000,000 | $150,000 | 0.034% |
| Carroll | $2,754,000 | $100,000 | 3.631% |
| Chicot | $961,000,000 | $2,960,000 | 0.308% |
| Clark | $2,174,000 | $275,000 | 12.649% |
| Clay | $1,532,000 | $170,000 | 11.097% |
| Cleburne | $2,958,000 | $20,000 | 0.676% |
| Cleveland | $761,000,000 | $0 | 0.000% |
| Columbia | $2,429,000 | $25,000 | 1.029% |
| Conway | $1,772,000 | $120,000 | 6.772% |
| Craighead | $9,707,000 | $1,250,000 | 12.877% |
| Crawford | $5,637,000 | $225,000 | 3.991% |
| Crittenden | $4,447,000 | $0 | 0.000% |
| Cross | $1,540,000 | $25,000 | 1.623% |
| Dallas | $809,000,000 | $0 | 0.000% |
| Desha | $1,270,000 | $105,000 | 8.268% |
| Drew | $1,772,000 | $120,000 | 6.772% |
| Faulkner | $10,585,000 | $210,000,000 | 1983.940% |
| Franklin | $1,581,000 | $310,000 | 19.608% |
| Fulton | $1,141,000 | $0 | 0.000% |
| Garland | $10,515,000 | $600,000 | 5.706% |
| Grant | $1,638,000 | $125,000 | 7.631% |
| Greene | $3,656,000 | $250,000 | 6.838% |
| Hempstead | $2,046,000 | $15,000 | 0.733% |
| Hot Spring | $2,678,000 | $5,000 | 0.187% |
| Howard | $1,381,000 | $1,500,000 | 108.617% |
| Independence | $3,540,000 | $270,000 | 7.627% |
| Izard | $1,278,000 | $350,000 | 27.387% |
| Jackson | $1,603,000 | $240,000 | 14.972% |
| Jefferson | $7,230,000 | $108,000 | 1.494% |
| Johnson | $2,067,000 | $20,000 | 0.968% |
| Lafayette | $628,000,000 | $0 | 0.000% |
| Lawrence | $1,547,000 | $60,000 | 3.878% |
| Lee | $775,000,000 | $150,000 | 0.019% |
| Lincoln | $829,000,000 | $500,000 | 0.060% |
| Little River | $1,206,000 | $210,000 | 17.413% |
| Logan | $2,155,000 | $0 | 0.000% |
| Lonoke | $6,235,000 | $185,000 | 2.967% |
| Madison | $1,378,000 | $1,040,000 | 75.472% |
| Marion | $1,644,000 | $0 | 0.000% |
| Miller | $3,930,000 | $0 | 0.000% |
| Mississippi | $4,421,000 | $320,000 | 7.238% |
| Monroe | $850,000,000 | $125,000 | 0.015% |

| | | | |
|---|---|---|---|
| Montgomery | $907,000,000 | $475,000 | 0.052% |
| Nevada | $847,000,000 | $100,000 | 0.012% |
| Newton | $842,000,000 | $225,000 | 0.027% |
| Ouachita | $2,418,000 | $50,000 | 2.068% |
| Perry | $856,000,000 | $5,000 | 0.001% |
| Phillips | $1,996,000 | $60,000 | 3.006% |
| Pike | $1,035,000 | $15,000 | 1.449% |
| Poinsett | $2,304,000 | $0 | 0.000% |
| Polk | $1,930,000 | $445,000 | 23.057% |
| Pope | $5,743,000 | $250,000 | 4.353% |
| Prairie | $823,000,000 | $20,000 | 0.002% |
| Pulaski | $48,464,000 | $13,655,000 | 28.176% |
| Randolph | $1,684,000 | $0 | 0.000% |
| St. Francis | $2,138,000 | $550,000 | 25.725% |
| Saline | $10,250,000 | $1,225,000 | 11.951% |
| Scott | $1,025,000 | $150,000 | 14.634% |
| Searcy | $852,000,000 | $210,000 | 0.025% |
| Sebastian | $13,612,000 | $0 | 0.000% |
| Sevier | $1,300,000 | $0 | 0.000% |
| Sharp | $1,817,000 | $0 | 0.000% |
| Stone | $1,149,000 | $200,000 | 17.406% |
| Union | $4,564,000 | $35,000 | 0.767% |
| Van Buren | $1,676,000 | $3,580,000 | 213.604% |
| Washington | $19,369,000 | $900,000 | 4.647% |
| White | $6,809,000 | $2,190,000 | 32.163% |
| Woodruff | $707,000,000 | $5,000 | 0.001% |
| Yell | $1,875,000 | $505,000 | 26.933% |

The following counties may have increased vulnerability to tornado events due to the percentage of mobile homes:

- **Counties with 20%-25% of housing stock as mobile homes:** Ashley, Clark, Cleburne, Fulton, Hempstead, Independence, Izzard, Lafayette, Madison, Nevada, Polk, Prairie, Saline, Searcy, Union and White
- **Counties with greater than 25% of housing stock as mobile homes:** Calhoun, Cleveland, Drew, Grant, Hot Spring, Lincoln, Perry, Pike, Sevier, Stone and Van Buren

Population vulnerability for each county is a function of the following component parts:

- Population change over time
- Vulnerable populations
- Population density

In general:

- Counties with a high population are at increased risk
- Counties with growing populations are at increasing risk
- Counties with a high population of children under 5 or adults over the age of 65 may be at increased risk.

Additionally, according to the Michigan State University study, “The annual impact of tornados is expected to increase threefold over the next few decades due to the twin forces of increased climate variability and growth in the human-built environment.”

The USDA Risk Management Agency provides data on the crop exposure value, the total dollar value of all crops, for each Arkansas county.  USDA Risk Management Agency crop loss data allows us to quantify the monetary impact of tornado events on the agricultural sector. In general, the higher the percentage loss, the higher the vulnerability the county has to tornado events. Please note that only three counties, detailed below, had crop loss data reported to the USDA during the 2012-2017 period.

| USDA Risk Management Agency Cause of Loss Indemnities, Tornadoes | | | |
|---|---|---|---|
| **Year** | **Number of Reported Claims** | **Acres Lost** | **Total Amount of Loss** |
| 2022 | 1 | 0 | $2,100 |
| 2021 | - | - | - |
| 2020 | - | - | - |
| 2019 | 1 | 127 | 3,625 |

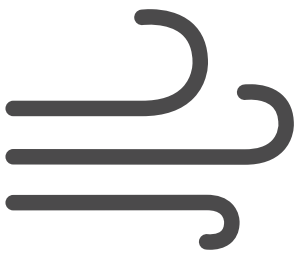
### 4.4.9.5 - IMPACT AND CONSEQUENCE ANALYSIS

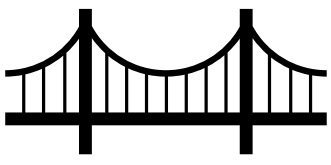
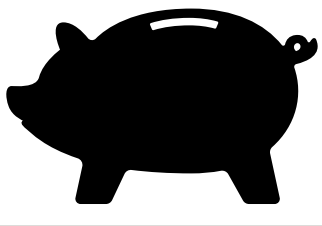
As per EMAP requirements, the following table provides the Consequence Analysis.

| Tornado Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Tornado** |
| Health and Safety of the Public | Impact of the immediate area could be severe depending on whether individuals were able to seek shelter and get out of the trajectory of the tornado.  Casualties are dependent on warning systems and warning times. |
| Health and Safety of Responders | Impact to responders is expected to be minimal unless responders live within the affected area. |
| Continuity of Operations | Temporary to permanent relocation may be necessary if government facilities experience damage. |
| Property, Facilities, and Infrastructure | Localized impact could be severe in the trajectory path.  Roads, buildings, and communications could be adversely affected.  Damage could be severe. |
| Environment | Impact will be severe for the immediate impacted area.  Impact will lessen as distance increases from the immediate incident area. |
| Economic Conditions | Impacts to the economy will greatly depend on the trajectory of the tornado.  If a jurisdiction takes a direct hit then the economic conditions will be severe.  With an indirect hit the impact could be low to severe. |
| Public Confidence in the Jurisdiction's Governance | Public confidence could be eroded if response and recovery are not timely and effective.  Warning systems in place and the timeliness of those warnings could affect confidence in government. |

# WILDFIRE

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Human, natural, technological | • Populations - See WUI Map<br>• Locations - Se WUI Map | • Number of Occurrences - 7077 18-21<br>• Presidential Declared Disasters - 0 |

| Potential Effects of Climate Change | |
|---|---|
| Changes in Temperature  | Warmer periods can increase the possibility of a wildfire especially during a dry period. |
| Changes in Precipitation  | Decrease in rainfall or drought conditions as a result can lead to increased risk of a wildfire. |
| Extreme Weather  | Extreme weather such as thunderstorms with lightning can cause wildfires to occur. Especially if the storm occurs after a prolonged warm dry period with limited precipitation. |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Populations will be limited to those that live in forested area or communities that have large areas of forrest. |
|  | Government impact would be limited since most facilities are not located in forested areas. |
|  | The built environment most at risk are those that have infrastructure running through areas of significant forested areas. |
|  | Natural resource impacted would be limited to timber, and gas lines that run through a forested area. |
|  | Depending on where the wildfire occurs will depend on the economic impact. If a wildfire was to occur in an area that has significant tourism and or manufacturing verses an area that is remote with no manufacturing or tourism the difference could be significant. |

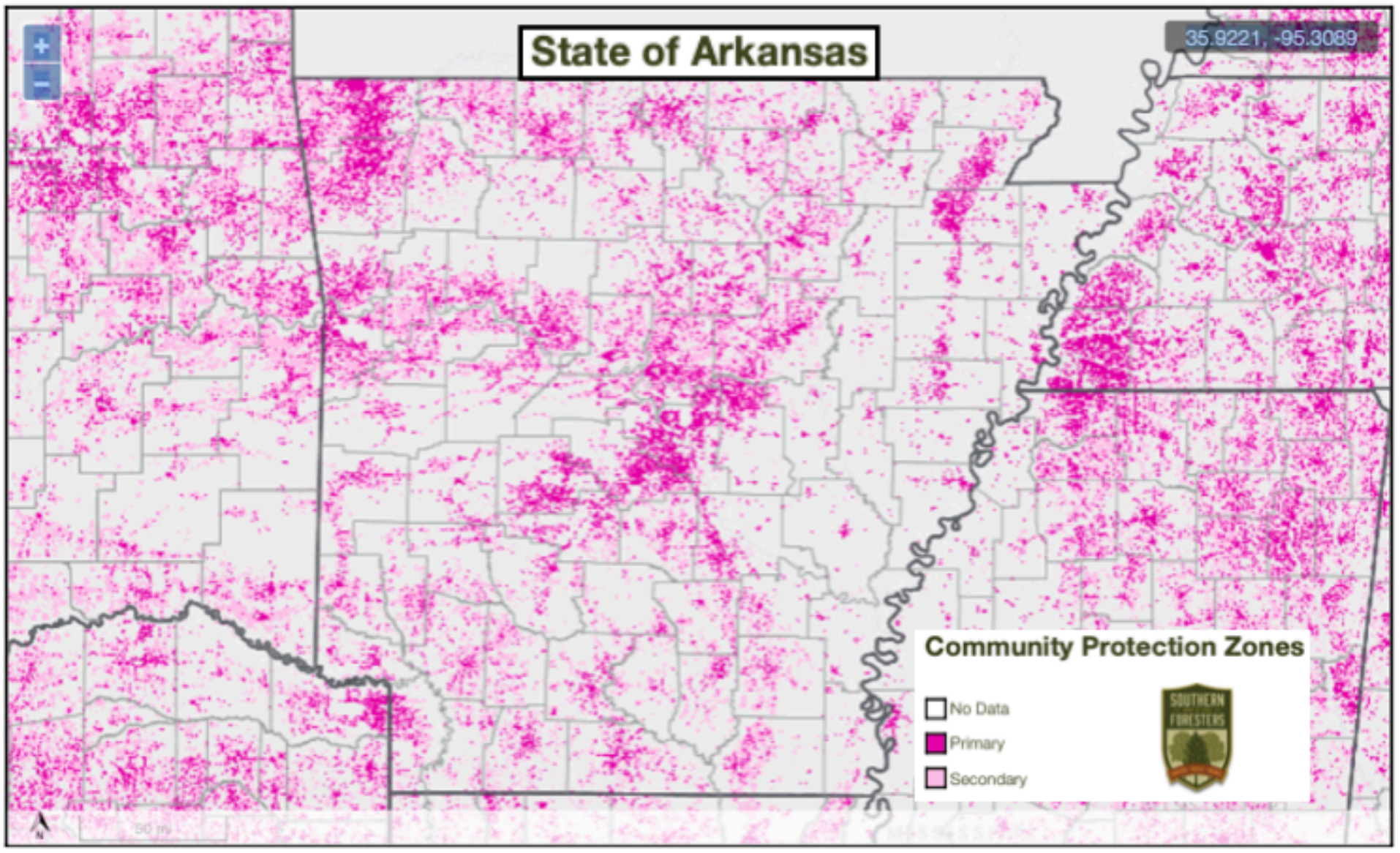
## 4.4.10 Wildfire



The NWS defines a wildfire as any free burning uncontainable wildland fire not prescribed for the area which consumes the natural fuels and spreads in response to its environment. They can occur naturally, by human accident, and on rare occasions by human action.  Population de-concentration in the U.S. has resulted in rapid development in the outlying fringe of metropolitan areas and in rural areas with attractive recreational and aesthetic amenities, especially forests. This expansion has increased the likelihood that wildfires will threaten life and property.

### 4.4.10.1 - LOCATION AND EXTENT

The Community protection zone that is displayed below show areas of the state where mitigation efforts should be undertaken to truce the risk of Wildfire danger. Another map that the state uses to help with mitigation and to understand the extent in which a wildfire could have an impact on a county or area if the fire intensity scale which is included later into this section on page  150.




### 4.4.10.2 - PREVIOUS OCCURRENCES

The Arkansas Forestry Commission completes a fire report on each fire its Rangers and Foresters suppress. This information is presented in the following table.

**Fires by County since 2018 - 2021**

| | 2018 | | 2019 | | 2020 | | 2021 | | Total FIRES | Total ACRES |
|---|---|---|---|---|---|---|---|---|---|---|
| | FIRES | ACRES | FIRES | ACRES | FIRES | ACRES | FIRES | ACRES | | |
| Arkansas | 2 | 51 | | | | | 1 | 4 | 3 | 55 |
| Ashley | 21 | 178 | 23 | 286 | 7 | 7 | 14 | 145 | 65 | 616 |
| Baxter | 16 | 264 | 5 | 167 | 11 | 198 | 16 | 508 | 48 | 1137 |
| Benton | 18 | 626 | 8 | 103 | 15 | 480 | 10 | 299 | 51 | 1508 |
| Boone | 7 | 173 | 1 | 2 | 7 | 176 | 6 | 280 | 21 | 631 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Boone | 7 | 173 | 1 | 2 | 7 | 176 | 6 | 280 | 21 | 631 |
| Bradley | 12 | 26 | 13 | 115 | 4 | 38 | 6 | 20 | 35 | 199 |
| Calhoun | 17 | 339 | 8 | 57 | 8 | 28 | 8 | 91 | 41 | 515 |
| Carroll | 15 | 551 | 4 | 53 | 11 | 173 | 23 | 850 | 53 | 1627 |
| Chicot | | | | | | | | | 0 | 0 |
| Clark | 17 | 368 | 13 | 429 | 7 | 47 | 46 | 605 | 83 | 1449 |
| Clay | 1 | 80 | | | | | | | 1 | 80 |
| Cleburne | 11 | 176 | 12 | 48 | 10 | 96 | 15 | 162 | 48 | 482 |
| Cleveland | 15 | 88 | 13 | 60 | 9 | 14 | 14 | 214 | 51 | 376 |
| Columbia | 22 | 275 | 9 | 94 | 3 | 93 | 8 | 45 | 42 | 507 |
| Conway | 24 | 585 | 13 | 443 | 21 | 660 | 24 | 721 | 82 | 2409 |
| Craighead | 3 | 33 | | | 2 | 30 | 3 | 24 | 8 | 87 |
| Crawford | 16 | 98 | 11 | 73 | 16 | 212 | 15 | 73 | 58 | 456 |
| Crittenden | | | | | | | | | 0 | 0 |
| Cross | | | | | | | | | 0 | 0 |
| Dallas | 10 | 95 | 3 | 102 | 3 | 24 | 11 | 192 | 27 | 413 |
| Desha | | | | | | | | | 0 | 0 |
| Drew | 5 | 49 | 19 | 245 | 11 | 94 | 24 | 45 | 59 | 433 |
| Faulkner | 18 | 563 | 10 | 242 | 11 | 691 | 19 | 296 | 58 | 1792 |
| Franklin | 12 | 252 | 5 | 32 | 7 | 273 | 10 | 37 | 34 | 594 |
| Fulton | 29 | 1,551 | 19 | 622 | 17 | 705 | 19 | 540 | 84 | 3418 |
| Garland | 19 | 386 | 20 | 91 | 19 | 558 | 30 | 350 | 88 | 1385 |
| Grant | 35 | 272 | 11 | 58 | 19 | 284 | 39 | 318 | 104 | 932 |
| Greene | 1 | 15 | | | | | 2 | 4 | 3 | 19 |
| Hempstead | 5 | 20 | 9 | 89 | 5 | 19 | 10 | 187 | 29 | 315 |
| Hot Spring | 38 | 252 | 30 | 124 | 19 | 143 | 34 | 340 | 121 | 859 |
| Howard | 6 | 14 | 7 | 9 | 2 | 4 | 3 | 20 | 18 | 47 |
| Independence | 25 | 856 | 12 | 217 | 22 | 532 | 22 | 417 | 81 | 2022 |
| Izard | 54 | 1,551 | 12 | 229 | 32 | 695 | 27 | 867 | 125 | 3342 |
| Jackson | | | 3 | 50 | 1 | 60 | 2 | 54 | 6 | 164 |
| Jefferson | 13 | 256 | 4 | 132 | 4 | 38 | 16 | 185 | 37 | 611 |
| Johnson | 12 | 105 | 5 | 26 | 7 | 53 | 9 | 36 | 33 | 220 |
| Lafayette | 15 | 357 | 6 | 13 | 1 | 31 | 4 | 10 | 26 | 411 |
| Lawrence | 8 | 647 | 3 | 108 | 3 | 270 | 5 | 464 | 19 | 1489 |
| Lincoln | 3 | 9 | 6 | 93 | 2 | 4 | 3 | 5 | 14 | 111 |
| Little River | 11 | 170 | 8 | 38 | | | 4 | 202 | 23 | 410 |
| Logan | 10 | 98 | 4 | 43 | 2 | 37 | 13 | 86 | 29 | 264 |
| Lonoke | 1 | 3 | 3 | 82 | 4 | 91 | 3 | 126 | 11 | 302 |
| Madison | 5 | 293 | 5 | 165 | 10 | 242 | 15 | 616 | 35 | 1316 |
| Marion | 21 | 382 | 9 | 55 | 7 | 106 | 2 | 68 | 39 | 611 |
| Miller | 47 | 260 | 22 | 57 | 7 | 44 | 21 | 152 | 97 | 513 |
| Monroe | 3 | 54 | 1 | 30 | | | 1 | 35 | 5 | 119 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Montgomery | 9 | 14 | 5 | 10 | 6 | 7 | 14 | 67 | 34 | 98 |
| Nevada | 16 | 243 | 13 | 198 | 6 | 116 | 13 | 97 | 48 | 654 |
| Newton | 6 | 157 | 2 | 8 | 7 | 95 | 6 | 204 | 21 | 464 |
| Ouachita | 32 | 274 | 20 | 61 | 16 | 160 | 23 | 95 | 91 | 590 |
| Perry | 16 | 142 | 12 | 189 | 11 | 157 | 20 | 345 | 59 | 833 |
| Phillips | | | | | | | | | 0 | 0 |
| Pike | 14 | 63 | 6 | 44 | 9 | 43 | 9 | 114 | 38 | 264 |
| Poinsett | | | | | 1 | 30 | 1 | 4 | 2 | 34 |
| Polk | 23 | 73 | 10 | 51 | 2 | 6 | 7 | 86 | 42 | 216 |
| Pope | 15 | 141 | 7 | 79 | 8 | 29 | 9 | 126 | 39 | 375 |
| Prairie | | | 1 | 10 | 1 | 2 | 1 | 61 | 3 | 73 |
| Pulaski | 16 | 401 | 13 | 71 | 4 | 9 | 14 | 145 | 47 | 626 |
| Randolph | 11 | 251 | 9 | 521 | 10 | 221 | 18 | 601 | 48 | 1594 |
| Saline | 45 | 455 | 15 | 85 | 25 | 409 | 22 | 332 | 107 | 1281 |
| Scott | 6 | 58 | 4 | 54 | 5 | 64 | 12 | 247 | 27 | 423 |
| Searcy | 50 | 2,862 | 18 | 273 | 25 | 1,198 | 28 | 1,579 | 121 | 5912 |
| Sebastian | 9 | 77 | 6 | 46 | 9 | 43 | 17 | 86 | 41 | 252 |
| Sevier | 4 | 26 | 6 | 31 | 5 | 48 | 6 | 76 | 21 | 181 |
| Sharp | 30 | 429 | 14 | 272 | 12 | 300 | 28 | 603 | 84 | 1604 |
| St. Francis | | | 1 | 3 | 5 | 49 | 3 | 25 | 9 | 77 |
| Stone | 9 | 107 | 2 | 42 | 14 | 183 | 10 | 146 | 35 | 478 |
| Union | 32 | 299 | 18 | 87 | 10 | 48 | 13 | 153 | 73 | 587 |
| Van Buren | 19 | 448 | 11 | 180 | 14 | 98 | 21 | 634 | 65 | 1360 |
| Washington | 4 | 39 | 3 | 60 | 4 | 110 | 7 | 44 | 18 | 253 |
| White | 38 | 564 | 17 | 324 | 16 | 321 | 17 | 517 | 88 | 1726 |
| Woodruff | | | | | 1 | 13 | | | 1 | 13 |
| Yell | 13 | 195 | 3 | 67 | 1 | 1 | 12 | 457 | 29 | 720 |
| Grand Total | 1,040 | 19,739 | 585 | 7,648 | 573 | 11,010 | 888 | 16,537 | 3,086 | 54,934 |

### 4.4.10.3 - HAZARD PROBABILITY ANALYSIS

For purposes of determining a probability of occurrence the following table presents the number of wildfires recorded by the Arkansas Forestry Commission from the period 2007 to 2021.

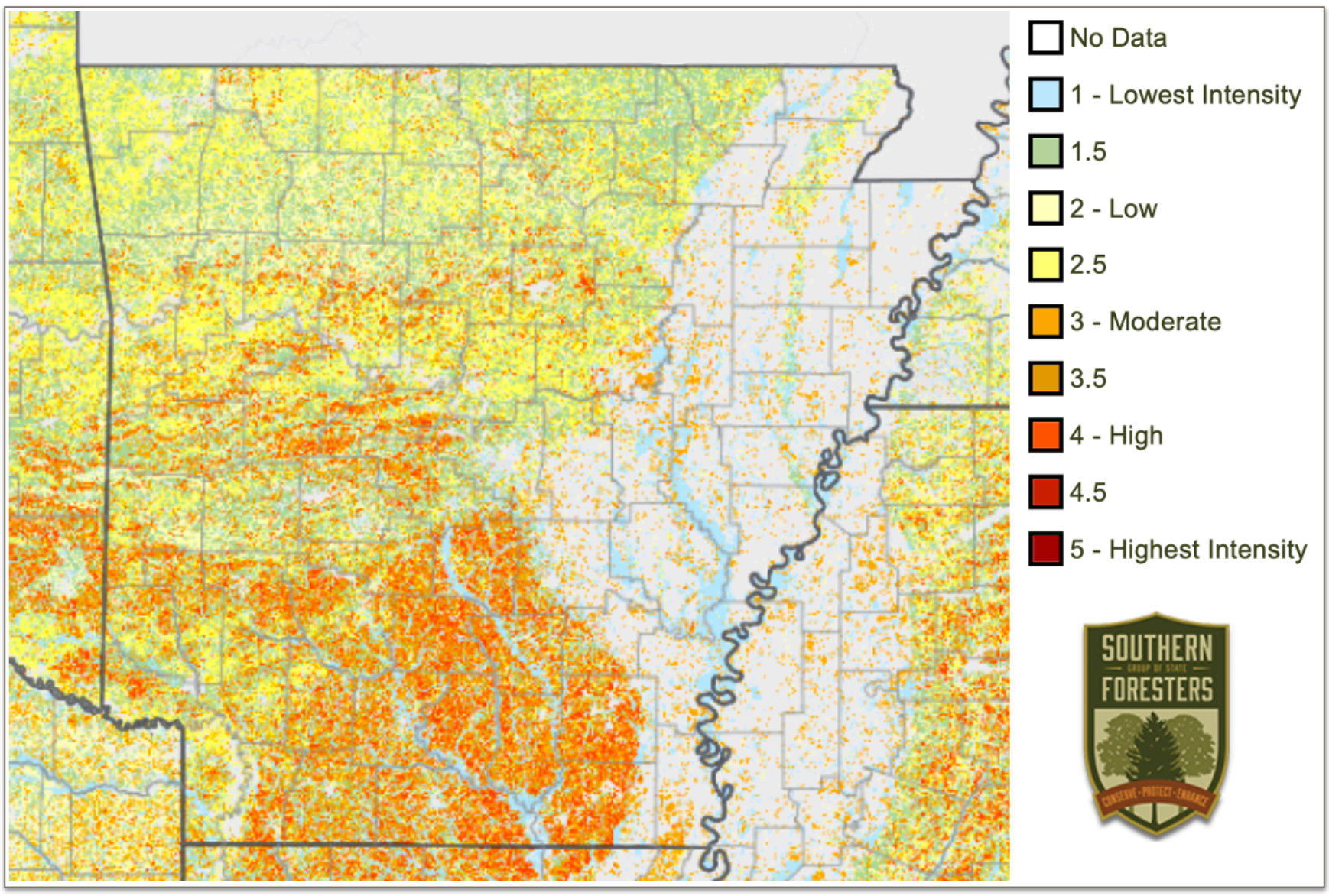
| Wildfire data last 10 years | | |
|---|---|---|
| **Year** | **Fires** | **Acres** |
| 2021 | 1,122 | 17,532 |
| 2020 | 1,277 | 19,956 |
| 2019 | 1,441 | 22,340 |
| 2018 | 1,488 | 23,160 |
| 2017 | 1,472 | 22,265 |
| 2016 | 1,437 | 21,211 |
| 2015 | 1,559 | 23,977 |
| 2014 | 1,662 | 25,906 |
| 2013 | 1,674 | 26,394 |
| 2012 | 1,757 | 27,615 |
| 2011 | 1,662 | 25,949 |
| 2010 | 1,556 | 23,337 |
| 2009 | 1,605 | 23,328 |
| 2008 | 1,756 | 24,323 |
| 2007 | 1,821 | 24,832 |

Based on the number of Arkansas Forestry Commission reported events we derive the following probability for event occurrence:

- Probability of a wildfire of any size: 1,552 events per year

However, if events are normalized for acreage burned over 1,000 acres, we derive the following probability for event occurrence:

- Probability of a wildfire impacting over 23,475 acres



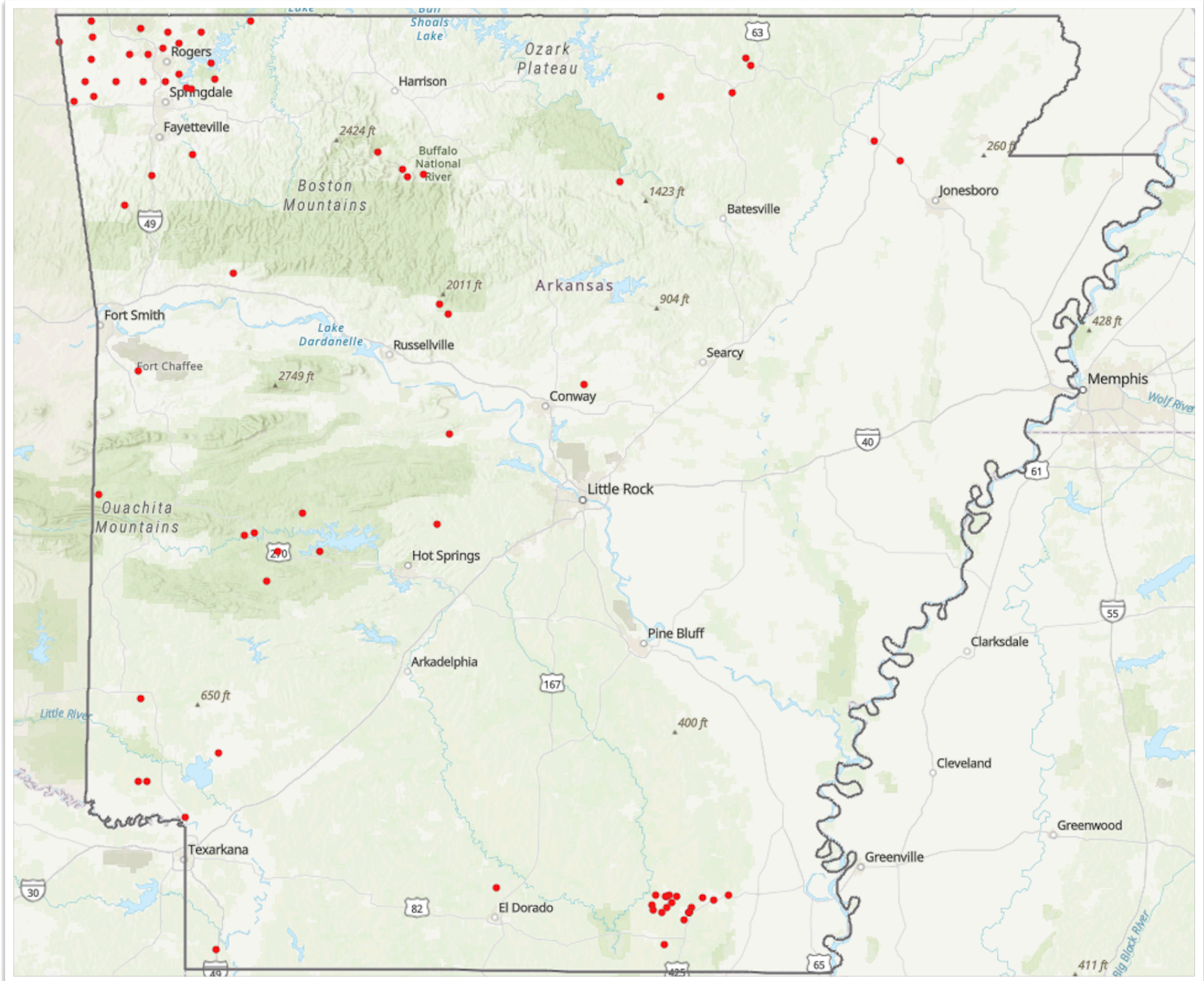
Mapping created by the Southern Foresters indicates the Wildfire Hazard Potential for the State of Arkansas. In general, the map indicates that most of the state is the low or not-burnable class. Some areas of the state, notably the southern third and the northwest corner are rated as moderate on the scale, with small pockets rated as high.

| County | City | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Stone County | Mountain View | $0 | $0 | $29,708.26 | $33,048 | $32,543.04 |
| Pope County | Atkins | $9,149.06 | $17,470.75 | $9,765.12 | $11,492 | $8,961.56 |
| Little River County | Ashdown | $3,278.20 | $3,323.18 | $3,983.48 | $3,427.20 | $3,418.50 |
| Sharp County | Ash Flat | $12,767.54 | $14,317.09 | $12,943.18 | $19,828.80 | $16,153.64 |
| Benton County | Rogers | $0 | $54,927.08 | $60,497.97 | $59,976 | $63,180.48 |
| Benton County | Rogers | $0 | $94,292.72 | $92,766.92 | $100,232 | $82,148.96 |
| Benton County | Bella Vista | $372,697.46 | $365,581.68 | $373,414.12 | $399,024 | $595,858.12 |
| Benton County | Bentonville | $550,453.80 | $0 | $457,740 | $614,720 | $646,431 |
| Scott County | Mena | $3,365.90 | $5,110.28 | $4,052.08 | $27,608 | $9,842.76 |
| Ashley County | North Crossett | $0 | $0 | $0 | $0 | $2,712.82 |
| Newton County | Mount Judea | $3,983.10 | $10,330.72 | $6,463.79 | $0 | $5,565.30 |
| Benton County | Cave Springs | $0 | $49,893.66 | $40,509.99 | $49,041.60 | $50,944.12 |
| Benton County | Centerton | $0 | $159,445.95 | $189,021.19 | $132,668.40 | $141,915.70 |
| Sharp County | Cherokee Village | $72,985.80 | $78,612.36 | $110,823.94 | $62,750.40 | $77,058 |
| Perry County | Perryville | $0 | $0 | $23,084.96 | $10,447 | $11,044.98 |
| Ashley County | Hamburg | $0 | $0 | $7,156.40 | $0 | $5,236.78 |
| Ashley County | Crossroads | $0 | $0 | $5,835.47 | $0 | $3,759.80 |
| Ashley County | North Crossett | $0 | $0 | $0 | $0 | $4,394.60 |
| Benton County | Decatur | $0 | $39,060.48 | $39,642.79 | $16,195.80 | $18,066.04 |
| Miller County | Doddridge | $10,211.22 | $7,756.15 | $8,102.86 | $15,558.40 | $7,991.20 |
| Washington County | Elkins | $33,881.86 | $37,142.70 | $31,812.93 | $31,062.40 | $31,707.94 |
| Benton County | Siloam Springs | $0 | $63,525.40 | $55,869.71 | $57,092.80 | $27,455.48 |
| Sevier County | De Queen | $3,699.28 | $3,229.61 | $4,068.80 | $3,168 | $6,421.50 |
| Benton County | Gentry | $21,419.56 | $36,994.57 | $48,901.89 | $54,505.60 | $61,903.26 |
| Benton County | Gravette | $0 | $65,948.34 | $72,373.78 | $80,376 | $92,584.86 |
| Sebastian County | Greenwood | $191,012.98 | $174,503.08 | $175,349.48 | $204,038 | $226,438.40 |
| Ashley County | Hamburg | $17,083.88 | $29,907.02 | $29,291.16 | $33,316.14 | $39,526.44 |
| Benton County | Lowell | $0 | $67,326.60 | $60,675.98 | $65,579.20 | $88,974 |
| Benton County | Gentry | $0 | $48,104.96 | $40,560.85 | $48,062.40 | $51,429.96 |
| Benton County | Rogers | $0 | $71,000.56 | $66,245.15 | $74,326.60 | $98,748.40 |
| Carroll County | Holiday Island | $0 | $0 | $0 | $45,002 | $79,718 |
| Faulkner County | Vilonia | $8,237.92 | $8,185.02 | $9,078.51 | $0 | $8,875.94 |
| Ashley County | Hamburg | $2,534.70 | $4,000.68 | $4,878.86 | $12,769.76 | $10,311.72 |
| Saline County | Hot Springs Village | $0 | $258,742.14 | $365,457.76 | $318,445.60 | $281,156.90 |
| Lawrence County | Hoxie | $10,452.62 | $18,247.45 | $18,182.45 | $19,324.60 | $20,491.72 |
| Newton County | Jasper | $14,359.32 | $15,181.71 | $18,894.49 | $46,729.60 | $24,829.80 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Montgomery County | Mount Ida | $19,894.80 | $22,185.96 | $24,817.96 | $35,033.60 | $35,346.79 |
| Ashley County | Hamburg | $0 | $0 | $0 | $0 | $4,093.34 |
| Benton County | Little Flock | $0 | $26,216.61 | $27,184.67 | $55,705.60 | $50,943.90 |
| Benton County | Lowell | $244,930.48 | $258,552.82 | $141,416.23 | $183,382.40 | $276,541.98 |
| Ashley County | Hamburg | $2,414 | $3,356.46 | $2,425.86 | $2,610.10 | $36,425.30 |
| Benton County | Maysville | $5,171.98 | $11,263.18 | $13,884.78 | $19,060.60 | $18,322.68 |
| Ashley County | Mist | $2,148.46 | $23,223.86 | $1,991.38 | $2,191.60 | $16,749.40 |
| Montgomery County | Mount Ida | $6,638.50 | $15,165 | $19,104.04 | $9,904.60 | $17,457.42 |
| Newton County | Mount Judea | $3,886.54 | $13,961.07 | $12,826.29 | $17,253 | $6,026.32 |
| Benton County | Garfield | $0 | $93,073.80 | $95,334.49 | $73,168 | $77,033.22 |
| Ashley County | Hamburg | $0 | $4,348.53 | $4,869.85 | $0 | $3,250.92 |
| Fulton County | Hardy | $7,579.96 | $15,029.13 | $21,691.79 | $15,721.60 | $12,414.90 |
| Montgomery County | Norman | $4,364.06 | $5,625.06 | $7,813.41 | $13,465.40 | $6,835.33 |
| Union County | El Dorado | $0 | $9,993.99 | $6,916.96 | $6,963.20 | $7,249.16 |
| Little River County | Ashdown | $4,634.88 | $2,034.40 | $2,288.70 | $2,366.40 | $2,854 |
| Montgomery County | Oden | $20,567.28 | $17,428.10 | $39,770.83 | $9,057.60 | $8,223.74 |
| Little River County | Ogden | $3,307.18 | $3,178.75 | $3,356.76 | $3,372.80 | $3,710.20 |
| Ashley County | Hamburg | $0 | $0 | $5,874.33 | $0 | $4,151.98 |
| Izard County | Oxford | $6,291.72 | $14,092.20 | $6,253.20 | $5,723.60 | $6,999.60 |
| Benton County | Pea Ridge | $0 | $122,623.46 | $140,399.03 | $115,844.80 | $205,345.30 |
| Montgomery County | Pencil Bluff | $7,579.96 | $25,414.17 | $21,488.35 | $3,590.40 | $7,762.88 |
| Ashley County | Hamburg | $0 | $8,544.48 | $2,771.87 | $0 | $2,829.52 |
| Benton County | Rogers | $12,756.12 | $20,293.33 | $80,333.37 | $81,137.60 | $83,169.98 |
| Benton County | Lowell | $0 | $21,867.64 | $33,974.48 | $20,726.40 | $39,841.84 |
| Ashley County | Hamburg | $2,534.70 | $3,491.62 | $3,926.08 | $4,261.52 | $23,466.16 |
| Ashley County | Crossett | $0 | $1,729.24 | $3,204.18 | $0 | $2,962.22 |
| Lawrence County | Sedgwick | $0 | $5,289.44 | $3,865.36 | $2,040 | $5,351.25 |
| Benton County | Siloam Springs | $225,782.52 | $220,102.04 | $399,411.30 | $342,148.80 | $224,210.24 |
| Ashley County | Hamburg | $0 | $4,806.27 | $5,543.74 | $0 | $6,212.08 |
| Montgomery County | Story | $15,819.04 | $15,258 | $27,426.56 | $32,585.60 | $42,142.09 |
| Washington County | West Fork | $0 | $5,092.70 | $7,406.33 | $7,190 | $7,289.48 |
| Benton County | Sulphur Springs | $0 | $18,762.74 | $17,826.43 | $18,206.40 | $18,993.50 |
| Howard County | Mineral Springs | $5,262.52 | $7,323.84 | $13,427.04 | $13,491.20 | $22,489.52 |
| Ashley County | Hamburg | $2,220.88 | $1,398.65 | $3,146.75 | $1,651.50 | $5,193.96 |
| Ashley County | Hamburg | $2,148.46 | $6,870.46 | $2,383.82 | $1,414.40 | $6,033.40 |
| Ashley County | Crossett | $11,916.64 | $12,289.44 | $11,858.77 | $20,074.60 | $26,422.93 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Newton County | Vendor | $3,548.58 | $8,841.50 | $11,267.35 | $22,576 | $7,980.80 |
| Franklin County | Watalula | $0 | $10,974.22 | $31,049.95 | $11,228.60 | $40,696.98 |
| Pope County | Hector | $75,316.80 | $11,710.83 | $9,739.69 | $12,144.80 | $7,762.88 |
| Washington County | West Fork | $86,710.88 | $43,663.31 | $33,694.75 | $35,958.40 | $33,106.40 |
| Ashley County | Montrose | $0 | $6,578.26 | $3,184.88 | $1,281.20 | $3,316.56 |

## Firewise Communities




The national Firewise USA® recognition program provides a collaborative framework to help neighbors in a geographic area get organized, find direction, and take action to increase the ignition resistance of their homes and community and to reduce wildfire risks at the local level.  Any community that meets a set of voluntary criteria on an annual basis and retains an “In Good Standing Status” may identify itself as being a Firewise® Site.

The Firewise USA® program is administered by NFPA® and is co-sponsored by the USDA Forest Service and the National Association of State Foresters.  While the NFPA® administers this program, individuals and communities participate on a voluntary basis. The NFPA® disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from participation in the Firewise USA® program. The NFPA® also makes no guaranty or warranty as to the accuracy or completeness of program guidance.

As administrators of this national program, the NFPA® may use the information provided by communities in a variety of ways, including research, to obtain risk reduction success stories, and to provide value-added benefits to participants through its work with private sector entities

### 4.4.10.4 - VULNERABILITY ANALYSIS

For purposes of this assessment, all state-owned facilities within the state were determined to be at equal risk to wildfire events. However, in determining the vulnerability of state-owned and operated critical facilities data concerning wildfires and the fire intensity scale were used to identify critical facilities at a potentially greater risk. Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential wildfire event.

| State-Owned Facilities Susceptible to Wildfires | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Total Valuation** | **Critical Facilities** | **Critical Facility Total Valuation** | **State-Owned Bridges** |
| State of Arkansas | 3792 | $10,898,646,452.31 | 576 | $2,361,260,565.35 | 7,303 |
| Arkansas | 18 | $8,188,582.03 | 8 | $4,632,718.64 | 75 |
| Ashley | 6 | $2,687,791.08 | 6 | $2,687,791.08 | 69 |
| Baxter | 45 | $91,766,282.09 | 5 | $2,219,240.82 | 35 |
| Benton | 42 | $187,483,529.72 | 9 | $20,793,432.56 | 156 |
| Boone | 34 | $88,586,892.96 | 8 | $9,303,386.12 | 55 |
| Bradley | 50 | $34,148,922.88 | 6 | $7,137,451.50 | 50 |
| Calhoun | 4 | $1,419,567.33 | 3 | $1,174,960.59 | 66 |
| Carroll | 7 | $2,073,119.30 | 4 | $1,545,985.64 | 67 |
| Chicot | 64 | $80,475,656.77 | 6 | $43,713,906.99 | 57 |
| Clark | 109 | $468,703,593.32 | 5 | $3,481,546.94 | 113 |
| Clay | 16 | $10,077,262.01 | 4 | $987,511.15 | 85 |
| Cleburne | 11 | $36,847,548.25 | 4 | $2,061,124.38 | 28 |
| Cleveland | 3 | $705,243.86 | 3 | $705,243.86 | 61 |
| Columbia | 115 | $445,672,715.10 | 3 | $1,028,401.23 | 75 |
| Conway | 76 | $55,626,364.83 | 4 | $1,627,388.29 | 76 |
| Craighead | 227 | $1,319,922,341.64 | 10 | $9,154,672.74 | 175 |
| Crawford | 38 | $25,365,272.07 | 5 | $3,640,863.16 | 176 |
| Crittenden | 35 | $127,719,120.92 | 8 | $3,690,430.15 | 163 |
| Cross | 65 | $36,051,200.33 | 6 | $3,375,873.26 | 93 |
| Dallas | 6 | $2,111,608.88 | 4 | $1,554,408.18 | 81 |
| Desha | 13 | $4,733,763.86 | 4 | $1,564,467.00 | 50 |
| Drew | 17 | $7,416,013.74 | 9 | $4,664,369.45 | 85 |
| Faulkner | 295 | $1,217,867,581.07 | 8 | $7,761,135.06 | 124 |
| Franklin | 17 | $34,387,533.73 | 3 | $842,906.65 | 83 |
| Fulton | 24 | $12,583,989.23 | 5 | $2,214,766.13 | 65 |
| Garland | 120 | $170,275,197.06 | 9 | $9,311,635.69 | 152 |
| Grant | 8 | $4,117,068.71 | 7 | $4,001,568.71 | 96 |
| Greene | 47 | $31,323,797.11 | 6 | $4,320,196.19 | 93 |
| Hempstead | 73 | $76,583,328.98 | 10 | $8,713,511.18 | 132 |
| Hot Spring | 84 | $301,854,794.31 | 10 | $193,799,059.91 | 126 |
| Howard | 16 | $11,098,640.33 | 6 | $3,048,527.15 | 60 |
| Independence | 23 | $15,735,541.79 | 7 | $3,225,844.00 | 97 |
| Izard | 34 | $107,021,175.39 | 6 | $3,530,254.70 | 42 |
| Jackson | 66 | $228,406,869.70 | 8 | $88,337,243.72 | 111 |
| Jefferson | 161 | $393,195,391.16 | 27 | $219,978,530.97 | 151 |

| | | | | | |
|---|---|---|---|---|---|
| Johnson | 16 | $8,150,351.06 | 6 | $2,998,316.49 | 108 |
| Lafayette | 15 | $6,608,475.68 | 6 | $1,878,830.68 | 47 |
| Lawrence | 32 | $21,602,740.78 | 4 | $1,656,152.26 | 99 |
| Lee | 36 | $147,668,860.84 | 8 | $124,325,081.05 | 54 |
| Lincoln | 134 | $294,072,621.01 | 22 | $194,270,813.56 | 59 |
| Little River | 15 | $5,330,273.81 | 4 | $1,881,746.22 | 49 |
| Logan | 87 | $136,349,990.20 | 4 | $1,116,877.63 | 81 |
| Lonoke | 38 | $23,801,536.92 | 5 | $2,682,492.09 | 135 |
| Madison | 17 | $7,116,437.26 | 5 | $2,583,642.97 | 92 |
| Marion | 10 | $12,118,168.36 | 6 | $2,829,428.22 | 39 |
| Miller | 17 | $112,750,921.68 | 4 | $2,136,754.03 | 161 |
| Mississippi | 53 | $136,317,546.13 | 6 | $2,876,716.16 | 182 |
| Monroe | 5 | $2,343,993.15 | 5 | $2,343,993.15 | 78 |
| Montgomery | 6 | $1,786,277.98 | 4 | $1,506,992.51 | 88 |
| Nevada | 18 | $5,238,210.69 | 5 | $1,932,814.34 | 101 |
| Newton | 8 | $2,973,644.76 | 5 | $2,186,847.15 | 41 |
| Ouachita | 67 | $132,961,321.03 | 9 | $4,729,918.11 | 90 |
| Perry | 7 | $2,365,119.68 | 3 | $675,236.80 | 81 |
| Phillips | 25 | $24,218,066.63 | 4 | $1,994,460.34 | 59 |
| Pike | 33 | $16,250,267.73 | 4 | $1,567,310.07 | 63 |
| Poinsett | 31 | $26,949,937.41 | 6 | $3,192,391.42 | 127 |
| Polk | 18 | $19,618,252.24 | 4 | $1,736,600.40 | 102 |
| Pope | 127 | $549,329,560.19 | 10 | $5,326,204.73 | 101 |
| Prairie | 15 | $7,844,861.42 | 4 | $1,418,153.96 | 66 |
| Pulaski | 445 | $2,676,770,640.25 | 104 | $1,247,800,470.37 | 381 |
| Randolph | 39 | $88,255,338.41 | 4 | $2,624,642.63 | 84 |
| St. Francis | 68 | $158,283,776.17 | 5 | $1,795,505.00 | 100 |
| Saline | 8 | $2,665,524.39 | 5 | $1,638,971.22 | 123 |
| Scott | 6 | $2,813,373.71 | 4 | $1,927,101.02 | 44 |
| Searcy | 50 | $80,970,807.10 | 14 | $21,570,578.51 | 171 |
| Sebastian | 4 | $1,311,098.72 | 4 | $1,311,098.72 | 72 |
| Sevier | 11 | $11,336,228.20 | 5 | $1,969,885.73 | 54 |
| Sharp | 51 | $79,811,432.22 | 8 | $8,784,795.86 | 154 |
| Stone | 40 | $37,290,337.17 | 5 | $1,869,090.84 | 55 |
| Union | 50 | $131,527,527.57 | 6 | $3,765,195.32 | 124 |
| Van Buren | 7 | $2,434,162.08 | 4 | $1,700,450.94 | 50 |
| Washington | 108 | $111,752,738.51 | 12 | $6,780,582.89 | 171 |
| White | 63 | $149,862,444.12 | 6 | $2,645,017.47 | 205 |
| Woodruff | 4 | $1,249,134.83 | 4 | $1,249,134.83 | 62 |
| Yell | 39 | $16,311,150.68 | 7 | $4,149,915.87 | 128 |

For vulnerability and loss estimation purposes all counties were considered at equal risk to wildfires. Counties with a higher identified population and number of structures are to be considered to have a potentially greater vulnerability.  However, these vulnerabilities should be viewed as theoretical due to the number of variables involved in a wildfire event.

Population vulnerability for each county is a function of the following component parts:

- Population change over time
- Vulnerable populations
- Population density

In general:

- Counties with a high population are at increased risk
- Counties with growing populations are at increasing risk
- Counties with a high population of children under 5 or adults over the age of 65 may be at increased risk.

The following counties may have increased vulnerability to wildfire events due to population factors:

- **Counties with a large population increase:** Benton, Craighead, Faulkner, Lonoke, Pulaski, Sebastian, Washington and White
- Counties with a population gain of over 1,000 children under the age of 5: Benton, Craighead Faulkner, Lonoke, Pulaski, Saline and Washington
- **Counties with a population gain of over 1,000 adults over the age of 65:** Baxter, Benton, Boone, Cleburne, Craighead, Crawford, Faulkner, Garland, Greene, Independence, Lonoke, Marion, Miller, Pope, Randolph, Saline, Sebastian, Washington and White

The USDA 2017 Census of Agriculture (the latest available data) provides data on the crop exposure value, the total dollar value of all crops, for each Arkansas county.  USDA Risk Management Agency crop loss data allows us to quantify the monetary impact of wildfire events on the agricultural sector. In general, the higher the percentage loss, the higher the vulnerability the county has to wildfire events. Please note that only counties that a had a recorded impact, either crops lost or building damaged, are show in the following table.

**County Agricultural Vulnerability Data for Wildfires**

| County | USDA Estimated Crop Exposure | USDA Crop Loss, Wildfires 2012-2017 Yearly Average | Percentage of Crop Exposure Lost to Wildfires | Total Acres Burned |
|---|---|---|---|---|
| State of Arkansas | $9,775,758,000 | $18,946,497 | 0.1938% | 96,080 |
| Arkansas | $298,173,000 | $28,859 | 0.0097% | 254 |
| Ashley | $78,844,000 | $43,484 | 0.0552% | 618 |
| Benton | $529,128,000 | $39,178 | 0.0074% | 461 |
| Bradley | $43,633,000 | $1,961,154 | 4.4947% | 392 |
| Chicot | $204,719,000 | $80,524 | 0.0393% | 1,355 |
| Clark | $15,083,000 | $11,300 | 0.0749% | 300 |
| Clay | $246,172,000 | $2,327,465 | 0.9455% | 11,694 |
| Conway | $161,648,000 | $3,786 | 0.0023% | 62 |
| Craighead | $261,600,000 | $123,596 | 0.0472% | 234 |
| Crawford | $67,408,000 | $96,783 | 0.1436% | 844 |
| Crittenden | $215,016,000 | $404,515 | 0.1881% | 4,791 |
| Cross | $188,778,000 | $785,446 | 0.4161% | 5,312 |
| Dallas | $1,305,000 | $0 | 0.0000% | 0 |
| Desha | $212,893,000 | $88,285 | 0.0415% | 2,104 |
| Drew | $88,347,000 | $234,302 | 0.2652% | 2,219 |
| Franklin | $158,178,000 | $2,872 | 0.0018% | 87 |
| Greene | $177,326,000 | $6,423,163 | 3.6222% | 26,614 |
| Independence | $131,867,000 | $152,852 | 0.1159% | 1,855 |
| Jackson | $186,837,000 | $382,087 | 0.2045% | 4,345 |
| Jefferson | $215,265,000 | $70,050 | 0.0325% | 479 |
| Johnson | $141,042,000 | $13,245 | 0.0094% | 401 |

| | | | | |
|---|---|---|---|---|
| Lawrence | $149,140,000 | $974,987 | 0.6537% | 2,982 |
| Lee | $171,870,000 | $229,138 | 0.1333% | 1,910 |
| Lincoln | $219,452,000 | $21,041 | 0.0096% | 287 |
| Little River | $76,510,000 | $11,760 | 0.0154% | 280 |
| Lonoke | $223,378,000 | $563,349 | 0.2522% | 3,950 |
| Miller | $45,538,000 | $177,347 | 0.3894% | 918 |
| Mississippi | $314,647,000 | $309,077 | 0.0982% | 4,294 |
| Monroe | $194,373,000 | $329,239 | 0.1694% | 3,172 |
| Phillips | $247,998,000 | $579,081 | 0.2335% | 6,239 |
| Poinsett | $287,420,000 | $453,301 | 0.1577% | 5,387 |
| Pope | $150,102,000 | $18,180 | 0.0121% | 169 |
| Prairie | $165,065,000 | $301,875 | 0.1829% | 2,254 |
| Randolph | $79,585,000 | $680,187 | 0.8547% | 3,176 |
| St. Francis | $189,878,000 | $94,064 | 0.0495% | 1,487 |
| White | $100,373,000 | $378,634 | 0.3772% | 2,388 |
| Woodruff | $167,588,000 | $549,484 | 0.3279% | 2,122 |
| Yell | $196,381,000 | $2,807 | 0.0014% | 20 |

#### 4.4.10.5 - IMPACT AND CONSEQUENCE ANALYSIS

As per EMAP requirements, the following table provides the Consequence Analysis.

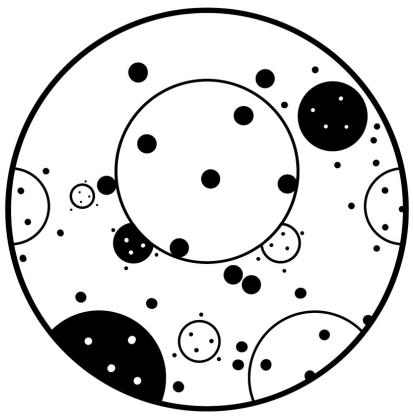
| **Wildfire Consequence Analysis** | |
|---|---|
| **Subject** | **Impacts of Wildfire** |
| Health and Safety of the Public | Impact could be severe for people living and working in the immediate area. Surrounding communities may also be impacted by evacuees. |
| Health and Safety of Responders | Impact to responders could be severe depending on the size and scope of the fire, especially for firefighters. Impact will be low to moderate for support responders with the main threat as smoke inhalation. |
| Continuity of Operations | Temporary relocation may be necessary if government facilities experience damage. |
| Property, Facilities, and Infrastructure | Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained. |
| Environment | Impact will be severe for the immediate area with regards to trees, bushes, animals, and crops. Impact will lessen as distance increases. |
| Economic Conditions | Impacts to the economy could be moderate in the immediate area. |
| Public Confidence in the Jurisdiction's Governance | Response and recovery will be in question if not timely and effective. Evacuation orders and shelter availability could be called in to question. |

# MAJOR DISEASE

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Natural, manmade, technological | • Populations - All: depends on event<br>• Locations - all | • Presidential Declared Disasters<br>  • 1 |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | All populations are at risk of a pandemic or epidemic. The event istelf determines what populations are most at risk. |
|  | All government offices could be impacted by a pandemic or epidemic however the impact is dependent upon the type and the populations that are effected. |
|  | Impacts are limited |
|  | Impact is limited and depends on type of pandemic or epidemic. |
|  | Impacts can be widespread as can be found when looking at the Covid-19 pandemic. The impact and severity of an event will determine the economic impact that will be felt at the local, state, and federal level. |

## 4.4.11 Major Disease



For this plan, major disease is classified as infectious diseases caused by microscopic agents, including viruses, bacteria, parasites, and fungi or by their toxins, that may impact humans or animals.  They may be spread by direct contact with an infected person or animal, ingesting contaminated food or water, vectors such as mosquitoes or ticks, contact with contaminated surroundings such as animal droppings, infected droplets, or by aerosolization

### 4.4.11.1 - LOCATION AND EXTENT

While there are many biological diseases/agents that are of concern to Arkansas, the following categories of disease are being addressed in this plan, human transmissible disease and animal transmissible disease.

**Human Transmissible Diseases**

Human transmissible disease and infectious diseases are human and animal illnesses caused by microscopic agents, including viruses, bacteria, parasites, and fungi or by their toxins.  They may be spread by direct contact with an infected person or animal, ingesting contaminated food or water, vectors such as mosquitoes or ticks, contact with contaminated surroundings such as animal droppings, infected droplets, or by aerosolization.

The entire planning area is susceptible to a transmissible disease outbreak.  However, more densely populated areas may be more susceptible.

**Animal Transmissible Diseases**

Because livestock animals are both raised locally and imported into the state the potential for highly contagious animal disease poses a threat to the state economy.  Of particular concern are two economically devastating animal diseases, foot and mouth disease and bovine spongiform encephalopathy.  Infection with these could result in a decline in milk production, spontaneous abortion, and animal death.  It would not only affect farmer and ranchers, but support and related industries as well.

The entire planning area is susceptible to an animal disease outbreak.  However, counties with a higher number of cattle and swine may be more susceptible to animal disease. The following table, with data from the United States Department of Agriculture National Agricultural Statistics Service, details the top ten Arkansas counties for cattle and swine.

| Top Ten Arkansas Counties for Cattle and Swine, 2017 | | |
|---|---|---|
| **County** | **Number of Cattle** | **Number of Swine** |
| State of Arkansas | 1,759,375 | 130,774 |
| Benton | 96,027 | 3,762 |
| Boone | 80,388 | 1,728 |
| Carroll | 81,128 | - |
| Conway | - | 12,006 |
| Franklin | 55,590 | - |
| Hempstead | 53,124 | 13,130 |
| Howard | 44,029 | 22,683 |
| Logan | 63,713 | - |
| Madison | 67,965 | - |
| Montgomery | - | 6,745 |
| Newton | - | - |
| Pike | - | - |

| | | |
|---|---|---|
| Polk | - | - |
| Pope | - | 2,846 |
| Sevier | - | 9,788 |
| Washington | 98,673 | 2,265 |
| White | 47,116 | - |
| Yell | - | 18,166 |

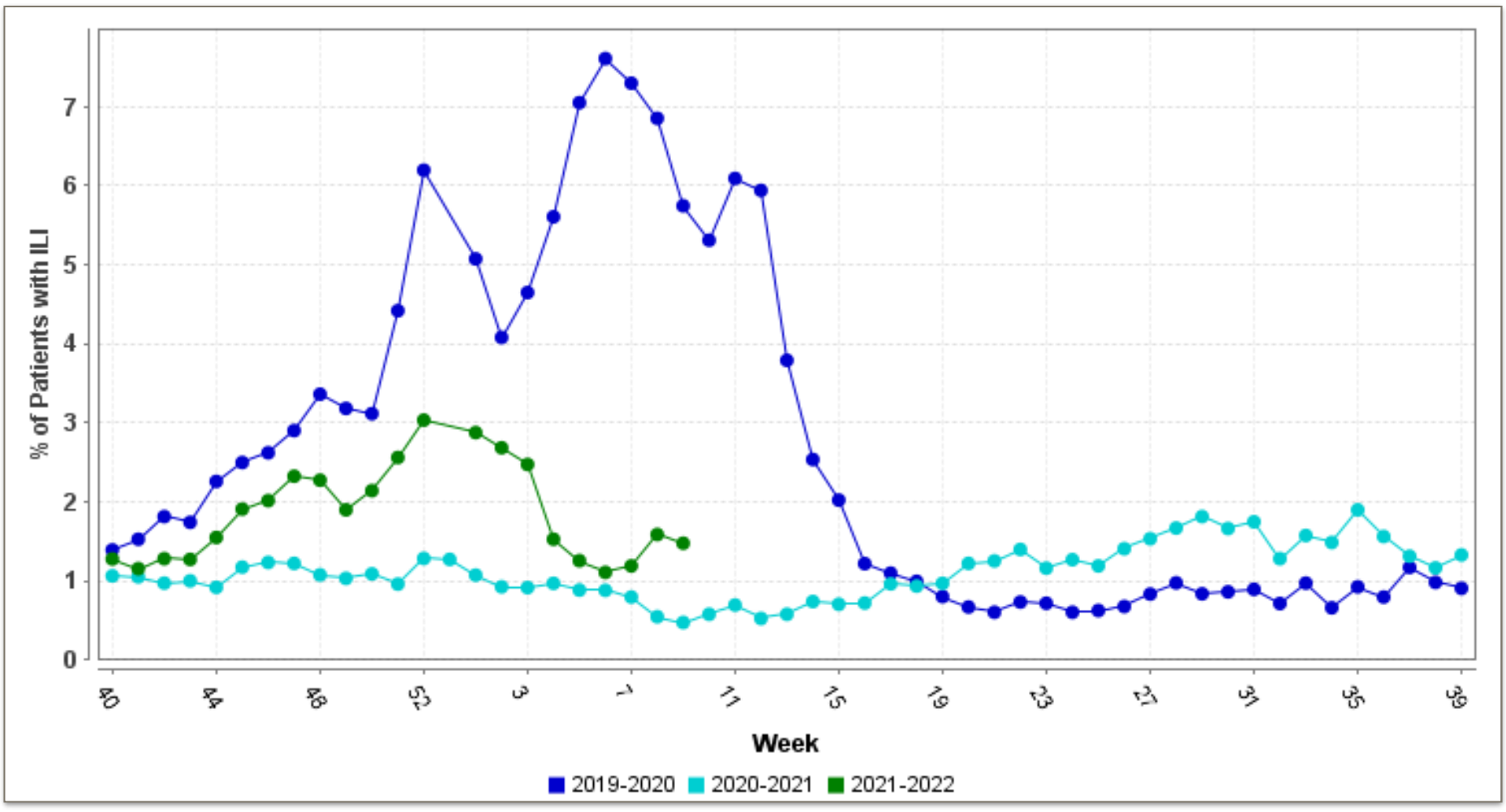
Source: United States Department of Agriculture National Agricultural Statistics Service
-: County not in top ten

### 4.4.11.2 - PREVIOUS OCCURRENCES

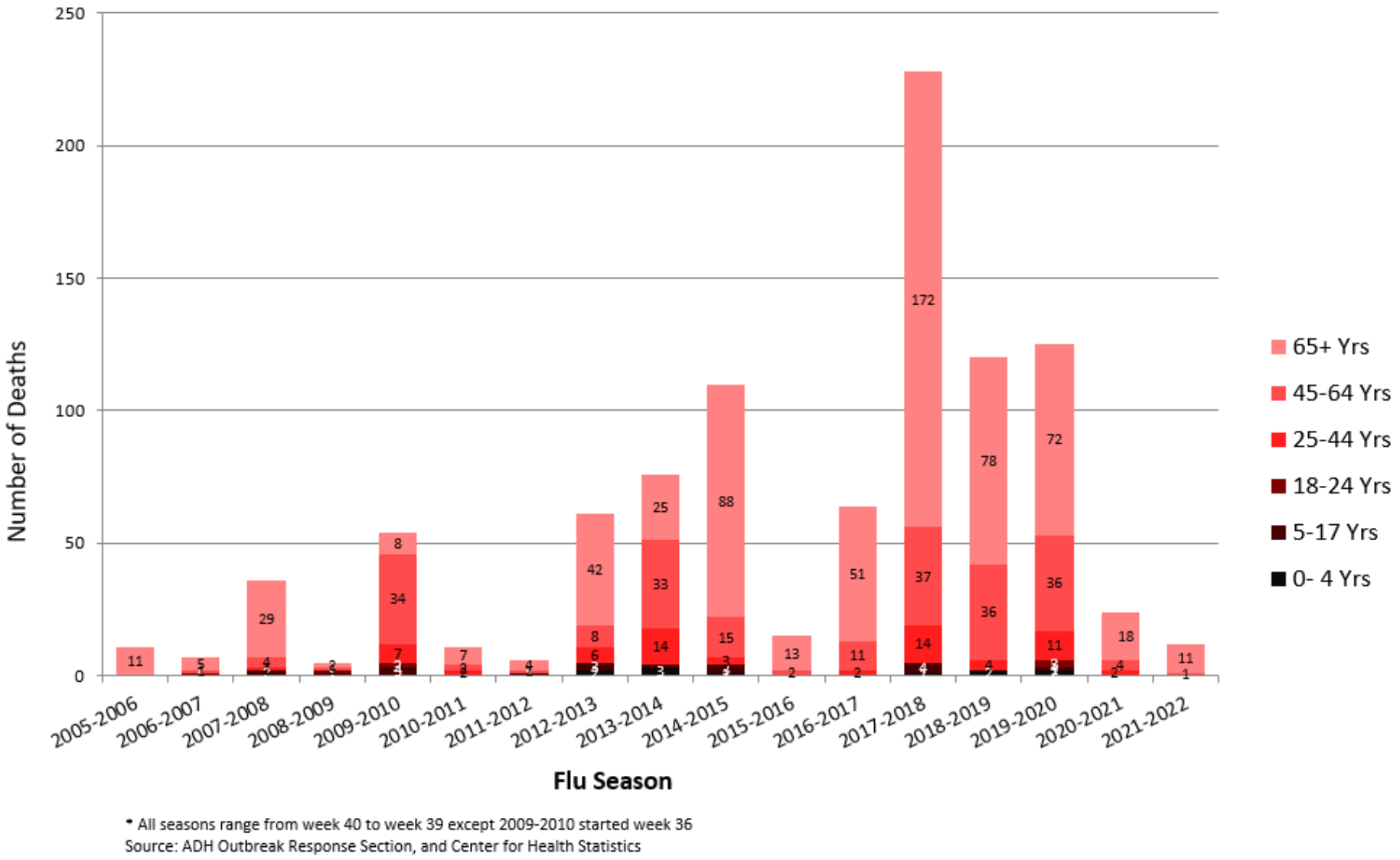
The state of Arkansas Department of Health (ADH) was contacted concerning the epidemiological tracking of contagious and/or human transmissible diseases. The following table provides information concerning select diseases of concern.
Source: Arkansas Department of Health

The following graph, provided by the ADH, details the percentage of emergency room visits for Influenza like illness for the period 2015 to 2017.

**Percent Emergency Room Visits with Influenza Like Illness, Arkansas 2019-2021**




Additionally, the graph below provided by ADH illustrates the mortality rate of Influenza for the State of Arkansas.




### 4.4.11.3 - HAZARD PROBABILITY ANALYSIS

Each year the Centers for Disease Control (CDC) produces a report detailing the legally “reportable diseases” in States. While over time this report can serve as a predictor of the likelihood of future disease, it is impossible to predict outbreaks. Based on the relatively limited/controlled outbreak history in the state, the possibility of a large-scale major disease outbreak to be limited.

### 4.4.11.4 - VULNERABILITY ANALYSIS

For purposes of this assessment, no state-owned and operated facilities are considered vulnerable to the major disease hazard.

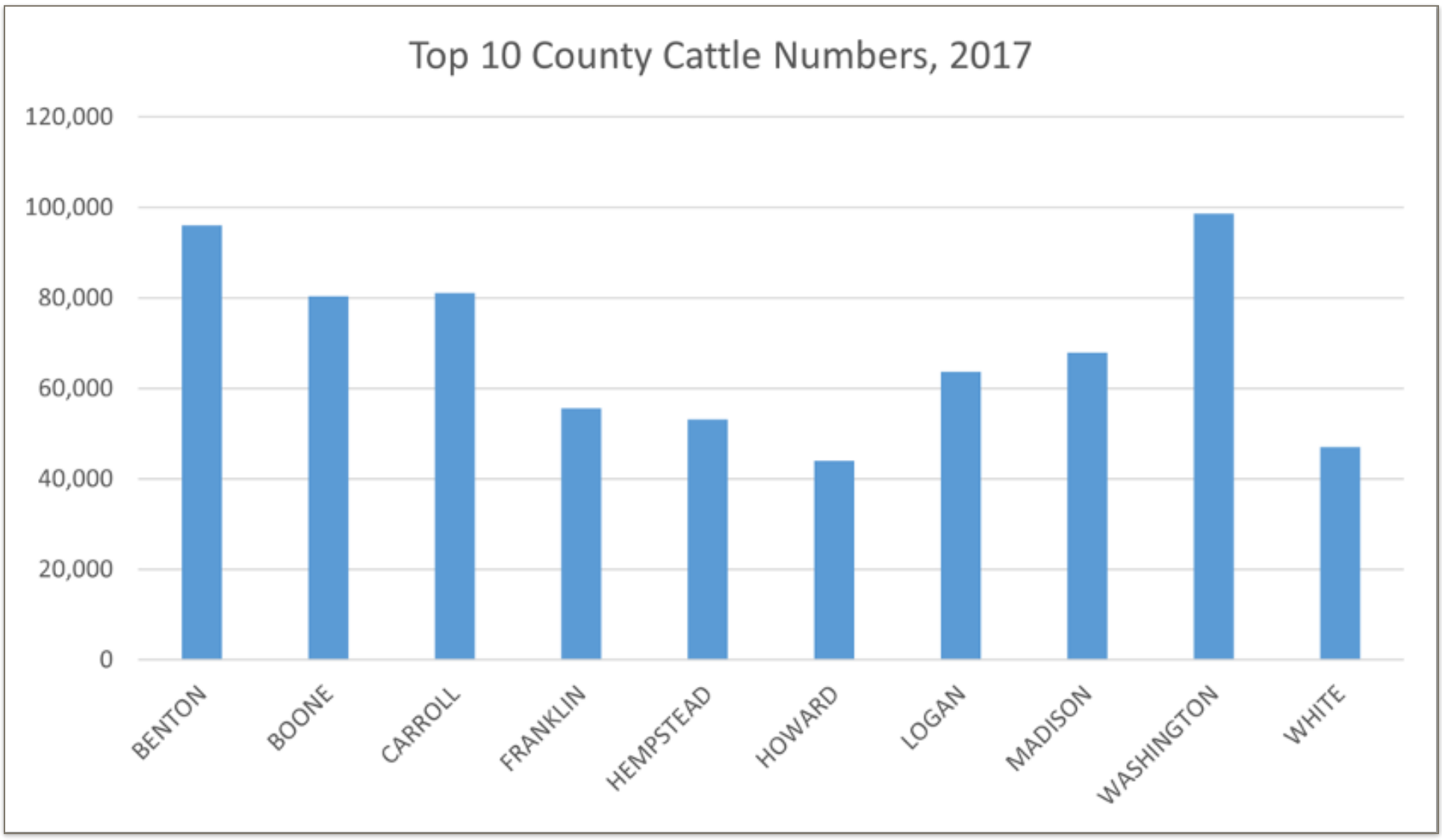
Due to the person to person transmission of many diseases of concern, and the increased likelihood of mortality for very young and very old populations, in general:

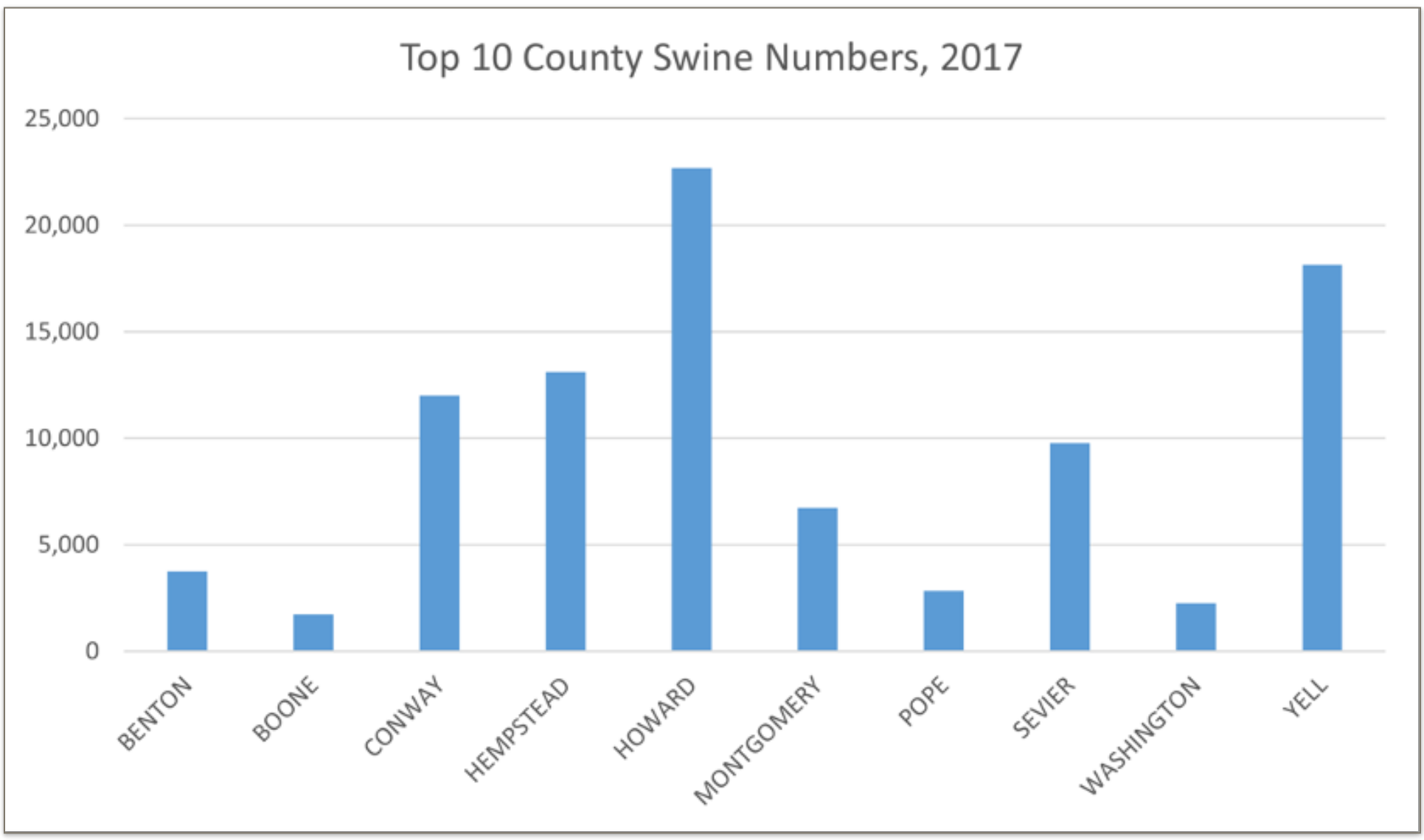
- Counties with a high population are at increased risk
- Counties with growing populations are at increasing risk
- Counties with a high population of children under 5 or adults over the age of 65 may be at increased risk.

Population data may be found in previous sections. However, it is worth highlighting the following counties may have increased vulnerability to disease events due to population factors:

- Counties with a large population increase: Benton, Craighead, Faulkner, Lonoke, Pulaski, Sebastian, Washington and White
- Counties with a population gain of over 1,000 children under the age of 5: Benton, Craighead Faulkner, Lonoke, Pulaski, Saline and Washington
- Counties with a population gain of over 1,000 adults over the age of 65: Baxter, Benton, Boone, Cleburne, Craighead, Crawford, Faulkner, Garland, Greene, Independence, Lonoke, Marion, Miller, Pope, Randolph, Saline, Sebastian, Washington and White

Additionally, counties with a high number of livestock can be considered at increased risk to animal disease. The following charts detail animal numbers and animal change data for the ten most vulnerable counties within the state.


Top 10 County Cattle Numbers, 2017
120,000
100,000
80,000
60,000
40,000
20,000
0
BENTON
BOONE
CARROLL
FRANKLIN
HEMPSTEAD
HOWARD
LOGAN
MADISON
WASHINGTON
WHITE


Top 10 County Swine Numbers, 2017
25,000
20,000
15,000
10,000
5,000
0
BENTON
BOONE
CONWAY
HEMPSTEAD
HOWARD
MONTGOMERY
POPE
SEVIER
WASHINGTON
YELL

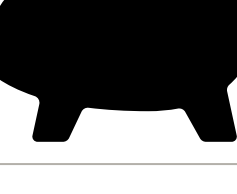
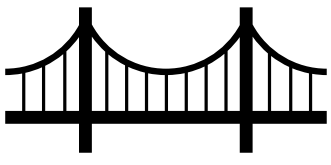
#### 4.4.11.5 - IMPACT AND CONSEQUENCE ANALYSIS

As per EMAP requirements, the following table provides the Consequence Analysis.

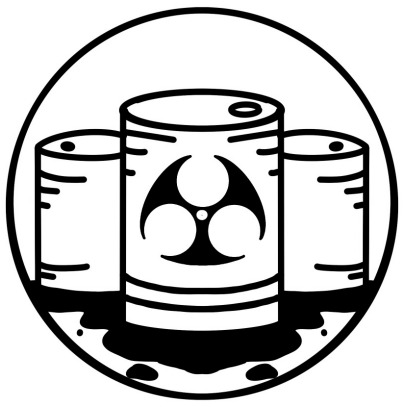
| Major Disease Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Major Disease Outbreak** |
| Health and Safety of Persons in the Area of the Incident | Impact over a widespread area could be severe depending on type of outbreak and whether it is a communicable disease. Casualties are dependent on warning systems, warning times and the availability of vaccines, antidotes, and medical services |
| Responders | Impact to responders could be severe, especially if they reside in the affected area and/or depending on their type of exposure during response. With proper precautions and safety nets in place the impact is lessened. |
| Continuity of Operations | Continuity of Operations will be greatly dependent on availability of healthy individuals. COOP is not expected to be exercised. |
| Property, Facilities, and Infrastructure | Access to facilities and infrastructure could be affected until decontamination is completed |
| Environment | Impact could be severe for the immediate impacted area depending on the source of the outbreak. Impact could have far-reaching implications if disease is transferable between humans and animals or to wildlife. |
| Economic Conditions | Impacts to the economy could be severe if the disease is communicable. Loss of tourism, revenue, and business as usual will greatly affect the local economy and the state. |
| Public Confidence in Governance | Response and recovery will be in question if not timely and effective. Availability of medical supplies, vaccines, and treatments will come into question. |

# HAZARDOUS MATERIALS

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Manmade or technological | • Populations - workers and populations near roadways, rail, or manufacturing facilities<br>• Locations - varies from county to county | • Number of Occurrences<br>• Presidential Declared Disasters |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Population most at risk are those that live along interstates, HWY, rail lines, and manufacturing and or storage facilities where chemicals are used and or stored. |
|  | Government functions near along interstates, HWY, rail lines, and manufacturing and or storage facilities where chemicals are used and or stored. |
|  | Impacts on built environment is limited. |
|  | Impacts on natural resources are limited. |
|  | Economic impact is limited and dependent of scope of accident and where it occurs. |

## 4.4.12 Hazardous Materials



Hazardous materials (HazMat) are any substances that pose a risk to health, life, or property when released or improperly handled. Generally, the term refers to materials with hazardous chemical or physical properties, though sometimes biological agents can fall under this category. The basic types of hazardous materials may be categorized according to more than six different systems; but the categories of U.S. Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11002) provide a general guide to hazardous materials:

•***Extremely Hazardous Substances:*** Materials that have acutely toxic chemical or physical properties and may cause irreversible damage or death to people, or harm the environment if released or used outside their intended use.
•***Hazardous Substances:*** Materials posing a threat to human health and/or the environment, or any substance designated by the EPA to be reported if a designated quantity of the substance is spilled into waterways, aquifers, or water supplies or is otherwise released into the environment.




### 4.4.12.1 - LOCATION AND EXTENT

In Arkansas, HazMat incidents are generally classified as:

- Fixed Facility Incidents: Commercial Facilities, Superfund Sites
- Transportation Incidents: Highway, Railway, Pipeline, Air, and Water

**Fixed Facilities**

When facilities have hazardous materials in quantities at or above the threshold planning quantity, they must submit Tier II information to appropriate federal and state agencies to facilitate emergency planning in accordance with the Community Right to Know Act. The forms are known as Tier II reports and the facilities included are referred to as Tier II facilities. According to data previously provided by ADEM, there 3,268 Tier II Facilities housing hazardous chemicals in Arkansas. The following table details the number of Tier II facilities by county.

| Tier II Facilities by County | | | | |
|---|---|---|---|---|
| **County** | **Tier II Facilities** | | **County** | **Tier II Facilities** |
| State of Arkansas | 3,268 | | Lawrence | 15 |
| Arkansas | 26 | | Lee | 5 |
| Ashley | 21 | | Lincoln | 7 |

| | | | | |
|---|---|---|---|---|
| Baxter | 26 | | Little River | 12 |
| Benton | 127 | | Logan | 56 |
| Boone | 28 | | Lonoke | 22 |
| Bradley | 5 | | Madison | 6 |
| Calhoun | 15 | | Marion | 5 |
| Carroll | 21 | | Miller | 35 |
| Chicot | 7 | | Mississippi | 57 |
| Clark | 15 | | Monroe | 12 |
| Clay | 13 | | Montgomery | 4 |
| Cleburne | 36 | | Nevada | 9 |
| Cleveland | 4 | | Newton | 1 |
| Columbia | 203 | | Ouachita | 59 |
| Conway | 38 | | Perry | 5 |
| Craighead | 82 | | Phillips | 33 |
| Crawford | 149 | | Pike | 5 |
| Crittenden | 49 | | Poinsett | 21 |
| Cross | 10 | | Polk | 13 |
| Dallas | 5 | | Pope | 68 |
| Desha | 16 | | Prairie | 11 |
| Drew | 11 | | Pulaski | 272 |
| Faulkner | 78 | | Randolph | 15 |
| Franklin | 168 | | St. Francis | 19 |
| Fulton | 8 | | Saline | 31 |
| Garland | 37 | | Scott | 10 |
| Grant | 9 | | Searcy | 5 |
| Greene | 36 | | Sebastian | 503 |
| Hempstead | 33 | | Sevier | 9 |
| Hot Spring | 36 | | Sharp | 4 |
| Howard | 17 | | Stone | 4 |
| Independence | 33 | | Union | 134 |
| Izard | 5 | | Van Buren | 41 |
| Jackson | 16 | | Washington | 111 |
| Jefferson | 53 | | White | 112 |
| Johnson | 52 | | Woodruff | 12 |
| Lafayette | 21 | | Yell | 16 |

The National Priorities List (NPL) is a published list of hazardous waste sites in the country that are eligible for extensive, long-term cleanup under the Superfund program.  A Superfund site is an uncontrolled or abandoned location where hazardous waste is located which may affect local ecosystems and/or people.  The EPA has indicated that the following Superfund sites are within the State of Arkansas.

| Arkansas NPL Facilities | | |
|---|---|---|
| **Facility Name** | **Location** | **County** |
| ARKWOOD, INC. | OMAHA | BOONE |
| CEDAR CHEMICAL CO. | HELENA-WEST HELENA | PHILLIPS |
| GURLEY OIL PIT | EDMONDSON | CRITTENDEN |
| INDUSTRIAL WASTE CONTROL | JENNY LIND | SEBASTIAN |
| JACKSONVILLE (GRAHAM ROAD) MUNICIPAL | JACKSONVILLE | LONOKE |
| MACMILLAN RING-FREE OIL | Norphlet | UNION |
| MID-SOUTH WOOD PRODUCTS | MENA | POLK |
| MONROE AUTO EQUIPMENT CO. | PARAGOULD | GREENE |
| MOUNTAIN PINE PRESSURE TREATING | PLAINVIEW | YELL |
| OLD MIDLAND PRODUCTS | OLA | YELL |
| OUACHITA NEVADA WOOD TREATER | READER | OUACHITA |
| POPILE, INC. | EL DORADO | UNION |
| ROGERS ROAD MUNICIPAL LANDFILL | JACKSONVILLE | PULASKI |
| SOUTH 8TH STREET LANDFILL | WEST MEMPHIS | CRITTENDEN |
| VERTAC, INC. | JACKSONVILLE | PULASKI |
| CECIL LINDSEY | NEWPORT | JACKSON |
| FRIT INDUSTRIES | WALNUT RIDGE | LAWRENCE |

Source: Arkansas Department of Energy and Environment

**Transportation**

The following table, with date from Arkansas Department of Transportation (ArDOT) presents both state and county highway mileage by county.

| Interstate and Highway Mileage by County | | | |
|---|---|---|---|
| **County** | **Interstates (Miles)** | **US Highways (Miles)** | **State Highways (miles)** |
| State of Arkansas | 749 | 3,666 | 12,034 |
| Arkansas | 0 | 79 | 209 |
| Ashley | 0 | 98 | 122 |
| Baxter | 0 | 33 | 167 |
| Benton | 17 | 64 | 290 |
| Boone | | 54 | 128 |
| Bradley | 0 | 68 | 68 |
| Calhoun | 0 | 70 | 85 |
| Carroll | 0 | 63 | 149 |
| Chicot | 0 | 69 | 127 |
| Clark | 27 | 32 | 186 |
| Clay | 0 | 67 | 111 |

| | | | |
|---|---|---|---|
| Cleburne | 0 | 0 | 199 |
| Cleveland | 0 | 55 | 107 |
| Columbia | 0 | 100 | 104 |
| Conway | 21 | 22 | 184 |
| Craighead | 14 | 56 | 221 |
| Crawford | 49 | 44 | 123 |
| Crittenden | 50 | 54 | 155 |
| Cross | 0 | 54 | 193 |
| Dallas | 0 | 22 | 159 |
| Desha | 0 | 42 | 141 |
| Drew | 0 | 71 | 134 |
| Faulkner | 18 | 57 | 184 |
| Franklin | 19 | 21 | 185 |
| Fulton | 0 | 53 | 108 |
| Garland | 0 | 78 | 133 |
| Grant | 2 | 63 | 118 |
| Greene | 0 | 60 | 153 |
| Hempstead | 23 | 84 | 162 |
| Hot Spring | 25 | 54 | 139 |
| Howard | 0 | 71 | 91 |
| Independence | 0 | 32 | 200 |
| Izard | 0 | 0 | 147 |
| Jackson | 0 | 37 | 229 |
| Jefferson | 29 | 109 | 161 |
| Johnson | 28 | 29 | 150 |
| Lafayette | 0 | 17 | 119 |
| Lawrence | 0 | 73 | 148 |
| Lee | 0 | 37 | 148 |
| Lincoln | 0 | 37 | 149 |
| Little River | 0 | 19 | 126 |
| Logan | 0 | 1 | 206 |
| Lonoke | 22 | 65 | 225 |
| Madison | 0 | 32 | 182 |
| Marion | 0 | 26 | 125 |
| Miller | 58 | 78 | 111 |
| Mississippi | 44 | 47 | 335 |
| Monroe | 13 | 71 | 138 |
| Montgomery | 0 | 40 | 126 |
| Nevada | 13 | 72 | 139 |
| Newton | 0 | 5 | 196 |
| Ouachita | 0 | 75 | 132 |
| Perry | 0 | 0 | 165 |
| Phillips | 0 | 38 | 178 |

| | | | |
|---|---|---|---|
| Pike | 0 | 30 | 144 |
| Poinsett | 27 | 22 | 229 |
| Polk | 0 | 68 | 130 |
| Pope | 27 | 28 | 243 |
| Prairie | 20 | 45 | 156 |
| Pulaski | 87 | 45 | 219 |
| Randolph | 0 | 37 | 153 |
| St. Francis | 24 | 23 | 106 |
| Saline | 0 | 59 | 119 |
| Scott | 0 | 36 | 126 |
| Searcy | 11 | 36 | 198 |
| Sebastian | 0 | 63 | 71 |
| Sevier | 0 | 52 | 106 |
| Sharp | 46 | 56 | 160 |
| Stone | 0 | 0 | 165 |
| Union | 0 | 111 | 142 |
| Van Buren | 0 | 35 | 169 |
| Washington | 34 | 92 | 207 |
| White | 0 | 89 | 312 |
| Woodruff | 0 | 44 | 157 |
| Yell | 0 | 0 | 254 |

**Arkansas Rail System**

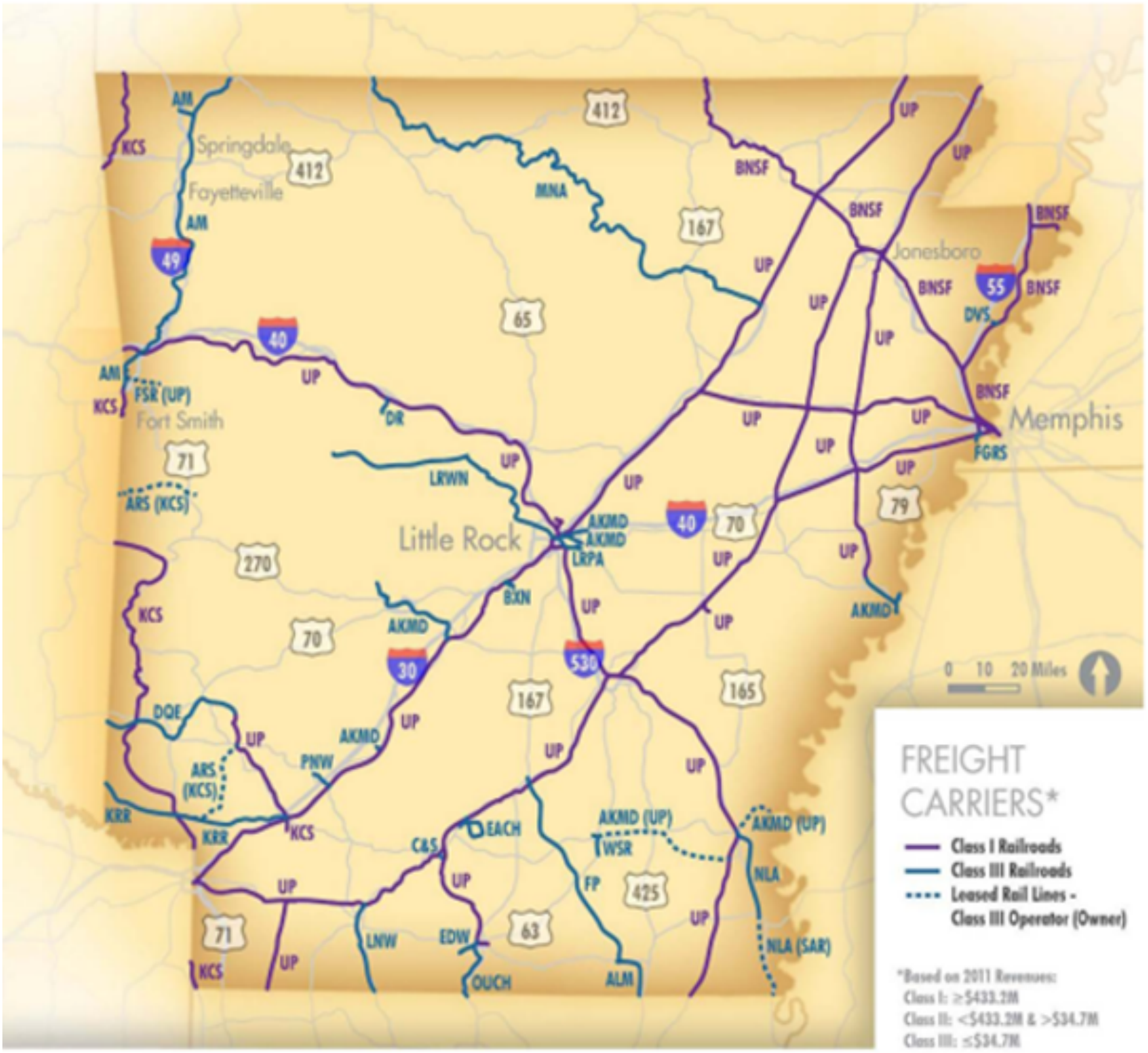
There are three classifications of railroads: Class I, II, and III. Per definition by the United States Surface Transportation Board (STB), Class III or short line railroads are those with annual operating revenues of $37.4 million or less. Railroads with revenues be4tween $37.4 and $467.0 million are classified as Class II railroads and are considered regional operators. Class I railroads are those with revenues of $467.0 million or more. Currently, no Class II railroads operate in Arkansas. Short line railroads usually play a gathering role in the freight rail system. They originate and terminate individual or groups of railcars and then make railcars available to Class I rail carriers. The Class I carriers then provide long-distance transportation, carrying cars between regional markets across North America.

Of the 2,662 miles of active rail lines in Arkansas, the breakdown of rail operations are as follows:

Arkansas is served by over 25 railroad companies.  Railroads are generally defined by three classes, predicated on revenue and size, with Class I being the largest. There are three Class I railroads providing service with long-haul deliveries to national market areas and intermodal rail/truck service providers:

- Burlington Northern and Santa Fe Railway,
- Kansas City Southern Railway, and
- Union Pacific Railroad (most track mileage in Arkansas)

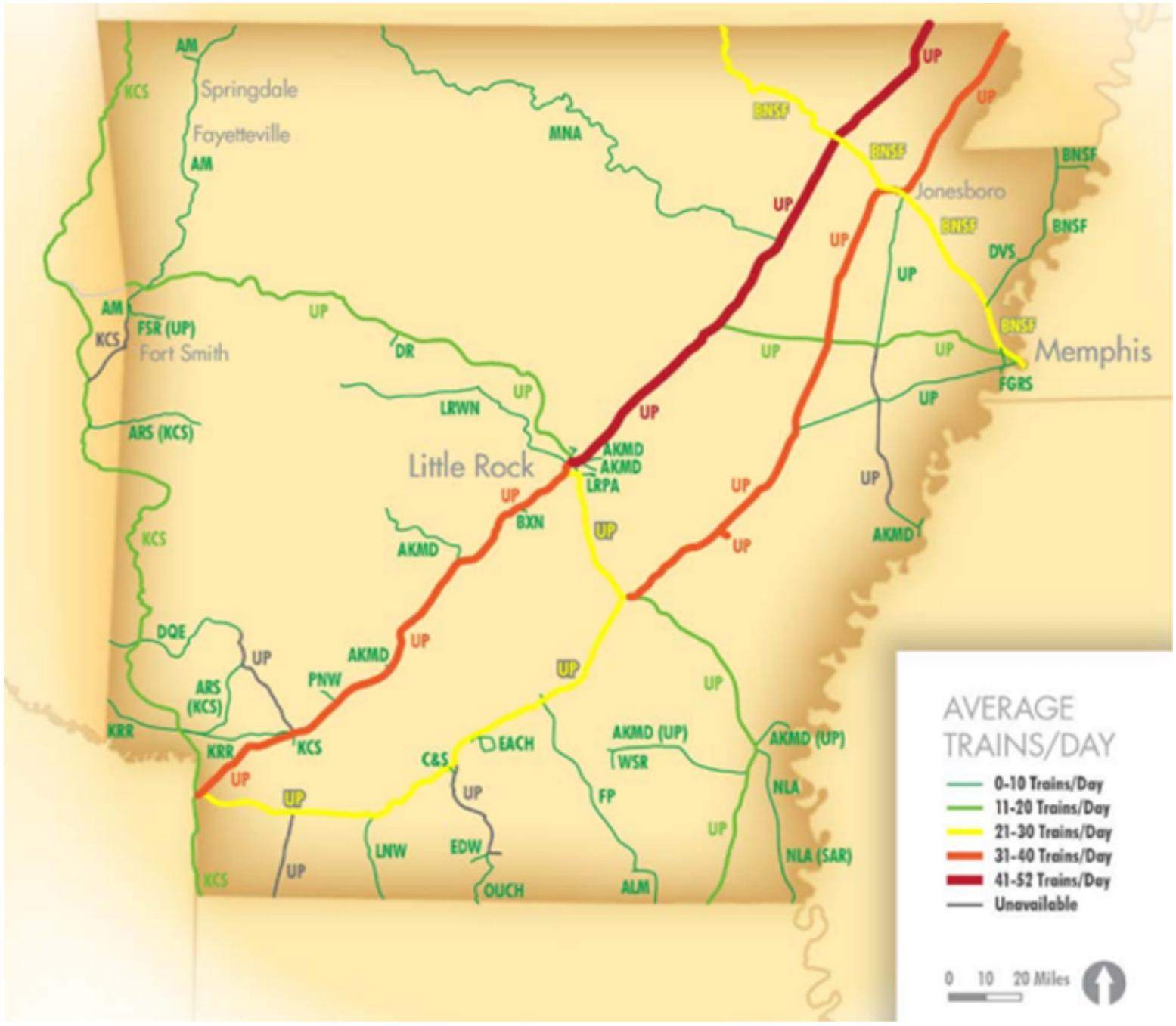
The following table provides brief information on rail systems within the state.




RAILROADS

| | | | | | |
|---|---|---|---|---|---|
| AKMD | Arkansas Midland Railroad | DVS | Delta Valley & Southern Railway | LRWN | Little Rock & Western Railway |
| ALM | Arkansas, Louisiana & Mississippi Railroad | EACH | East Camden & Highland Railroad | MNA | Missouri & Northern Arkansas Railroad |
| AM | Arkansas & Missouri Railroad | EDW | El Dorado & Wesson Railway | NLA | North Louisiana & Arkansas Railroad |
| ARS | Arkansas Southern Railroad | FGRS | Friday-Graham Rail Spur | OUCH | Ouachita Railroad |
| BNSF | BNSF Railway | FP | Fordyce & Princeton Railroad | PNW | Prescott & Northwestern Railroad |
| BXN | Bauxite & Northern Railroad | FSR | Fort Smith Railroad | SAR | Southeast Arkansas Economic Development District |
| C&S | Camden & Southern Railroad | KCS | Kansas City Southern Railway | UP | Union Pacific Railroad |
| DQE | DeQueen & Eastern Railroad | KRR | Kiamichi Railroad | WSR | Warren & Saline River Railroad |
| DR | Dardanelle & Russellville Railroad | LNW | Louisiana & North West Railroad | | |
| | | LRPA | Little Rock Port Authority Railroad | | |

***Average Trains Per Day:***




**Union Pacific Railroad**

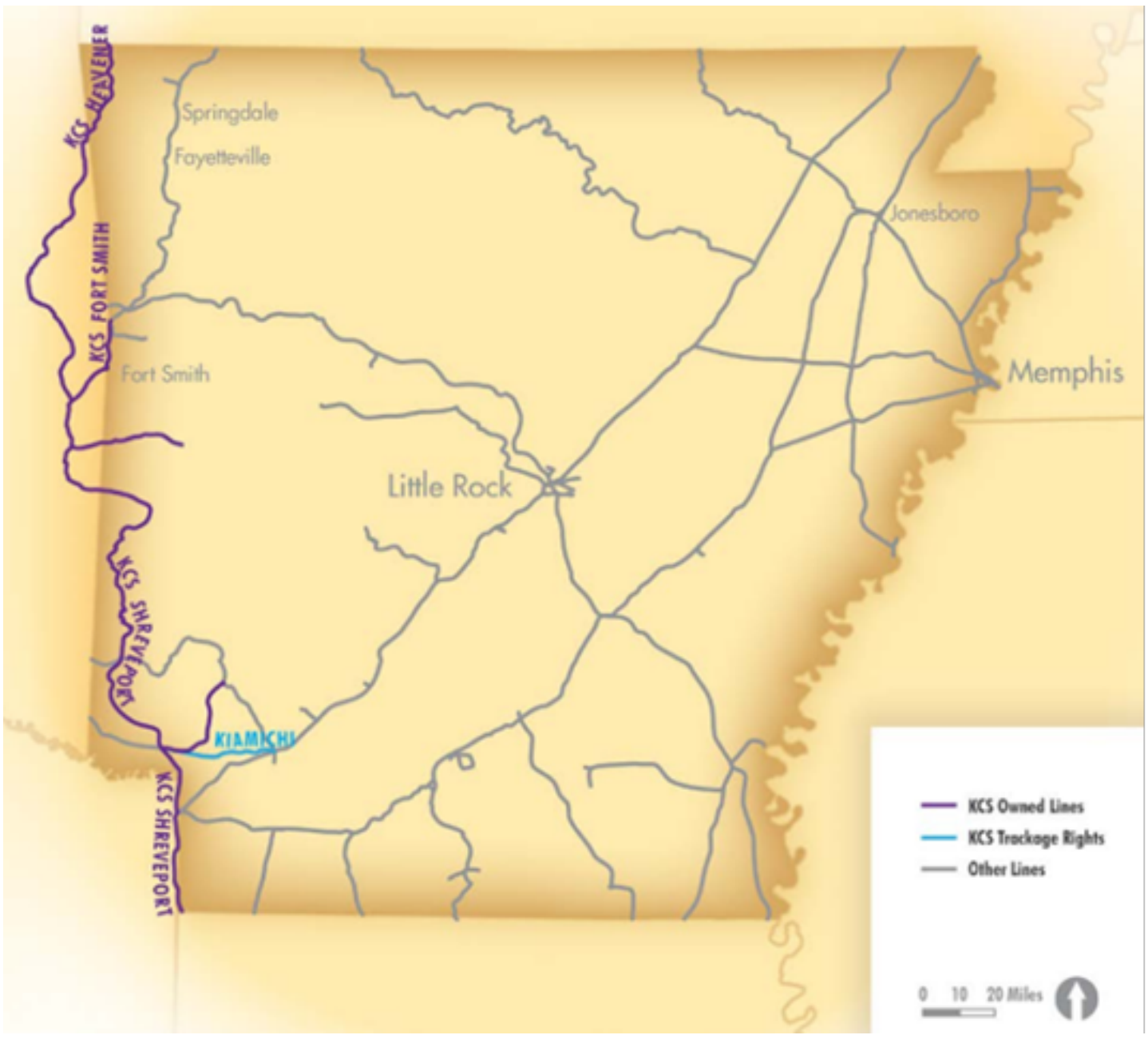



*Liquid & dry chemicals comprise 2.5 percent of the total commodities terminated in Arkansas by Union Pacific.*

**BNSF Railroad**



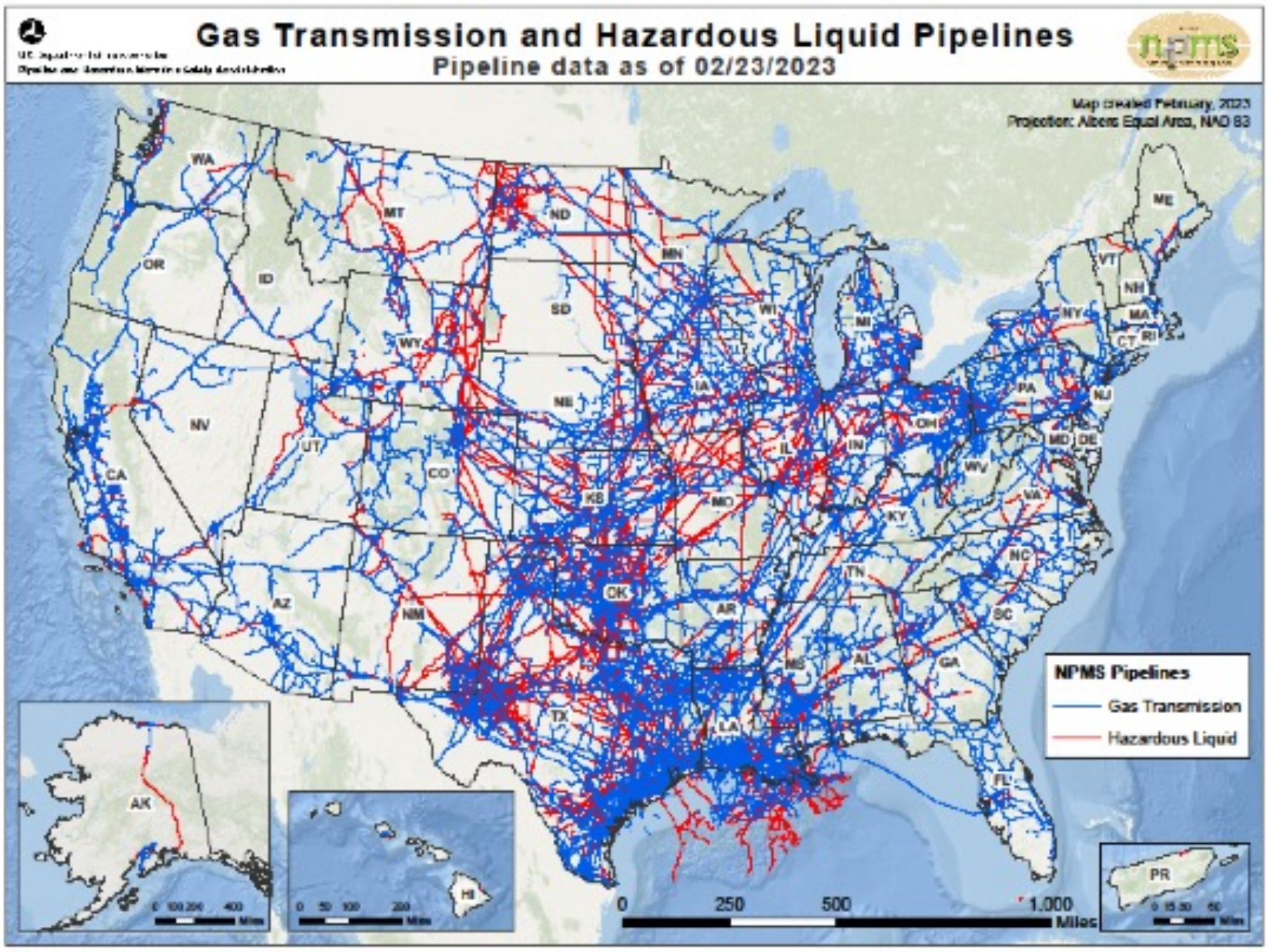

*Liquid & dry chemicals comprise 2.5 percent of the total commodities terminated in Arkansas by Union Pacific.*




*Liquid & dry chemicals comprise 2.5 percent of the total commodities terminated in Arkansas by Union Pacific.*

## *Pipelines*

The following map, provided by the United States Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), shows the gas and hazardous liquid pipelines that run through the state.




The following data, provided by ADEM and the United States Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), indicates the total number of gas and liquid pipeline mileage per county.

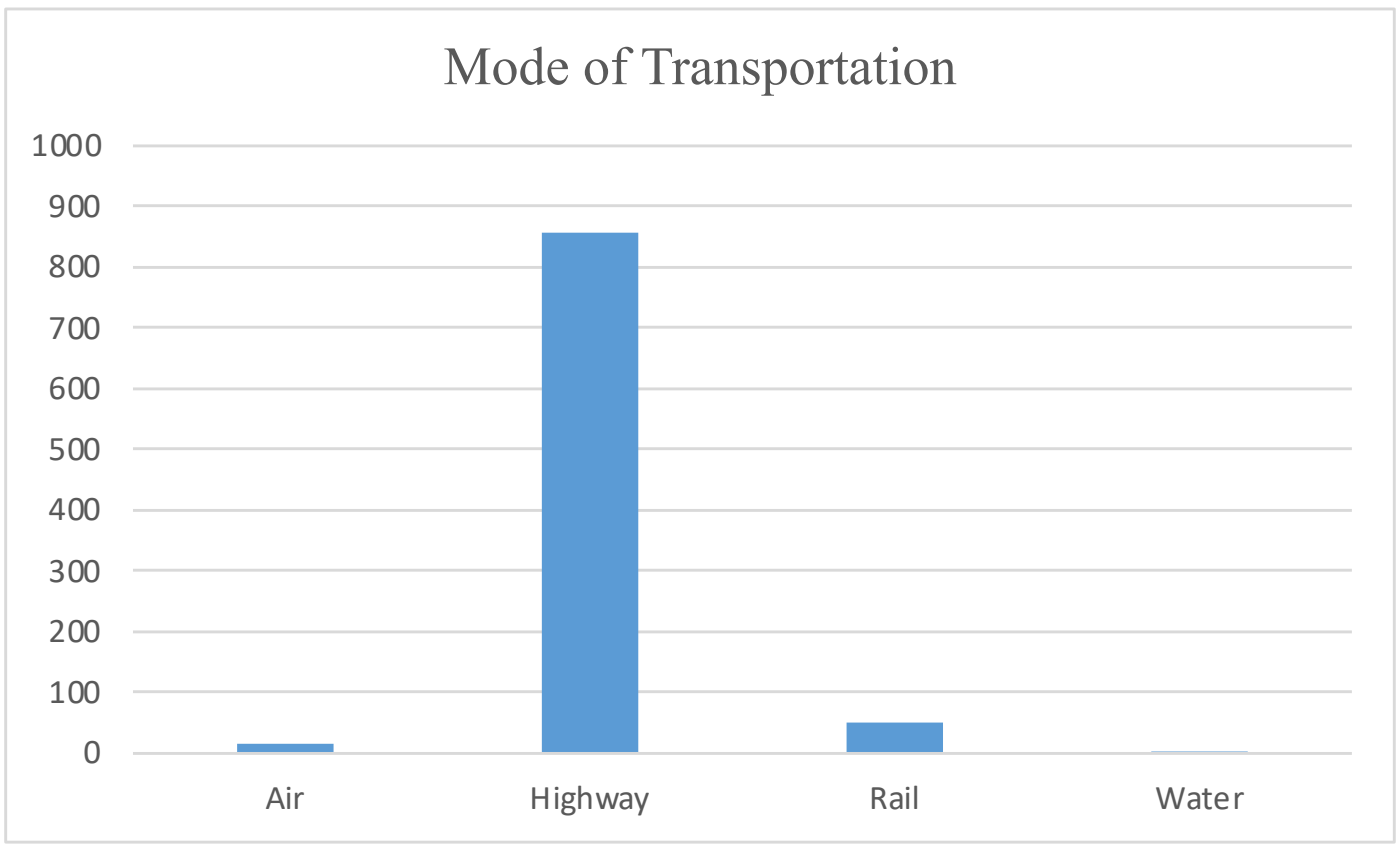
**PHMSA Pipeline Mileage by County**

| County | Gas (miles) | Liquid (miles) | | County | Gas (miles) | Liquid (miles) |
|---|---|---|---|---|---|---|
| State of Arkansas | 8,178 | 1,804 | | Lawrence | 141 | 46 |
| Arkansas | 117 | 0 | | Lee | 90 | 0 |
| Ashley | 199 | 0 | | Lincoln | 112 | 0 |
| Baxter | 43 | 0 | | Little River | 45 | 18 |
| Benton | 150 | 11 | | Logan | 145 | 0 |
| Boone | 42 | 0 | | Lonoke | 114 | 80 |
| Bradley | 95 | 0 | | Madison | 128 | 0 |
| Calhoun | 53 | 139 | | Marion | 21 | 0 |
| Carroll | 42 | 0 | | Miller | 207 | 0 |
| Chicot | 365 | 20 | | Mississippi | 128 | 0 |
| Clark | 242 | 0 | | Monroe | 22 | 0 |
| Clay | 110 | 67 | | Montgomery | 6 | 6 |
| Cleburne | 45 | 3 | | Nevada | 201 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Cleveland | 39 | 58 | | Newton | 129 | 0 |
| Columbia | 168 | 80 | | Ouachita | 12 | 1 |
| Conway | 129 | 0 | | Perry | 162 | 0 |
| Craighead | 82 | 29 | | Phillips | 42 | 26 |
| Crawford | 19 | 0 | | Pike | 55 | 0 |
| Crittenden | 87 | 14 | | Poinsett | 50 | 0 |
| Cross | 7 | 0 | | Polk | 141 | 0 |
| Dallas | 24 | 20 | | Pope | 19 | 0 |
| Desha | 27 | 0 | | Prairie | 197 | 143 |
| Drew | 129 | 0 | | Pulaski | 99 | 27 |
| Faulkner | 180 | 51 | | Randolph | 69 | 35 |
| Franklin | 269 | 0 | | St. Francis | 107 | 16 |
| Fulton | 0 | 18 | | Saline | 10 | 0 |
| Garland | 77 | 36 | | Scott | 209 | 2 |
| Grant | 142 | 113 | | Searcy | 40 | 14 |
| Greene | 60 | 80 | | Sebastian | 18 | 0 |
| Hempstead | 142 | 0 | | Sevier | 24 | 0 |
| Hot Spring | 292 | 0 | | Sharp | 316 | 210 |
| Howard | 71 | 17 | | Stone | 49 | 0 |
| Independence | 26 | 63 | | Union | 206 | 0 |
| Izard | 61 | 23 | | Van Buren | 476 | 206 |
| Jackson | 277 | 93 | | Washington | 105 | 22 |
| Jefferson | 225 | 16 | | White | 80 | 0 |
| Johnson | 109 | 0 | | Woodruff | 141 | 46 |
| Lafayette | 58 | 1 | | Yell | 90 | 0 |

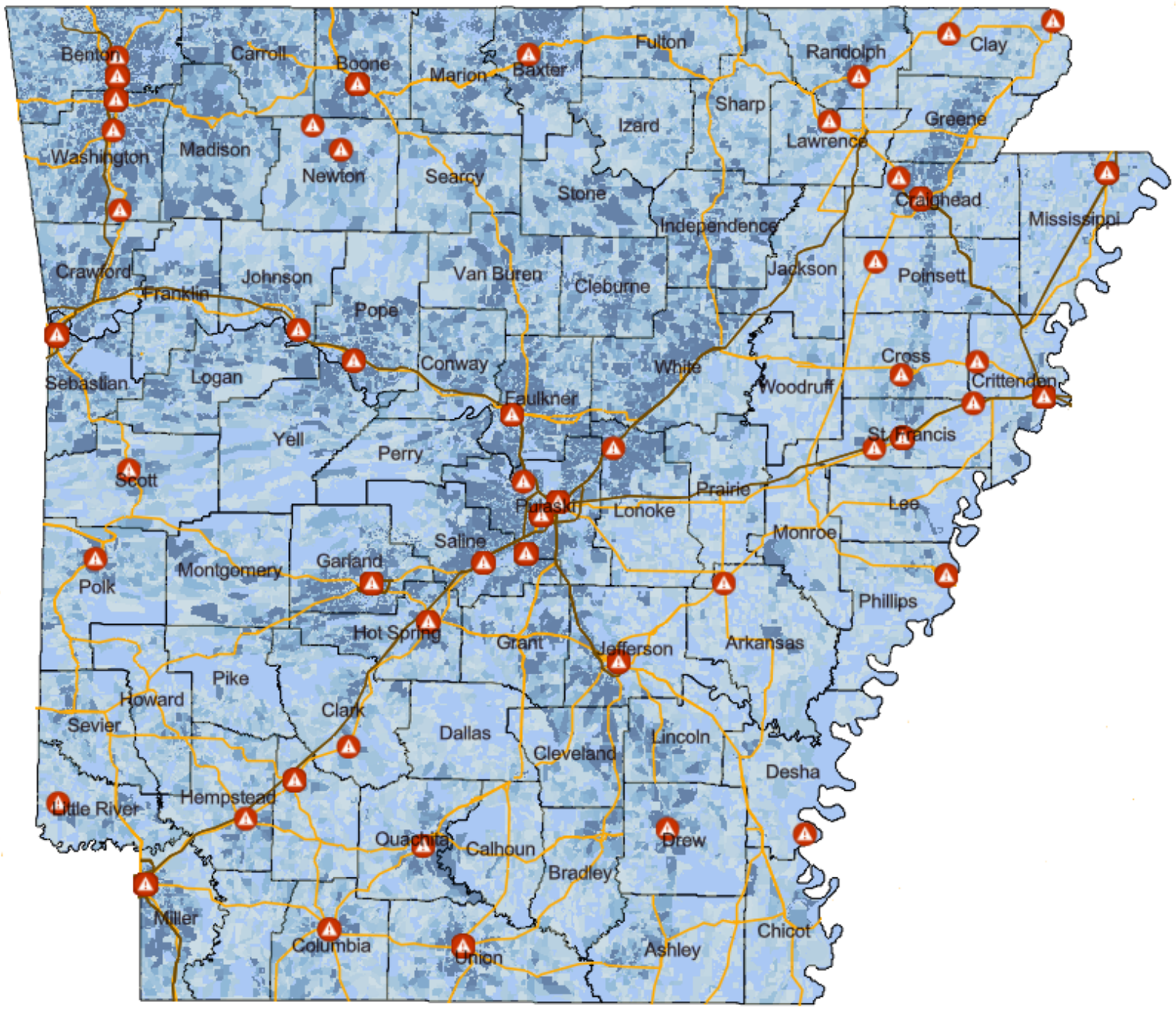
### 4.4.12.2 – PREVIOUS OCCURRENCES

Hazardous Materials Regulations (49 CFR Parts 171-180) require certain types of HazMat incidents be reported, with data tracked by PHMSA's Office of Hazardous Materials Safety (OHMS) by transportation category type (Air, Highway, Rail and Water). The OHMS Incident Report Database from 2018 to 2023 indicated 925 reported incidents within the state of Arkansas. The following charts detail the number of events per transportation category.



| Mode of Transportation | Number of Incidents |
|---|---|
| Air | 15 |
| Highway | 858 |
| Rail | 51 |
| Water | 1 |

The graphic below shows the locations in which the hazardous materials incidents occurred.




The following table breaks down the OHMS Incident Report Database, for all categories of HazMat transportation, from 2018 to 2023 by county, including reported monetary damages.

| OHMS Transportation Incident Report Database by County, 2018 to 2023 | | | | |
|---|---|---|---|---|
| **County** | **Total HazMat Transportation** | **Total HazMat Deaths** | **HazMat Injury Indicator** | **Total Amount of Damages** |
| State of Arkansas | 925 | 0 | Yes | $1,956,486 |
| Arkansas | 1 | 0 | No | $2,625 |
| Ashley | - | - | - | - |
| Baxter | 1 | 0 | No | $3,400 |
| Benton | 26 | 0 | No | $6,500 |
| Boone | 26 | 0 | No | $0 |
| Bradley | - | - | - | - |
| Calhoun | - | - | - | - |
| Carroll | - | - | - | - |
| Chicot | - | - | - | - |

| | | | | |
|---|---|---|---|---|
| Clark | 1 | 0 | No | $4,200 |
| Clay | 2 | 0 | Yes | $235,260 |
| Cleburne | - | - | - | - |
| Cleveland | - | - | - | - |
| Columbia | 2 | 0 | No | $0 |
| Conway | - | - | - | - |
| Craighead | 20 | 0 | No | $109,500 |
| Crawford | 1 | 0 | No | $4,000 |
| Crittenden * | 101 | 0 | 0 | $64,400 |
| Cross | 1 | 0 | No | $4,200 |
| Dallas | - | - | - | - |
| Desha | 1 | 0 | No | $0 |
| Drew | 1 | 0 | No | $0 |
| Faulkner | 7 | 0 | No | $18,880 |
| Franklin | - | - | - | - |
| Fulton | - | - | - | - |
| Garland | 18 | 0 | No | $7,500 |
| Grant | - | - | - | - |
| Greene | 1 | 0 | No | $4,200 |
| Hempstead | 1 | 0 | No | $7,000 |
| Hot Spring | 5 | 0 | No | $3,800 |
| Howard | - | - | - | - |
| Independence | - | - | - | - |
| Izard | - | - | - | - |
| Jackson * | 1 | 0 | No | $560 |
| Jefferson | 12 | 0 | No | $48,359 |
| Johnson | 2 | 0 | No | $31,000 |
| Lafayette | 2 | 0 | No | $145,000 |
| Lawrence | 2 | 0 | No | $50,000 |
| Lee | - | - | - | - |
| Lincoln | - | - | - | - |
| Little River | 1 | 0 | No | $0 |
| Logan | - | - | - | - |
| Lonoke | 1 | 0 | No | $4,503 |
| Madison | - | - | - | - |
| Marion | - | - | - | - |
| Miller | 84 | 0 | No | $28,500 |
| Mississippi | 10 | 0 | No | $40,176 |
| Monroe | - | - | - | - |
| Montgomery | - | - | - | - |
| Nevada | 6 | 0 | No | $104,530 |
| Newton | 2 | 0 | No | $219,739 |
| Ouachita | 4 | 0 | No | $20,000 |

| | | | | |
|---|---|---|---|---|
| Perry * | - | - | - | - |
| Phillips | 3 | 0 | 0 | $0 |
| Pike | - | - | - | - |
| Poinsett * | 2 | 0 | No | $268,668 |
| Polk * | 1 | 0 | No | $0 |
| Pope * | 5 | 0 | No | $5,000 |
| Prairie | - | - | - | - |
| Pulaski * | 450 | 0 | Yes | $287,872 |
| Randolph * | 1 | 0 | No | $0 |
| St. Francis | 11 | - | No | $45,750 |
| Saline | 6 | 0 | No | $15,000 |
| Scott | 1 | 0 | No | $200,000 |
| Searcy | - | - | - | - |
| Sebastian | 35 | 0 | No | $18,400 |
| Sevier | - | - | - | - |
| Sharp * | - | - | - | - |
| Stone | - | - | - | - |
| Union | 17 | 0 | No | $16,000 |
| Van Buren | - | - | - | - |
| Washington | 46 | 0 | No | $17,130 |
| White | 2 | 0 | No | $4500 |
| Woodruff | - | - | - | - |
| Yell | - | - | - | - |

Data from the period 2018 to 2023 indicates that there were 50 pipeline incidents that caused one fatality, three injuries and $19,794,498 in damages.

| Pipeline Incidents in Arkansas | | | | |
|---|---|---|---|---|
| **Year** | **Number of Incidents** | **Fatalities** | **Injuries** | **Total Cost Reported** |
| 2018 | 8 | 0 | 0 | $491,993 |
| 2019 | 9 | 0 | 0 | $13,006,693 |
| 2020 | 11 | 0 | 2 | $2,049,633 |
| 2021 | 9 | 1 | 1 | $1,562,953 |
| 2022 | 10 | 0 | 0 | $2,096,289 |
| 2023 | 3 | 0 | 0 | $586,937 |
| Total | 50 | 1 | 3 | $19,794,498 |

PHSMA

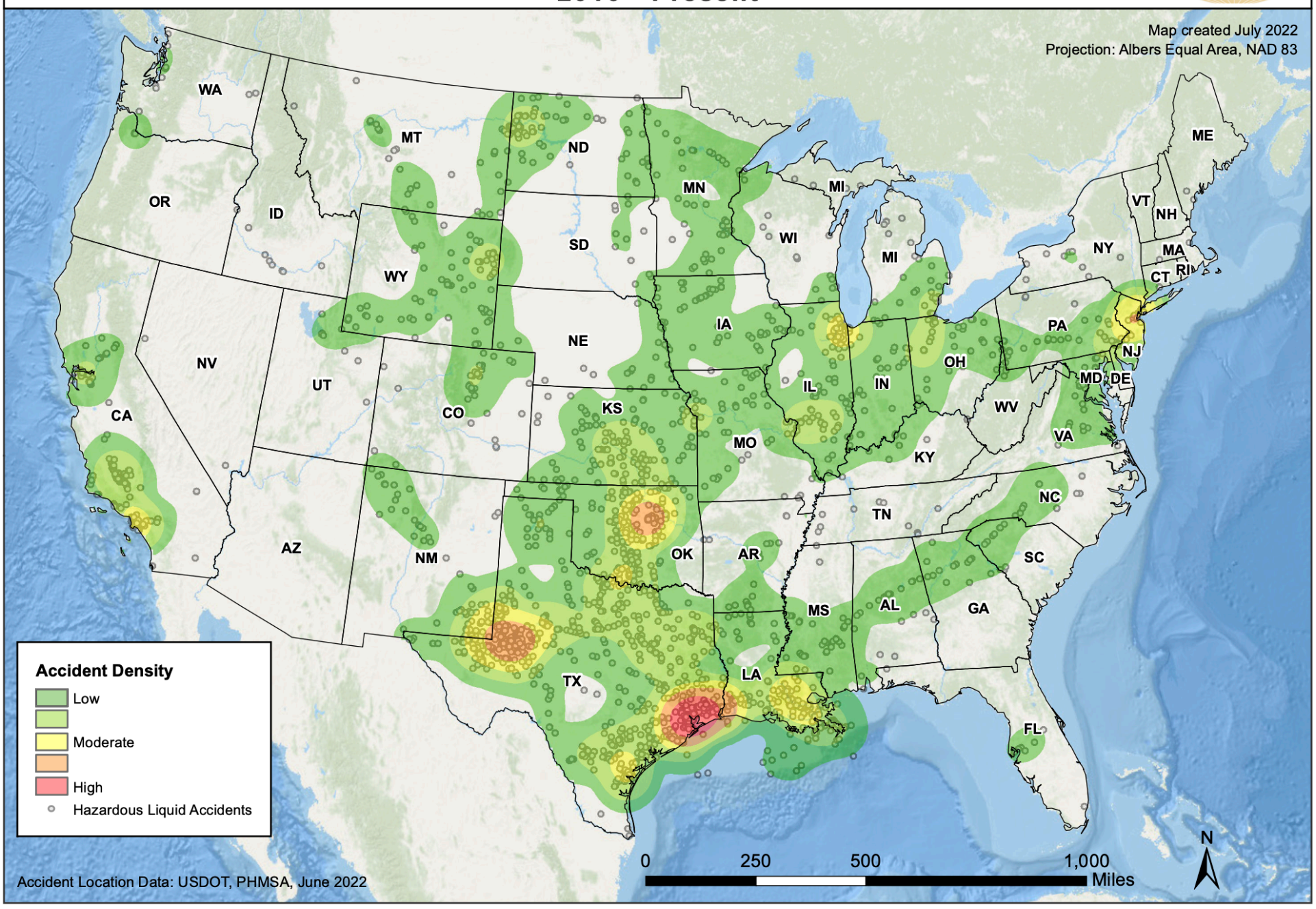
The following heat maps show accident density for both hazardous liquid pipelines and gas transmission pipelines along with incident point locations.

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

# Hazardous Liquid Pipeline Accident Heat Map

## 2010 - Present

Map created July 2022
Projection: Albers Equal Area, NAD 83

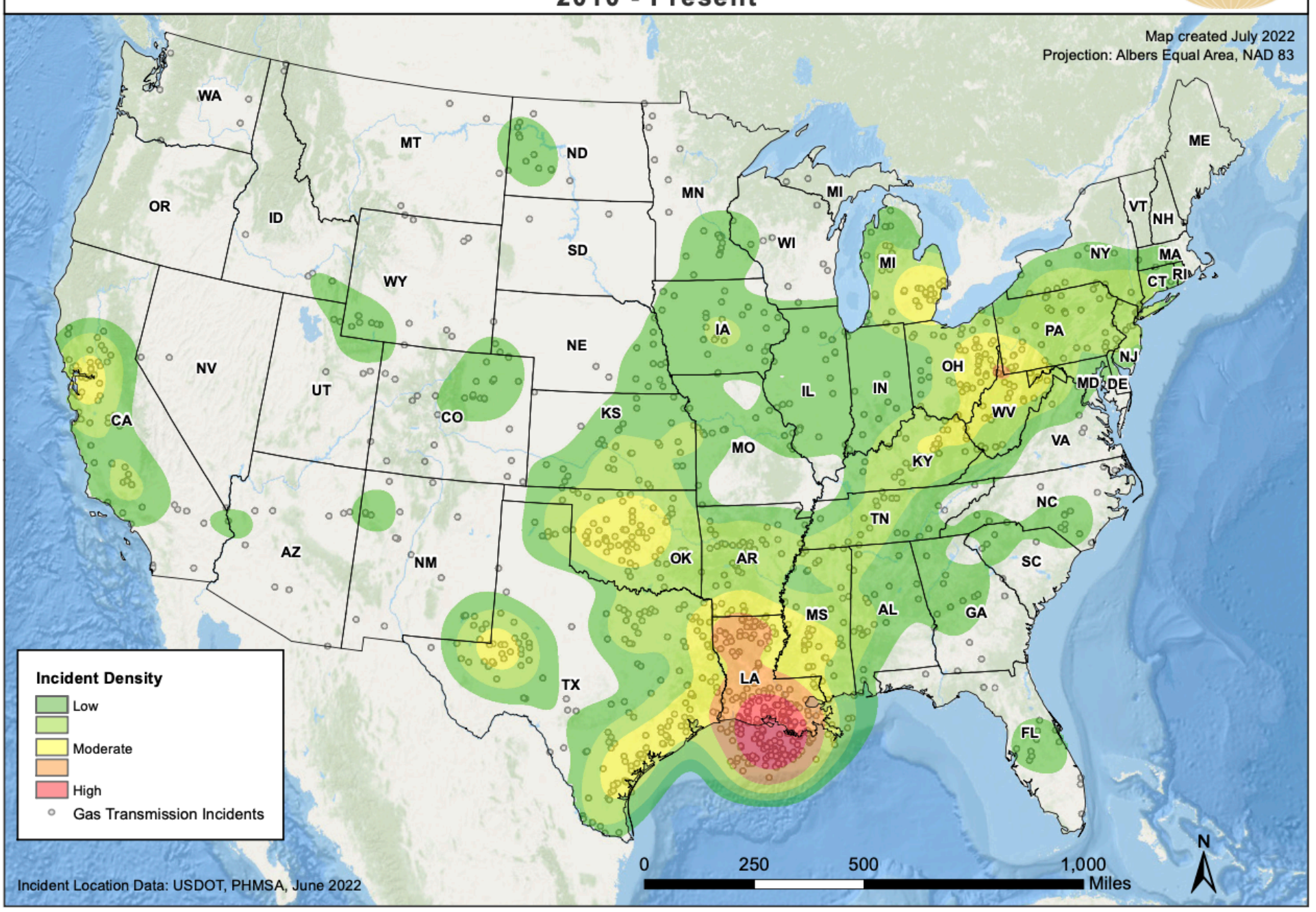



Accident Location Data: USDOT, PHMSA, June 2022

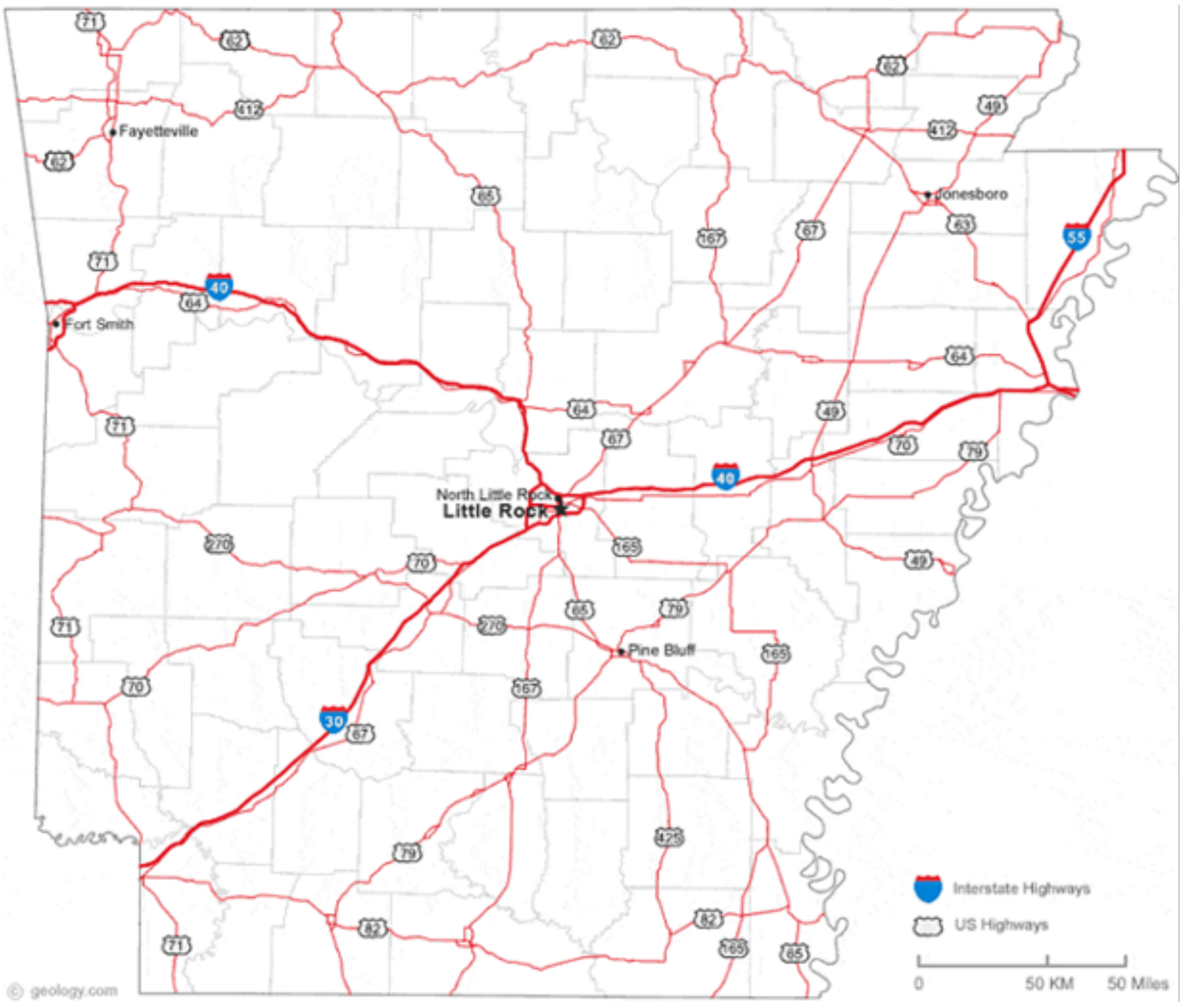
# Gas Transmission Pipeline Incident Heat Map

## 2010 - Present

Map created July 2022
Projection: Albers Equal Area, NAD 83




Incident Location Data: USDOT, PHMSA, June 2022


Fayetteville
Fort Smith
Jonesboro
North Little Rock
Little Rock
Pine Bluff
Interstate Highways
US Highways
0
50 KM
50 Miles
© geology.com

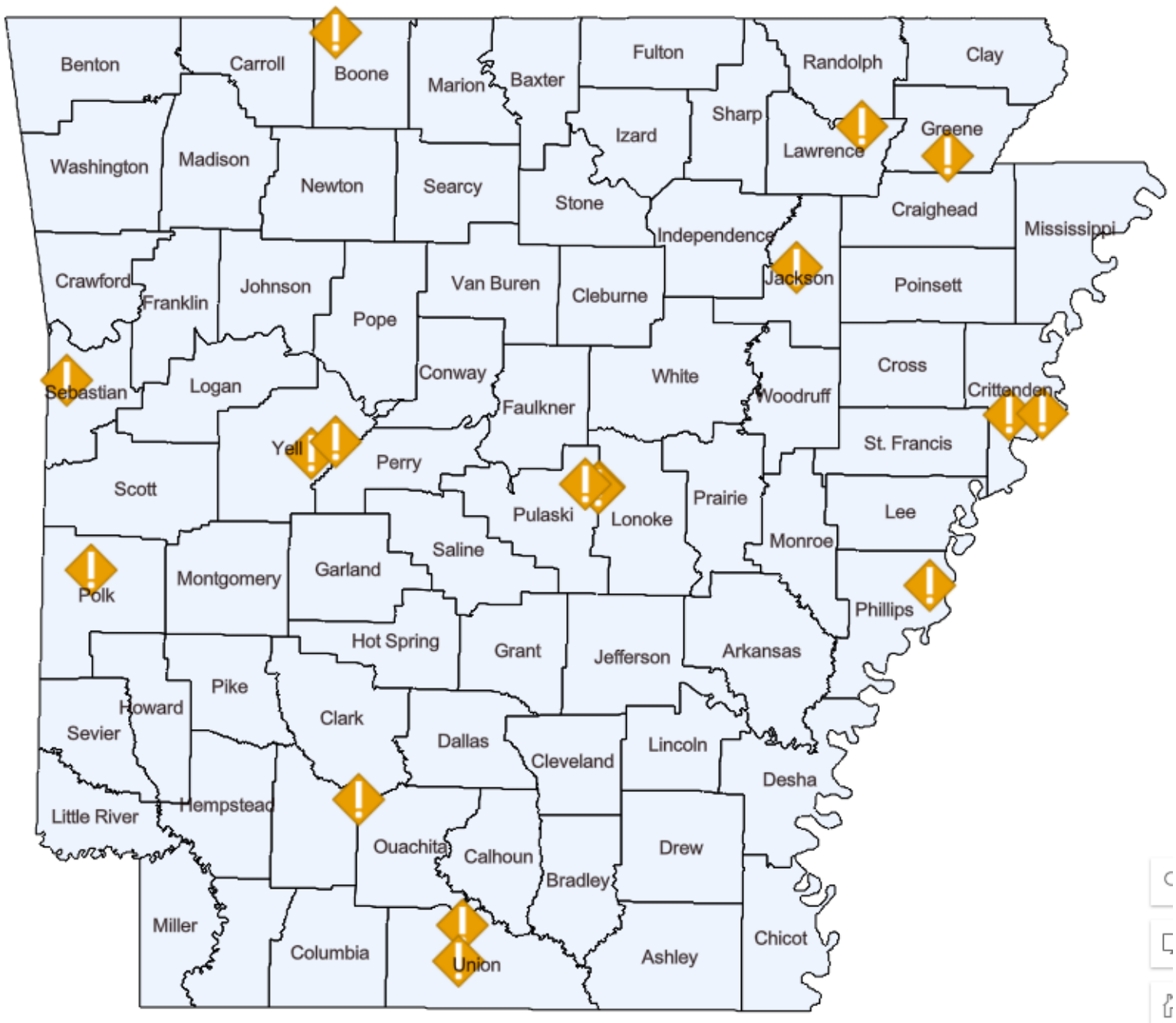
### 4.4.12.3 – HAZARD PROBABILITY ANALYSIS

The following heat maps show accident density for both hazardous liquid pipelines and gas transmission pipelines along with incident point locations.

Data indicates that the State of Arkansas can expect, on average:

- **Fixed Facility Events:** 133 fixed facility HazMat events and three related deaths per year

While NPL (Superfund) sites have been identified by the EPA as requiring cleanup, in general, the probability of an incident endangering the public from these sites is low due to active identification and remediation measures.



Data indicates that the State of Arkansas can expect on average:

- **Air Transportation:** Three events and $0 in damages per year
- **Highway Transportation:** 185 events and $391,297.20 in damages per year
- **Rail Transportation:** 10 events and $120,110 in damages per year
- **Water Transportation:** <1 event and $0 in damages per year

The following table summarizes PHMSA's OHMS data for transportation related HazMat events for the State of Arkansas for the period 2018 through 2023.

| State of Arkansas Pipeline Related HazMat Incident Data Summary, 2018 - 2023 | |
|---|---|
| **Data** | **Recorded Impact** |
| Number of Reported Events | 50 |
| Average Events per Year | 8 |
| Total Deaths | 1 |
| Average Deaths per Year | <1 |
| Total Injuries | 3 |
| Average Injuries Events per Year | <1 |
| Total Monetary Property Damage | $19,794,498 |
| Average Monetary Property Damage per Year | $3,299,083 |

Data indicates that the State of Arkansas can expect on average:

- Pipeline Incidents: Eight events, less than one death, less than one injury, and $3,299,083 in damages per year.

#### 4.4.12.4 – VULNERABILITY ANALYSIS

The following table indicates the number of state owned critical facilities and bridges within 0.5 miles of a classified Tier II facility, using previously available data as new data was unavailable.

| State Owned Facilities and Bridges Within 0.5 Miles of a Tier II Facility | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Value** | **State-Owned Critical Facilities** | **Value** | **State Owned Bridges** |
| Arkansas | 0 | $0 | 0 | $0 | 0 |
| Ashley | 0 | $0 | 0 | $0 | 3 |
| Baxter | 6 | $52,004,086 | 6 | $52,004,086 | 3 |
| Benton | 1 | $9,664,855 | 1 | $9,664,855 | 31 |
| Boone | 2 | $42,433,716 | 2 | $42,433,716 | 7 |
| Bradley | 0 | $0 | 0 | $0 | 0 |
| Calhoun | 0 | $0 | 0 | $0 | 1 |
| Carroll | 0 | $0 | 0 | $0 | 2 |
| Chicot | 0 | $0 | 0 | $0 | 0 |
| Clark | 1 | $7,989,493 | 1 | $7,989,493 | 7 |
| Clay | 0 | $0 | 0 | $0 | 3 |
| Cleburne | 0 | $0 | 0 | $0 | 2 |
| Cleveland | 0 | $0 | 0 | $0 | 0 |
| Columbia | 19 | $211,753,893 | 19 | $211,753,893 | 7 |
| Conway | 0 | $0 | 0 | $0 | 13 |
| Craighead | 6 | $125,339,254 | 6 | $125,339,254 | 29 |
| Crawford | 0 | $0 | 0 | $0 | 21 |

| | | | | | |
|---|---|---|---|---|---|
| Crittenden | 1 | $8,548,559 | 1 | $8,548,559 | 18 |
| Cross | 0 | $0 | 0 | $0 | 2 |
| Dallas | 0 | $0 | 0 | $0 | 0 |
| Desha | 0 | $0 | 0 | $0 | 0 |
| Drew | 0 | $0 | 0 | $0 | 10 |
| Faulkner | 0 | $0 | 0 | $0 | 8 |
| Franklin | 0 | $0 | 0 | $0 | 0 |
| Fulton | 1 | $8,521,270 | 1 | $8,521,270 | 21 |
| Garland | 0 | $0 | 0 | $0 | 2 |
| Grant | 0 | $0 | 0 | $0 | 7 |
| Greene | 1 | $7,932,152 | 1 | $7,932,152 | 4 |
| Hempstead | 1 | $7,720,312 | 1 | $7,720,312 | 10 |
| Hot Spring | 0 | $0 | 0 | $0 | 6 |
| Howard | 0 | $0 | 0 | $0 | 3 |
| Independence | 0 | $0 | 0 | $0 | 0 |
| Izard | 0 | $0 | 0 | $0 | 4 |
| Jackson | 3 | $49,557,016 | 3 | $49,557,016 | 14 |
| Jefferson | 0 | $0 | 0 | $0 | 12 |
| Johnson | 0 | $0 | 0 | $0 | 0 |
| Lafayette | 0 | $0 | 0 | $0 | 3 |
| Lawrence | 0 | $0 | 0 | $0 | 3 |
| Lee | 0 | $0 | 0 | $0 | 0 |
| Lincoln | 0 | $0 | 0 | $0 | 1 |
| Little River | 0 | $0 | 0 | $0 | 0 |
| Logan | 0 | $0 | 0 | $0 | 9 |
| Lonoke | 0 | $0 | 0 | $0 | 5 |
| Madison | 0 | $0 | 0 | $0 | 1 |
| Marion | 0 | $0 | 0 | $0 | 0 |
| Miller | 0 | $0 | 0 | $0 | 12 |
| Mississippi | 5 | $44,730,865 | 5 | $44,730,865 | 5 |
| Monroe | 0 | $0 | 0 | $0 | 1 |
| Montgomery | 0 | $0 | 0 | $0 | 1 |
| Nevada | 0 | $0 | 0 | $0 | 1 |
| Newton | 0 | $0 | 0 | $0 | 0 |
| Ouachita | 2 | $15,239,343 | 2 | $15,239,343 | 7 |
| Perry | 0 | $0 | 0 | $0 | 1 |
| Phillips | 0 | $0 | 0 | $0 | 1 |
| Pike | 0 | $0 | 0 | $0 | 0 |
| Poinsett | 0 | $0 | 0 | $0 | 5 |
| Polk | 0 | $0 | 0 | $0 | 3 |
| Pope | 8 | $113,967,063 | 8 | $113,967,063 | 12 |
| Prairie | 0 | $0 | 0 | $0 | 1 |
| Pulaski | 59 | $1,621,381,084 | 59 | $1,621,381,084 | 126 |

| | | | | | |
|---|---|---|---|---|---|
| Randolph | 3 | $26,176,489 | 3 | $26,176,489 | 1 |
| St. Francis | 3 | $22,272,436 | 3 | $22,272,436 | 9 |
| Saline | 0 | $0 | 0 | $0 | 9 |
| Scott | 0 | $0 | 0 | $0 | 1 |
| Searcy | 0 | $0 | 0 | $0 | 0 |
| Sebastian | 1 | $12,704,241 | 1 | $12,704,241 | 32 |
| Sevier | 0 | $0 | 0 | $0 | 3 |
| Sharp | 0 | $0 | 0 | $0 | 2 |
| Stone | 0 | $0 | 0 | $0 | 2 |
| Union | 5 | $48,844,433 | 5 | $48,844,433 | 10 |
| Van Buren | 0 | $0 | 0 | $0 | 5 |
| Washington | 1 | $7,032,389 | 1 | $7,032,389 | 22 |
| White | 1 | $7,232,966 | 1 | $7,232,966 | 25 |
| Woodruff | 0 | $0 | 0 | $0 | 0 |
| Yell | 0 | $0 | 0 | $0 | 6 |

Counties with a higher identified population near Tier II facilities and major and interstate highways, using previously available data, are to be considered to have a potentially greater vulnerability. However, these assumed vulnerabilities should be viewed as theoretical due to the tremendous number of variables involved in a potential HazMat release event.

| Population Within 0.5 Miles of a Tier II Facility or Interstate Highway | | |
|---|---|---|
| **County** | **Population in 0.5 Mile of a Major Highway or Interstate Highway** | **Population in 0.5 Mile of a Tier II Facility** |
| Arkansas County | 17,235 | 4,325 |
| Ashley County | 17,368 | 3,395 |
| Baxter County | 25,727 | 1,885 |
| Benton County | 92,605 | 31,387 |
| Boone County | 20,920 | 3,666 |
| Bradley County | 8,275 | 2,411 |
| Calhoun County | 3,877 | 16 |
| Carroll County | 14,662 | 5,153 |
| Chicot County | 10,148 | 2,759 |
| Clark County | 16,776 | 3,807 |
| Clay County | 12,345 | 4,733 |
| Cleburne County | 14,813 | 2,362 |
| Cleveland County | 4,345 | 97 |
| Columbia County | 17,716 | 6,884 |
| Conway County | 13,425 | 3,381 |
| Craighead County | 58,804 | 12,927 |
| Crawford County | 32,816 | 5,850 |
| Crittenden County | 42,543 | 8,317 |
| Cross County | 15,148 | 3,688 |
| Dallas County | 7,324 | 4 |
| Desha County | 13,304 | 3,016 |
| Drew County | 12,292 | 3,160 |

| | | |
|---|---|---|
| Faulkner County | 43,021 | 4,878 |
| Franklin County | 12,395 | 2,126 |
| Fulton County | 6,054 | 136 |
| Garland County | 50,927 | 7,577 |
| Grant County | 10,102 | 526 |
| Greene County | 24,583 | 6,029 |
| Hempstead County | 17,725 | 4,770 |
| Hot Spring County | 17,585 | 4,241 |
| Howard County | 9,814 | 2,976 |
| Independence County | 20,248 | 3,545 |
| Izard County | 5,063 | 615 |
| Jackson County | 8,101 | 3,769 |
| Jefferson County | 57,245 | 13,681 |
| Johnson County | 15,578 | 2,333 |
| Lafayette County | 5,741 | 529 |
| Lawrence County | 12,419 | 3,366 |
| Lee County | 4,035 | 2,627 |
| Lincoln County | 5,697 | 1,143 |
| Little River County | 5,133 | 2,102 |
| Logan County | 14,898 | 3,078 |
| Lonoke County | 16,818 | 2,882 |
| Madison County | 6,515 | 1,003 |
| Marion County | 9,078 | 319 |
| Miller County | 20,199 | 2,613 |
| Mississippi County | 42,424 | 12,844 |
| Monroe County | 7,434 | 2,368 |
| Montgomery County | 4,798 | 226 |
| Nevada County | 6,731 | 197 |
| Newton County | 3,755 | 25 |
| Ouachita County | 14,673 | 3,534 |
| Perry County | 3,753 | 588 |
| Phillips County | 17,443 | 6,078 |
| Pike County | 7,762 | 8 |
| Poinsett County | 6,975 | 4,916 |
| Polk County | 12,465 | 3,876 |
| Pope County | 24,949 | 7,024 |
| Prairie County | 5,377 | 1,179 |
| Pulaski County | 210,563 | 90,028 |
| Randolph County | 9,341 | 513 |
| St. Francis County | 16,910 | 5,492 |
| Saline County | 33,955 | 8,262 |
| Scott County | 7,364 | 278 |
| Searcy County | 3,838 | 818 |

| | | |
|---|---|---|
| Sebastian County | 75,827 | 33,394 |
| Sevier County | 10,361 | 3,000 |
| Sharp County | 6,305 | 724 |
| Stone County | 3,623 | 196 |
| Union County | 23,323 | 8,897 |
| Van Buren County | 7,988 | 741 |
| Washington County | 109,803 | 34,000 |
| White County | 26,302 | 15,397 |
| Woodruff County | 5,701 | 447 |
| Yell County | 11,135 | 1,530 |

The following data related to potentially At-Risk population structures, as defined above, within 0.5 miles of a fixed Tier II facility.

| Potentially At-Risk Populations Structures Within 0.5 Miles of a Tier II Facility | | | | |
|---|---|---|---|---|
| **County** | **Hospitals** | **Education Facilities** | **Eldercare Facilities** | **Correctional Facilities** |
| Arkansas | 1 | 3 | 2 | 1 |
| Ashley | 0 | 3 | 2 | 0 |
| Baxter | 0 | 3 | 1 | 0 |
| Benton | 0 | 20 | 4 | 0 |
| Boone | 0 | 0 | 2 | 0 |
| Bradley | 1 | 1 | 0 | 0 |
| Calhoun | 0 | 0 | 0 | 0 |
| Carroll | 2 | 7 | 1 | 0 |
| Chicot | 0 | 2 | 0 | 0 |
| Clark | 0 | 2 | 0 | 0 |
| Clay | 0 | 6 | 0 | 0 |
| Cleburne | 0 | 1 | 0 | 0 |
| Cleveland | 0 | 0 | 0 | 0 |
| Columbia | 1 | 3 | 0 | 0 |
| Conway | 1 | 5 | 4 | 0 |
| Craighead | 3 | 9 | 4 | 0 |
| Crawford | 0 | 16 | 0 | 0 |
| Crittenden | 1 | 5 | 4 | 0 |
| Cross | 1 | 4 | 1 | 0 |
| Dallas | 0 | 0 | 0 | 0 |
| Desha | 1 | 2 | 4 | 0 |
| Drew | 0 | 4 | 1 | 1 |
| Faulkner | 1 | 6 | 2 | 1 |
| Franklin | 0 | 1 | 0 | 0 |
| Fulton | 0 | 2 | 0 | 0 |
| Garland | 3 | 5 | 5 | 0 |
| Grant | 0 | 0 | 0 | 0 |
| Greene | 0 | 4 | 2 | 0 |
| Hempstead | 0 | 6 | 1 | 0 |

| | | | | |
|---|---|---|---|---|
| Hot Spring | 0 | 3 | 1 | 0 |
| Howard | 0 | 0 | 2 | 0 |
| Independence | 1 | 3 | 0 | 1 |
| Izard | 0 | 2 | 0 | 0 |
| Jackson | 1 | 0 | 0 | 0 |
| Jefferson | 0 | 11 | 3 | 0 |
| Johnson | 0 | 3 | 1 | 0 |
| Lafayette | 0 | 1 | 0 | 0 |
| Lawrence | 0 | 0 | 0 | 0 |
| Lee | 0 | 1 | 0 | 0 |
| Lincoln | 0 | 3 | 1 | 0 |
| Little River | 1 | 2 | 0 | 0 |
| Logan | 1 | 3 | 1 | 0 |
| Lonoke | 0 | 2 | 0 | 0 |
| Madison | 0 | 1 | 0 | 0 |
| Marion | 0 | 0 | 0 | 0 |
| Miller | 0 | 1 | 0 | 0 |
| Mississippi | 1 | 7 | 0 | 0 |
| Monroe | 0 | 0 | 1 | 0 |
| Montgomery | 0 | 1 | 0 | 0 |
| Nevada | 0 | 0 | 1 | 0 |
| Newton | 0 | 0 | 0 | 0 |
| Ouachita | 0 | 1 | 0 | 0 |
| Perry | 0 | 1 | 0 | 0 |
| Phillips | 0 | 2 | 1 | 0 |
| Pike | 0 | 0 | 0 | 0 |
| Poinsett | 0 | 4 | 1 | 0 |
| Polk | 0 | 3 | 3 | 0 |
| Pope | 0 | 7 | 1 | 0 |
| Prairie | 0 | 1 | 0 | 0 |
| Pulaski | 11 | 62 | 13 | 1 |
| Randolph | 0 | 0 | 0 | 0 |
| St. Francis | 0 | 4 | 0 | 0 |
| Saline | 1 | 3 | 2 | 0 |
| Scott | 0 | 1 | 0 | 0 |
| Searcy | 0 | 2 | 1 | 0 |
| Sebastian | 2 | 16 | 5 | 1 |
| Sevier | 1 | 0 | 2 | 0 |
| Sharp | 0 | 1 | 0 | 0 |
| Stone | 0 | 0 | 0 | 0 |
| Union | 1 | 7 | 5 | 1 |
| Van Buren | 0 | 0 | 1 | 0 |
| Washington | 2 | 14 | 5 | 2 |

| | | | | |
|---|---|---|---|---|
| White | 2 | 11 | 4 | 0 |
| Woodruff | 0 | 0 | 0 | 0 |
| Yell | 1 | 0 | 1 | 0 |

Population vulnerability for each county is a function of the following component parts:

- Population change over time
- Vulnerable populations
- Population density

In general:

- Counties with a high population are at increased risk
- Counties with growing populations are at increasing risk
- Counties with a high population of At-Risk facilities may be at increased risk.

Population data may be found in previous sections. The following counties may have increased vulnerability to HazMat events due to population factors:

- **Counties with a large population increase:** Benton, Craighead, Faulkner, Lonoke, Pulaski, Sebastian, Washington and White
- Counties with a population gain of over 1,000 children under the age of 5: Benton, Craighead Faulkner, Lonoke, Pulaski, Saline and Washington
- **Counties with a population gain of over 1,000 adults over the age of 65:** Baxter, Benton, Boone, Cleburne, Craighead, Crawford, Faulkner, Garland, Greene, Independence, Lonoke, Marion, Miller, Pope, Randolph, Saline, Sebastian, Washington and White

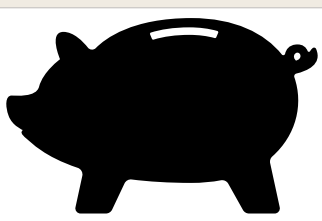
### 4.4.12.5 - IMPACT AND CONSEQUENCE ANALYSIS

As per EMAP requirements, the following table provides the Consequence Analysis.

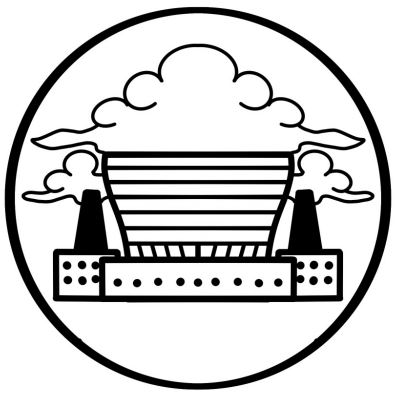
| Hazardous Materials Incident Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Hazardous Materials Incident** |
| Health and Safety of Persons in the Area of the Incident | Impact in the immediate area could be severe and long lasting. |
| Responders | Impact to responders is expected to be moderate to severe, potentially even with required safety equipment. |
| Continuity of Operations | Long term relocation may be necessary if government facilities experience contamination or damage. |
| Property, Facilities, and Infrastructure | Localized impact could be severe in the incident area. Facilities may need to be abandoned and razed. Large areas may become inaccessible. |
| Environment | Impact could be severe for the immediate area. Impact will lessen with distance. The proximity of open bodies of water could compound the impact. |
| Economic Conditions | Local economy and finances may be adversely affected, depending on the nature, extent and duration of the event. |
| Public Confidence in Governance | Response and recovery will be in question if not timely and effective. Warning systems and the timeliness of those warnings could be questioned. |

# NUCLEAR INCIDENT

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Technological | • Populations - area around nuclear power plant<br>• Locations - Pope County | • Number of Occurrences - 0<br>• Presidential Declared Disasters - 0 |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Population at risk are those living in Russellville AR in Pope County and the surrounding area. |
|  | Government function that are at risk are those that are located in Russellville and in the surrounding area. |
|  | Limited impact expected on the built environment |
|  | Limited impact expected on natural resources however it depends on the scope of the incident. |
|  | Economic impact will be dependent upon the scope of the incident. |

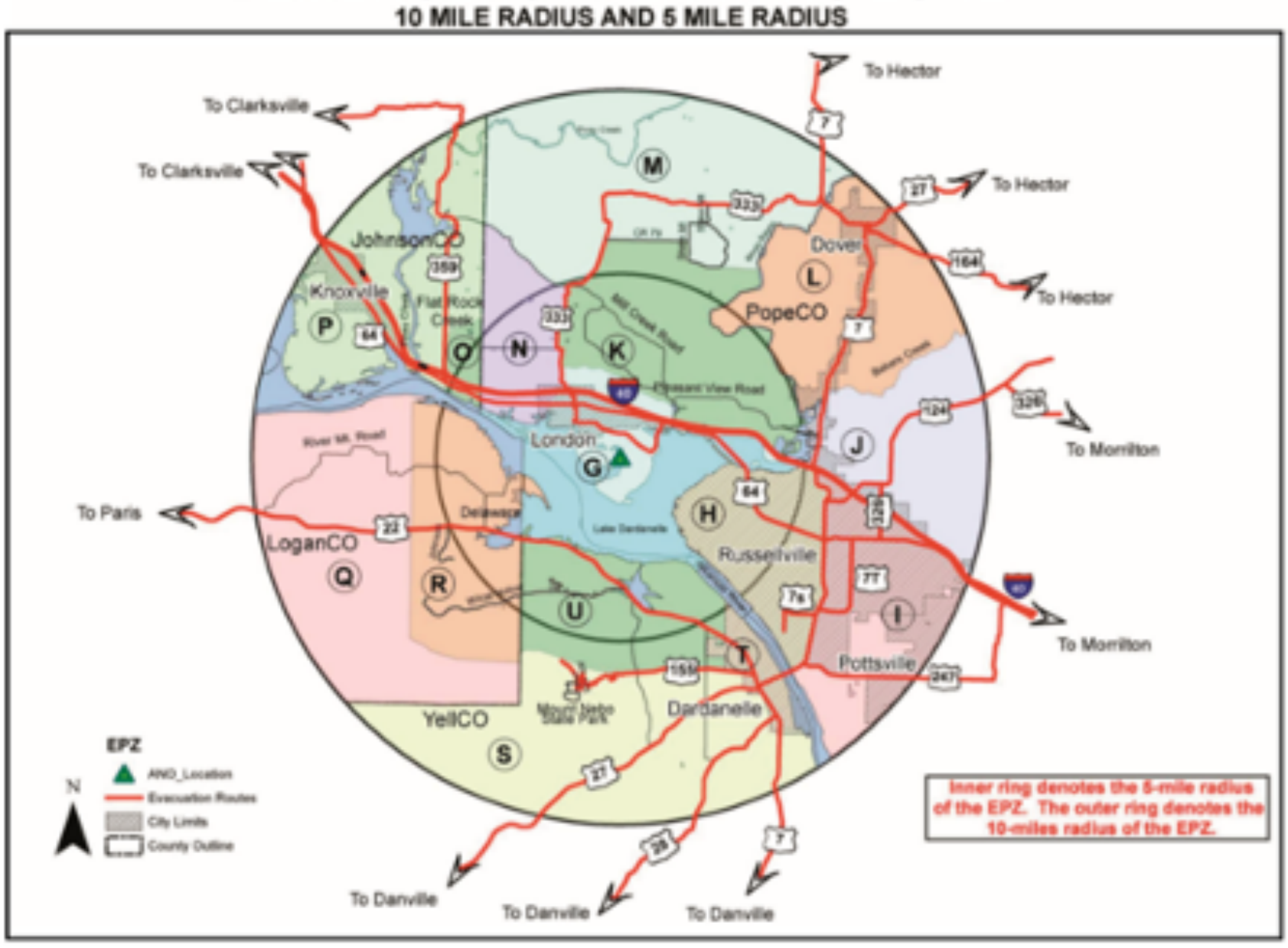
## 4.4.13 Nuclear Incident



For purposes of this plan, a nuclear incident is considered an accident involving a release of radioactive materials from a nuclear reactor.  Radiological accidents could cause injury or death, contaminate property and valuable environmental resources, as well as disrupt the functioning of communities and their economies. Since 1980, each utility that owns a commercial nuclear power plant in the United States has been required to have both an onsite and offsite emergency response plan as a condition of obtaining and maintaining a license to operate that plant. Onsite emergency response plans are approved by the U.S. Nuclear Regulatory Commission.

### 4.18.1 - LOCATION AND EXTENT

The only active nuclear reactor within the state is Arkansas Nuclear One (ANO).  ANO is a two-unit pressurized water reactor nuclear power plant located in London in Pope County.  The following map, provided by the Arkansas Department of Health in their 2022 publication “Emergency Instructions Arkansas Nuclear One,” details the 10-mile emergency planning zone (EPZ) around ANO.




As indicated by the map, Johnson, Logan, Pope and Yell Counties all fall within the EPZ.

### 4.4.13.2 - PREVIOUS OCCURRENCES

There have been no previous nuclear events in the State of Arkansas.

### 4.4.13.3 - HAZARD PROBABILITY ANALYSIS

Historically there has been no nuclear failure and/or release events in the State of Arkansas. The firm regulations imposed by the U.S. Nuclear Regulatory Commission on ANO ensure its safe operation.  The amount of radioactivity released by a nuclear power plant is monitored continuously to be sure it does not go above allowed levels. The same sophisticated monitoring equipment provides exact information about any accidental release. The risk to the public from radioactivity released from nuclear power plants is much smaller than the exposure received naturally every day.

### 4.4.13.4 - VULNERABILITY ASSESSMENT

The following table indicates the number of state-owned facilities and bridges within 10 miles of ANO. For vulnerability purposes, only the four counties within the 10-mile EPZ were considered. Assuming an amount of damage to each facility is not possible due to the tremendous number of variables involved in a potential nuclear release event.

| State Owned Facilities and Bridges Within 10 Miles EPZ of ANO | | | | | |
|---|---|---|---|---|---|
| **County** | **State-Owned Facilities** | **Value** | **State-Owned Critical Facilities** | **Value** | **State Owned Bridges** |
| Johnson County | 0 | $0 | 0 | $0 | 4 |
| Logan County | 0 | $0 | 0 | $0 | 4 |
| Pope County | 21 | $283,229,787 | 21 | $283,229,787 | 34 |
| Yell County | 0 | $0 | 0 | $0 | 25 |

Source: ADEM and HAZUS

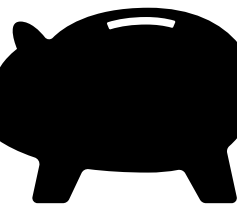
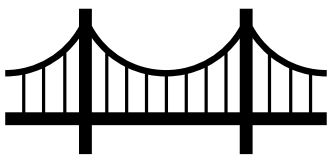
### 4.4.13.5 - IMPACT AND CONSEQUENCE ANALYSIS

As per EMAP requirements, the following table provides the Consequence Analysis.

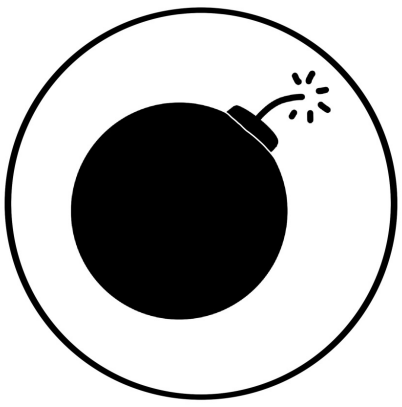
| Nuclear Incident Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Nuclear Incident** |
| Health and Safety of Persons in the Area of the Incident | Impact in the immediate area could be severe and long lasting. |
| Responders | Impact to responders is expected to be severe, potentially even with required safety equipment. |
| Continuity of Operations | Long term relocation may be necessary if government facilities experience contamination. |
| Property, Facilities, and Infrastructure | Localized impact could be severe in the incident area. Facilities may need to be abandoned and razed. Large areas may become inaccessible. |
| Environment | Impact could be severe for the immediate area. Impact will lessen with distance. |
| Economic Conditions | Local economy and finances may be adversely affected, depending on the nature, extent and duration of the event. |
| Public Confidence in Governance | Response and recovery will be in question if not timely and effective. Warning systems and the timeliness of those warnings could be questioned. |

# TERRORISM

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Manmade | • Populations - All<br>• Locations - All | • Number of Occurrences - NA<br>• Presidential Declared Disasters - 0 |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | Depends on scope of the event |
|  | Depends on scope of the event<br><br>If attack is against an government office or facility then major disruptions could occur and have a significant impact. |
|  | Depends on scope of the event<br>Attack on a built environment item such as a bridge or other infrastructure then significant impact could result on the built environment . |
|  | Depends on scope of the event<br>Attack on natural resources could cause disruptions or significant impact to that natural resource. |
|  | Depends on scope of the event . The scope of the attack and what the attack is made on will depend on the economic consequences. |

## 4.4.14 Terrorism



The United States does not have a standardized definition of terrorism that is agreed upon by all agencies.  The Federal Bureau of Investigation generally defines terrorism as:

"the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."

### 4.4.14.1 - LOCATION AND EXTENT

In 2021 the Arkansas Fusion Center reported that there were fourteen active hate groups in Arkansas

| Title | State | Group | Ideology | Headquarters | Statewide |
|---|---|---|---|---|---|
| Shieldwall Network | Arkansas | | White Nationalist | Yes | |
| Patriot Front | Arkansas | Patriot Front | White Nationalist | | Yes |
| W.A.R./P.F.R. | Arkansas | | Racist Skinhead | Yes | Yes |
| Nationalist Social Club (NSC-131) | Arkansas | | Neo-Nazi | | Yes |
| League of the South | Arkansas | League of the South | Neo-Confederate | | |
| Knights of the Ku Klux Klan | Arkansas | Knights of the Ku Klux Klan | Ku Klux Klan | Yes | |
| Tightrope Records | Arkansas | | Hate Music | Yes | Yes |
| Proud Boys | Arkansas | Proud Boys | General Hate | | Yes |
| Israel United In Christ | Arkansas | | General Hate | | |
| Great Millstone | Arkansas | | General Hate | | |
| Kingdom Identity Ministries | Arkansas | Kingdom Identity Ministries | Christian Identity | Yes | |
| Christian Revival Center | Arkansas | | Christian Identity | | |
| Nation of Islam | Arkansas | Nation of Islam | General Hate | | |
| ACT for America | Arkansas | ACT for America | Anti-Muslim | | |

### 4.4.14.2 - PREVIOUS OCCURRENCES

Arkansas has been fortunate to escape a major terrorist incident.  A incident on June 1, 2009 involving a lone gunman who killed one, and injured another, at a U.S. military recruiting office in Little Rock was initially categorized as a potential terrorist event, but was prosecuted as capital murder and related charges, not terrorism.

### 4.4.14.3 - HAZARD PROBABILITY ANALYSIS

By nature, acts of terrorism are difficult to foresee.  However, the probability of a major terrorist event in the State of Arkansas is considered very low due the lack of any documented historical events. Again, it is worth noting that no previous occurrences in no way guarantees no future occurrences.

### 4.4.14.4 - VULNERABILITY ANALYSIS

For purposes of this assessment, data is not available to quantify vulnerability or estimated losses because of terrorism incidents that might impact state-owned facilities.

For this assessment, it is not possible to calculate a specific vulnerability for each county. However, because of the desire for publicity following attacks, it is more likely that counties with greater population densities would be the target of attacks. Sparsely populated rural counties are less desirable targets for publicity-seeking terrorists. It is expected that the likelihood of attack is directly related to population density or, more likely, to an event or location of importance to the attacker. For example, a large venue event, such as a sporting event attended by tens of thousands of people might be considered a desirable target. Most large public events occur in densely populated areas since those areas can provide the infrastructure support (hotels, eateries, etc) for large numbers of people.

In general, it is difficult to quantify potential losses from terrorism due to the many variables, human elements and lack of historical precedents. Therefore, for the purposes of this plan, the loss estimates will consider three hypothetical scenarios. The estimated impact of each event was calculated using the Electronic Mass Casualty Assessment and Planning Scenarios developed by Johns Hopkins University.

Please note that the hypothetical scenarios are included for illustrative purposes only.

**Scenario #1: Mustard Gas Release**

Event: Mustard gas is released from a light aircraft onto the stadium during a home football game. The agent directly contaminates the stadium and the immediate surrounding area. This attack would cause harm to humans and could render portions of the stadium unusable for a short time period to allow for a costly clean-up. There might also be a fear by the public of long-term contamination of the stadium and subsequent low attendance at games resulting in a loss of revenue and tourism dollars.

Event Assumptions: For this scenario the number of people in the stadium is 50,000 with an additional 5,000 persons outside the stadium in the adjacent parking areas. The agent used, mustard gas, is extremely toxic and may damage eyes, skin and respiratory tracts with death sometimes resulting from secondary respiratory infections. The death rate from exposure is estimated to be 3%. The estimated decontamination cost is $12 person. For this scenario it is assumed that all persons with skin injuries will require decontamination.

Results: The following table presents the estimated human and economic impacts of the scenario.

| Estimated Impact of Scenario #1, Mustard Gas Release | | |
|---|---|---|
| **Impact** | **Post Exposure Onset Time** | **Effect** |
| Severe Eye Injuries | 1 -2 Hours | 41,250 persons |
| Severe Airway Injuries | 1 - 2 Hours | 41,250 persons |
| Severe Skin Injuries | 2 Hours to Days | 49,500 persons |
| Deaths | Immediate to Days | 1,100 persons |
| Cost of Decontamination | N/A | $594,000 |

**Scenario #2: Pneumonic Plague**

Event: Four Canisters containing aerosolized pneumonic plague bacteria are opened in public bathrooms of heavily populated buildings (airports, stadiums, etc.). Each release location will directly infect 110 people; hence, the number of release locations dictates the initial infected population. The secondary infection rate is used to calculate the total infected population. This attack method would not cause damages to buildings or other infrastructure, only to human populations.

Event Assumptions: Each canister contains 650 milliliters of pneumonic plague bacteria. The type of infectious agent used is identified on Day 4. After identification, the fatality rate is 10% for new cases. Pneumonic plague has a 1-15 percent mortality rate in treated cases and a 40-60 percent mortality rate in untreated cases.

Results: The following table presents the estimated human impacts of the scenario.

| Estimated Impact of Scenario #2, Pneumonic Plague Release | |
|---|---|
| **Impact** | **Effect** |
| Initial Infected Population | 440 persons |
| Secondary Infected Population | 883 persons |
| Deaths (7% of Infected) | 62 |

Source: Electronic Mass Casualty Assessment and Planning Scenarios by Johns Hopkins University

**Scenario #3: Improvised Explosive Device**

Event: An improvised explosive device utilizing an ammonium nitrate/fuel oil mixture is carried in a panel van to a parking area and detonated during a time when stadium patrons are leaving their cars and entering the stadium. Potential losses with this type of scenario include both human and structural assets.

Event Assumptions: The quantity of ammonium nitrate/fuel oil mixture used is 4,000 pounds. The population density of the lot is assumed to be 1 person per every 25 square feet for a pre-game crowd. The Lethal Air Blast Range for such a vehicle is estimated to be 50 feet according to the Bureau of Alcohol, Tobacco, Firearms and Explosives Standards. The Falling Glass Hazard distance is estimated at 600 feet according to Bureau of Alcohol, Tobacco, Firearms and Explosives Explosive Standards. In this event, damage would occur to vehicles, and depending on the proximity of other structures, damages would occur to the stadium complex itself. The exact amount of these damages is difficult to predict because of the large numbers of factors, including the type of structures nearby and the amount of insurance held by vehicle owners. It is estimated that the average replacement cost for a vehicle is $20,000 and the average repair cost for damaged vehicles would be $4,000.

Results: The following table presents the estimated human impacts of the scenario.

| Estimated Impact of Scenario #3, Improvised Explosive Device | |
|---|---|
| **Impact** | **Effect** |
| Deaths | 1,391 persons |
| Trauma Injuries | 2,438 persons |
| Urgent Care Injuries | 11,935 |
| Injuries not Requiring Hospitalization | 4,467 |
| Repair Costs for 100 Vehicles | $400,000 |
| Replacement Costs for 50 Vehicles | $1,000,000 |

Source: Electronic Mass Casualty Assessment and Planning Scenarios by Johns Hopkins University

### 4.4.14.5 - IMPACT AND CONSEQUENCE ANALYSIS

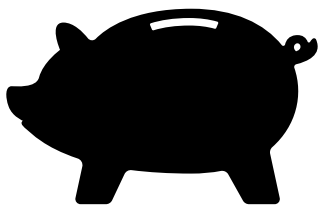
There is no consensus on estimates of potential fatalities and injuries for terrorism events. Injury and death tolls would be dependent on the type, size and weapon used. Areas with higher population densities would likely result in a greater number of casualties.

As per EMAP requirements, the following table provides the Consequence Analysis.

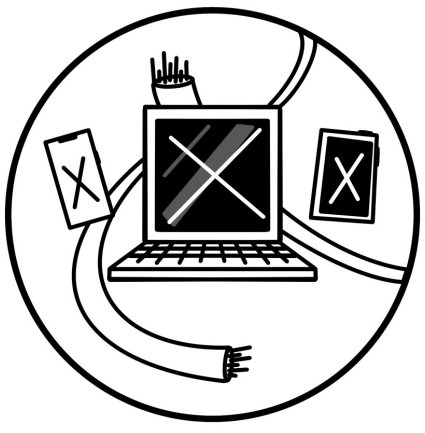
| Terrorism Consequence Analysis | |
|---|---|
| **Subject** | **Impacts of Terrorism** |
| Health and Safety of Persons in the Area of the Incident | Impact could be severe for persons in the incident area. |
| Responders | Impact to responders could be severe if not trained and properly equipped. Responders that are properly trained and equipped will have a low to moderate impact. |
| Continuity of Operations | Depending on damage to facilities/personnel in the incident area, relocation may be necessary and lines of succession execution. |
| Property, Facilities, and Infrastructure | Impact within the incident area could be severe for explosion, moderate to low for Hazmat. |
| Environment | Localized impact within the incident area could be severe depending on the type of incident. |
| Economic Conditions | Economic conditions could be adversely affected and dependent upon time and length of clean up and investigation. |
| Public Confidence in Governance | Impact dependent on if the incident could have been avoided by government entities, clean-up, investigation times and outcomes. |

# CYBER SECURITY

| Cause | Most At-risk | Past Events |
|---|---|---|
| What causes event in Arkansas?<br>Manmade | • Populations - limited<br>• Locations - Limited | • Number of Occurrences - NA<br>• Presidential Declared Disasters - 0 |

| Key Sectors Vulnerability and Exposure | |
|---|---|
|  | |
|  | |
|  | |
|  | |
|  | |

## 4.4.15 Cyber Security



# Section 5 - Capability Assessment



## 5.1 – STATE OF ARKANSAS EMERGENCY MANAGEMENT CODES

44 CFR 201.4(c)(3)(ii) A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

Emergency Management legislation for Arkansas is detailed in the 2022 A.C.A.. ADEM is mandated by Act 511 of 1973, which is codified A.C.A. §12-75-101 et al, to establish and maintain a management system that, to the extent possible, effectively provides mitigation of and recovery from the effects of natural and man-made disasters. In addition, under the 2022 A.C.A., the following relate specifically to emergency management:

- Title 12 - Law Enforcement, Emergency Management, and Military Affairs
  - Subtitle 5 - Emergency Management
    - Chapter 75 - Arkansas Emergency Services Act of 1973
    - Chapter 76 - Interstate Compacts
    - Chapter 77 - Arkansas Earthquake Preparedness Act of 1989
    - Chapter 78 - Emergency Communications Act of 1991
    - Chapter 79 - Arkansas Hazardous and Toxic Materials Emergency Notification Act
    - Chapter 80 - Earthquake Resistant Design for Public Structures
    - Chapter 81 - Commission to Assist Persons Who Have Suffered Catastrophic Financial Loss [repealed.]
    - Chapter 82 - Arkansas Serc/lepc Act
    - Chapter 83 - Emergency Volunteer Reserve Act of 1985
    - Chapter 84 - Arkansas Hazmat Emergency Management Act
    - Chapter 85 - Disaster Service Volunteer Leave Act
    - Chapter 86 - Emergency Preparedness
    - Chapter 87 - Uniform Emergency Volunteer Health Practitioners Act
    - Chapter 88 - Business Rapid Response to State Disasters Facilitation Act

In addition, the following acts and executive orders relate to emergency management and mitigation planning:

- **Act 629 of 1969**: As Amended, authorizes cities, towns, counties, and the Arkansas Natural Resources Commission, where necessary, to enact and enforce land use measures which will prevent and alleviate flood hazards and losses in flood-prone areas of the State; and for other purposes.
- **Subchapter 2 of Chapter 22 of Title 15 of the Arkansas Code of 1987, as amended:** Authorizes the Arkansas Natural Resources Commission to develop and enforce rules and regulations governing the design and operation of dams in the State.
- **Act 247 of 1989:** An act to establish a state earthquake preparedness program within the Arkansas Office of Emergency Services.
- **Act 833 of 1991:** An act to provide for additional funding of Arkansas Fire Departments through additional insurance premium tax in order to reduce homeowner insurance rates.
- **Act #36 of 1979:** Establishing within the Arkansas Department of Agriculture Forestry Division. The purpose of this division was to establish a program to encourage and assist in the establishment, development, and the operation of fire protection districts and associations in rural areas which had little or no fire protection available.
- **Act 833 of 1991, as amended during subsequent legislative sessions:** Enacted the Fire Protection Services Program Act of Arkansas which increased fire insurance premiums for revenues that may be used to defray training expenses of firefighters and to purchase, improve, or buy firefighting equipment in compliance with the National Fire Protection Association standards.
- **Act 372 of 2021:** An act to increase hazard mitigation funds from $3,000,000 to $6,000,000 annually, solely for the use in hazard mitigation assistance.

## 5.2 – STATE OF ARKANSAS DEPARTMENTAL CAPABILITIES

44 CFR 201.4(c)(3)(ii) A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

The roles and responsibilities of state departments and agencies involved mitigation activities are briefly detailed below.

**Arkansas Division of Emergency Management**

ADEM is Arkansas' Homeland Security and Preparedness Agency. ADEM serves as the state's coordination center for the capabilities necessary to prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk to the security of the Nation.

The Mitigation Branch and the SHMO are generally charged with all mitigation related activities, including:

- Preventing future loss of lives and property through mitigation measures and programs
- Overseeing the development, revision and implementation of all state hazard mitigation plans
- Assisting with the implementation and completion of identified mitigation actions and programs
- Providing direction and oversight on all hazard mitigation related funding and grants

The following are programs that ADEM operates and oversees related to hazard mitigation planning and mitigation initiatives.

**Federal Hazard Mitigation Grant Program (HMGP)**

The HMGP provides grants to states and local jurisdictions to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The State of Arkansas, through ADEM, administers the HMGP. The FEMA cost share for this program will not be more than 75 percent. Local jurisdictions are responsible for the remaining cost share. This program is managed under the policies of Section 404 of Public Law 93-288, as amended, the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

**Building Resilient Infrastructure and Communities (BRIC)**

The Building Resilient Infrastructure and Communities (BRIC) program makes federal funds available to states, U.S territories, federally recognized tribal governments, and local communities for hazard mitigation activities. It does so with a recognition of the growing hazards associated with climate change and of the need for natural hazard risk mitigation activities that promote climate adaptation and resilience with respect to those hazards. The program is nationally competitive and available on an annual basis.

**Arkansas Hazard Mitigation Grant Program (State)**

In 1993, the Arkansas Legislature approved Amendment 1049 to Act 511, establishing Arkansas as the first state in the nation to develop a state hazard mitigation disaster fund. The goal of the program is to assist local governments that have suffered repetitive disaster losses. This is accomplished by funding projects that permanently solve these repetitive problems. The Arkansas Hazard Mitigation Grant Program is available for all jurisdictions to use. This program has a 75 percent local and 25 percent state cost share up to $300,000.

**Pre-Disaster Mitigation Congressionally Directed Spending**

These funds allow governments to plan for and implement sustainable cost-effective measures designed to reduce the risk to individuals and property from future natural hazards, while also reducing reliance on federal funding from future disasters.

**Federal Public Assistance Program**

ADEM (Recipient) administers the Federal Public Assistance (PA) Grant Program. Federal assistance will be granted when the situation is clearly beyond the capability of both local and state governments. A team of Local, State and Federal personnel will complete preliminary damage assessments which will help with determining eligibility for a Presidential Declaration. Federal determination is based on a number of factors: which include population (implied tax base), impact upon jurisdiction's infrastructure and recent disaster history. The PA Program is available to assist with reimbursement of repairs to damaged eligible facilities. It is made available to eligible applicants (Local Governments, State Governments and certain Private Non-Profit organizations) that are located in a designated damage area. The Federal cost share for this program will not be less than 75% of eligible expenses for emergency measures and permanent restoration.

**State Public Assistance Program**

The State Public Assistance Program is authorized under Arkansas Code Annotated 12-75-101 et.al and administered under State PA Standard Operating Procedures.  The Arkansas Department of Emergency Management administers the State PA Program. The State PA program is designed to fill the gap between local recovery efforts and federal disaster assistance following a disaster situation. The program provides assistance to eligible applicants and facilities for debris removal, emergency protective measures, and permanent restoration of infrastructure. It is made available to eligible applicants (Local Governments and State Governments) that are located in a designated damage area. The State share of these expenses cannot be more than 35 percent (35%) of eligible costs. The State cannot provide assistance until the situation has clearly exceeded the capability of local government. The Arkansas Department of Emergency Management has established the State PA Grant Program Guidelines to be used in the implementation of the State PA Program. Please refer to the State PA Grant Program Guidelines for specific information on the program.

**State Individual Assistance Program**

The State Individual Assistance Program is authorized under Arkansas Code Annotated 12-75-101 et.al.

The Arkansas Division of Emergency Management administers the State Individual Assistance Program. Through the development of a disaster declaration and damage assessments individuals may be eligible to receive disaster assistance from the State of Arkansas. The assistance is for qualified homeowners/renters whose primary residence was damaged or destroyed in a declared designated area. If the damage exceeds the capabilities of local government, a state declaration will be requested through the Governor's Office. The State of Arkansas disaster assistance covers basic needs and will not compensate for the entire loss.

The Arkansas Division of Emergency Management has established the State IA Grant Program Guidelines to be used in the implementation of the State IA Program. Please refer to the State IA Grant Program Guidelines for specific information on the program.

**Federal Individual Assistance Program**

If both local and state governments are overwhelmed the Governor of Arkansas will submit a Presidential request for assistance. If approved, federal assistance will be available for qualified individuals, families, and businesses whose damaged property is in a designated area. FEMA along with the State of Arkansas will jointly administer the Individuals and Households Program and make available other needed assistance.

**Governor's Earthquake Advisory Council**

The Governor's Earthquake Advisory Council was created by then Governor Clinton in 1984. Members are representatives from state agencies, utilities, universities, hospitals, engineering, geology, local government, and state and federal legislative bodies. It serves as a forum for sharing ideas and information, networking of professionals, lobbying for legislative changes, searching for programs and funds, and planning. Past activities include promotion of seismic safety for the state, retrofitting projects in schools and hospitals, school safe rooms, promotion of disaster resistant communities, and the formation of the Pre-Disaster Mitigation Advisory Council.

**Arkansas Earthquake Program**

ADEM, under the authority granted by A.C.A. § 12-77-103, coordinates an earthquake program designed to protect the lives and property of persons of this state from the direct and secondary effects of earthquake. The program includes all activities involved in mitigation of and preparedness for seismic events. The program includes seismic risk assessment, training, education, and planning. Arkansas coordinates activities with the federal government and other states and promotes awareness and preparedness to the citizens of the state, particularly those living near the New Madrid Seismic Zone.

**Preparedness Planning**

ADEM has developed and updated the ARCEMP to define the structure of emergency operations at the state level, to describe the relationships between the state and its partners at the household, local and federal levels, and to identify the various agencies and departments with functional responsibilities. The State of Arkansas has adopted the National Incident Management System and this is reflected in the ARCEMP. The ARCEMP addresses all hazards as identified in this Mitigation Plan. This program supports loss reduction by providing both emergency management and continuity of operations planning resources to the counties, other state agencies, and other organizations.

**ADEM Two-Year Strategic Plan**

This strategic plan is designed to guide the department over a five-year period as a blueprint for improving services and capabilities. This plan relates to goals, objectives, and action items for preparedness, response, recovery, and mitigation. This plan is constantly monitored and updated to meet the changing state and federal initiatives and any current high priority disaster-related issues.

**Emergency Management Performance Grant (EMPG)**

The EMPG program provides resources to assist state, local, tribal and territorial governments in preparing for all hazards, as authorized by Section 662 of the Post Katrina Emergency Management Reform Act (6 U.S.C § 762) and the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended (42 U.S.C. §§ 5121 et seq.). Title VI of the Stafford Act authorizes FEMA to make grants for the purpose of providing a system of emergency preparedness for the protection of life and property in the United States from hazards and to vest responsibility for emergency preparedness jointly in the federal government and the states and their political subdivisions. EMPG reimburses certain eligible expenses, under program guidelines, to support state and local emergency management costs.

**Fire Protection Services Fund (Act 833)**

Fire Services has a vital role in the State of Arkansas. The Fire Services Office provides administration and distribution of the Act 833 grant program for Arkansas fire departments and reviews and certifies that departments are in accordance with Act 833 of 1991. Additionally, the Fire Services Office provides technical assistance and grant information, carries out administrative functions and directives from the Arkansas Fire Protection Services Board and provides support for developing new fire departments. This Pre-Disaster program supports loss reduction by providing funding for equipment, apparatus and facilities directly related to improve the department Fire Protection Classification rating (ISO Rating).

**Homeland Security Grant Program**

The objective of this program is to enhance the capacity of state and local emergency responders to prevent, respond to, and recover from a weapon of mass destruction terrorism incidents. These incidents may include events involving chemical, biological, radiological, nuclear and explosive devices, cyber-attacks, and major disasters. Funds are provided to enhance homeland security and preparedness planning, training, and exercises, and to purchase specialized equipment to enhance the capability of state and local agencies to prevent, respond to, and mitigate incidents. The most recent posted Homeland Security Grant Program funding priorities include:

· Enhancement and maintenance of specialized terrorism response capabilities in the areas of weapon of mass destruction bomb/ Improvised Explosive Device detection and deterrence
· Urban search and rescue,
· SWAT/Terrorism response.

Also supported is the State's Fusion Center, cyber security, community preparedness/public awareness, and tactical emergency casualty care. Funding is provided to the State through the Homeland Security Grant Program (Department of Homeland Security (DHS)/FEMA).

**Hazardous Materials Program**

Provides pre-disaster hazardous materials training to groups and organizations throughout the state. Updates and maintains a database and file of all Tier II and TRI reports. The information is used in the event of emergencies to provide data analysis for Local Emergency Planning Committees (LEPC) emergency planning, and to support the Freedom of Information Act. Fees collected from Tier II reporting are used to facilitate safety training for HAZMAT trainers as well as first responders. This pre-disaster program supports loss reduction by training first responders.

**Arkansas Emergency Response Commission**

The commission's priorities are to supervise and coordinate the activities of the LEPC in each of the emergency planning districts making sure that plans in each district are adequately developed, maintained, and exercised to ensure an effective response to accidents and incidents involving hazardous materials. Additionally, the commission ensures the emergency response plans, along with the pertinent information, are accessible for review by the general public.

In addition to ADEM, a number State of Arkansas departments and agencies provide services related to hazard mitigation through a variety of programs and initiatives. Differing from previous planning efforts, no contact information has been provided for these departments as it was determined that staff turnover often rendered listed contacts obsolete. Contacts for these departments may easily be found on the State of Arkansas Website.

**Arkansas Building Authority**

The Arkansas Building Authority is the state government's leasing agent, construction overseer, and examiner of architectural/ engineering plans, and sets policies, guidelines, standards and procedures.

**Arkansas Economic Development Commission**

This agency oversees Community Development Block Grant (CDBG) Loan and Grant Programs fund projects in eligible communities that improve, repair or rehabilitate housing or infrastructure systems to meet urgent needs or to deal with an imminent threat to public health and safety. The CDBG has been used in conjunction with other federal mitigation grants to build community saferooms.

**Arkansas Department of Energy & Environment**

Arkansas Energy and Environment manages many programs to assist businesses, educators and the public with regulatory and other issues, and offers loans and tax credits for environmental improvement projects. This program supports loss reduction by providing funding for mitigation initiatives.

**Arkansas Department of Health**

The ADH operates and oversees numerous programs related to hazard mitigation planning and mitigation initiatives.

- Preparedness & Emergency Response Program works with internal and external partners in planning, City Readiness Initiative, Strategic National Stockpile, surveillance, epidemiology, public health labs, crisis communication, the health alert network, training, exercises and drills.

- Bioterrorism Preparedness Program is focused on potential terrorism agents, but these efforts are also mitigating the potential effects of naturally occurring diseases. This program supports the development and funding of regional plans to purchase training, equipment, and supplies that enhance preparedness to respond to disease outbreaks.
- Strategic National Stockpile is a national repository of medical drugs and equipment. The State of Arkansas is a full participant in this federal program. Potential funding is available through this program for pre-event mitigation initiatives.
- Health Alert Network includes planning and funding for improving local technical capabilities for public health including high speed internet connectivity and statewide databases for health care providers.
- The Hospital Preparedness Program, which is jointly operated by the Arkansas Department of Public Health and the Arkansas Hospital Association, works with hospitals throughout the state to ensure that they prepared to meet the medical needs of their patients and communities. The program works closely with the hospitals on communication, drills and exercises, mass fatality plans, evacuation and alternate care sites.

**Arkansas Department of Agriculture, Forestry Division**

The Arkansas Forestry Commission operates and oversees numerous programs related to hazard mitigation planning and mitigation initiatives.

- The National Fire Plan Hazard Mitigation program provides funding for providing training and technical assistance to rural communities and volunteer fire departments in conducting community wildfire hazard risk assessments, development of mitigation projects to reduce the risk from wildfire fires and the development of Community Wildfire Protection Plans. Potential funding is available through this program for pre-event mitigation initiatives.
- FireWise is a cooperative effort among federal, state, and private agencies and organizations to promote fire safety in the wild land/urban interface.
- Arkansas Fire Prevention Code, as updated by the Fire Marshal's Office, references best practices for building disaster resistant structures.
- The Rural Fire Protection division was established to encourage and assist in the establishment, development, and operation of fire protection districts and associations in rural areas that previously had little to no fire protection capabilities.
- The Landowner Assistance program offers a variety of free technical assistance services in forest management, and includes written forest management plans, and information and site recommendations for protection, restoration, and improvement of water and wetland resources. Fire lane construction and prescribed burning can be conducted for a fee.

**Arkansas Geographic Information Office**

This office coordinates statewide GIS data creation standards, administers the data repository, and serves as liaison between local, state, and federal GIS programs. Under this office reside the following programs:

- The Arkansas Centerline File Program was developed to support state legislative initiatives to establish spatial data infrastructure benefits the GIS user communities in areas such as E-911 applications, location-based services, homeland security, and various government entities. Free services to cities and counties include agency coordination, training and guidance and technical support. Potential funding is available through this program for pre-event mitigation initiatives.
- The Arkansas County Assessor Mapping Program provides technical and GIS input and support for county assessors for the development of cadastral (showing the extent, value, and ownership of land, especially for taxation) mapping with a goal of giving the public, including mitigation planners, easier access to assessment data. Potential funding is available through this program for pre-event mitigation initiatives.

**Arkansas Geological Survey**

The AGS identifies, studies, monitors, and advises the public and officials about active or potentially active hazardous geologic processes (earthquakes and associated hazards, landslides, expansive soils and ground subsidence) in Arkansas. The AGS monitors statewide earthquake activity in Arkansas with the nine broadband seismometers comprising the Arkansas Seismic Network (AG). They provide real-time earthquake monitoring 24/7/365, provide seismic data and information to the public and officials.  Geohazard study findings may be used to support analysis, decision making and risk reduction including: 1) Improve understanding of geohazard/seismic risk in Arkansas (New Madrid Seismic Zone and other areas), 2) Promote geohazard risk awareness and mitigation of high-risk communities, 3) Support awareness of seismic building code provisions, 4) Support disaster response and recovery planning.

**Arkansas Department of Transportation**

Under this department, the Technology Transfer Program is responsible for assisting cities and counties in implementation of transportation related technology. ARDOT also has funding mechanisms to provide infrastructure projects to state roads and bridges.

**Arkansas Livestock and Poultry Commission**

The Commission has full authority for the control, suppression, and eradication of livestock and poultry diseases and pests, and supervision of livestock and poultry sanitary work in this state. In addition, the Commission also maintains the Animal Disease Emergency Response Plan, conducts inspections, and operates the Veterinary Diagnostic Lab.

**Arkansas Department of Agriculture Natural Resources Division (ADA NRD)**

The ADA NRD operates and oversees numerous programs related to hazard mitigation planning and mitigation initiatives.

- The FMA Grant Program was created as part of the National Flood Insurance Reform Act of 1994 with the goal of reducing or eliminating claims under the NFIP. Consistent with Biggert-Waters Flood Insurance Reform Act of 2012 (Public Law 112-141), the FMA program for fiscal year 2013 and beyond includes provisions to mitigate SRL and RL properties. Only NFIP-participating communities with FEMA approved flood/hazard mitigation Plans can apply for FMA project grants. The FMA program provides funds on an annual basis so that measures can be taken to reduce or eliminate the risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP.
- The Floodplain Management Program, under Act 629 of 1969, authorizes relevant jurisdictions and the ANRC, where necessary, to enact and enforce land use measures which will prevent and alleviate flood hazards and losses in flood-prone areas. The purpose of this is to promote the public health, safety, and general welfare of the state and to minimize public and private losses due to flood conditions.
- Act 754 of 2003, as amended, authorizes the ANRC to require that local communities with floodplain management ordinances appoint a floodplain manager to administer local floodplain management laws, and obtain accreditation of the floodplain administrator through the ANRC. The purpose of the legislation was to make sure that local floodplain management regulations were properly administered, thereby reducing the likelihood of future flood damages to property owners in Arkansas.
- The Dam Safety Program provides for the comprehensive regulation and supervision of dams for the protection of the health, safety, and welfare of the citizens, and assures proper planning, design, construction, maintenance, monitoring, and supervision of dams, including such preventive measures necessary to provide an adequate margin of safety.
- The Conservation District Grant Program helps enhance the capability of conservation districts to carry out conservation projects, including resource enhancement, restoration or protection. Projects must be new, or augment projects in which a district is currently involved. Potential funding is available through this program for pre-event mitigation initiatives.
- The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities which exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions meeting the three goals of the CRS, the reduction of flood losses, the facilitation of accurate insurance rating, and the promotion the awareness of flood insurance.
- Cooperative Technical Partnership (CTP) And Risk MAP - Through the CTP Program, Arkansas works with FEMA to identify, mitigate, and manage the natural hazard risks in our state through sound science and engineering practices and effective communication so that all of our citizens are aware of the potential risks in their communities.Through the CTP program, ANRC has produced a number of flood risk products.

**Department of Arkansas Heritage**

This department maintains a number of databases, including the Historic Places and Landmarks Database, with over 20,000 historical locations throughout the state.

**University of Arkansas**

The University of Arkansas operates and oversees numerous programs related to hazard mitigation planning and mitigation initiatives.

- The Arkansas Archeological Survey includes a database that contains more than 44,000 entries for prehistoric and historic sites located throughout the state.
- The Arkansas Earthquake Center is a collaborative program in hazard mitigation emphasizes public education, hazard mitigation, earthquake monitoring, and scientific research. Potential funding is available through this program for pre-event mitigation initiatives.
- The University of Arkansas for Medical Sciences Bioterrorism Steering Committee assists other organizations in the state and region in their bioterrorism planning efforts.
- The Center of Excellence for Poultry Science educates future workers and provides subject matter expertise to businesses and government.

## 5.3 – RELATED MITIGATION PLANNING EFFORTS

### Animal and Plant Health Inspection Services

The agency improves agricultural productivity and competitiveness and contributes to the national economy and the public health. Arkansas is a full participant in the various programs from the Animal and Plant Health Inspection Services, especially related to potential biological hazards that could impact the poultry and cattle industry of the state.

### Arkansas Animal Disease Emergency Response Plan

The committee in charge of this plan is primarily composed of members of the Arkansas Livestock and Poultry Commission and the Veterinarian Services. These would be the lead agencies for any events involving animal disease. This existing planning effort is being incorporated into the state's mitigation strategies for biological hazards.

### Arkansas Manufactured Home Commission

Responsibilities include enforcing construction and safety standards for manufactured housing, dealer lot inspections and monitoring of consumer complaints. The Arkansas Manufactured Home Commission sets, administers, and enforces standards for the proper installation of manufactured homes in the State of Arkansas.

### Arkansas Regulatory Partnership Program

The Arkansas Regulatory Partnership Program is a cooperative effort among 19 Arkansas pipeline and gas companies and the Arkansas One-Call Center. Its role is to address the first responder, public official, and excavator audiences.

### Arkansas State Disaster Insurance Coalition Plan

This plan, which works to ensure that citizens of Arkansas will receive the best possible services when disasters occur in the state, is a comprehensive contingency plan that facilitates a timely and comprehensive response from the insurance industry.  ADEM is a lead partner in this coordinated planning effort.

### Central Arkansas Veterans Healthcare System – Bioterrorism Readiness Plan

This plan contains operations information for this organization for responding to potential outbreaks.

### Center for Disease Control Emergency Planning

As part of the federal government's bioterrorism planning efforts, the CDC has developed detailed emergency plans a variety of pandemic hazards. These federal plans are implemented through state and local government public health agencies. The CDC provides significant grant funding to the state's Department of Health and Human Services for bioterrorism planning and response. The state has also considered the Model State Emergency Health Powers Act that was distributed by the CDC for discussion at the state and local levels.

### Central United States Earthquake Consortium (CUSEC) / USDOT - Earthquake Vulnerability of Transportation Systems in the Central United States

The U.S. Department of Transportation collaborated with the CUSEC on several projects and training activities to address the vulnerability of transportation systems in the New Madrid earthquake zone, and measures that can be taken to advance mitigation, response and recovery planning. This plan is available on the CUSEC website.

### CUSEC Earthquake Awareness Month

Each year several CUSEC states participate in joint efforts to raise the level of earthquake awareness in the central United States. Activities include press conferences, proclamations, meetings, exhibits, and earthquake related training.

### CUSEC/FEMA/American Red Cross - The New Madrid Housing Recovery Initiative Plan

A New Madrid Housing Recovery Working Group was organized under the auspices of CUSEC in 1998 to develop a multi-year plan for developing a strategy which could be useful to decision makers and service providers in addressing the basic shelter and housing needs of disaster victims displaced from their residences because of a major earthquake. This plan is available on the CUSEC website.

### CUSEC - New Madrid Catastrophic Planning Initiative

This project was enacted to increase national readiness for a catastrophic earthquake in the NMSZ.  CUSEC, the MAEC, the USGS, and FEMA have completed planning scenarios of potential impacts of an earthquake in the NMSZ.

**CUSEC- Rapid Visual Screening (RVS) Project**

The Central U.S. Earthquake Consortium (CUSEC) is conducting a program to screen critical facilities (e.g. police, fire, EMS, etc.) for potential seismic hazards. The program will be conducted over several years in counties most susceptible to earthquakes, such as those in the New Madrid Seismic Zone. The purpose of the screening program will be to a) create an inventory of critical facilities, b) identify which of those facilities may be potential candidates for mitigation projects or further evaluation, and c) update mitigation and other plans with the information collected.

**CUSEC- State/Regional Earthquake Scenarios Risk Assessments/Loss Estimations**

CUSEC will conduct multiple earthquake scenario impact analyses and loss estimations for states, building upon the work and model started in FY20 for the regional resilience planning project. The FY22 project will involve conducting advanced Hazus loss estimations for multiple earthquake scenarios (e.g. New Madrid, Wabash), which can be used for planning for state and local government, the private sector, and other emergency management stakeholders. The loss estimations will be done on a state and regional level, unified, similar to the 2009 MAE Center regional earthquake impact study.

Outputs from this project will be used to support FEMA's 2024 New Madrid earthquake planning process. Every effort will be made to conduct loss estimations for multiple magnitudes affecting multiple states. Hazus loss estimations will be done for at least three earthquake scenarios, GIS Dashboard of earthquake scenarios, and customize earthquake impact reports for states and counties.

**National Earthquake Hazards Reduction Program**

Losses in the United States through basic and directed research and implementation activities in the fields of earthquake science and engineering. NEHRP is a multi-agency program consisting of the National Institute of Standards and Technology (NIST), FEMA, the United States Geological Survey (USGS), and the National Science Foundation (NSF).
The program prioritizes reducing the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program. The program objectives are:

- Improve understanding of earthquake processes and impacts.
- Develop cost-effective measures to reduce earthquake impacts on individuals, the built environment, and society at large.
- Improve the earthquake resilience of communities nationwide.

**Emergency Poultry Disease Committee**

This committee is made up of private sector veterinarians and industry experts committed to protecting the poultry flocks within the State of Arkansas. They focus on disaster planning, disease identification and surveillance and response/containment issues.

**Federal Animal Disease Risk Assessment, Prevention and Control Act of 2001 – Final Report**

This report was issued in 2003 and is a primary element of the state's emergency planning for animal pandemics. This is a coordinated effort with the USDA and the Animal and Plant Health Inspection Services program.

**FEMA - National Mitigation Strategy**

In response to the unacceptable loss of life and property from recent disasters, and the prospect of even greater catastrophic loss in the future, the National Mitigation Strategy has been developed to provide a conceptual framework to reduce these losses.  The long-term goal of the strategy is to substantially increase public awareness of natural hazard risk and to significantly reduce the risk of loss of life, injuries, economic costs, and the disruption of families and communities caused by natural hazards.

**National Animal Health Monitoring System**

The National Animal Health Monitoring System was initiated in 1983 for collecting, analyzing, and disseminating data on animal health, management, and productivity and in conducting disease surveillance across the United States

**National Fire Protection Association**

The goal of the National Fire Protection Association is to reduce the burden of fire and other hazards on the quality of life by providing research, training, and education, and advocating consensus on codes and standards worldwide.

**National Incident Management System (NIMS)**

The Federal Department of Homeland Security has developed the NIMS system as the integrated standard for emergency planning. The State of Arkansas has officially adopted the NIMS system and is continually implementing this program within state agencies and with local jurisdictions.

**NOAA StormReady Program**

The StormReady Program is a voluntary program to help communities better prepare for and mitigate effects of extreme weather-related events. StormReady also helps establish a commitment to creating an infrastructure and systems that will save lives and protect property.  For each community, preparedness criteria are outlined by a partnership between the NWS and state and local emergency managers. At a minimum, communities must establish a 24-hour warning point and emergency operations center, have more than one method of receiving severe weather forecasts and warnings and alerting the public, create a system that monitors local weather conditions, promote the significance of public readiness through community seminars, and develop a formal hazardous weather plan.

**National Strategy for Pandemic Influenza**

The State of Arkansas has considered this planning effort and incorporated it into the statewide public health emergency planning. This coordination between the federal and the state government is part of an on-going effort to protect the population from a variety of health risks.

**USGS National Landslide Mitigation Strategy**

This plan outlines key elements of a comprehensive and effective national strategy for reducing losses from landslides nationwide, including activities at the national, state, and local levels, in both the public and private sectors. Methodologies include the use of scientific information, maps, methodology, and land-use planning.

**USACE Silver Jackets Program**

State-led Silver Jackets teams exist in all states and several territories, bringing together multiple state, federal, and sometimes local agencies and Tribes to learn from one another and work together to reduce risk from floods and sometimes other natural hazards. Silver Jackets teams conduct diverse collaborative efforts. Team focal areas vary as state priorities vary. By applying their shared knowledge, the teams enhance preparedness, mitigation, and response and recovery efforts when such events do occur. Resources for team activities are provided through the individual programs of each participating agency, within the constraints of available budgets and authorities.

## 5.4 - STATE OBSTACLES AND CHALLENGES

**Funding**

Lack of both federal and local mitigation funding is a major obstacle in the state. In some of the recent disasters there was not enough HMGP funding available for FEMA to reimburse the standard 75 percent, so the local jurisdictions had to provide the difference. Many jurisdictions struggle to afford the 25 percent cost share already, so this only adds to their burden.

**Project Types**

Many jurisdictions are primarily interested in using mitigation grant funds to build community safe rooms, however, this activity is not a priority for FEMA under the BRIC program. The state has to rely on the HMGP to fund these safe rooms and as mentioned above often times there is not enough funding available. BRIC priorities are to fund large-scale infrastructure projects that rural states either do not have the interest in or the capabilities to submit viable applications or implement these types of projects. ADEM often uses the State Hazard Mitigation Grant Program to fund the smaller mitigation projects that most local jurisdictions are interested in.

**Community Involvement**

Lack of interest at the local level is another obstacle that the state faces when implementing mitigation efforts. ADEM, as the state's emergency management agency, uses opportunities to inform local jurisdictions on the importance of hazard mitigation via workshops, conferences, meetings, etc. Though information is presented on mitigation planning and grant opportunities, often times a project does not result from the outreach. ADEM will continue to present information to the locals, increase our efforts to reach disadvantaged communities, and provide more targeted outreach approach.

**Solutions**

The Arkansas Division of Emergency Management and other state agencies are working together to find solutions to the challenges that the the state and local level faces when it comes to mitigation. One solution that has been happening as of late is more regional meetings with state and local partners where mitigation information can be discussed and addressed. Another solution that ADEM is working on is increasing the mitigation team staff in order to expand its capabilities and offerings.

## 5.5- LOCAL JURISDICTION CAPABILITIES ASSESSMENT

The local jurisdiction capabilities assessment includes a description of local jurisdictional mitigation capabilities, a discussion of policies and programs, and a general discussion of their effectiveness.  For this hazard mitigation plan, each available FEMA-approved local hazard mitigation plans were reviewed.

**Personnel**

Currently, all Arkansas counties have an Emergency Manager and associated emergency management program. However, the capabilities of each county program vary based largely on the size and financial capabilities the county. Many, but not all, counties have the capability needed to conduct mitigation planning, apply for grant funding, and oversee mitigation projects. Augmenting local emergency management capabilities, Area Coordinators act as ADEM's liaisons to the counties for state and federal mitigation and emergency management initiatives and available funding opportunities.

Other local personnel capabilities vary widely, and again are often tied to county size and financial capabilities. In general, more urban or larger counties have a greater range of full time personnel dedicated to planning, engineering, mapping, and response, while smaller counties lack these capabilities.

**Technical**

Technical capabilities for each county vary widely and are generally based largely on the size and financial capabilities the county. As with personnel, and in general, more urban or populated counties have a greater range of technical capabilities related to planning, engineering, mapping, and response, while less populated counties lack these capabilities. It should be noted that ADEM offers a variety of programs to provide local jurisdictions with technical expertise, including mapping and planning.

**Fiscal**

A review of local level hazard mitigation plans indicates that most local jurisdictions have limited to no funding sources for mitigation initiatives and rely on available state or federal grant programs. However, tax generated funding (often generated from property and/or sales tax) can be allocated to infrastructure improvements for schools, public works, and other government functions. In addition, some larger jurisdictions have dedicated transportation or capital improvements sales or use taxes that can be obligated to fund mitigation projects.

On a yearly basis, most jurisdictions throughout the State of Arkansas fully allocated their tax revenue on basic services and programs. As a result, funding for mitigation projects is often unavailable or severely limited. While the capability to assess special taxes or issue bonds does exist, historically it has been shown that passing these measures is extremely difficult. As a result, many needed mitigation projects throughout the state are not completed due to lack of funding.

It should be noted that ADEM offers a variety of programs to provide local jurisdictions with financial expertise, including grant application and determining potential funding streams.

**Building Codes**

Building codes set a reference point for the design and construction of all structures, providing minimum safe building practices to ensure occupant safety and structure resiliency. Enforced building codes are one of the most effective hazard mitigation tools available against a wide variety of hazards.

The Arkansas Building Code is adopted by the State Fire Marshal's office as part of the Fire Prevention Code and is applied statewide. While many jurisdictions adopt the Fire Prevention Code, and thus the Arkansas Building Code, through ordinance, Code enforcement does not require local ordinance.

The following are all relevant building codes for the state:

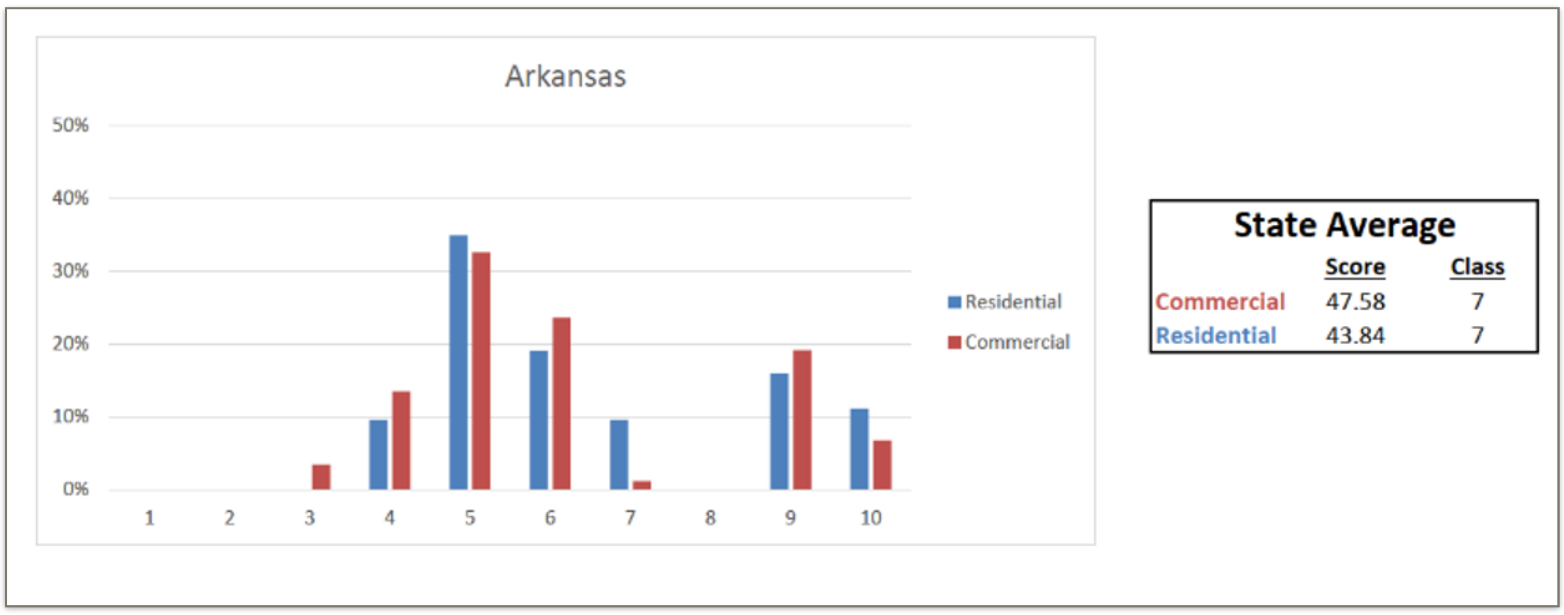
- Fire: 20221Arkansas Fire Prevention Code, Volume I (2021 IFC with Arkansas Amendments)
- Building: 2021 Arkansas Fire Prevention Code, Volume II (2021 IBC with Arkansas Amendments) Residential: 2021 Arkansas Fire Prevention Code, Volume III (2021 IRC with Arkansas Amendments)
- Electrical: 2014 National Electrical Code (2014 Arkansas Electrical Code)
- Plumbing: 2018 Arkansas State Plumbing Code, 9th Edition
- Gas: 2018 Arkansas State Gas Code
- Liquefied Gas: 2008 State Code Liquefied Petroleum Gas Containers & Equipment, AR
- Mechanical: 2021 Arkansas Mechanical Code (2021 IMC)
- Energy: 2014 Arkansas Energy Code
- Accessibility: State: ANSI A117.3 Federal: ADAAG, 2010
- Seismic: 2016 Arkansas Code § 12-80-104, and as amended by 2016 House Bill 1014, provides for earthquake resistant design for public structures.

All building codes revisions are managed by the Fire Code Revision Committee. This committee consists of municipal fire marshals, building officials, architects, engineers, Arkansas Home Builders Association representatives, Arkansas Oil Marketers Association representatives, Manufactured Housing Association representatives, and officials from other state agencies and private sectors interests.

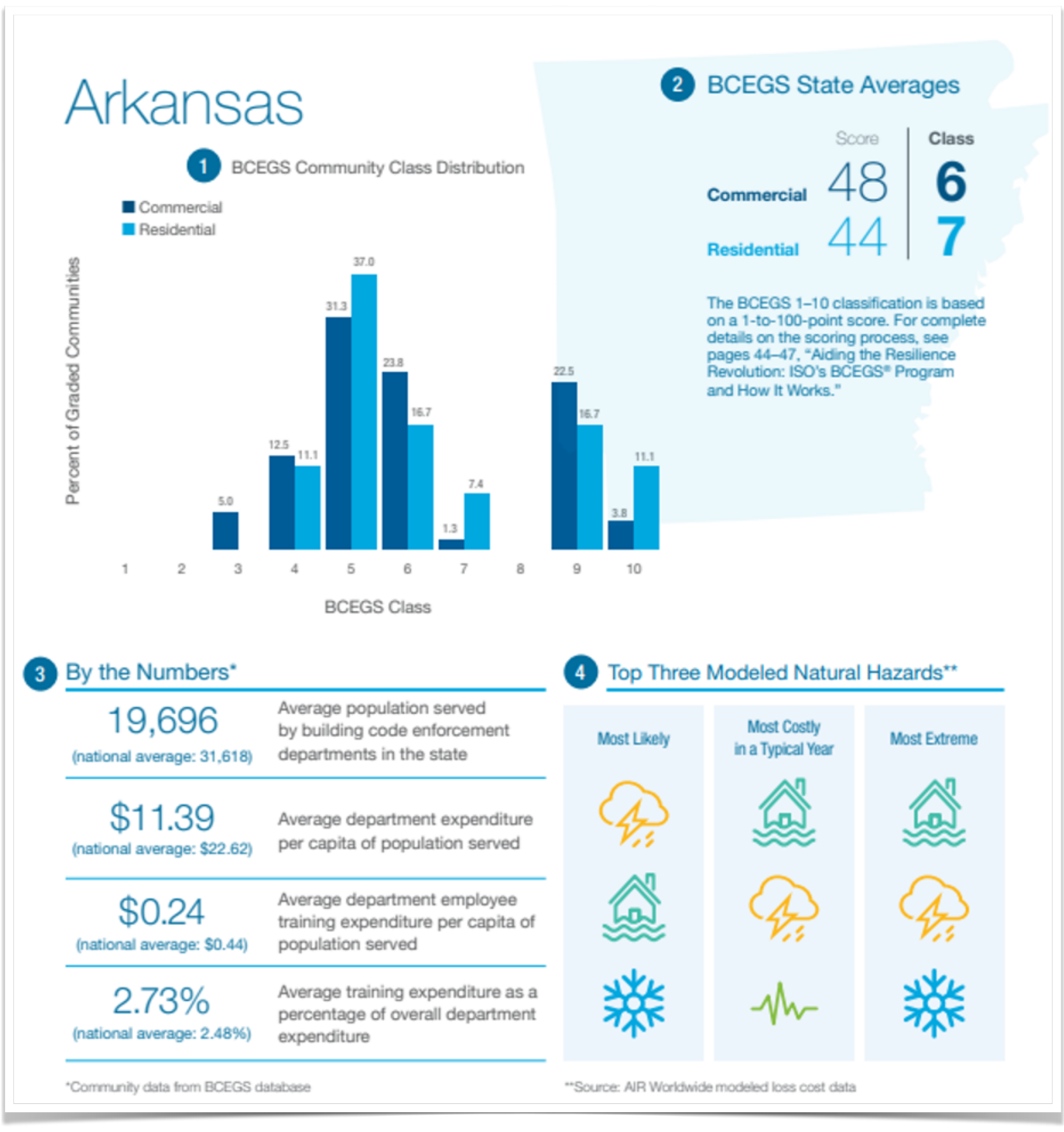
The Building Code Effectiveness Grading Schedule (BCEGS®) assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards. The BCEGS program assigns each participating municipality a BCEGS grade of 1 (exemplary commitment to building code enforcement) to 10.  The following graph illustrates the rating for each State of Arkansas participating municipality.

**Challenges with Building Codes**

There are numerous challenges around the state concerning building codes. The State of Arkansas does pass various codes that are adopted by the legislatures but many counties and or cities do not have the staff to enforce those codes. Some Cities in the state do not even have a building inspector that can enforce the codes. In those cases it may be up to a local fire dept or the state fire Marshall to aid in this enforcement especially when it comes to the State Fire Code. A few cities have adopted codes that are more stringent then the state code and have the enforcement capability.;




National Building Code Assessment Report 2019 Edition



**Zoning, Land Use Planning, and Subdivision Regulations Section 6 - Mitigation Strategy**

Zoning is the traditional, and most common, tool available to local jurisdictions to control the use of land. Zoning is used to promote health, safety, and the general welfare of the community. Zoning is used to dictate the type of land use and to set minimum specifications for use such as lot size, building height and setbacks, and density of population.

State laws enable local governments to adopt and enforce zoning based upon locally developed and adopted land use plans. Adoption of land use regulations is a local government decision as there are no state-prepared comprehensive land use plans or provisions. Local governments are authorized to divide their jurisdiction into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, special use districts or conditional use districts. In addition, numerous cities in the state are enabled through state legislation to extend zoning into extraterritorial areas, or areas outside of their defined boundaries.

Zoning restriction and land use planning are some of the most effective hazard mitigation tools available against a wide variety of hazards. However, a review of local hazard mitigation plans indicated that fewer than half of the reviewed jurisdictions had zoning ordinances or land use planning.

**Floodplain Development**

Pursuant to Arkansas Code Ann. §14-268-104 and the political subdivision's Flood Damage Prevention Ordinance or Flood Damage Prevention Code, NFIP participating communities shall follow the floodplain management criteria in 44 CFR 60.3 for areas designated special flood hazard areas by the Federal Insurance Administrator.

Local floodplain ordinances are often used to prevent inappropriate development in floodplains and to reduce flood hazards. In general, they allow the jurisdiction to:

- Minimize the extent of floods by preventing obstructions that inhibit water flow and increase flood height and damage.
- Prevent and minimize loss of life, injuries, and property damage in flood hazard areas.
- Promote the public health, safety and welfare of citizens in flood hazard areas.
- Manage planned growth
- Grant permits for use in development within special flood hazard areas that are consistent with the community ordinance and the NFIP under 44 CFR 60.3

Local floodplain ordinances also make certain that the jurisdiction meets the minimum requirements of participation in the NFIP. The incentive for local governments adopting such ordinances is that they will afford their residents the ability to purchase flood insurance through the NFIP. In addition, communities with such ordinances in place may be given priority in the consideration of applications for loans and grants.

While there is no state or federal funding available for local governments for floodplain management, floodplain ordinances and management are one of the most effective hazard mitigation tools available against flooding. Largely due to its requirement for participation in the NFIP, floodplain management regulations are one of the most common hazard-related land use regulations for local jurisdictions.

**Partnerships**

The most common hazard mitigation and emergency management coordination between local jurisdictions are Planning and Development Districts PDDs and LEPCs. LEPCs are required by the Emergency Planning and Community Right-to-Know Act of 1986, which was passed to encourage the coordination of planning efforts and information sharing at all levels of government, private industry, and the public. LEPCs include representatives from both public and private organizations as well as representatives from every facility in the jurisdiction subject to the emergency planning requirements of the act.

Arkansas counties also have County Health Units, which are jointly sponsored by the county and by the state to provide for health-related planning and services. As part of this program, within the state there are five geographic Public Health Regions, overseen by a regional Health Office. These two entities are, in general, responsible for local disaster planning and any related hazard mitigation activities. These programs can be very effective in both local and regional information sharing.

**Planning Integration**

All local jurisdictions with an active hazard mitigation plan have committed to integrating all planning efforts with hazard mitigation planning. Effective plan integration can allow for a more comprehensive approach to hazard mitigation, and for the institutionalization of hazard mitigation principals into daily governmental activities.

**Education and Awareness**

Hazard awareness programs, designed to inform citizens as to the nature and extent potential hazards, is an effective way to inform citizens on mitigation related topics.  As citizens are made more aware of potential hazards and the local and regional process to mitigation against their impacts, it was believed that they would take a stronger role in making their homes, neighborhoods, schools, and businesses safer from the potential effects of natural hazards. Public outreach efforts were conducted as part of all local hazard mitigation planning programs.

## 5.6 – OPPORTUNITIES FOR CAPABILITY IMPROVEMENT

As part of this plan update, the MPC identified the following opportunities for improvement across the state concerning current capabilities:

**Local Funding**
- Integration of mitigation plans with other local plans and programs, such as capital improvement plans
- Adoption of cost-effective mitigation measures when developing capital improvement projects

**Public Education and Outreach**
- Regular deployment of hazard awareness campaigns to enhance public awareness

**Technical Support**
- Continued, and augmented provision of GIS and other technical assistance from the State
- Advertise continued access to on-line GIS GeoStor data clearinghouse

**Local Plan Updates**
- Notification and provision of FEMA local plan guidance updates
- Encouraging existing intergovernmental local emergency management committees to take a larger role in mitigation
- Encouraging better integration with community comprehensive plans, capital improvement plans, and other long-term community goals

**Land Use Planning and Regulations**
- Continued encouragement of using land use planning to identify areas at risk to natural hazards
- Stormwater retention/detention projects to reduce flooding
- Locally funded buyouts of hazard prone properties

**Floodplain Management**
- Encourage and support new participation in the NFIP and in the CRS
- Continue the promotion and enforcement of NFIP and CRS floodplain management programs

# Section 6 - Mitigation Strategy







## 6.1 – INTRODUCTION

44 CFR 201.4(c)(3) [To be effective the plan must include a] Mitigation Strategy that provides the State's blueprint for reducing the losses identified in the risk assessment.

As part of this planning effort, the State of Arkansas worked to minimize the risk of future impacts from identified hazards to all citizens of the state. To shape future regulations, ordinances and policy decisions on both a state and local basis, the MPC reviewed and developed a hazard mitigation strategy. This comprehensive strategy includes:

- Goals to guide the selection of activities to mitigate and reduce potential loss
- Objectives to be pursued in order to reach the goals
- A discussion of state funding capabilities for hazard mitigation projects
- Interim and long-term goals, actions, and objective
- Identification, evaluation and prioritization of mitigation actions along with potential funding sources

## 6.2 – GOALS AND OBJECTIVES

44 CFR 201.4(c)(3)(i) [The state mitigation strategy shall include a] description of state goals to guide the selection of activities to mitigate and reduce potential losses. 44 CFR 201.4(c)(3)(v) [...the plan must describe the strategy the State has to ensure that local jurisdictions with severe repetitive loss properties take actions to reduce the number of these properties.

MPC members and stakeholders agreed that the previous listing of goals in the 2018 hazard mitigation plan remained valid, however, some of the verbiage was clarified. All of the goals listed below are ongoing, meaning they are being accomplished both currently and will continue to be pursued long-term. In compliance with EMAP Standards, objectives for each goal are also listed. The objectives are either ongoing, interim or long-term.

**Goal 1: Reduce the vulnerability to jurisdictions, infrastructure and state-owned properties in Arkansas to all hazards.**

· **Objective 1.1:** Participate in all appropriate federal programs related to disaster planning and mitigation including FEMA, DHS, CDC, and others. (Ongoing)
· **Objective 1.2:** Educate and assist the Governor's Office and the Arkansas General Assembly in developing policies and state legislation that will further enhance hazard mitigation. (Long-term)
· **Objective 1.3:** Expand mitigation project opportunities throughout Arkansas. (Ongoing)
· **Objective 1.**4: Encourage and maintain state partnerships (ongoing)

**Goal 2: Promote sustainable and disaster resilient development within Arkansas and its communities.**

· **Objective 2.1:** Promote NFIP participation and compliance for all communities throughout the state. (Ongoing)
· **Objective 2.2:** Promote sustainable development and "smart growth" initiatives through coordination with state agencies and non-profit organizations. (Long-term)
· **Objective 2.3:** Identify mitigation opportunities to protect, upgrade and strengthen existing structures through acquisition, elevation, relocation and retrofit. (Ongoing)
· **Objective 2.**4: Adopt and enforce latest building codes (ongoing)

**Goal 3: Support mitigation grant opportunities for local governments, their sub-jurisdictions and the general public.**

· **Objective 3.1:** Provide mitigation grant program technical assistance and funding to local jurisdictions for eligible planning and project activities. (Ongoing)
· **Objective 3.2:** Provide floodplain management technical assistance and resources to all communities. (Ongoing)

**Goal 4: Offer hazard mitigation training, education, and technical assistance to local jurisdictions in the development of hazard mitigation plans and implementation of projects.**

· **Objective 4.1:** Provide training, education and technical assistance to local jurisdictions in the development of local mitigation plans. (Ongoing)
· **Objective 4.2:** Provide training, education and technical assistance to local jurisdictions in the implementation of local mitigation plans. (Ongoing)
· **Objective 4.3:** Provide training, education and technical assistance to local jurisdictions in the use of FEMA's Benefit-Cost Analysis software. (Ongoing)
· **Objective 4.4:** Increase awareness and knowledge of hazard mitigation principles and practices among local public officials. (Ongoing)

**Goal 5: Utilize the latest technology to improve vulnerability assessments of all identified hazards.**

· **Objective 5.1:** Coordinate with partners at all government levels to identify and promote best technology practices in the development and implementation of hazard mitigation plans and projects. (Long-term)
· **Objective 5.2:** Develop and implement a methodology for identifying and prioritizing new mitigation projects based upon on loss reduction criteria. (Ongoing)
· **Objective 5.3:** Develop and monitor any mitigation data deficiencies referenced in the current state mitigation plan. (Interim)

**Goal 6: Reduce the total number of repetitive loss and severe repetitive loss properties.**

· **Objective 6.1:** Develop and implement a repetitive loss strategy to prevent future losses. (Ongoing)
· **Objective 6.2:** Utilize HMGP, PDM, and FMA grant funds to perform acquisitions and elevations of severe repetitive loss and repetitive loss properties. (Ongoing)
· **Objective 6.3:** Enhance education efforts that increase the public's, and home or business owners' knowledge and awareness of NFIP insurance, its benefits, and mitigation grants by conducting various outreach activities. (Long-term)
· **Objective 6.4:** Analysis of the repetitive loss communities and SRL properties with the greatest financial losses will be utilized to identify and prioritize areas for cost-effective mitigation projects. (Ongoing)
· **Objective 6.5:** Work with jurisdictions to ensure grant eligibility by keeping mitigation plans current. (Ongoing)
· **Objective 6.6:** Provide assistance in the implementation of flood mitigation plans and projects in flood-prone areas, in accordance with federal and state regulatory, funding, and technical assistance programs. (Ongoing)

## 6.3 - PRIORITIZATION OF MITIGATION ACTIONS

44 CFR 201.4(c)(3)(iii) An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy…linked to local plans where specific local actions and projects are identified. [44 CFR 201.4 (c)(3)(v)…the plan must describe the strategy the State has to ensure that local jurisdictions with severe repetitive loss properties take actions to reduce the number of these properties…]

The MPC selected and prioritized actions based upon the updated risk assessment. Determining factors included the potential effects on the overall risk to life and property, ease of implementation, community and agency support, consistency with local mitigation plans and the availability of funding. The MPC only considered projects that are technically feasible, environmentally sound, and cost effective.

Based on this review, previously identified and new action items were prioritized as follows:

High priority:
- Actions deemed most critical by the MPC to achieve identified goals and objectives
- Resources and capabilities may not be available

Medium priority:
- Actions deemed important by the MPC to meet identified goals and objectives
- Resources and capabilities may not be available

Low priority
- Actions identified by the MPC that have lowest impact toward achieving goals and objectives
- Resources and capabilities may not be available; not feasible

## 6.4 - EMERGENCY MANAGEMENT ACCREDITATION PROGRAM INTEGRATION

In identifying and reviewing mitigation actions, the following activities recommended by the EMAP were considered:

· The use of applicable building construction standards
· Hazard avoidance through appropriate land-use practices
· Relocation, retrofitting, or removal of structures at risk
· Removal or elimination of the hazard
· Reduction or limitation of the amount or size of the hazard
· Segregation of the hazard from that which is to be protected
· Modification of the basic characteristics of the hazard
· Control of the rate of release of the hazard
· Provision of protective systems or equipment for both cyber or physical risks
· Establishment of hazard warning and communication procedures
· Redundancy or duplication of essential personnel, critical systems, equipment, and information materials.

## 6.5 -MITIGATION ACTIONS

During this plan update, the MPC assessed existing actions and developed new actions for consideration based on:

- Updated state risk assessment and information from local risk assessments
- Goals and objectives
- Existing state actions
- State and local capabilities
- Actions identified in local plans
- Climate Change
- Social Vulnerability

The following tables present identified, reviewed and retained mitigation actions for the State of Arkansas.

| Action Number | Action Description | Potential Funding Source | Priority | Identified in Local Plans | Contribution to Mitigation Strategy (Goals) | Evaluation |
|---|---|---|---|---|---|---|
| 1 | Perform acquisition and/ or relocation of properties vulnerable to flooding including repetitive and severe repetitive loss properties. | HMGP, BRIC, FMA, CDBG | High | Yes | 1, 2,3,6 (Reduces risk by removing structures vulnerable to flooding) | On-going |
| 2 | Provide federal HMGP, BRIC, and FMA planning grants to local jurisdictions | HMGP, BRIC, FMA | High | | 3,4,5 (Reduces risk by providing funding to implement mitigation projects) | On-going |
| 3 | Provide funding to jurisdictions to build community and school saferooms. | BRIC, HMGP, CDBG, Facilities Partnership Program | High | Yes | 1,2,3 (Loss avoidance by protecting lives from wind events) | On-going |
| 4 | Allocate CDC grant funding to local health units to improve their emergency planning for bioterrorism and naturally occurring biological outbreaks and mass care situations resulting from natural hazards. | ADH | High | | 1,3 (Reduces risk by providing funding to plan and prepare for outbreaks) | On-going |
| 5 | Erosion control and bank stabilization | HMGP, BRIC, FMA, ARHMGP, ARDOT, USACE | Medium | Yes | 1,3 (Reduces risk by preventing flooding) | On-going |
| 6 | Construction / Rehabilitation of dams and levees | HMGP, BRIC, local funding, USACE, ARDOT, ARHMGP, HHPD, NRCS | Medium | Yes | 1,3 (Reduces risk by preventing flooding) | On-going |
| 7 | Increase the number of homeowner hazard insurance policies | NEHRP, local funding | High | | 1,2,6 (Reduces losses) | Long-term |
| 8 | Increase utilization of mass notification systems for hazard alerts and warnings | HMGP, Silver Jackets, local funding | High | Yes | 1,3,4 (Reduces risk by providing early warning to citizens) | On-going |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | Implement fuel reduction activities such as prescribed burns and underbrush removal | HMGP, local funding, AR Forestry Commission funds, FMAG | High | Yes | 1,2,3 (Reduces probability of a wildfire) | Long-term |
| 10 | Install Detention and Retention Ponds to reduce/eliminate flooding | HMGP, PDM, FMA, local funds, ARHMGP, NRCS | High | Yes | 1,2,3,6 (Reduces risk by reducing/eliminating flooding) | On-going |
| 11 | Include sustainable development policies and pre-disaster mitigation opportunities in public policies. | Local funding, no cost | High | Yes | 2,4 | Long-term |
| 12 | Implement laws and regulations related to the subject of quarantine in times of disease outbreak. | local funding | High | | 2 (Reduces risk of transmission from disease outbreak) | Long-term |
| 13 | Represent mitigation at the Governor's Earthquake Advisory Council meetings. | local funding | High | | 1,2,4 | On-going |
| 14 | Upgrade flood prone infrastructure such as roads and bridges | HMGP, ARHMGP, BRIC, ARDOT | High | Yes | 1,2,3,6 (Reduces risk by eliminating flooding) | On-going |
| 15 | Increase community participation in NFIP, Firewise, Shakeout, and CRS Programs. | local funding, NEHRP, NFIP, Firewise | Medium | Yes | 1,2 | Long-term |
| 16 | Use green mitigation techniques such as bio swales, rain gardens, and permeable pavers | HMGP, BRIC, FMA, ARHMGP, EPA 319 local funding | Medium | | 1,2,3,6 (Reduces risk by preventing flooding) | Long-term |
| 17 | Fund drainage projects in areas susceptible to flooding | HMGP, BRIC, FMA, ARHMGP, ARDOT, USACE, local funding | High | Yes | 1,2,3,6 (Reduces risk by preventing flooding) | On-going |
| 18 | Provide training to local floodplain administrators to increase knowledge of good floodplain management practices. | local funding, CAP, NFIP | Medium | | 4,6 | On-going |
| 19 | Provide public education to include mitigation ideas in school curriculums. | local funding, NEHRP, state funding | Medium | Yes | 4 | On-going |
| 20 | Conduct mitigation outreach activities and education presentations for local public officials. | local funding | Medium | Yes | 4 | On-going |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | Update and enforce building codes in hazard prone areas | local funding, state funding, State Building Authority | High | Yes | 1,2,4,6 (Reduces risk by strengthening building codes to make structures less susceptible to damage from hazards) | Long-term |
| 22 | Utilize 406 Mitigation after a disaster declaration | HMGP, PA, local funding | High | Yes | 1,2,3 (Reduces risk by implementing projects that will prevent future damages) | On-going |
| 23 | Elevate properties that are located in areas vulnerable to flooding. | HMGP, BRIC, FMA, local funding | High | Yes | 1,2,3,6 (Reduces risk from flooding by raising the structure above the base flood | On-going |
| 24 | Structural retrofits for structures that are vulnerable to wind and earthquake events. | HMGP, BRIC, local funding | High | Yes | 1,2,3,4,5 (Reduces risk by strengthening structures making them less vulnerable) | On-going |
| 25 | Install netting to catch falling debris during landslides | HMGP, BRIC, local funding, ARDOT, ARHMGP | Low | Yes | 1,3,4 (Mitigates loss to lives and property caused by debris from landslides) | On-going |
| 26 | Non-structural retrofits such as bracing for structures that are vulnerable to wind and earthquakes | HMGP, BRIC, local funding, ARHMGP, NEHRP | Low | Yes | 1,2,3 (Mitigates loss to vulnerable structures) | On-going |
| 27 | Bury electric and harden other utility lines to prevent disruption during ice, wind, and snow hazards. | HMGP, BRIC, local funding | Low | Yes | 1,3,5 (Mitigates loss of utilities during various hazards) | Long-term |
| 28 | Educate locals on the importance of adopting ordinance that limit development in flood zones. | No cost | High | Yes | 1,2,4 (Mitigates loss of life and property) | On-going |
| 29 | Continue participation with CDC and DHS in the establishment and the distribution of pharmaceuticals under the federal Strategic National Stockpile (SNS) program. | ADH | High | | 1,3 | On-going |
| 30 | Work with the USDA APHIS Veterinary Services to continue participating in the Domestic Detection and Surveillance Program including on-going programs from the National Surveillance Unit and the National Animal Health Monitoring System | APHIS grants, existing state resources | High | | 1,3 | On-going |

| | | | | | | |
|---|---|---|---|---|---|---|
| 31 | Include the public health agencies throughout the state in the mitigation planning process for expert input on biological hazard | ADH | Medium | | 1,3 | On-going |
| 32 | Publish and disseminate the USDA APHIS information about bio-security for poultry | USDA, APHIS, CDC | Medium | | 1,3,4 | On-going |
| 33 | Conduct hazmat and terrorism training for local emergency planners and responder to improve their capabilities | No cost | High | | 1,4 | On-going |
| 34 | Continue ADEM and Arkansas Livestock and Poultry Commission partnership to conduct animal disease related exercises in the state. | No cost | Medium | | 1 | On-going |
| 35 | Conduct studies to determine previous occurrences, damages, and future probability of expansive soils. Currently a data deficiency for this hazard | HMGP, local funds | Low | Yes | 1,2,5 | New/Interim |
| 36 | Conduct studies to determine occurrences, damages and future probability of landslides. | HMGP, BRIC, local | High | Yes | 1,2,4,5 | New |
| 37 | Install Generators at facilities determined to be critical | HMPG, BRIC, Local | High | Yes | 1,2 | Ongoing |

The MPC determined that the majority of the actions identified in the 2018 plan were considered on-going and will remain in future plan updates. For example, there will always be a need for community saferooms. This action will never change to "completed".

*Ongoing is for the next 1 - 5 years and longterm is for the next 5 - 10 years.

Actions that have been removed from this plan updated are listed below

### 6.6 -COMPLETED MITIGATION ACTIONS

The majority of actions in the HMP are ongoing, however, the specific projects completed since the 2018 Hazard Mitigation Plan are detailed in the following tables.

## Primary

| HMGP 2017 - 2023 | | | | | |
|---|---|---|---|---|---|
| **Year** | **Disaster #** | **Jurisdiction** | **Project Type** | **Total Cost** | **Benefits** |
| 2017 | 4318 | Baxter County | Bridge Improvement | $1,200,000.00 | $7,200,000.00 |
| 2017 | 4318 | Greenbrier School District | Safe Room | $2,670,653.39 | $16,023,920.34 |
| 2017 | 4318 | City of Conway | Acquisition | $1,789,987.50 | $10,739,925.00 |
| 2019 | 4441 | Perry County | Acquisition | $1,261,450.00 | $7,568,700.00 |
| 2019 | 4441 | Jefferson County | Acquisition | $1,202,761.98 | $7,216,571.88 |
| 2019 | 4441 | Faulkner County | Acquisition | $522,793.95 | $3,136,763.70 |

| | | | | | |
|---|---|---|---|---|---|
| 2019 | 4441 | Desha County | Acquisition | $677,353.95 | $4,064,123.70 |
| 2019 | 4441 | Garland County | Acquisition | $562,551.68 | $3,375,310.08 |
| 2019 | 4441 | Faulkner County | Acquisition | $1,571,593.75 | $9,429,562.50 |
| 2019 | 4441 | Conway Corporation | Berm - Phased | $1,682,973.30 | $10,097,839.80 |
| 2019 | 4441 | Jonesboro | Acquisition | $401,572.50 | $2,409,435.00 |
| 2019 | 4441 | Black River Technical College | Berm | $1,621,905.81 | $9,731,434.86 |
| 2019 | 4441 | Jaser School District | Safe Room | $1,308,824.27 | $7,852,945.62 |
| 2019 | 4460 | Mulberry-Pleasant View School District | Safe Room | $883,139.00 | $5,298,834.00 |
| 2019 | 4460 | Arkansas Geological Survey | Landslide Database | $17,828.00 | $106,968.00 |
| 2019 | 4460 | Arkansas Geological Survey | GIS Software | $48,000.00 | $288,000.00 |
| 2020 | 4544 | Craighead County | Safe Room | $1,681,540.00 | $10,089,240.00 |
| 2020 | 4556 | City of Batesville | Drainage - Phase 1 | $70,049.00 | $420,294.00 |
| 2020 | 4556 | City of Conway | Advance Assistance -Drainage Study | $203,437.50 | $1,220,625.00 |
| 2020 | 4556 | City of Des Arc | Advance Assistance -Drainage Study | $78,750.00 | $472,500.00 |
| 2021 | 4518 | City of Van Buren | Drainage | $968,520.00 | $5,811,120.00 |
| 2021 | 4518 | City of Fort Smith | Acquisition | $2,059,785.00 | $12,358,710.00 |
| 2021 | 4518 | City of Trumann | Safe Room | $660,000.00 | $3,960,000.00 |
| 2022 | 4633 | ? | ? | $0.00 | $0.00 |

| BRIC 2020 - 2023 | | | | | |
|---|---|---|---|---|---|
| **Year** | **Disaster #** | **Jurisdiction** | **Project Type** | **Total Cost** | **Benefits** |
| 2021 | EMT-2020-BR-009-01 | Independence County Mitigation Plan | Mitigation Plan | $40,000.00 | N/A |
| 2021 | EMT-2020-BR-009-09 | Little River County Mitigation Plan | Mitigation Plan | $35,000.00 | N/A |
| 2021 | EMT-2020-BR-009-10 | Nevada County Mitigation Plan | Mitigation Plan | $35,000.00 | N/A |
| 2021 | EMT-2020-BR-009-11 | Woodruff County Mitigation Plan | Mitigation Plan | $40,000.00 | N/A |
| 2021 | EMT-2020-BR-009-17 | Cleburne County Mitigation Plan | Mitigation Plan | $40,000.00 | N/A |
| 2021 | EMT-2020-BR-009-21 | Sharp County Mitigation Plan | Mitigation Plan | $40,000.00 | N/A |
| 2021 | EMT-2020-BR-009-24 | Jackson County Mitigation Plan | Mitigation Plan | $40,000.00 | N/A |
| 2021 | EMT-2020-BR-009-27 | Saline County Mitigation Plan | Mitigation Plan | $35,000.00 | N/A |
| 2022 | EMT-2021-BR-133-03 | City of Humnoke | Drainage Study - Scoping | $42,656.25 | $255,937.50 |
| 2022 | EMT-2021-BR-133-06 | Mountain View School District | Safe Room | $643,762.00 | $3,862,572.00 |
| 2022 | EMT-2021-BR-133-08 | City of Conway | Drainage Study - Scoping | $151,620.00 | $909,720.00 |
| 2022 | EMT-2021-BR-133-17 | City of Sherwood | Project Scoping | $98,667.00 | $592,002.00 |
| 2023 | EMT-2022-BR-014-03 | City of Greenwood | Acquisition | $1,407,460.00 | $8,444,760.00 |
| 2023 | EMT-2022-BR-014-04 | City of Beebe | Drainage Study - Phased | $2,661,068.00 | $15,966,408.00 |

| | | | | | |
|---|---|---|---|---|---|
| 2023 | EMT-2022-BR-014-05 | City of Clarendon | Utility and Infrastructure Protection - Phased | $10,825,084.21 | $64,950,505.26 |
| 2023 | EMT-2022-BR-014-07 | City of North Little Rock | Drainage Study - Scoping | $503,892.67 | $3,023,356.02 |
| 2023 | EMT-2022-BR-014-08 | Danville School District | Safe Room | $2,837,592.75 | $17,025,556.50 |

**Arkansas PDM 2017 - 2019 Replacement by BRIC**

| Year | Disaster # | Jurisdiction | Project Type | Total Cost | Benefits |
|---|---|---|---|---|---|
| 2017 | PDM 2018 | Searcy County School District-Marshall High School | Safe Room | $2,065,570.00 | $12,393,420.00 |
| 2017 | PDM 2018 | Stone County Mitigation Plan | Mitigation Plan | $30,000.00 | N/A |
| 2017 | PDM 2018 | Pope County Mitigation Plan | Mitigation Plan | $49,000.00 | N/A |
| 2017 | PDM 2018 | Grant County Mitigation Plan | Mitigation Plan | $24,000.00 | N/A |
| 2018 | PDM2019 | Harmony Grove School District | Safe Room | $3,950,367.16 | $23,702,202.96 |
| 2018 | PDM 2019 | Perryville School District | Safe Room | $1,527,443.94 | $9,164,663.64 |
| 2018 | PDM 2019 | Baxter County Mitigation Plan | Mitigation Plan | $40,000.00 | N/A |

**State Mitigation Projects**

| Year | Jurisdiction | Project | Project Total | Benefits |
|---|---|---|---|---|
| 2022 | Arkadelphia | Haddock Street Drainage Improvements | $669,510.00 | $4,017,060.00 |
| 2022 | Avoca | Town Hall Generator | $53,556.59 | $321,339.54 |
| 2022 | Benton | Gattin Drainage Project | $625,000.00 | $3,750,000.00 |
| 2022 | Benton County | Gailey Hollow Road Drainage Project | $244,713.30 | $1,468,279.80 |
| 2022 | Bryant | Raintree Drainage Project | $430,546.60 | $2,583,279.60 |
| 2022 | Cabot | Barnwell Bank Restablilization | $750,000.00 | $4,500,000.00 |
| 2022 | Calhoun County | Whitewater Bridge Improvements (Big Hill Rd) | $462,639.00 | $2,775,834.00 |
| 2022 | Carroll County | CR 818 Bridge Improvements | $400,000.00 | $2,400,000.00 |
| 2022 | Clark County | Casa Mesa Creek Bridge Improvements | $78,930.00 | $473,580.00 |
| 2022 | Craighead County | CR 342 Drainage Improvements | $48,676.75 | $292,060.50 |
| 2022 | Crawford County | Pointer Trail East Drainage Improvements | $410,000.00 | $2,460,000.00 |
| 2022 | | Merit Park Drainage Improvements | $250,000.00 | $1,500,000.00 |
| 2022 | Faulkner County | Roden Mill Bridge Elevation | $620,440.00 | $3,722,640.00 |
| 2022 | Garfield | Town Hall Generator | $53,556.59 | $321,339.54 |
| 2022 | Glenwood | Glenwood Drainage improvements | $384,920.00 | $2,309,520.00 |
| 2022 | Hot Spring County | Chandler Road Bridge Elevation | $114,825.00 | $688,950.00 |
| 2022 | Lake Hamilton | Lake Hamilton A1 Primary Drainage Improvements | $437,830.00 | $2,626,980.00 |
| 2022 | Marshall | Walnut and Ozark Street Drainage Project | $17,830.00 | $106,980.00 |
| 2022 | Montgomery County | Hole in the Ground Bridge Elevation | $220,578.00 | $1,323,468.00 |
| 2022 | Nashville | Dodson Creek Street Bridge Elevation | $417,175.00 | $2,503,050.00 |
| 2022 | New Blaine | New Blaine Fire Department Generator | $41,250.00 | $247,500.00 |
| 2022 | Perryville | Perryville Drainage Culvert Project | $132,317.00 | $793,902.00 |
| 2022 | Pulaski County | Pulaski County Levee Drainage | $513,882.73 | $3,083,296.38 |
| 2022 | Randolph County | Crenshaw Road Pipe Project | $154,865.00 | $929,190.00 |
| 2022 | Sharp County | Crabtree Branch Crossing Bridge Improvements | $88,300.00 | $529,800.00 |
| 2022 | Sheridan | Gum Street West Drainage Improvements | $440,250.83 | $2,641,504.98 |
| 2022 | Sherwood | Whitewood Drainage Project | $403,000.00 | $2,418,000.00 |
| 2022 | Springdale | Springdale Airport Detention Pond | $739,825.00 | $4,438,950.00 |

| | | | | |
|---|---|---|---|---|
| 2022 | Trumann | Trumann Pump Station Renovation | $305,900.00 | $1,835,400.00 |
| 2022 | Vilonia | Duncan Street Bridge Improvements | $210,775.00 | $1,264,650.00 |
| 2022 | Wonderview | Wonderview SD Drainage | $76,630.00 | $459,780.00 |
| 2021 | Arkadelphia | Caddo/27th Street Drainage | $400,000.00 | $2,400,000.00 |
| 2021 | Benton County | Coose Hollow Drainage | $215,412.22 | $1,292,473.32 |
| 2021 | Briarcliff | Duncan Gray Road Culverts | $11,044.00 | $66,264.00 |
| 2021 | Bryant | Hilltop/Springhill Drainage | $580,142.23 | $3,480,853.38 |
| 2021 | Cave Springs | Pace Lane Improvements | $290,500.00 | $1,743,000.00 |
| 2021 | Clarendon | Clarendon Drainage | $131,300.00 | $787,800.00 |
| 2021 | Clark County | Smyrna Road/Love Creek Bridge | $77,489.84 | $464,939.04 |
| 2021 | Craighead County | Replace Culverts CR 7628/CR 7629 with Bridge | $169,403.65 | $1,016,421.90 |
| 2021 | Crawford County | North Rudy Road Drainage | $410,000.00 | $2,460,000.00 |
| 2021 | Dallas County | CR 208 Bridge | $59,702.20 | $358,213.20 |
| 2021 | Eureka Springs | Black Bass Dam Stabilization | $400,000.00 | $2,400,000.00 |
| 2021 | Franklin County | Reed Mountain Road Low Water Crossing | $82,135.16 | $492,810.96 |
| 2021 | Garfield | Wimpy Jones Rd | $263,545.00 | $1,581,270.00 |
| 2021 | Garfield | Blueberry Lane Drainage | $114,375.00 | $686,250.00 |
| 2021 | Heber Springs | HS Wastewater Plant Bank Stabilization | $132,500.00 | $795,000.00 |
| 2021 | Hempstead County | CR 2 Concrete Box Culverts | $348,765.00 | $2,092,590.00 |
| 2021 | Hot Spring County | Chestnut Road Bridge | $94,125.00 | $564,750.00 |
| 2021 | Hot Spring County | Country Club Road Bridge | $77,825.00 | $466,950.00 |
| 2021 | Little Rock | Kanis Park Bridge | $250,000.00 | $1,500,000.00 |
| 2021 | Little Rock Wastewater Reclamation Auth. | Fourche Bottoms Sewer Trunk Main Upgrade | $600,000.00 | $3,600,000.00 |
| 2021 | Lowell | Zion St (South Culvert) Drainage | $178,920.00 | $1,073,520.00 |
| 2021 | Madison County | CR 5205 Bridge Elevation | $134,592.00 | $807,552.00 |
| 2021 | Magnolia | Columbia St Retention Basin | $431,000.00 | $2,586,000.00 |
| 2021 | Montgomery County | Caney Creek Bridge | $296,295.68 | $1,777,774.08 |
| 2021 | Perry County | Bethel Road/West Fork Mill Creek Culvert | $65,000.00 | $390,000.00 |
| 2021 | Polk County | Elevation of Bridge on CR 671 | $279,000.00 | $1,674,000.00 |
| 2021 | Randolph County | 3 Bridges on Old Ferry Road | $105,520.50 | $633,123.00 |
| 2021 | Saline County | Rapper Haskell Road Drainage | $314,000.00 | $1,884,000.00 |
| 2021 | Sebastian County | Elevation of Gap Road Bridge | $202,000.00 | $1,212,000.00 |
| 2021 | Sevier County | Rolling Fork Branch Road Bridge | $175,000.00 | $1,050,000.00 |
| 2021 | Sherwood | Whitewood Drainage | $200,000.00 | $1,200,000.00 |
| 2021 | Siloam Springs | Willows Addition Drainage | $100,000.00 | $600,000.00 |
| 2021 | Smackover-Norphlet School District | Smackover Public School Drainage | $110,198.50 | $661,191.00 |
| 2021 | Tontitown | Barrington Heights Subdivision Retention Pond | $289,600.00 | $1,737,600.00 |
| 2021 | Trumann | Wastewater Pump Station Upgrade | $147,059.00 | $882,354.00 |
| 2021 | Tucker Volunteer Fire Dept. | Generator for Fire Dept | $23,000.00 | $138,000.00 |
| 2021 | Vilonia | South Church Street Bridge | $209,150.00 | $1,254,900.00 |
| 2021 | Vilonia | South Mount Olive Street Bridge | $160,375.00 | $962,250.00 |
| 2021 | White County | North Apple Road Bridge | $150,000.00 | $900,000.00 |
| 2021 | White County | Red Hill Road Bridge | $155,500.00 | $933,000.00 |
| 2020 | Arkansas County | Roth Prairie Rd Bridge | $107,649.23 | $645,895.38 |
| 2020 | Benton | Oak Creek Village Box Culverts | $300,000.00 | $1,800,000.00 |
| 2020 | Benton | Sagecrest Creek Culverts | $300,000.00 | $1,800,000.00 |
| 2020 | Benton | Westbrook Creek Box Culverts | $300,000.00 | $1,800,000.00 |

| | | | | |
|---|---|---|---|---|
| 2020 | Benton County | Bill Young Rd Drainage Improvements | $154,094.78 | $924,568.68 |
| 2020 | Bradley County | CR 33 Culverts | $71,500.00 | $429,000.00 |
| 2020 | Calhoun County | CR 245/Champognolle Creek Loop Culverts | $300,077.80 | $1,800,466.80 |
| 2020 | Clark County | Gus Still Creek Culverts | $108,350.00 | $650,100.00 |
| 2020 | Cleveland County | Shady Grove Road Culverts | $36,500.00 | $219,000.00 |
| 2020 | Conway Corporation | Aerial Sewer Crossings Modifications | $250,275.00 | $1,501,650.00 |
| 2020 | Conway Corporation | Replace Stone Dam Creek Crossing Bridge | $330,000.00 | $1,980,000.00 |
| 2020 | Conway Corporation | Gravity Sewer Main Modifications | $194,480.00 | $1,166,880.00 |
| 2020 | Craighead County | CR 780 Concrete Box Culverts | $76,085.10 | $456,510.60 |
| 2020 | Craighead County | CR 312 Concrete Box Culverts | $10,876.88 | $65,261.28 |
| 2020 | Faulkner County | Old Springfield Rd Bridge Replacement | $79,250.00 | $475,500.00 |
| 2020 | Faulkner County | Stanley Road Bridge | $469,250.00 | $2,815,500.00 |
| 2020 | Haskell | Upsize culverts on various streets to prevent flooding. | $40,000.00 | $240,000.00 |
| 2020 | Hot Spring County | Cox Creek Road Bridge | $52,100.00 | $312,600.00 |
| 2020 | Independence County | DOTA Creek- Charlotte Community | $135,822.00 | $814,932.00 |
| 2020 | Little Rock Water Reclamation Authority | Elevation of Transformers at Little Maumelle Pump Station | $325,500.00 | $1,953,000.00 |
| 2020 | Madison County | Bridge Elevation CR 5205 | $80,330.00 | $481,980.00 |
| 2020 | Miller County | CR 29 Culverts | $42,020.80 | $252,124.80 |
| 2020 | Montgomery County | Smith Creek Bridge at Liberty Church | $234,422.16 | $1,406,532.96 |
| 2020 | Perry County | Baylor House Rd Bridge at Rankin Creek | $65,000.00 | $390,000.00 |
| 2020 | Perry County | Bethel Rd  Culverts | $70,000.00 | $420,000.00 |
| 2020 | Polk County | Elevation of Bridge on CR42 | $110,410.00 | $662,460.00 |
| 2020 | Sebastian County | Elevate Roth Prairie Rd Bridge | $75,000.00 | $450,000.00 |
| 2020 | Sevier County | Almond Creek Bridge | $325,000.00 | $1,950,000.00 |
| 2020 | Sherwood | Drainage project on Patricia Lynn Road | $60,000.00 | $360,000.00 |
| 2020 | Vilonia | South Church Street Bridge | $150,473.00 | $902,838.00 |
| 2020 | Vilonia | South Marshall Street Bridge | $149,290.00 | $895,740.00 |
| 2019 | Arkansas County | Replace wooden bridge on Moss Road. | $80,566.93 | $483,401.58 |
| 2019 | Baxter County | Box culverts on Indian Springs Drive. | $69,084.58 | $414,507.48 |
| 2019 | Beebe | Elevate Sewer Pump at Red Cut Slough | $75,000.00 | $450,000.00 |
| 2019 | Benton County | Box culverts at Posy Mtn. Road/Coose Hollow Road. | $187,541.00 | $1,125,246.00 |
| 2019 | Bodcaw | Culverts on CR134 and CR120 | $10,000.00 | $60,000.00 |
| 2019 | Boone County | Culverts on Long Creek Road | $98,600.00 | $591,600.00 |
| 2019 | Bradley County | Bridge on CR360. | $99,000.00 | $594,000.00 |
| 2019 | Calhoun County | Bridge on CR20. | $96,827.00 | $580,962.00 |
| 2019 | Carroll County | Bridge on CR705. | $265,000.00 | $1,590,000.00 |
| 2019 | Charleston | Drainage Projects on Washington and Second Street | $23,000.00 | $138,000.00 |
| 2019 | Clark County | Bridge on Copeland Ridge Road. | $27,250.00 | $163,500.00 |
| 2019 | Cleveland County | Bridge on CR 10 at Darby Crossing | $40,000.00 | $240,000.00 |
| 2019 | Conway | Bridge on Tyler Road and Tucker Creek. | $250,000.00 | $1,500,000.00 |
| 2019 | Conway Corporation | Elevate Rd to Emergency Pump Station | $27,360.00 | $164,160.00 |
| 2019 | Greenbrier | Culverts on Cedar Road. | $220,000.00 | $1,320,000.00 |

| | | | | |
|---|---|---|---|---|
| 2019 | Haskell | Culverts at Gary/Harding and Monroe/Grand Intersections | $20,000.00 | $120,000.00 |
| 2019 | Hot Spring County | Culverts on Strawberry Road. | $8,545.00 | $51,270.00 |
| 2019 | Lawrence County | Bridge on CR201. | $27,000.00 | $162,000.00 |
| 2019 | Madison County | Bridge on CR6444 . | $64,000.00 | $384,000.00 |
| 2019 | Miller County | Bridge on CR41. | $245,000.00 | $1,470,000.00 |
| 2019 | Monroe County | Bridge on Pleasant Valley Road. | $77,600.00 | $465,600.00 |
| 2019 | Montgomery County | Bridge on Sims Loop Road/Rainy Creek Crossing. | $274,680.00 | $1,648,080.00 |
| 2019 | Prescott | Drainage project on Mockingbird Lane. | $14,728.00 | $88,368.00 |
| 2019 | Sharp County | Bridge #16950 on Bluff Road. | $125,000.00 | $750,000.00 |
| 2019 | Sharp County | Bridge # 18955 on Bluff Road. | $98,000.00 | $588,000.00 |
| 2019 | Union County | Bridge on Dollar Junction Road. | $125,000.00 | $750,000.00 |
| 2019 | Van Buren County | Culverts on Old Hwy #9. | $50,000.00 | $300,000.00 |
| 2019 | Vilonia | Bridge on Barnard Road. | $170,595.00 | $1,023,570.00 |
| 2019 | Vilonia | Bridge on Simpson Road. | $138,000.00 | $828,000.00 |
| 2019 | White County | Bridge on El Paso Road. | $150,000.00 | $900,000.00 |
| 2019 | White County | Bridge #17527 on Black Road. | $150,000.00 | $900,000.00 |
| 2019 | Wynne | Bridge at intersection of J Street/L 'Aguirre Avenue. | $272,160.00 | $1,632,960.00 |
| 2018 | Baxter County | Culverts on CR16 | $54,445.80 | $326,674.80 |
| 2018 | Benton County | Punkin Hollow Road Culverts | $166,880.00 | $1,001,280.00 |
| 2018 | Bradley County | Replace bridge CR 11 | $50,000.00 | $300,000.00 |
| 2018 | Bryant, City of | Monticello  Drainage Project in Stoneybrook Subdivision | $152,000.00 | $912,000.00 |
| 2018 | Calhoun County | Bridge on CR44 | $57,500.00 | $345,000.00 |
| 2018 | Calhoun County | Replace culverts on CR199 | $79,000.00 | $474,000.00 |
| 2018 | Calhoun County | Replace culverts on CR62 with larger box culverts | $69,000.00 | $414,000.00 |
| 2018 | City of Prescott | 3 Drainage Projects | $100,422.50 | $602,535.00 |
| 2018 | Clay County | CR431/Big Creek Bridge | $92,588.68 | $555,532.08 |
| 2018 | Clay County | Replace CR406 Bridge #17835 with elevated Bridge | $92,840.89 | $557,045.34 |
| 2018 | Craighead County | Install box culverts at CR155/CR160 | $125,000.00 | $750,000.00 |
| 2018 | Craighead County | Replace culverts on CR315 | $75,000.00 | $450,000.00 |
| 2018 | Crawford County | Replace bridge on Old 81 Loop | $300,000.00 | $1,800,000.00 |
| 2018 | Des Arc, City of | Replace and elevate Sewer Lift Station | $150,000.00 | $900,000.00 |
| 2018 | Fairfield Bay, City of | Drainage Project on W Cliff Dr/Lynn Creek | $300,000.00 | $1,800,000.00 |
| 2018 | Faulkner County | Replace bridge on Ritchie Lane | $225,000.00 | $1,350,000.00 |
| 2018 | Fulton County | Replace bridge on Whippoorwill Road | $6,625.00 | $39,750.00 |
| 2018 | Fulton County | Replace bridge on Big Stone Road | $10,725.00 | $64,350.00 |
| 2018 | Hot Spring County | Replace culverts on Sunflower Road | $5,300.00 | $31,800.00 |
| 2018 | Logan County | Replace bridge at Page Road/Rock Creek | $130,000.00 | $780,000.00 |
| 2018 | Montgomery County | Replace bridge at Liberty Road/Smith Creek | $123,895.00 | $743,370.00 |
| 2018 | Montgomery County | Replace bridge at Liberty Rd/Smith Crossing | $73,742.00 | $442,452.00 |
| 2018 | Poinsett County | Replace culverts on Moore, Timothy, and Perkins Roads | $91,863.50 | $551,181.00 |
| 2018 | Poinsett County | Replace culverts on Lily, Greenfield, and Butterfly Roads | $35,000.00 | $210,000.00 |
| 2018 | Randolph County | Replace culverts on Snodgrass Road | $39,193.00 | $235,158.00 |

| | | | | |
|---|---|---|---|---|
| 2018 | Randolph County | Replace culverts on Stoney Point Road | $35,495.00 | $212,970.00 |
| 2018 | Saline County | Box culverts at 3 streams crossing on Avilla E Road | $387,435.00 | $2,324,610.00 |
| 2018 | Scott County | Replace 2 bridges on Manocrest Road | $98,000.00 | $588,000.00 |
| 2018 | Sharp County | Replace culverts with bridge on Cardinal Road | $70,000.00 | $420,000.00 |
| 2018 | Sharp County | Replace culverts with bridge on Wild Cat Road, Site #1 | $100,000.00 | $600,000.00 |
| 2018 | Vilonia, City of | Replace bridge on North Marshall Road | $114,000.00 | $684,000.00 |
| 2018 | White County | Replace wooden bridge with steel on Liles Road | $150,000.00 | $900,000.00 |
| 2018 | White County | Replace wooden bridge with steel on Morris Road | $100,000.00 | $600,000.00 |
| 2018 | Woodruff County | Burrows Subdivision Drainage Project | $12,500.00 | $75,000.00 |
| 2017 | Arkansas County | Replace bridge on Pin Oak Rd | $118,817.01 | $712,902.06 |
| 2017 | Benton County | Install culverts at 5 different locations | $277,430.50 | $1,664,583.00 |
| 2017 | Bradford, City of | Goad Road Bridge | $100,000.00 | $600,000.00 |
| 2017 | Bradley County | Replace bridge CR 4 at Felsenthal Refuge | $90,000.00 | $540,000.00 |
| 2017 | Bradley County | Culvert replacement on CR# 7 North | $70,000.00 | $420,000.00 |
| 2017 | Cabot, City of | Drainage Improvements at intersection of Kerr/ Candlewood | $120,100.00 | $720,600.00 |
| 2017 | Calhoun County | Bridge on CR# 5/Locust Bayou Community | $110,000.00 | $660,000.00 |
| 2017 | Cedarville, City of | Replace low water bridge on Neal Road | $58,000.00 | $348,000.00 |
| 2017 | Clay County | Replace bridge at CR319 & Bridge #21294 | $89,221.93 | $535,331.58 |
| 2017 | Crawford County | Replace bridge at 300 fine Way Street, Alma | $43,320.00 | $259,920.00 |
| 2017 | Cross County | Increase 14 culvert's size on CR 661 | $80,000.00 | $480,000.00 |
| 2017 | Cross County | Increase 9 culvert's size on CR 646 & CR 634 | $76,000.00 | $456,000.00 |
| 2017 | Cross County | Increase 2 culvert's size on CR 744 & CR 7415 | $22,000.00 | $132,000.00 |
| 2017 | Hempstead County | Install box culverts at 7 points Little Bodcau & Caney Creek | $305,000.00 | $1,830,000.00 |
| 2017 | Hot Spring County | Install culvert on Possum Trot Rd at Morrison Spring Creek | $3,763.00 | $22,578.00 |
| 2017 | Izard County | Install bridge on Hightower Road | $64,100.00 | $384,600.00 |
| 2017 | Izard County | Install bridge on Tree Farm Rd | $64,100.00 | $384,600.00 |
| 2017 | Izard County | Install bridge on Finley Creek Road | $33,100.00 | $198,600.00 |
| 2017 | Izard County | Install bridge on Hickory Flat Rd Site #1 | $47,500.00 | $285,000.00 |
| 2017 | Izard County | Install bridge on Hickory Flat Rd Site #2 | $43,000.00 | $258,000.00 |
| 2017 | Izard County | Install bridge on South Springhill Rd | $60,500.00 | $363,000.00 |
| 2017 | Lafayette County | Increase culverts and elevate road on CR 25, Phase II | $123,813.85 | $742,883.10 |
| 2017 | Logan County | Replace bridge Tate Rd/Petit Jean River/Fletcher Creek Cross | $80,000.00 | $480,000.00 |
| 2017 | Logan County | Culverts on Ray Davis Rd/Six Mile Creek Crossing | $80,000.00 | $480,000.00 |
| 2017 | Montgomery County | Replace bridge on Southside CR at Shirley Creek | $150,000.00 | $900,000.00 |
| 2017 | Montgomery County | Bridge on Martin Simpson CR | $72,750.00 | $436,500.00 |
| 2017 | Polk County | Replace wooden bridge w/concrete CR#60 | $123,500.00 | $741,000.00 |
| 2017 | Saline County | Replace bridge on Detonti Rd at Mud Creek Crossing | $168,000.00 | $1,008,000.00 |
| 2017 | Saline County | Bridge on Mars Hill Rd at Wet Lost Creek Crossing | $130,000.00 | $780,000.00 |
| 2017 | Sebastian County | Bridge on West Lake DR & N River Rd Crossing | $138,500.00 | $831,000.00 |
| 2017 | Sharp County | Bridge on Martin Creek Road | $60,000.00 | $360,000.00 |
| 2017 | Sharp County | Install box culverts on Rock Creek Road | $37,500.00 | $225,000.00 |
| 2017 | Sharp County | Install box culverts on Mill Creek Road | $75,000.00 | $450,000.00 |
| 2017 | Sharp County | Install box culverts on Spring River Ranch Road | $37,500.00 | $225,000.00 |

| | | | | |
|---|---|---|---|---|
| 2017 | Van Buren, City of | Replace bridge at Mike Meyers Park | $230,000.00 | $1,380,000.00 |
| 2017 | White County | Install bridge on Fischer Hill Road Bridge | $250,000.00 | $1,500,000.00 |
| 2017 | White County | Install "I" beam bridge on Smith Road | $150,000.00 | $900,000.00 |
| 2017 | White County | Install "I" beam bridge on Tweedy Road | $250,000.00 | $1,500,000.00 |
| | | | $34,521,459.29 | $207,128,755.74 |

## FMA Grant Award Summary, 2018 - 2023

| FY Year/Grant | County | Jurisdiction | Project Type | Project Total | Local Share | Federal Share | Status |
|---|---|---|---|---|---|---|---|
| 2017 FMA, EMT-2018-FM-E003 | Benton | Benton | Acquisition & Demolition | $973,204.00 | 0 | $973,204.00 | Project Ongoing |
| 2017 FMA, EMT-2018-FM-E003 | Garland | City of Hot Springs | Advance Assistance | $95,173.11 | $20,512.29 | $71,379.83 | Grant Closed |
| 2017 FMA, EMT-2018-FM-8003 | Craighead | City of Jonesboro | Acquisition & Demolition | $403,325.09 | 0 | $403,325.09 | Grant Closed |
| 2017 FMA, EMT-2018-FM-E003 | Pulaski | City of Little Rock | Acquisition & Demolition | $123,505.59 | 0 | $123,505.59 | Grant Closed |
| 2017 FMA, EMT-2018-FM-E003 | Pulaski | City of Maumelle | Advance Assistance | $4,055,260.00 | $1,013,815.00 | $3,041,445.00 | Project Ongoing |
| 2017 FMA, EMT-2018-FM-E003 | Statewide | State Management Costs | Management | $259,172.44 | $23,325.52 | $235,846.92 | Project Ongoing |
| 2018 FMA, EMT-2020-FM-E003 | Jackson | City of Grubbs | Acquisition & Demolition | $155,019.20 | 0 | $155,019.20 | Grant Closed |
| 2018 FMA, EMT-2020-FM-E003 | Statewide | State Management Costs | Management | $20,576.79 | $2,720.24 | $17,856.55 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Lonoke | City of Lonoke | Advance Assistance | $131,250.00 | $32,812.50 | $98,437.50 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Saline | City of Shannon Hills | Acquisition & Demolition | $407,229.69 | $37,733.56 | $369,496.13 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Lonoke | City of Ward | Advance Assistance | $21,000.00 | $5,250.00 | $15,750.00 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Faulkner | Faulkner County | Acquisition & Demolition | $578,117.40 | $15,286.15 | $562,831.25 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Jefferson | Jefferson County | Acquisition & Demolition | $878,129.18 | $20,444.03 | $857,685.15 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Jefferson | Jefferson County | Elevation | $344,882.72 | $86,220.68 | $258,662.04 | Project Ongoing |
| 2019 FMA, EMT-2020-FM-E005 | Perry | Perry County | Acquisition & Demolition | $577,494.06 | $109,078.65 | $468,415.41 | Project Ongoing |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2019 FMA, EMT-2020-FM-E005 | Statewide | Statewide Management Costs | Management | $3,152,850.90 | $305,202.62 | $2,847,378.28 | Project Ongoing |

**COMPLETED ACTIONS FROM OTHER MITIGATION PROGRAMS**

**INSPARK**

Arkansas has had a training program for building inspection in place for over twenty years. The INSPARK website (inspectarkansas.org) allows members to access information, take reassessment tests, and learn more about mitigating damage from earthquakes in the state The ArcGIS Survey123 App, the primary means of data collection during trainings and real-life events, has been successfully integrated into the INSPARK Program. The Survey123 App information can be conveyed to the State Emergency Operations Center (SEOC) in real time during a disaster. INSPARK leaders have been working to build a stronger relationship with the American Institute of Architects Arkansas (AIAAR) Chapter. AIAAR has established a Disaster Assistance Committee (DAC) whose role it will be to support ADEM and the INSPARK program. The committee will be looking at means to support members and member firms that suffer a loss from a disaster. DAC will also be working toward recruiting architects to join INSPARK and educating the architecture profession about natural and man-made hazards and what these architects can do to protect themselves, their families, and their offices from risks.

**Department of Energy, Ground Water Protection Council Grant**

The Arkansas Geological Survey submitted a grant closeout report at the end of September to the Department of Energy, Ground Water Protection Council. The ongoing study, funded by this grant, involves the deployment of a small seismic array around the El Dorado, Arkansas area, where oil and gas production has been occurring since the 1920s. The area experienced seismicity in the 1930s, 1980s, in 2007 and more recently in February 2020 and May 2021. The project analyzes the data from past earthquakes in order to determine the expected velocity (how fast a point on the ground is shaking as a result of an earthquake) of future earthquakes in the El Dorado area. This seismicity study will also evaluate which modeling
method can be most effectively used to understand the area's seismicity. This research may show that seismic activity is shallower than is currently thought and it may be linked to human activity.

Training and education of the state and local government officials, employees, and citizens of Arkansas regarding preparation and protective measures that can be taken before, during, and after an earthquake:

During the period covered by this report, ADEM hosted courses to support response to earthquakes. Below is a list of classes offered by the state:

| | |
|---|---|
| December 7, 2021: Cal OES Safety Assessment Program (SAP) Training | April 29, 2021 : ATC-20, Rapid Visual Inspection Training |
| January 20, 2022: ATC-20, Rapid Visual Inspection Training | June 1, 2021: Cal OES Safety Assessment Program (SAP) |
| April 14, 2022: Cal OES Safety Assessment Program (SAP) | July 9, 2021: ATC-20, Rapid Visual Inspection Training |
| June 22, 2022: ATC-20, Rapid Visual Inspection Training | In 2021, ADEM promoted the following courses that FEMA, CUSEC, and the Applied Technology Council sponsored and offered to citizens, government officials, and employees. |
| September 16, 2022: Cal OES Safety Assessment Program (SAP) Training | February 10, 2021: Web-Based Training on Reducing Earthquake Risk in the Classroom and Beyond (FEMA's National Earthquake Technical Assistance Program) |
| October 26, 2022: ATC-20, Rapid Visual Inspection Training | February 17, 2021: FEMA P-2018 Seismic Evaluation of Older Concrete Buildings for Collapse Potential |
| In 2022, ADEM promoted the following courses offered by FEMA, the Central US Earthquake Consortium, and the Applied Technology Council. | February 24, 2021: New Madrid Earthquake Resilience Webinar #2 |
| June 9, 2022: FEMA 395, Earthquake Safety and Mitigation for Schools | February 25, 2021: Technologies for Ea1thquake Resilience (CUSEC) |
| June 16, 2022: FEMA Reducing Earthquake Risk in the Classroom and Beyond, Seismic Mitigation of Nonstructural Hazards in Schools | May 13, 2021 : FEMA P-154, Rapid Visual Screening of Buildings for Potential Seismic Hazards (pre-disaster), and ATC-20, Post Earthquake Safety Evaluation of Buildings (post-disaster) |
| June 21, 2022: FEMA P-154, Rapid Visual Screening of Buildings for Potential Seismic Hazards (pre-disaster) | May 27, 2021: FEMA P-1000, Safer, Stronger, Smarter: A Guide to Improving School Natural Hazard Safety |
| June 23, 2022: FEMA P-767, Earthquake Mitigation for Hospitals | June 3, 2021: FEMA 395, Earthquake Safety and Mitigation for Schools |
| June 29, 2022: FEMA P-1000, Safer, Stronger, Smarter: A Guide to Improving School Natural Hazard Safety | June 24, 2021: FEMA P-767, Earthquake Mitigation for Hospitals |
| July 5, 2022: FEMA E-74, Reducing the Risks of Non-Structural Earthquake Damage 2021 | |

| | |
|---|---|
| December 8, 2020: ATC-20, Rapid Visual Inspection Training | |

**Governor's Levee Grant**

Following the 2019 Arkansas River Flood, Governor Hutchinson and Arkansas lawmakers set aside $10 million in available grant funds for the construction and maintenance of levee projects. Levee districts located within the declared national disaster areas resulting from the floods were eligible to receive grant funds. Twelve Arkansas counties were located within the disaster areas. The project list includes:

| Recipient | Amount |
|---|---|
| City of Clarksville | $1,000,000.00 |
| Conway County Levee District #6 | $339,520.00 |
| Conway-Pope Counties Levee District #1 | $997,459.00 |
| Dardanelle Carden Bottoms (Yell County) | $1,515,700.00 |
| Fourche Dam Island Drainage District #2 | $762,886.00 |
| Little Rock-Pulaski County Drainage District #2 | $349,200.00 |
| McClean Bottoms Levee District | $91,000.00 |
| Old River Drainage District | $429,856.00 |
| Perry County Levee District #1 | $450,000.00 |
| Petit Jean Levee District | $427,800.00 |
| Plum Bayou Levee District | $540,000.00 |
| Riverdale Levee District- Harbor and Wall Repair | $1,623,397.00 |
| Riverdale Levee District-Drainage System Repair | $1,331,106.00 |
| Roland Levee District | $480,440.00 |
| Tucker Lake Levee and Drainage District | $1,274,053.00 |
| Tupelo Bayou Irrigation and Watershed District | $81,400.00 |
| **Total Funds Obligated** | **$11,693,817.00** |

**Arkansas Silver Jackets Program**

- Bob Kidd Lake Flood Study- A multi-purpose study to assess flood hazards, residual flood risk, dam break flood risk scenarios, and a mitigation strategy with an effective emergency response and communication plan, such as early warning systems.
- Lake Poinsett Flood Study-Perform hydrological and hydraulic analyses for use by state in ensuring a dam's spillway is adequately sized.
- Dixie Flood Study-Provide an in-depth analysis into all available Federal, State and Local programs that exist that can be used to identify all non-structural programs that are available to assist the community of Dixie.
- High Water Mark SOP- Massey Alexander Levee Assist with updating Emergency Action Plan and perform a levee breach analysis.
- White County Emergency Evacuation Plan- Develop a comprehensive emergency evacuation plan for White County to be better prepared for any overtopping or breach of Greers Ferry Lake structures.
- Russellville, AR Floodplain Management Plan
- Taney County Emergency Evacuation Plan
- Jackson County Emergency Evacuation Plan
- Cherokee Lake Emergency Evacuation Plan
- Develop a comprehensive evacuation plan for Hardy to better prepare the residents and businesses in the community that are located in the inundation area of a Cherokee Lake dam breach.
- Lake Elmdale Emergency Evacuation Plan
- Develop a comprehensive evacuation plan for Elm Springs to better prepare the residents and businesses in the community that are located in the inundation area of a Lake Elmdale dam breach.
- Arkansas Flood Risk Assessment
- Develop methods for the State to analyze flood risks associated with dam failures at high hazard dams (regulated by the State) and work with affected communities to address those risks in a local Hazard Mitigation Plan (HMP).

**Arkansas Forestry Division**

- From the past five years 1/1/2018-12/31/2022:
- 457 Presentations for Fire Prevention
- 1,133 miles of Permanent Fire Breaks opened
- 1,420,567 acres were treated on 6,941 prescribed burns.

**Infrastructure Investment and Jobs Act, Watershed and Flood Prevention Operations Program**

Through the Act, **$96 million in Arkansas** has been provided to NRCS' **Watershed and Flood Prevention Operations (WFPO) Program**. Authorized by the Watershed Protection and Flood Prevention Act (PL-566), WFPO provides financial and technical assistance for erosion and sediment control, watershed protection, flood prevention, water quality improvements, fish and wildlife habitat enhancement, and other purposes. Tide gates and land treatment measures that are part of a larger plan and design approved by NRCS could be funded through the WFPO program.

ARKANSAS First Creek – L'Anguille River Watershed – AR1 A preliminary investigation feasibility report (PIFR) will be prepared to determine if WFPO can be used to assist with sedimentation from agricultural areas, streambank erosion, and other activities has reduced the capacity of streams within the watershed causing extensive flooding of cropland, homes, and roads during heavy rain events. Flooding in the watershed has damaged much of the timber especially in the Outlet First Creek drainage area.

ARKANSAS City of Altheimer – AR4 The Arkansas Black Mayors Association and City of Altheimer, AR request assistance with conducting a PIFR and planning for a potential watershed project for Little Bayou Meto watershed in Jefferson County, AR. Flooding from heavy rainstorm events has damaged commercial and residential properties and roadways, resulting in displaced residents.

City of Blytheville – AR1 The City of Blytheville requests assistance to conduct a Preliminary Investigation and Feasibility Report (PIFR) for a project within Pemiscot Bayou Watershed and the Tyronza River Watershed. Over the past 5 years, flooding has caused significant problems for both humans, property and deteriorated existing infrastructure. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within Blytheville for decades.

City of Camden – AR4 The City of Camden requests assistance to conduct a PIFR, Planning, Design, and Construction project in the Freeo Creek-Ouachita River & North Bayou-Two Bayou Watersheds. The city is experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within Camden for decades. Also, Camden and Ouachita County have roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

City of Cotton Plant – AR1 The City of Cotton Plant requests assistance to conduct a Preliminary Investigation and Feasibility Report for a watershed project in the Buffalo Creek - Bayou DeView Watershed. The City of Cotton Plant is experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within Cotton Plant for decades. Also, Cotton Plant and Woodruff County have roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

City of Dumas – AR1 The City of Dumas requests assistance to conduct a PIFR and planning for a watershed project located within the Canal No. 19-Canal No. 18, Headwaters Boeuf River, Canal No. 81, and Clay Bayou Watersheds. The City of Dumas is experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within Dumas for decades. Desha County also has roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

City of El Dorado – AR4 The City of El Dorado requests assistance to conduct a preliminary investigation and feasibility report (PIFR), and subsequent Planning, Design, and Construction for a WFPO project located within the Hibank Creek-Bayou de Loutre, Little Cornie Bayou, and Haynes Creek-Smackover Creek Watersheds. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within El Dorado for decades. Also, Union County has roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

City of Eudora – AR1 The Arkansas Black Mayors Association and City of Eudora, AR request assistance with conducting a PIFR and planning for a potential watershed project for Camp Bayou CanalBoeuf River, Caney Bayou, Grand Lake-Bayou Macon, and Tiger Bayou watersheds in Chicot County, AR. Flooding from heavy rainstorm events has damaged commercial and residential properties and roadways, resulting in displaced residents.

Cities of Forrest City – Haynes – Marianna – AR1 The Cities of Forrest City, Haynes, and Marianna collectively request assistance to conduct a PIFR, Planning, Design, and Construction for a PL-566 project in the Larkin Creek – L'Anguille River Watershed. These cities are experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within these cities for decades. Also, St. Francis County and Lee County have roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.
City of Fountain Hill – AR4 The Arkansas Black Mayors Association and City of Fountain Hill, AR request assistance with conducting a Preliminary Investigation Feasibility Report (PIFR) for a potential watershed project in the Snake River - Saline River watersheds in

Ashley County, Arkansas. Flooding from heavy rainstorm events has damaged commercial and residential properties and roadways, resulting in displaced residents.

City of Fulton - AR4 The City of Fulton requests assistance to conduct a Preliminary Investigation and Feasibility Report for a possible PL-566 project in the Bois d'Arc Creek - Red River Watershed. The City of Fulton is reportedly experiencing flooding within the city limits that impacts safety, comfort, and quality of life. They also experience roadway flooding that impedes commerce into and out of the city. Non-point source pollution is also of concern.

City of Hughes and Jennette - AR1 The Arkansas Black Mayors Association's (ABMA) and city of Hughes and Jennette would like to request assistance with conducting a Preliminary Investigation and Feasibility Report (PIFR and planning for a watershed project for the Blackfish Bayou in St. Francis County. Flooding has caused significant problems, both human and property in our city over the past five years. The ABMA and the City have a unique and trusting relationship with their community, thus both entities are prepared to team together as co-sponsors for this initiative.

Lick Creek-Big Creek Watershed - AR1 Lick Creek serves the local Durham, Arkansas community and is listed as an impaired stream that threatens local water resource. Funds will be used to implement conservation practices that restore the watershed, improve water quality, and implement ag-water management practices.

Long Lake Bayou-Little Bee Bayou Watershed - AR1 Little Bee Bayou is located in Phillips County, Arkansas. Restoration work is being planned to restore the watershed that is currently impairing access to and from Lake Bayou due to rising sediment and vegetation. The plan will address flood prevention, agwater management and provide watershed protection. The Little Bee watershed provides an abundance of habitat and food sources for wildlife, including nearby White River National Wildlife Refuge, and recreational opportunity for the surrounding community.

City of Madison - AR1 The City of Madison, Arkansas Black Mayors Association, and East Arkansas Enterprise Community request assistance with conducting a PIFR and planning for a potential watershed project for L'Anguille River - St. Francis River watershed in St. Francis County, AR. Flooding from heavy rainstorm events has damaged commercial and residential properties and roadways, resulting in displaced residents.

City of Menifee - AR2 The City of Menifee requests assistance to conduct a PIFR for a possible PL-566 project in the Rocky Cypress Creek-Arkansas River Watershed and the Lower Cadron Creek Watershed. The city is experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed for decades. Also, Menifee and Conway County have roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

City of Pine Bluff - AR4 The City of Pine Bluff requests assistance to conduct the PIFR, Planning, Design, and Construction for a PL-566 project in 9 sub-watersheds: Bayou Bartholomew Headwaters, Caney Creek-Caney Bayou, Caney Creek-Arkansas River, Plum Bayou-Arkansas River, Cousart Bayou Headwaters-Lake Alice, Imbeau Bayou, Nevins Creek, Upper Deep Bayou, and Boggy Bayou-Bayou Bartholomew Watershed. The city is experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within these cities for decades. Also, Jefferson County has roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

Cities of Stamps and Lewisville - AR4 The Cities of Stamps and Lewisville request assistance to conduct a PIFR and planning for a project in the Lake Erling-Bodeau Creek watershed. The cities have experienced flooding that impacts the safety, comfort, quality of life and deteriorates existing infrastructure throughout Lafayette County. Flooding and poverty are two intertwined socioeconomic and environmental problems that have existed within Stamps and Lewisville for decades.

City of Turrell - AR1 The City of Turrell requests assistance to conduct a PIFR and planning for a possible WFPO project in the Big Creek Watershed. The City of Turrell is experiencing flooding that impacts safety, comfort, and quality of life. Over the past 5 years, flooding has caused significant problems for both humans and property. Flooding and poverty are the two intertwined socioeconomic and environmental problems that have existed within Turrell for decades. Also, Crittenden County has roads, highways, streets, and bridges that continue to deteriorate due to more frequent flooding events.

City of Wilmot - AR4 The Arkansas Black Mayors Association and City of Wilmot, AR request assistance with conducting a PIFR, Planning, Design, and Construction for a potential watershed project for Camp Bayou & Overflow Creek watersheds in Ashley County, AR. Flooding from heavy rainstorm events has damaged commercial and residential properties and roadways, resulting in displaced residents.

## 6.7 -RISK REDUCTION FOR COMPLETED ACTIONS

Projects funded through the HMGP, BRIC, and FMA were evaluated for risk reduction by using the FEMA Benefit Cost Analysis Tool. Benefit-Cost Analysis is the method by which the future benefits of a hazard mitigation project are determined compared to its costs.

The result is a Benefit-Cost Ratio (BCR), which is calculated by a project's total benefits divided by its total costs. The BCR is a numerical expression of the "cost-effectiveness" of a project. A project is considered cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs. FEMA requires a BCA to validate cost effectiveness of proposed hazard mitigation projects prior to funding. The Mitigation Benefits column in the table above displays the benefits that were calculated by the BCA demonstrating how specific actions contribute to loss avoidance.

Another way to document risk reduction is through the National Institute of Building Sciences (NIBS) study. In 2005, NIBS calculated that for every $1 spent on mitigation, $4 is saved in future disaster losses ($5 for flood disaster losses). An updated 2018 study increased the overall hazard benefit-cost ratio to 6:1 for federally funded projects. Specifically, for every $1 spent on flood mitigation, $7 is saved in future losses. For wind mitigation such as community safe rooms, $5 is saved for every $1 spent. Over time, the return on investment for long-term mitigation measures will continue to increase. As documented above, the majority of completed projects are either flood or wind related. The NIBS study quantifies the return on investment for these types of hazards further validating loss avoidance.

## 6.8 - PRIMARY HAZARD MITIGATION FUNDING MECHANISMS

44 CFR 201.4(c)(3)(iv) Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities

The following table represents potential major mitigation grant programs. The recipients evaluate and recommend projects to FEMA for funding and pass federal grant funds through to sub-recipients.  Differing from previous planning efforts, no contact information has been provided for these programs as it was determined that staff turnover often rendered listed contacts obsolete. Contacts for these programs may easily be found on applicable websites.

| Primary Hazard Mitigation Funding Mechanisms | | | | | |
|---|---|---|---|---|---|
| **Program** | **Funding Agency** | **Funding Recipient** | **Sub- Recipient** | **Funding Match Requirement** | **Award Range** |
| Arkansas Hazard Mitigation Grant Program | Arkansas | ADEM | State and Local Jurisdictions | 25% | 25% local 75% state match, up to $300,000 state share; $6 million appropriated annually |
| Flood Mitigation Assistance | FEMA | ANRC | NFIP Participating Community | Varied | Program is subject to the availability of appropriation funding, as well as any program specific directive or restrictions. Individual planning grants shall not exceed $50,000 to any applicant or $25,000 to any sub-applicant. |
| Hazard Mitigation Grant Program (404) | FEMA | ADEM | State and Local Jurisdictions | 25% | Federal funding is available following a major disaster declaration if requested by the Governor. Grant will depend on the costs associated with each disaster. State is eligible for up to 15% for amounts not more than $2 billion, 10 percent for amounts of more than $2 billion, and not more than $10 billion, and 7.5 percent on amounts more than $10 billion, not more than $35.3 billion. |

| | | | | | |
|---|---|---|---|---|---|
| Building Resilient Infrastructure and Communities | FEMA | ADEM | State and Local Jurisdictions | 25% | Up to $800,000 federal share may be requested for a planning grant to develop a new hazard mitigation plan, up to $300,000 for a planning grant to update a hazard mitigation plan, and up to $3 million in a sub-application to implement a mitigation project. |
| Public Assistance Mitigation Program (406) | FEMA | ADEM | State and Local Jurisdictions | Varied | Funding is used to restore the parts of a structure that was damaged during a disaster, and the restoration must provide protection from subsequent events. |

## 6.9 - ADDITIONAL HAZARD MITIGATION FUNDING MECHANISMS

44 CFR 201.4(c)(3)(iv) Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities

While ADEM is the lead agency for emergency planning and hazard mitigation in the state, many other state agencies play an important role in supporting and funding mitigation. Each of these state agencies was contacted individually to develop a complete picture of the overall funding sources available throughout the state. All identified funding sources are listed below with brief program descriptions. The combination of the ADEM funding along with these programs from other agencies provides a complete assessment of the mitigation related funding sources for the State of Arkansas.

| Additional Hazard Mitigation Funding Mechanisms | | | |
|---|---|---|---|
| **Department** | **Program** | **Funding** | **Program Description** |
| Arkansas Department of Economic Development | Community Development Block Grant Program | Varied | Make grants to communities and loans to businesses for community and economic development Has been used to fund community saferooms. |
| Arkansas Division of Emergency Management | Emergency Management Performance Grant | Varied | EMPG reimburses certain eligible expenses, under program guidelines, to support state and local emergency management costs. |
| Arkansas Division of Emergency Management | Fire Protection Services Fund (Act 833) | Varied | Provides funding for equipment, apparatus and facilities directly related to improve the department Fire Protection Classification rating (ISO Rating). |
| Arkansas Division of Emergency Management | Homeland Security Grant Program | Varied | Funds are provided to enhance homeland security and preparedness planning, training, exercise, and to purchase specialized equipment to enhance the capability of state and local agencies to prevent, respond to, and mitigate incidents of terrorism and major disasters. |
| Arkansas Division of Emergency Management | Federal Public Assistance Program | Varied | The PA Program is available to assist with reimbursement of repairs to damaged eligible facilities. It is made available to eligible applicants (Local Governments, State Governments and certain Private Non-Profit organizations) that are located in a designated damage area. |

| | | | |
|---|---|---|---|
| Arkansas Division of Emergency Management | State Public Assistance Program | Varied | The program provides assistance to eligible applicants and facilities for debris removal, emergency protective measures, and permanent restoration of infrastructure. It is made available to eligible applicants (Local Governments and State Governments) that are in a designated damage area. |
| Arkansas Division of Emergency Management | Federal Individual Assistance Program | Varied | The assistance is for qualified homeowners/ renters whose primary residence was damaged or destroyed in a declared designated area. |
| Arkansas Division of Emergency Management | State Individual Assistance Program | Varied | Available for qualified individuals, families, and businesses whose damaged property is in a designated area. |
| Arkansas Department of Health | Bioterrorism Preparedness Program | Up to $260k | This program manages the state’s public health planning for potential bioterrorism events. |
| Arkansas Department of Rural Services | Rural Services Block Grant | Up to $75,000 | Fire departments have received funding for new fire stations, additional bays for existing stations, turn-out gear, communications equipment, fire trucks, SCBA's, extrication equipment and brush trucks |
| Arkansas Department of Rural Services | Rural Community Grant Program | Up to $15,000 | Funds new construction or renovation of community centers, fire stations, or multi-purpose buildings, and the purchase of fire trucks (pumper, tanker, brush or certain service trucks). Incorporated towns of less than 3,000 in population and unincorporated rural areas are eligible for matching funds. 50/50 match. |
| Arkansas Department of Transportation | Bridge Replacement and Rehabilitation Program | Up to $1 million in federal aid and $350k for signal/ intersection projects | Provides assistance for eligible bridges on any public road. For a bridge structure to qualify for replacement, it must be at least 20' in length, have a sufficiency rating of 50.0 or less, and be classified as functionally obsolete or structurally deficient. |
| Arkansas Department of Transportation | Surface Transportation Program | Up to $1,000,000 in federal aid, $350,000 for signal/ intersection projects | Provides roadway project funds for projects in unincorporated areas and cities with fewer than 200,000 in population. |
| Arkansas Department of Transportation | Safe Route to Schools Program | Up to $1 million in federal grants | Funds for a safer education infrastructure. |
| Arkansas Division of Public School Academic Facilities and Transportation | Academic Facilities Partnership Program | Varied | Provides state financial participation based upon a school district’s academic wealth index for eligible new construction projects. Program has been used to build school saferooms. |
| Forestry Division | Community Forestry Grants | Varied | 50/50 matching grants to communities for community forestry planning, tree planting, and tree maintenance. |
| Forestry Division | Volunteer Fire Assistance | Varied | 50/50 matching grants to volunteer fire departments, with funds used to buy tools, small equipment, and safety gear. |
| Forestry Division | Federal Excess Property Program | Varied | The acquisition and distribution (permanent or semi-permanent basis) of firefighting equipment and apparatus to volunteer fire departments. |

| | | | |
|---|---|---|---|
| Arkansas Livestock and Poultry Commission | Livestock Inspection and Disease Control Program | Varied | Used for the suppression and eradication of animal diseases. |
| Natural Resources Division | Conservation District Beaver Control Program | $15.00 per tail | This grant is used to help control Arkansas' beaver population. |
| Natural Resources Division | Clean Water Revolving Loan Fund | Low interest loans | Eligible jurisdiction can use loans for new collection systems, rehabilitation of existing systems, new treatment systems, and rehabilitation of existing treatment systems. |
| Natural Resources Division | Drinking Water State Revolving Fund | Low interest loans | Eligible jurisdiction can use loans for compliance, public health, water supply, treatment, distribution storage, planning and design, consolidation, restructuring projects. |
| Natural Resources Division | Grants to Districts | Up to $25,000 | This grant is used by conservation districts to fund additional positions and programs. |
| Natural Resources Division | Non-Point Source Pollution Management Grant | Up to $1,000,000 | Potential funding for Non-Point Source Pollution reduction and/or abatement and educational projects within prioritized watersheds. Any non-federal government agency, educational institution, or nonprofit corporation is eligible. |
| Natural Resources Division | Water Development Fund | Varied loans | Eligible jurisdiction can use loans for public water supply, irrigation, flood control and/or drainage, erosion and sediment control, stream bank stabilization, recreation and/or fish & wildlife, hydroelectric power, and navigation projects. |
| Natural Resources Division | Water Resources Cost Share Revolving Fund | Varied loans | Eligible jurisdiction can use loans for construction, replacement, acquisition and ownership of facilities, land and easement procurement, improvements for developing and utilization of water resources, projects to supply quality water to residents, provide water for navigation - provide recreational access to lakes and streams, reclaim, preserve and protect the state's land resources, protect the wealth of the state from disastrous floods. |
| Natural Resources Division | Water, Sewer, and Solid Waste Fund | Varied loans | Eligible jurisdiction can use loans for public water supply, sewer systems, and solid waste collection/disposal projects. |
| Natural Resources Division | Water, Waste Disposal and Pollution Abatement Facilities General Obligation | Varied bonds | Eligible jurisdiction can use loans for water (supply, storage, distribution and irrigation), solid waste landfills, solid waste recycling facilities, wastewater collection systems, wastewater treatment facilities, and non-point source reduction projects. |
| Natural Resources Division | Tax Credit Incentive Program | Tax credits | The purpose of this program is to encourage water users to invest in the construction of impoundments to use available surface water, the conversion from ground water use to surface water use, and land leveling to reduce agricultural irrigation water use. |

## 6.10 - REPETITIVE FLOOD LOSS STRATEGY

44 CFR 201.4(c)(3)(v) A State may request the reduced cost share authorized under § 79.4(c)(2)of this chapter for the FMA and SRL programs, if it has an approved State Mitigation Plan meeting the requirements of this section that also identifies specific actions the State has taken to reduce the number of repetitive loss properties (which must include severe repetitive loss properties), and specifies how the State intends to reduce the number of such repetitive loss properties. In addition, the plan must describe the strategy the State has to ensure that local jurisdictions with severe repetitive loss properties take actions to reduce the number of these properties, including the development of local mitigation plans.

**Background on the NFIP and Repetitive Loss**

Since the last plan was adopted, the Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the RFC program, and integrated three grant programs, including the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC) Program and Flood Mitigation Assistance (FMA) Program under the Unified Hazard Mitigation Assistance (HMA) Program.

Property acquisitions are an effective mitigation measure to address repetitive flood claims, because they are a permanent form of mitigation. This type of project allows State and local jurisdictions to remove people and property from floodplains, and reducing future costs associated with a community's disaster response, recovery, and repair. FEMA funds are available to states to purchase property in flood-prone areas and dedicate that property as green space. In order to be eligible for an increased Federal cost share in the FMA grant program the FEMA- approved State or Tribal Standard Mitigation Plan must also meet all of the requirements described *44 CFR 201.4(c)(3)(v)* Repetitive Loss Strategy**.** Arkansas has constructed this RL strategy in part to receive this share reduction.

| County | Policies in Force 2023 | Insurance in Force 2023 | Closed Losses 2023 | Total Payments 2023 |
|---|---|---|---|---|
| Arkansas County | 97 | $12,152,00 | 80 | $1,330,370 |
| Ashley County | 46 | $6,797,000 | 61 | $1,001,041 |
| Baxter County | 117 | $19,882,000 | 118 | $3,054,888 |
| Benton County | 563 | $148,700,000 | 371 | $9,983,925 |
| Boone County | 28 | $6,970,000 | 35 | $484,500 |
| Bradley County | 23 | $2,817,000 | 72 | $1,478,679 |
| Calhoun County | 5 | $634,000 | 8 | $138,394 |
| Carroll County | 8 | $1,092,000 | 7 | $9,023 |
| Chicot County | 207 | $57,336,000 | 169 | $4,028,197 |
| Clark County | 65 | $12,944,000 | 28 | $548,675 |
| Clay County | 138 | $18,577,000 | 172 | $3,928,380 |
| Cleburne County | 127 | $30,358,000 | 35 | $1,222,781 |
| Columbia County | 4 | $1,778,000 | 8 | $21,810 |
| Conway County | 29 | $4,522,000 | 27 | $279,414 |
| Craighead County | 638 | $120,962,000 | 402 | $7,463,135 |
| Crawford County | 141 | $34,314,000 | 73 | $2,126,677 |
| Crittenden County | 433 | $95,862,000 | 849 | $9,790,266 |
| Cross County | 76 | $9,085,000 | 66 | $1,729,325 |
| Dallas County | 3 | $257,000 | 1 | $7,084 |
| Desha County | 195 | $33,317,000 | 248 | $3,284,206 |
| Drew County | 28 | $4,172,000 | 36 | $471,100 |
| Faulkner County | 457 | $104,950,000 | 313 | $7,543,822 |
| Franklin County | 19 | $4,109,000 | 48 | $719,058 |
| Fulton County | 17 | $1,458,000 | 53 | $1,149,314 |
| Garland County | 705 | $156,357,000 | 251 | $3,981,794 |
| Grant County | 15 | $2,949,000 | 13 | $104,402 |
| Greene County | 384 | $47,854,000 | 230 | $986,745 |
| Hempstead County | 11 | $2,186,000 | 6 | $74,621 |
| Hot Spring County | 53 | $11,421,000 | 15 | $28,744 |

| | | | | |
|---|---|---|---|---|
| Howard County | 20 | $2,861,000 | 25 | $120,386 |
| Independence County | 95 | $18,620,000 | 184 | $2,231,554 |
| Izard County | 53 | $10,194,000 | 71 | $2,573,662 |
| Jackson County | 173 | $24,642,000 | 183 | $3,150,109 |
| Jefferson County | 263 | $45,728,000 | 602 | $14,547,945 |
| Johnson County | 60 | $4,108,000 | 6 | $34,108 |
| Lafayette County | 2 | $90,000 | 1 | $1,412 |
| Lawrence County | 110 | $15,538,000 | 55 | $799,893 |
| Lee County | 51 | $4,977,000 | 50 | $939,397 |
| Lincoln County | 32 | $4,789,000 | 28 | $667,926 |
| Little River County | 4 | $500,000 | 5 | $127,304 |
| Logan County | 13 | $1,805,000 | 7 | $78,179 |
| Lonoke County | 189 | $41,979,000 | 74 | $1,099,669 |
| Madison County | 4 | $946,000 | 7 | $112,499 |
| Marion County | 10 | $1,249,000 | 3 | $104,325 |
| Miller County | 131 | $23,960,000 | 124 | $2,598,356 |
| Mississippi County | 109 | $24,014,000 | 75 | $812,594 |
| Monroe County | 131 | $15,936,000 | 184 | $4,453,835 |
| Montgomery County | 49 | $8,794,000 | 92 | $2,139,035 |
| Nevada County | 2 | $336,000 | 1 | $5,209 |
| Newton County | 0 | $0 | 6 | $116,841 |
| Ouachita County | 51 | $9,728,000 | 85 | $1,332,278 |
| Perry County | 34 | $4,817,000 | 30 | $1,132,335 |
| Phillips County | 133 | $20,816,000 | 518 | $3,856,751 |
| Pike County | 24 | $7,287,000 | 10 | $230,064 |
| Poinsett County | 87 | $17,044,000 | 64 | $1,656,218 |
| Polk County | 15 | $3,068,000 | 22 | $191,764 |
| Pope County | 109 | $23,073,000 | 63 | $932,275 |
| Prairie County | 36 | $6,959,000 | 92 | $3,094,618 |
| Pulaski County | 1,699 | $422,024,000 | 1,699 | $28,038,920 |
| Randolph County | 140 | $27,817,000 | 224 | $9,081,391 |
| Saline County | 233 | $60,919,000 | 238 | $5,593,026 |
| Scott County | 6 | $1,820,000 | 10 | $1,019,487 |
| Sebastian County | 355 | $89,960,000 | 408 | $18,506,904 |
| Sevier County | 11 | $1,245,000 | 18 | $748,308 |
| Sharp County | 57 | $12,396,000 | 90 | $1,843,019 |
| St. Francis County | 84 | $16,466,000 | 22 | $413,951 |
| Stone County | 0 | $0 | 5 | $51,684 |
| Union County | 81 | $15,105,000 | 141 | $1,754,968 |
| Van Buren County | 18 | $4,967,000 | 18 | $598,461 |
| Washington County | 488 | $122,784,000 | 356 | $11,091,910 |
| White County | 183 | $41,997,000 | 132 | $3,054,406 |
| Woodruff County | 53 | $7,035,000 | 67 | $1,571,464 |
| Yell County | 27 | $6,407,000 | 12 | $147,132 |

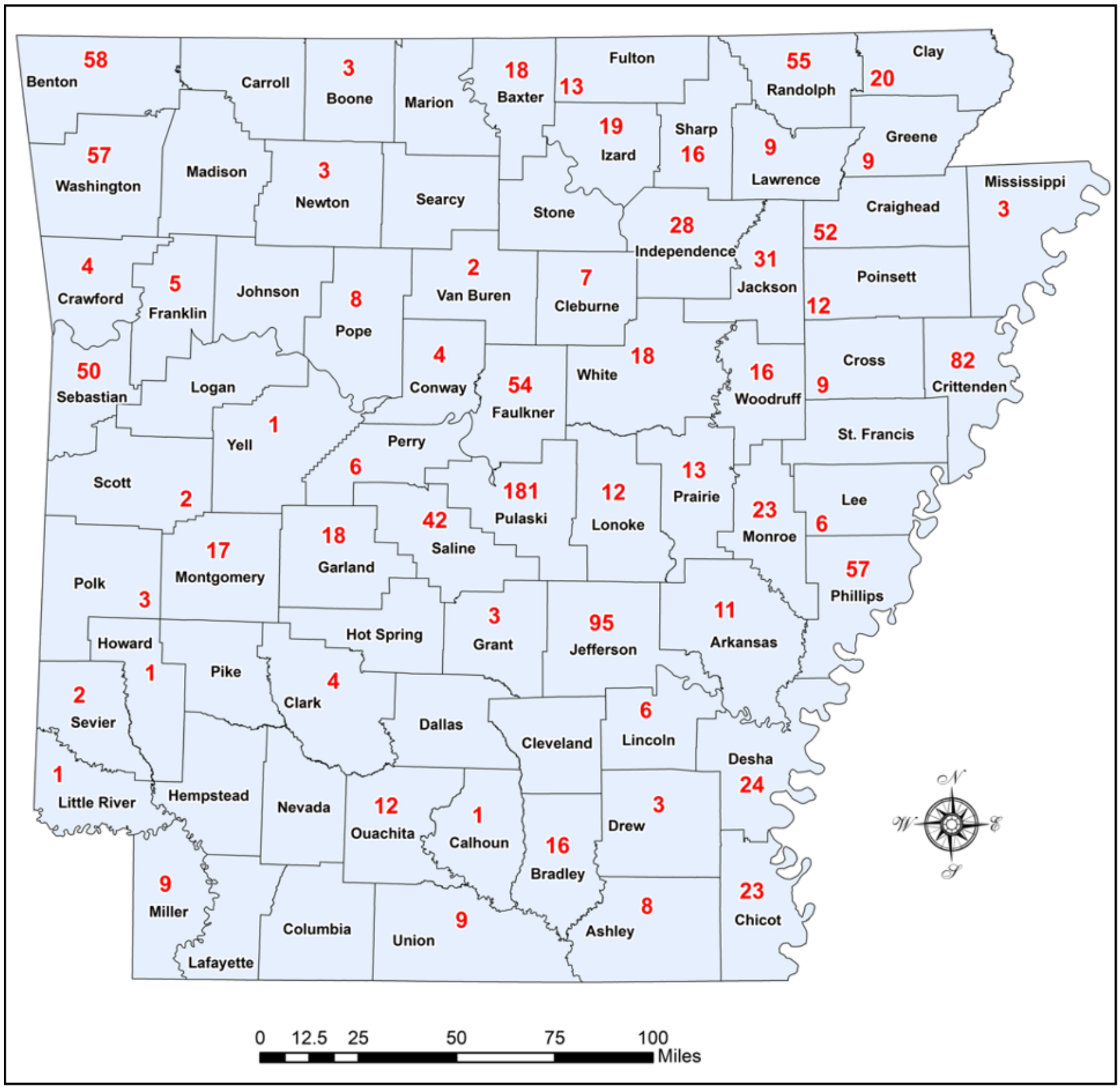
**Repetitive Loss Property Assessment**

Since the last plan update there have been eight (8) federally declared disasters with seven (7) involving flooding. These recent events have had a significant impact on the number of flood claims and an increase in the repetitive loss structures in the state. Reducing the number of RL and SRL properties continues to be a priority for the State of Arkansas.

As of March 31, 2023, the State of Arkansas had 1,242 total RL properties accounting for 3,561 losses with total (contents and structure) payments of $101,007,133.91, according to FEMA BureauNet data. In the previous plan, the State of Arkansas had 1,092 total RLs; this is an increase of 150 RL properties.

Based on the continuing and increasing claims we anticipate the dollar losses to equal or exceed the average payments. Section 7 - Coordination of Local Mitigation Planning

**Number of Repetitive Loss Properties by County (Data as of March 2023)**




One hundred twenty-seven (127) of the 1,242 RLs have been mitigated and are not currently counted as subject to repetitive flooding leaving 1,115 non-mitigated RLs. Mitigated means that the building has been elevated, acquired, floodproofed, or otherwise protected from flood damage, or the building has been destroyed by some natural disaster or human-caused event.

The 1,115 active non-mitigated RLs are spread over 63 counties as well as 180 non-mitigated SRL properties within those counties (data as of March 2023). Only 336 out of the 1,235 identified non-mitigated RLs in Arkansas or approximately 27 percent are currently insured by the NFIP. The City of Little Rock has the highest number of unmitigated RLs with 65 followed by the City of West Memphis with 62. The table below shows the number of non-mitigated RL properties by community.

## Non-Mitigated Repetitive Loss Properties in Arkansas (Data as of March 2023) *SRL Properties

| County Name | Community Name | RL Bldgs Total | RL Bldgs Insured | Building Payments | Content Payments | Total Payments | Average Payment | Losses |
|---|---|---|---|---|---|---|---|---|
| Arkansas County | Arkansas County | 6 | 1 | $465,457.74 | $24,245.17 | $489,702.91 | $28,806.05 | 17 |
| Arkansas County | Stuttgart | 4 | 2 | $120,081.55 | $17,973.71 | $138,055.26 | $17,256.91 | 8 |
| Arkansas County | Arkansas County* | 1 | 0 | $49,654.29 | $0.00 | $49,654.29 | $12,413.57 | 4 |
| Ashley County | Ashley County | 6 | 2 | $205,197.03 | $22,703.10 | $227,900.13 | $18,991.68 | 12 |
| Ashley County | Crossett | 1 | 6 | $9,878.95 | $421.00 | $10,299.95 | $2,574.99 | 4 |
| Ashley County | Hamburg | 1 | 2 | $92,861.03 | $0.00 | $92,861.03 | $46,430.52 | 2 |
| Baxter County | Mountain Home | 1 | 1 | $46,627.81 | $0.00 | $46,627.81 | $15,542.60 | 3 |
| Baxter County | Norfork | 14 | 3 | $1,381,098.12 | $198,187.48 | $1,579,285.60 | $45,122.45 | 35 |
| Baxter County | Norfork* | 3 | 0 | $469,676.45 | $42,600.00 | $512,276.45 | $46,570.59 | 11 |
| Benton | Elm Springs | 1 | 5 | $107,377.42 | $20,147.42 | $127,524.84 | $63,762.42 | 2 |
| Benton | Little Flock | 3 | 2 | $124,614.19 | $0.00 | $124,614.19 | $20,769.03 | 6 |
| Benton County | Benton County | 21 | 12 | $2,770,539.71 | $523,056.24 | $3,293,595.95 | $53,993.38 | 61 |
| Benton County | Benton County* | 7 | 5 | $1,156,261.12 | $182,355.79 | $1,338,616.91 | $51,485.27 | 26 |
| Benton County | Bentonville | 2 | 1 | $24,108.56 | $0.00 | $24,108.56 | $6,027.14 | 4 |
| Benton County | Decatur | 2 | 1 | $105,219.74 | $241,397.70 | $346,617.44 | $57,769.57 | 6 |
| Benton County | Decatur* | 1 | 0 | $64,801.71 | $215,332.70 | $280,134.41 | $70,033.60 | 4 |
| Benton County | Gravette | 1 | 1 | $20,693.82 | $740.46 | $21,434.28 | $10,717.14 | 2 |
| Benton County | Rogers | 11 | 9 | $593,514.89 | $3,824.38 | $597,339.27 | $17,066.84 | 35 |
| Benton County | Rogers* | 2 | 1 | $80,951.55 | $0.00 | $80,951.55 | $13,491.93 | 6 |
| Benton County 1 | Siloam Springs | 2 | 9 | $121,523.42 | $38,368.10 | $159,891.52 | $26,648.59 | 6 |
| Benton County, | Springdale | 5 | 2 | $464,283.20 | $31,220.89 | $495,504.09 | $45,045.83 | 11 |
| Boone County | Harrison | 3 | 9 | $128,268.23 | $3,960.19 | $132,228.42 | $18,889.77 | 7 |
| Bradley County | Bradley County* | 2 | 1 | $341,938.94 | $58,958.64 | $400,897.58 | $40,089.76 | 10 |
| Bradley County | Bradley County | 9 | 1 | $644,452.06 | $92,501.47 | $736,953.53 | $28,344.37 | 26 |
| Bradley County | Warren | 5 | 9 | $127,182.59 | $8,755.06 | $135,937.65 | $10,456.74 | 13 |
| Calhoun County | Hampton | 1 | 9 | $65,889.37 | $0.00 | $65,889.37 | $32,944.69 | 2 |
| Chicot County | Chicot County | 13 | 2 | $882,011.13 | $162,462.61 | $1,044,473.74 | $25,474.97 | 41 |
| Chicot County | Chicot County* | 4 | 1 | $440,119.60 | $95,363.31 | $535,482.91 | $26,774.15 | 20 |
| Chicot County | Dermott | 2 | 2 | $79,450.75 | $0.00 | $79,450.75 | $13,241.79 | 6 |
| Chicot County | Lake Village | 3 | 1 | $52,839.67 | $3,777.97 | $56,617.64 | $6,290.85 | 9 |
| Chicot County | Lake Village* | 1 | 1 | $45,780.75 | $2,557.77 | $48,338.52 | $9,667.70 | 5 |
| Clark County | Arkadelphia | 1 | 1 | $19,277.00 | $0.00 | $19,277.00 | $6,425.67 | 3 |
| Clark County | Clark County | 1 | 1 | $55,949.09 | $0.00 | $55,949.09 | $27,974.55 | 2 |
| Clark County | Gurdon | 2 | 1 | $23,167.17 | $90,390.66 | $113,557.83 | $22,711.57 | 5 |
| Clay County | Clay County* | 1 | 0 | $105,443.74 | $34,347.59 | $139,791.33 | $46,597.11 | 3 |
| Clay County | Success | 1 | 3 | $69,771.66 | $0.00 | $69,771.66 | $34,885.83 | 2 |
| Clay County | Clay County | 10 | 3 | $750,125.68 | $75,424.19 | $825,549.87 | $37,524.99 | 22 |
| Clay County | Corning | 5 | 1 | $171,407.95 | $4,024.00 | $175,431.95 | $12,530.85 | 14 |
| Clay County | Piggott | 3 | 1 | $83,933.58 | $10,905.53 | $94,839.11 | $13,548.44 | 7 |
| Cleburne County | Cleburne County | 5 | 2 | $720,845.71 | $252,952.67 | $973,798.38 | $74,907.57 | 13 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cleburne County | Cleburne County* | 2 | 0 | $325,447.72 | $59,752.58 | $385,200.30 | $55,028.61 | 7 |
| Conway County | Morrilton | 2 | 1 | $88,622.91 | $4,633.74 | $93,256.65 | $10,361.85 | 9 |
| Conway County | Morrilton* | 1 | 0 | $84,570.43 | $4,633.74 | $89,204.17 | $12,743.45 | 7 |
| Conway County | Plumerville | 1 | 1 | $12,808.26 | $6,618.73 | $19,426.99 | $9,713.50 | 2 |
| Craighead County | Bono | 9 | 1 | $204,026.61 | $26,783.52 | $230,810.13 | $10,035.22 | 23 |
| Craighead County | Bono* | 1 | 0 | $40,763.84 | $19,591.50 | $60,355.34 | $15,088.84 | 4 |
| Craighead County | Caraway | 1 | 1 | $8,302.73 | $0.00 | $8,302.73 | $4,151.37 | 2 |
| Craighead County | Jonesboro | 33 | 8 | $2,866,002.66 | $1,178,369.88 | $4,044,372.54 | $37,797.87 | 107 |
| Craighead County | Jonesboro* | 7 | 1 | $1,214,863.38 | $699,260.28 | $1,914,123.66 | $42,536.08 | 45 |
| Craighead County | Lake City | 1 | 8 | $8,235.49 | $0.00 | $8,235.49 | $4,117.75 | 2 |
| Crawford County | Crawford County | 1 | 2 | $144,940.36 | $12,658.02 | $157,598.38 | $52,532.79 | 3 |
| Crawford County | Van Buren | 3 | 2 | $233,026.20 | $21,200.14 | $254,226.34 | $31,778.29 | 8 |
| Crittenden County | Crittenden County | 2 | 1 | $108,204.50 | $6,999.15 | $115,203.65 | $19,200.61 | 6 |
| Crittenden County | Earle | 3 | 2 | $131,872.22 | $0.00 | $131,872.22 | $16,484.03 | 8 |
| Crittenden County | Marion | 2 | 3 | $16,192.16 | $737.06 | $16,929.22 | $4,232.31 | 4 |
| Crittenden County | West Memphis | 62 | 15 | $4,443,656.78 | $374,921.27 | $4,818,578.05 | $23,055.40 | 209 |
| Crittenden County | West Memphis* | 13 | 1 | $1,673,460.81 | $216,874.40 | $1,890,335.21 | $26,254.66 | 72 |
| Cross County | Cross County | 2 | 1 | $161,824.23 | $6,896.95 | $168,721.18 | $42,180.30 | 4 |
| Cross County | Wynne* | 1 | 0 | $29,804.05 | $64,846.94 | $94,650.99 | $23,662.75 | 4 |
| Cross County1 | Wynne | 6 | 1 | $128,466.44 | $68,850.75 | $197,317.19 | $11,606.89 | 17 |
| Desha County | Desha County | 3 | 1 | $121,543.48 | $20,000.00 | $141,543.48 | $20,220.50 | 7 |
| Desha County | Dumas | 5 | 2 | $183,863.59 | $25,287.37 | $209,150.96 | $14,939.35 | 14 |
| Desha County | Mcgehee | 15 | 3 | $546,878.02 | $39,972.22 | $586,850.24 | $13,337.51 | 44 |
| Desha County | Mcgehee* | 1 | 0 | $83,544.02 | $0.00 | $83,544.02 | $13,924.00 | 6 |
| Drew County | Drew County | 1 | 1 | $195,420.11 | $0.00 | $195,420.11 | $27,917.16 | 7 |
| Drew County | Monticello | 1 | 3 | $14,982.27 | $0.00 | $14,982.27 | $4,994.09 | 3 |
| Drew County | Drew County* | 1 | 0 | $195,420.11 | $0.00 | $195,420.11 | $27,917.16 | 7 |
| Faulkner County | Conway | 6 | 1 | $164,608.35 | $108,199.47 | $272,807.82 | $15,155.99 | 18 |
| Faulkner County | Faulkner County | 27 | 7 | $2,312,338.80 | $298,829.96 | $2,611,168.76 | $42,806.05 | 61 |
| Faulkner County | Faulkner County* | 1 | 0 | $254,597.62 | $97,356.04 | $351,953.66 | $70,390.73 | 5 |
| Faulkner County | Greenbrier | 1 | 1 | $163,431.24 | $7,863.77 | $171,295.01 | $42,823.75 | 4 |
| Faulkner County | Mayflower | 16 | 8 | $814,128.58 | $98,236.95 | $912,365.53 | $22,252.82 | 41 |
| Faulkner County | Mayflower* | 1 | 0 | $138,967.99 | $42,860.74 | $181,828.73 | $36,365.75 | 5 |
| Faulkner County | Vilonia | 1 | 1 | $53,001.97 | $14,239.62 | $67,241.59 | $33,620.80 | 2 |
| Faulkner County | Conway* | 1 | 0 | $53,224.49 | $28,526.77 | $81,751.26 | $11,678.75 | 7 |
| Franklin County | Charleston | 1 | 1 | $26,693.87 | $0.00 | $26,693.87 | $5,338.77 | 5 |
| Franklin County | Franklin County | 2 | 2 | $54,827.64 | $34,396.74 | $89,224.38 | $17,844.88 | 5 |
| Franklin County | Ozark | 1 | 1 | $306,789.53 | $55,033.53 | $361,823.06 | $30,151.92 | 12 |
| Franklin County | Ozark* | 1 | 0 | $306,789.53 | $55,033.53 | $361,823.06 | $30,151.92 | 12 |
| Fulton County | Fulton County | 8 | 5 | $511,875.53 | $138,752.31 | $650,627.84 | $26,025.11 | 25 |
| Fulton County | Fulton County* | 3 | 0 | $351,235.31 | $94,318.30 | $445,553.61 | $34,273.35 | 13 |
| Fulton County | Mammoth Spring | 2 | 1 | $229,745.94 | $89,133.23 | $318,879.17 | $53,146.53 | 6 |
| Garland County | Garland County | 9 | 2 | $385,032.58 | $18,116.78 | $403,149.36 | $22,397.19 | 18 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Garland County | Hot Springs | 9 | 3 | $629,614.88 | $81,199.64 | $710,814.52 | $33,848.31 | 21 |
| Grant County | Grant County | 1 | 2 | $16,454.05 | $0.00 | $16,454.05 | $8,227.03 | 2 |
| Grant County | Sheridan | 2 | 1 | $32,171.26 | $0.00 | $32,171.26 | $8,042.82 | 4 |
| Greene County | Greene County | 1 | 2 | $179,585.77 | $0.00 | $179,585.77 | $59,861.92 | 3 |
| Greene County | Greene County* | 1 | 0 | $179,585.77 | $0.00 | $179,585.77 | $59,861.92 | 3 |
| Greene County | Paragould | 6 | 3 | $165,399.08 | $0.00 | $165,399.08 | $9,729.36 | 17 |
| Greene County | Paragould* | 1 | 0 | $43,581.67 | $0.00 | $43,581.67 | $6,225.95 | 7 |
| Howard County | Nashville | 1 | 3 | $26,439.86 | $8,828.77 | $35,268.63 | $11,756.21 | 3 |
| Independence | Batesville | 15 | 1 | $510,523.53 | $54,835.84 | $565,359.37 | $13,460.94 | 42 |
| Independence | Independence | 7 | 2 | $239,059.03 | $13,024.97 | $252,084.00 | $14,828.47 | 17 |
| Independence | Oil Trough | 2 | 2 | $74,885.82 | $33,490.07 | $108,375.89 | $27,093.97 | 4 |
| Independence | Batesville* | 3 | 1 | $206,289.37 | $40,640.59 | $246,929.96 | $14,525.29 | 17 |
| Independence County | Independence County* | 1 | 0 | $105,057.54 | $12,819.25 | $117,876.79 | $29,469.20 | 4 |
| Izard County | Calico Rock | 4 | 2 | $184,966.25 | $0.00 | $184,966.25 | $18,496.63 | 10 |
| Izard County | Izard County | 12 | 1 | $819,000.04 | $106,990.58 | $925,990.62 | $31,930.71 | 29 |
| Izard County | Calico Rock* | 1 | 0 | $42,973.25 | $0.00 | $42,973.25 | $14,324.42 | 3 |
| Izard County | Izard County* | 2 | 0 | $353,401.84 | $48,190.58 | $401,592.42 | $57,370.35 | 7 |
| Jackson County | Diaz* | 1 | 0 | $138,428.46 | $45,150.33 | $183,578.79 | $45,894.70 | 4 |
| Jackson County | Grubbs* | 1 | 0 | $99,244.36 | $0.00 | $99,244.36 | $24,811.09 | 4 |
| Jackson County | Jackson County* | 5 | 2 | $651,424.01 | $38,911.64 | $690,335.65 | $24,654.84 | 28 |
| Jackson County | Diaz | 1 | 5 | $138,428.46 | $45,150.33 | $183,578.79 | $45,894.70 | 4 |
| Jackson County | Grubbs | 2 | 5 | $130,835.61 | $0.00 | $130,835.61 | $18,690.80 | 7 |
| Jackson County | Jackson County | 15 | 5 | $1,132,271.25 | $110,234.99 | $1,242,506.24 | $24,850.12 | 50 |
| Jackson County | Newport | 6 | 2 | $393,653.14 | $18,183.51 | $411,836.65 | $27,455.78 | 15 |
| Jefferson County | Altheimer | 2 | 2 | $47,774.96 | $19,700.00 | $67,474.96 | $13,494.99 | 5 |
| Jefferson County | Jefferson County | 40 | 14 | $4,293,394.79 | $451,560.26 | $4,744,955.05 | $34,634.71 | 137 |
| Jefferson County | Jefferson County* | 13 | 3 | $2,201,714.77 | $167,296.73 | $2,369,011.50 | $33,843.02 | 70 |
| Jefferson County | Pine Bluff | 29 | 3 | $2,080,644.01 | $464,117.46 | $2,544,761.47 | $24,468.86 | 104 |
| Jefferson County | Pine Bluff* | 10 | 2 | $865,085.61 | $224,577.27 | $1,089,662.88 | $22,701.31 | 48 |
| Jefferson County | White Hall* | 1 | 0 | $59,308.36 | $5,327.24 | $64,635.60 | $7,181.73 | 9 |
| Lawrence County | Black Rock | 1 | 3 | $38,000.00 | $0.00 | $38,000.00 | $19,000.00 | 2 |
| Lawrence County | Hoxie | 1 | 3 | $57,715.87 | $5,966.03 | $63,681.90 | $31,840.95 | 2 |
| Lawrence County | Lawrence County | 6 | 1 | $235,315.93 | $3,663.26 | $238,979.19 | $15,931.95 | 15 |
| Lawrence County | Lawrence County* | 1 | 0 | $72,018.08 | $0.00 | $72,018.08 | $24,006.03 | 3 |
| Lee County | Lee County | 3 | 1 | $129,088.79 | $18,031.67 | $147,120.46 | $18,390.06 | 8 |
| Lee County | Marianna | 3 | 3 | $361,434.03 | $36,600.47 | $398,034.50 | $66,339.08 | 6 |
| Lincoln County | Gould | 4 | 1 | $170,188.20 | $20,764.87 | $190,953.07 | $15,912.76 | 12 |
| Lincoln County | Gould* | 1 | 1 | $137,097.96 | $0.00 | $137,097.96 | $34,274.49 | 4 |
| Lincoln County | Lincoln County | 1 | 1 | $25,771.55 | $494.25 | $26,265.80 | $13,132.90 | 2 |
| Little River County | Ashdown | 1 | 1 | $66,114.67 | $15,389.25 | $81,503.92 | $40,751.96 | 2 |
| Lonoke County | Cabot | 3 | 1 | $111,559.88 | $17,662.67 | $129,222.55 | $21,537.09 | 6 |
| Lonoke County | Lonoke County | 8 | 2 | $328,659.08 | $50,141.55 | $378,800.63 | $18,038.13 | 21 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lonoke County | Lonoke County* | 1 | 0 | $40,205.11 | $12,000.00 | $52,205.11 | $26,102.56 | 2 |
| Miller County | Miller County | 1 | 2 | $6,356.72 | $0.00 | $6,356.72 | $3,178.36 | 2 |
| Miller County | Texarkana | 7 | 2 | $395,328.91 | $93,486.30 | $488,815.21 | $23,276.91 | 21 |
| Miller County | Texarkana* | 1 | 0 | $22,895.28 | $30,751.16 | $53,646.44 | $7,663.78 | 7 |
| Mississippi County | Gosnell | 2 | 1 | $172,463.45 | $81,296.73 | $253,760.18 | $28,195.58 | 9 |
| Mississippi County | Gosnell* | 1 | 1 | $145,398.68 | $81,296.73 | $226,695.41 | $32,385.06 | 7 |
| Monroe County | Brinkley | 3 | 3 | $39,285.97 | $0.00 | $39,285.97 | $6,547.66 | 6 |
| Monroe County | Clarendon | 3 | 3 | $12,057.79 | $9,065.38 | $21,123.17 | $3,520.53 | 6 |
| Monroe County | Holly Grove | 1 | 1 | $69,774.27 | $0.00 | $69,774.27 | $34,887.14 | 2 |
| Monroe County | Monroe County | 15 | 2 | $1,137,605.91 | $62,208.92 | $1,199,814.83 | $38,703.70 | 31 |
| Monroe County | Monroe County* | 1 | 0 | $128,090.25 | $9,960.57 | $138,050.82 | $69,025.41 | 2 |
| Montgomery County | Montgomery County | 16 | 1 | $750,196.73 | $229,848.49 | $980,045.22 | $24,501.13 | 40 |
| Montgomery County | Montgomery | 1 | 1 | $51,007.29 | $18,304.80 | $69,312.09 | $17,328.02 | 4 |
| Newton County | Jasper | 2 | 1 | $116,841.07 | $0.00 | $116,841.07 | $19,473.51 | 6 |
| Newton County | Jasper* | 1 | 0 | $71,300.89 | $0.00 | $71,300.89 | $17,825.22 | 4 |
| Ouachita County | Camden* | 1 | 0 | $13,279.37 | $0.00 | $13,279.37 | $6,639.69 | 2 |
| Ouachita County | Ouachita County* | 1 | 0 | $99,673.47 | $34,427.95 | $134,101.42 | $44,700.47 | 3 |
| Ouachita County | Camden | 3 | 3 | $43,417.88 | $0.00 | $43,417.88 | $7,236.31 | 6 |
| Ouachita County | Ouachita County | 7 | 3 | $262,989.00 | $72,240.04 | $335,229.04 | $20,951.82 | 16 |
| Perry County | Perry County | 4 | 1 | $249,092.26 | $0.00 | $249,092.26 | $24,909.23 | 10 |
| Perry County | Perry County* | 2 | 0 | $199,911.82 | $0.00 | $199,911.82 | $33,318.64 | 6 |
| Phillips County | Helena-West Helena | 30 | 1 | $665,437.17 | $511,497.59 | $1,176,934.76 | $11,426.55 | 103 |
| Phillips County | Helena-West Helena* | 7 | 0 | $303,706.64 | $392,359.06 | $696,065.70 | $18,317.52 | 38 |
| Phillips County | Phillips County | 9 | 3 | $722,307.66 | $223,745.92 | $946,053.58 | $31,535.12 | 30 |
| Phillips County | Phillips County* | 2 | 0 | $197,907.45 | $108,748.55 | $306,656.00 | $25,554.67 | 12 |
| Phillips County | West Helena | 6 | 1 | $275,449.87 | $80,049.75 | $355,499.62 | $10,455.87 | 34 |
| Phillips County | West Helena* | 3 | 0 | $237,973.35 | $69,049.38 | $307,022.73 | $11,808.57 | 26 |
| Poinsett County | Harrisburg | 1 | 2 | $10,898.56 | $4,986.68 | $15,885.24 | $7,942.62 | 2 |
| Poinsett County | Lepanto | 1 | 1 | $8,775.76 | $0.00 | $8,775.76 | $4,387.88 | 2 |
| Poinsett County | Marked Tree | 2 | 1 | $55,063.66 | $16,176.25 | $71,239.91 | $14,247.98 | 5 |
| Poinsett County | Poinsett County | 2 | 2 | $89,151.93 | $24,502.65 | $113,654.58 | $18,942.43 | 6 |
| Poinsett County | Poinsett County* | 1 | 1 | $54,193.90 | $12,727.83 | $66,921.73 | $16,730.43 | 4 |
| Poinsett County | Trumann | 4 | 2 | $859,947.42 | $9,912.48 | $869,859.90 | $79,078.17 | 11 |
| Poinsett County | Tyronza | 1 | 1 | $16,298.94 | $1,345.00 | $17,643.94 | $5,881.31 | 3 |
| Polk County | Mena | 2 | 2 | $74,083.46 | $3,683.10 | $77,766.56 | $8,640.73 | 9 |
| Polk County | Mena* | 1 | 1 | $46,875.21 | $0.00 | $46,875.21 | $7,812.54 | 6 |
| Pope County | Russellville | 7 | 1 | $188,754.58 | $122,781.83 | $311,536.41 | $19,471.03 | 16 |
| Pope County | Russellville* | 1 | 0 | $46,272.55 | $66,622.28 | $112,894.83 | $28,223.71 | 4 |
| Prairie County | De Valls Bluff | 2 | 19 | $85,103.70 | $1,300.00 | $86,403.70 | $21,600.93 | 4 |
| Prairie County | Nimmons | 1 | 3 | $20,893.11 | $0.00 | $20,893.11 | $10,446.56 | 2 |
| Prairie County | Prairie County | 9 | 1 | $564,127.95 | $23,149.17 | $587,277.12 | $32,626.51 | 18 |
| Prairie County | Prairie County* | 1 | 0 | $104,400.00 | $0.00 | $104,400.00 | $52,200.00 | 2 |
| Pulaski County | Jacksonville | 12 | 3 | $507,314.36 | $85,426.46 | $592,740.82 | $20,439.34 | 29 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pulaski County | Little Rock | 65 | 19 | $5,126,407.65 | $2,638,648.03 | $7,765,055.68 | $35,783.67 | 217 |
| Pulaski County | Little Rock* | 9 | 2 | $1,398,549.94 | $1,529,874.52 | $2,928,424.46 | $62,306.90 | 47 |
| Pulaski County | North Little Rock | 18 | 11 | $1,640,774.58 | $82,172.51 | $1,722,947.09 | $39,157.89 | 44 |
| Pulaski County | North Little Rock* | 2 | 1 | $185,295.11 | $29,676.28 | $214,971.39 | $35,828.57 | 6 |
| Pulaski County | Pulaski County | 37 | 17 | $2,719,477.57 | $386,029.71 | $3,105,507.28 | $34,505.64 | 90 |
| Pulaski County | Pulaski County* | 3 | 1 | $667,574.31 | $106,482.91 | $774,057.22 | $48,378.58 | 16 |
| Pulaski County | Sherwood | 30 | 19 | $1,500,783.18 | $58,906.87 | $1,559,690.05 | $17,927.47 | 87 |
| Pulaski County | Sherwood* | 5 | 4 | $371,010.83 | $27,456.01 | $398,466.84 | $15,325.65 | 26 |
| Randolph County | Pocahontas | 15 | 10 | $1,075,496.74 | $24,860.17 | $1,100,356.91 | $26,837.97 | 41 |
| Randolph County | Pocahontas* | 4 | 1 | $482,055.57 | $14,117.56 | $496,173.13 | $27,565.17 | 18 |
| Randolph County | Randolph County | 29 | 9 | $2,669,689.75 | $400,423.54 | $3,070,113.29 | $43,241.03 | 71 |
| Randolph County | Randolph County* | 7 | 1 | $799,801.93 | $154,693.16 | $954,495.09 | $41,499.79 | 23 |
| Saline County | Benton | 7 | 3 | $1,807,398.25 | $1,117,744.18 | $2,925,142.43 | $100,866.98 | 29 |
| Saline County | Benton* | 4 | 1 | $998,994.86 | $1,117,744.18 | $2,116,739.04 | $96,215.41 | 22 |
| Saline County | Bryant | 6 | 2 | $240,905.94 | $66,924.77 | $307,830.71 | $21,987.91 | 14 |
| Saline County | Bryant* | 1 | 0 | $91,967.65 | $59,770.08 | $151,737.73 | $37,934.43 | 4 |
| Saline County | Saline County | 8 | 1 | $183,915.50 | $40,227.67 | $224,143.17 | $11,207.16 | 20 |
| Saline County | Shannon Hills | 14 | 3 | $499,743.83 | $101,755.47 | $601,499.30 | $14,670.71 | 41 |
| Saline County | Shannon Hills* | 2 | 0 | $160,793.36 | $66,582.54 | $227,375.90 | $20,670.54 | 11 |
| Scott County | Waldron | 2 | 1 | $820,531.32 | $173,262.69 | $993,794.01 | $165,632.34 | 6 |
| Sebastian County | Fort Smith* | 10 | 3 | $3,169,847.44 | $344,483.59 | $3,514,331.03 | $68,908.45 | 51 |
| Sebastian County | Fort Smith | 35 | 6 | $4,312,489.39 | $535,416.95 | $4,847,906.34 | $43,284.88 | 112 |
| Sebastian County | Greenwood | 3 | 1 | $95,637.00 | $18,091.69 | $113,728.69 | $14,216.09 | 8 |
| Sebastian County | Lavaca | 1 | 1 | $241,957.59 | $0.00 | $241,957.59 | $120,978.80 | 2 |
| Sebastian County | Sebastian County | 1 | 9 | $148,938.10 | $12,874.38 | $161,812.48 | $80,906.24 | 2 |
| Sevier County | Sevier County | 2 | 1 | $23,142.55 | $9,391.07 | $32,533.62 | $8,133.41 | 4 |
| Sharp County | Cherokee Village | 1 | 1 | $25,415.20 | $12,551.64 | $37,966.84 | $18,983.42 | 2 |
| Sharp County | Hardy | 10 | 3 | $576,432.22 | $141,426.06 | $717,858.28 | $27,609.93 | 26 |
| Sharp County | Hardy* | 1 | 0 | $145,695.62 | $19,181.40 | $164,877.02 | $27,479.50 | 6 |
| Sharp County | Sharp County | 3 | 1 | $159,723.00 | $14,636.15 | $174,359.15 | $29,059.86 | 6 |
| Sharp County | Williford | 1 | 3 | $42,506.36 | $66,172.91 | $108,679.27 | $54,339.64 | 2 |
| Union County | Calion | 4 | 1 | $210,915.26 | $41,231.05 | $252,146.31 | $28,016.26 | 9 |
| Union County | El Dorado | 2 | 1 | $82,255.85 | $442.53 | $82,698.38 | $16,539.68 | 5 |
| Union County | Felsenthal | 1 | 3 | $13,441.04 | $0.00 | $13,441.04 | $6,720.52 | 2 |
| Union County | Union County | 2 | 2 | $90,374.87 | $21,919.80 | $112,294.67 | $22,458.93 | 5 |
| Van Buren County | Van Buren County | 2 | 2 | $79,138.26 | $14,983.89 | $94,122.15 | $18,824.43 | 5 |
| Washington County | Elkins | 3 | 5 | $75,285.56 | $0.00 | $75,285.56 | $10,755.08 | 7 |
| Washington County | Farmington | 5 | 5 | $841,948.97 | $466.80 | $842,415.77 | $52,650.99 | 16 |
| Washington County | Farmington* | 1 | 0 | $65,703.15 | $0.00 | $65,703.15 | $16,425.79 | 4 |
| Washington County | Fayetteville | 27 | 11 | $2,260,342.10 | $36,822.20 | $2,297,164.30 | $34,805.52 | 66 |
| Washington County | Fayetteville* | 2 | 0 | $226,596.96 | $13,810.93 | $240,407.89 | $21,855.26 | 11 |
| Washington County | Goshen | 2 | 1 | $124,494.56 | $11,984.32 | $136,478.88 | $27,295.78 | 5 |
| Washington County | Greenland | 1 | 11 | $101,356.61 | $0.00 | $101,356.61 | $50,678.31 | 2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Washington County | Johnson | 5 | 1 | $1,008,598.93 | $97,327.47 | $1,105,926.40 | $100,538.76 | 11 |
| Washington County | Prairie Grove | 1 | 1 | $88,535.20 | $0.00 | $88,535.20 | $44,267.60 | 2 |
| Washington County | Tontitown | 1 | 3 | $86,668.41 | $0.00 | $86,668.41 | $43,334.21 | 2 |
| Washington County | Washington County | 7 | 5 | $907,259.70 | $271,634.02 | $1,178,893.72 | $62,047.04 | 19 |
| Washington County | Washington County* | 1 | 1 | $84,488.97 | $0.00 | $84,488.97 | $16,897.79 | 5 |
| Washington County | West Fork | 1 | 1 | $3,318.48 | $17,026.94 | $20,345.42 | $10,172.71 | 2 |
| White County | Judsonia | 2 | 1 | $80,462.82 | $8,300.00 | $88,762.82 | $22,190.71 | 4 |
| White County | White County | 11 | 3 | $882,401.33 | $49,679.41 | $932,080.74 | $37,283.23 | 25 |
| White County | White County* | 1 | 1 | $160,658.51 | $0.00 | $160,658.51 | $53,552.84 | 3 |
| White County | Bald Knob | 2 | 1 | $102,350.45 | $3,362.42 | $105,712.87 | $21,142.57 | 5 |
| White County | Beebe | 2 | 1 | $96,963.00 | $2,355.74 | $99,318.74 | $24,829.69 | 4 |
| Woodruff County | Augusta | 1 | 1 | $106,692.92 | $12,200.00 | $118,892.92 | $59,446.46 | 2 |
| Woodruff County | Mccrory | 5 | 3 | $213,853.21 | $29,909.40 | $243,762.61 | $20,313.55 | 12 |
| Woodruff County | Woodruff County | 9 | 6 | $571,735.54 | $51,279.34 | $623,014.88 | $27,087.60 | 23 |
| Woodruff County | Woodruff County* | 1 | 1 | $89,611.15 | $0.00 | $89,611.15 | $22,402.79 | 4 |
| Yell County | Ola | 1 | 1 | $7,128.97 | $870.00 | $7,998.97 | $3,999.49 | 2 |
| TOTAL | | 1,274 | 565 | $100,658,112.63 | $21,207,821.85 | $121,865,934.48 | | 3,980 |

Further refining the RLs we have the communities with SRLs. Actual losses include building and contents losses as recorded by FEMA. Priority Ranking, on table from highest to lowest, is based on the community with the greatest annualized losses and Number of SRL Properties.

## Severe Repetitive Loss Properties by Community (Data as of March 2023)

| County Name | Community Name | Total Payments | Average Payment | Losses | Properties |
|---|---|---|---|---|---|
| Sebastian County | Fort Smith | $3,514,331.03 | $68,908.45 | 6 | 10 |
| Pulaski County | Little Rock | $2,928,424.46 | $62,306.90 | 20 | 9 |
| Jefferson County | Jefferson County | $2,369,011.50 | $33,843.02 | 5 | 13 |
| Saline County | Benton | $2,116,739.04 | $96,215.41 | 7 | 4 |
| Craighead County | Jonesboro | $1,914,123.66 | $42,536.08 | 4 | 7 |
| Crittenden County | West Memphis | $1,890,335.21 | $26,254.66 | 45 | 13 |
| Benton County | Benton County | $1,338,616.91 | $51,485.27 | 72 | 7 |
| Jefferson County | Pine Bluff | $1,089,662.88 | $22,701.31 | 4 | 10 |
| Randolph County | Randolph County | $954,495.09 | $41,499.79 | 6 | 7 |
| Pulaski County | Pulaski County | $774,057.22 | $48,378.58 | 7 | 3 |
| Phillips County | Helena-West Helena | $696,065.70 | $18,317.52 | 5 | 7 |
| Jackson County | Jackson County | $690,335.65 | $24,654.84 | 13 | 5 |
| Chicot County | Chicot County | $535,482.91 | $26,774.15 | 7 | 4 |
| Baxter County | Norfork | $512,276.45 | $46,570.59 | 4 | 3 |
| Randolph County | Pocahontas | $496,173.13 | $27,565.17 | 17 | 4 |
| Fulton County | Fulton County | $445,553.61 | $34,273.35 | 3 | 3 |
| Izard County | Izard County | $401,592.42 | $57,370.35 | 28 | 2 |
| Bradley County | Bradley County | $400,897.58 | $40,089.76 | 4 | 2 |
| Pulaski County | Sherwood | $398,466.84 | $15,325.65 | 4 | 5 |
| Cleburne County | Cleburne County | $385,200.30 | $55,028.61 | 48 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Franklin County | Ozark | $361,823.06 | $30,151.92 | 4 | 1 |
| Faulkner County | Faulkner County | $351,953.66 | $70,390.73 | 7 | 1 |
| Phillips County | West Helena | $307,022.73 | $11,808.57 | 7 | 3 |
| Phillips County | Phillips County | $306,656.00 | $25,554.67 | 2 | 2 |
| Benton County | Decatur | $280,134.41 | $70,033.60 | 4 | 1 |
| Independence County | Batesville | $246,929.96 | $14,525.29 | 3 | 3 |
| Washington County | Fayetteville | $240,407.89 | $21,855.26 | 2 | 2 |
| Saline County | Shannon Hills | $227,375.90 | $20,670.54 | 6 | 2 |
| Mississippi County | Gosnell | $226,695.41 | $32,385.06 | 12 | 1 |
| Pulaski County | North Little Rock | $214,971.39 | $35,828.57 | 38 | 2 |
| Perry County | Perry County | $199,911.82 | $33,318.64 | 26 | 2 |
| Drew County | Drew County | $195,420.11 | $27,917.16 | 4 | 1 |
| Jackson County | Diaz | $183,578.79 | $45,894.70 | 6 | 1 |
| Faulkner County | Mayflower | $181,828.73 | $36,365.75 | 4 | 1 |
| Greene County | Greene County | $179,585.77 | $59,861.92 | 16 | 1 |
| Sharp County | Hardy | $164,877.02 | $27,479.50 | 47 | 1 |
| White County | White County | $160,658.51 | $53,552.84 | 6 | 1 |
| Saline County | Bryant | $151,737.73 | $37,934.43 | 18 | 1 |
| Clay County | Clay County | $139,791.33 | $46,597.11 | 22 | 1 |
| Monroe County | Monroe County | $138,050.82 | $69,025.41 | 5 | 1 |
| Lincoln County | Gould | $137,097.96 | $34,274.49 | 4 | 1 |
| Ouachita County | Ouachita County | $134,101.42 | $44,700.47 | 11 | 1 |
| Independence County | Independence County | $117,876.79 | $29,469.20 | 26 | 1 |
| Pope County | Russellville | $112,894.83 | $28,223.71 | 11 | 1 |
| Prairie County | Prairie County | $104,400.00 | $52,200.00 | 4 | 1 |
| Jackson County | Grubbs | $99,244.36 | $24,811.09 | 4 | 1 |
| Cross County | Wynne | $94,650.99 | $23,662.75 | 6 | 1 |
| Woodruff County | Woodruff County | $89,611.15 | $22,402.79 | 12 | 1 |
| Conway County | Morrilton | $89,204.17 | $12,743.45 | 9 | 1 |
| Washington County | Washington County | $84,488.97 | $16,897.79 | 4 | 1 |
| Desha County | Mcgehee | $83,544.02 | $13,924.00 | 26 | 1 |
| Faulkner County | Conway | $81,751.26 | $11,678.75 | 10 | 1 |
| Benton County | Rogers | $80,951.55 | $13,491.93 | 3 | 2 |
| Lawrence County | Lawrence County | $72,018.08 | $24,006.03 | 7 | 1 |
| Newton County | Jasper | $71,300.89 | $17,825.22 | 7 | 1 |
| Montgomery County | Montgomery County | $69,312.09 | $17,328.02 | 5 | 1 |
| Poinsett County | Poinsett County | $66,921.73 | $16,730.43 | 3 | 1 |
| Washington County | Farmington | $65,703.15 | $16,425.79 | 7 | 1 |
| Jefferson County | White Hall | $64,635.60 | $7,181.73 | 70 | 1 |
| Craighead County | Bono | $60,355.34 | $15,088.84 | 3 | 1 |
| Miller County | Texarkana | $53,646.44 | $7,663.78 | 2 | 1 |
| Lonoke County | Lonoke County | $52,205.11 | $26,102.56 | 4 | 1 |
| Arkansas County | Arkansas County | $49,654.29 | $12,413.57 | 2 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Chicot County | Lake Village | $48,338.52 | $9,667.70 | 23 | 1 |
| Polk County | Mena | $46,875.21 | $7,812.54 | 3 | 1 |
| Greene County | Paragould | $43,581.67 | $6,225.95 | 4 | 1 |
| Izard County | Calico Rock | $42,973.25 | $14,324.42 | 11 | 1 |
| Ouachita County | Camden | $13,279.37 | $6,639.69 | 51 | 1 |

Analysis of the communities with SRL properties having the greatest financial losses will be utilized to identify and prioritize areas for mitigation projects. HMA Grant Program Managers at ADEM and ADA NRD, will work closely with these twenty-six (26) SRL communities to determine the potential for project development.

**Non-Mitigated Repetitive Loss Properties in Arkansas (Data as of March 2023)**

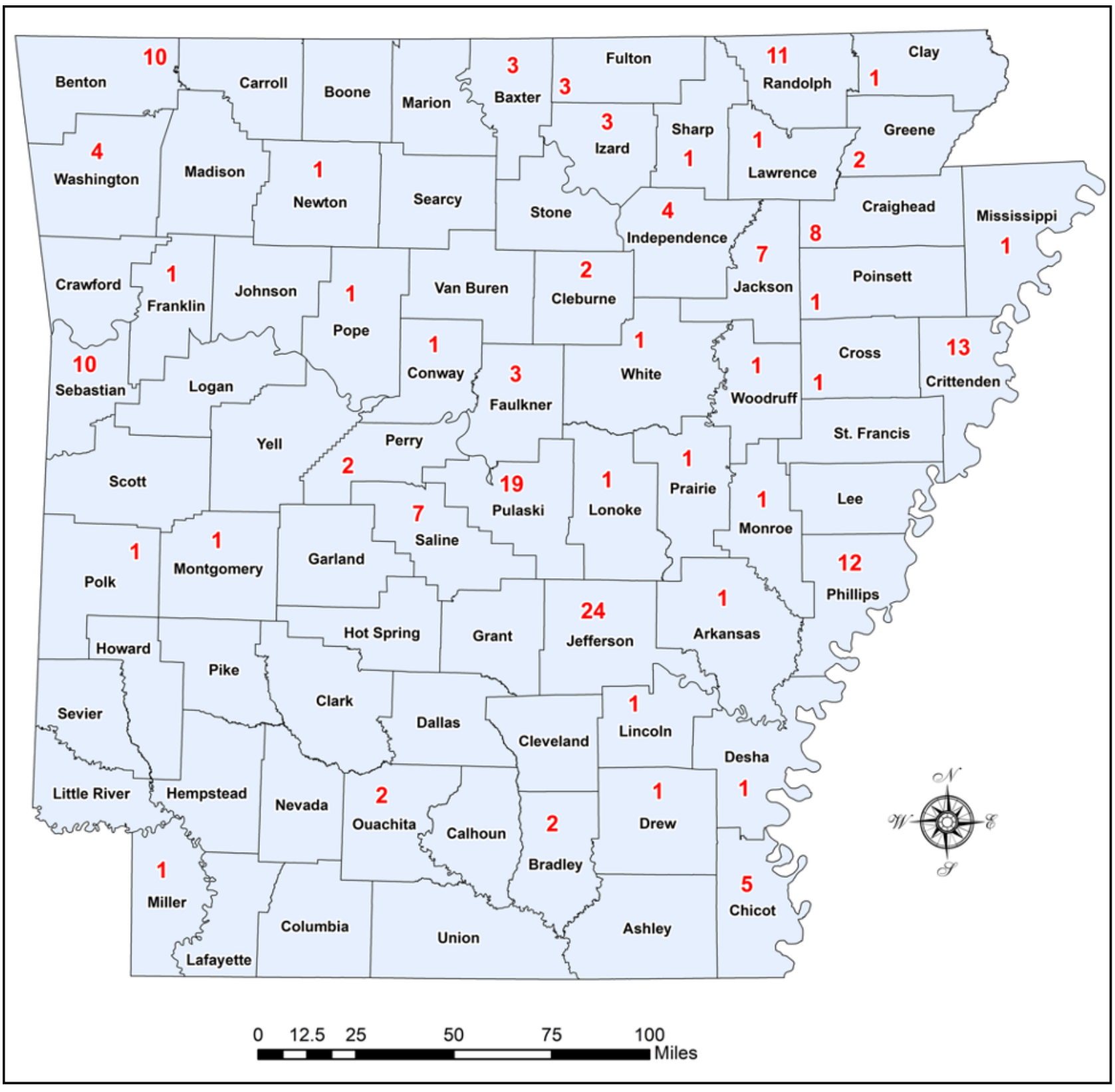


## Actions Taken to Reduce the Number of Repetitive Loss Properties

**Part 201.4(c)(3)(iii))** identify, evaluate, and prioritize cost-effective, environmentally sound, and technically feasible mitigation actions for repetitive loss properties.

In total there are 168 mitigated properties in the state funded from HMGP, FMA, Increased Cost of Compliance (NFIP policy holders), and the RFC program as well as some private funding. Forty-two out of the 75 total counties in Arkansas have mitigated at least one RL. Crittenden County has 13 mitigated RLs, the next highest number of mitigated RLs belongs to Jefferson County with 24. The remaining counties each have less than 19 mitigated RLs.

**Number of Mitigated Repetitive Loss Properties by County (Data as of March 2023)**




Through the Flood Mitigation Assistance (FMA) Program, the State of Arkansas has completed eight acquisition and demolition projects and has one elevation project ongoing.  A total of five acquisition and demolition continue through the Hazard Mitigation Grant Program (HMGP).

| FY Year/ Grant | County | Jurisdiction | Properties Mitigated | Project Type | Project Total | Status |
|---|---|---|---|---|---|---|
| 2017 FMA | Craighead | City of Jonesboro | 4 | Acquisition & Demolition | $403,325.09 | Grant Closed |
| 2017 FMA | Pulaski | City of Little Rock | 1 | Acquisition & Demolition | $123,505.59 | Grant Closed |
| 2017 FMA | Benton | Benton County | 3 | Acquisition & Demolition | $973,204.00 | Grant Ongoing |
| 2018 FMA | Jackson | City of Grubbs | 1 | Acquisition & Demolition | $155,019.20 | Grant Closed |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2019 FMA | Saline | City of Shannon Hills | 3 | Acquisition & Demolition | $407,229.69 | Grant Ongoing |
| 2019 FMA | Faulkner | Faulkner County | 3 | Acquisition & Demolition | $578,117.40 | Grant Ongoing |
| 2019 FMA | Jefferson | Jefferson County | 8 | Acquisition & Demolition | $878,129.18 | Grant Ongoing |
| 2019 FMA | Jefferson | Jefferson County | 5 | Elevation | $344,882.72 | Grant Ongoing |
| 2019 FMA | Perry | Perry County | 5 | Acquisition & Demolition | $577,494.06 | Grant Ongoing |
| DR-4441 | Perry | Perry County | - | Acquisition & Demolition | - | Application Phase |
| DR-4441 | Faulkner | Faulkner County | 1 | Acquisition & Demolition | $645,467.96 | Grant Ongoing |
| DR-4441 | Desha | Desha County | 2 | Acquisition & Demolition | - | Grant Ongoing |
| DR-4441 | Jefferson | Jefferson County | 6 | Acquisition & Demolition | $983,690.40 | Grant Ongoing |
| DR-4441 | Craighead | City of Jonesboro | 2 | Acquisition & Demolition | $135,353.76 | Pending Closeout |

**Part 201.4 (c)(4)(i)** A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.

Through inter-agency coordination the State has maintained its commitment to providing mitigation grant program funding to local jurisdictions for eligible planning activities through funding from HMGP, PDM, BRIC, and FMA programs. Technical assistance in plan development and update is provided by ADEM and FEMA Region VI, as well as ADA NRD providing direct assistance with the risk assessment sections on Dams and Flooding. ADA NRD has also included mitigation planning, HMA grants, and ICC mitigation into their annual floodplain accreditation training that is conducted, required by Act 754 of 2003, for all NFIP participating communities.

**Part 201.4 (c)(3)(iv)** Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.

The State will continue to utilize HMGP, PDM, and FMA grant funds to perform acquisitions and/or elevations of SRL and RL properties as well as work with communities to maximize the benefits available through Increased Cost of Compliance funds available through individual NFIP flood policies after flood events.

For BRIC FY2023 there are two projects are pending FEMA approval and award. these projects will mitigate multiple residential properties through acquisition and demolition. The State will continue to utilize HMGP, BRIC, and FMA grant funds to perform acquisitions and/or elevations of SRL and RL properties as well as work with communities to maximize the benefits available through Increased Cost of Compliance funds available through individual NFIP flood policies after flood events.

## HIGH HAZARD POTENTIAL DAM STRATEGY

### Mitigation Goals

NRD has developed strategies to reduce long-term vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public.  Minimal compliance and aging infrastructure are considered the most significant challenges with respect to ongoing operation of high hazard dams in Arkansas.  Thus, mitigation strategies have been prioritized based on regulatory imperative (i.e., compliance with Title 7 and Title 15) and concerns regarding ageing infrastructure.  The table below uses a strategy and action basis to provide pathway to meeting the mitigation goals.

### Local Mitigation Capabilities

Partnership with local stakeholders provides many opportunities to address the concerns regarding minimal compliance and aging infrastructure.  The capability of the local stakeholders to address high hazard potential dams that pose an unacceptable risk to the

public, however, is limited in part by lack of data, ineffective or non-extent partnership with HH dam owners, inaccurate or incomplete understanding of State and dam owner roles.  To this end, NRD has incorporated four goals leveraging local partnership in the HHPD Mitigation Strategy:

- **Goal 2:** Require all High Hazard dams to conduct at least one tabletop exercise per year and one test drill every three years. Tabletop exercises and test drills require the participation of local emergency managers and jurisdictions.  These provide a hands-on opportunity for local jurisdiction sand emergency managers to interface with HH dam owners and operators.
- **Goal 6:** Improve HH dam information including databases and maps.  Updated information may be shared with local governments and emergency managers to facilitate consideration in local mitigation plans.

| High Hazard Dam Hazard Mitigation Initiatives | | | | | | |
|---|---|---|---|---|---|---|
| Priority | Strategy | Action | Projected Timeline | Projected Resources | Rationale for Action | How Action Contributes to Mitigation Strategy |
| 1 | Require all High Hazard dams to have an updated EAP, created within the last 5 years. | ▪ Confirm status of current EAPs through email, postal, and telephone outreach.<br>▪ Provide all HH dam owners with EAP guidance.<br>▪ Include EAP development training in all dam owner workshops. | Ongoing | NDSP | To ensure that all HH dam stakeholders are aware of potential emergency conditions and have developed preplanned actions to be followed to minimize property damage and loss of life. | The purpose of an EAP is to protect lives and reduce property damage.  Planning in advance helps ensure that all stakeholders know what to do when an emergency occurs and that associated damages are minimized. |
| 2 | Require all High Hazard dams to conduct at least one tabletop exercise per year and one test drill every three years. | ▪ Confirm date of most recent tabletop exercise through email, postal, and telephone outreach.<br>▪ Provide all HH dam owners with tabletop guidance.<br>▪ Include tabletop guidance in all dam owner workshops. | Ongoing | NDSP | By State regulation, implementation of EAPs must include at least one tabletop exercise per year and one test drill every three years. | Tabletop exercises ensures that all stakeholders are aware of their responsibilities and prepared to execute the strategies outlined in the EAP. |
| 3 | Identify aging (50 years +) HH dams | Examine the vulnerability of dam infrastructure and develop strategies for ensuring dams are still adequately maintained to function safely. | Ongoing | NDSP, State resources | By cataloging ageing HH dams, State can begin development and implementation of strategies for minimizing the likelihood of future failures. | Identifying potential infrastructure weaknesses enables stakeholders to plan solutions before the failures occur, and to allocate resources proactively. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Develop framework for HH dam operation license renewal. | ■ Determine if and what changes may be required to applicable Arkansas Code.<br>■ Develop procedure for operational license renewal, including notification procedures, timelines for compliance, and regulatory requirements with respect to condition assessment and design criteria. | 2023 - 2025 | NDSP, State resources | Through this framework, the State will provide a regulatory strategy for ensuring the continued safe operation of older HH dams and identify those dams which may require rehabilitation or decommissioning. | Providing a strategy for license renewal preemptively addresses future potential failures and risks to the public. |
| 5 | Promote enforcement of State dam owner regulatory requirements. | ■ Provide all HH dam owners with copies of Title 7 and Tile 15.<br>■ Include review of relevant sections in all dam owner workshops.<br>■ Post copies of regulations on Dam Safety website.<br>■ Include relevant sections in all correspondence with HH dam owners. | Ongoing | NDSP, State resources | Title 7 and Title 15 clearly outline HH dam owner responsibilities, but many dam owners remain unaware of these requirements. | Conformance to minimum regulatory requirements ensures safer structures which, in turn, contribute to the safety of the public. |
| 6 | Improve HH dam information including databases and maps | Improve and maintain existing databases and mapping for HH dams. | Ongoing | NDSP, State resources | Current HH dam database does not fully reflect current field conditions or regulatory compliance for all HH dams. | Maintaining a verified centralized database will improve usefulness and effectiveness when communicating with dam owners, resulting in better dam management and mitigation initiatives. |
| 7 | Provide access to free dam owner training resources. | ■ Enhance Dam Safety website to provide downloadable technical and guidance materials.<br>■ Enhance Dam Safety website to provide access to ASDSO Dam Owners Academy portal. | Ongoing | NDSP, State resources, ASDSO | Increasing access to technical and guidance materials will enhance the ability of HH dam owners to maintain their structures and operate them in a safe manner. | Increasing access to guidance materials may reduce the likelihood of failure and loss of life or damage to the property of others. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Promote stakeholder participation with County-level emergency managers. | Send out annual listing of HH dams in each county to OEM Director. Listing will include locations, condition assessment, EAP status, and tabletop exercise status. | Ongoing | NDSP, State resources | Ensure that local OEM are aware of current conditions at HH dams in their jurisdiction. This will provide a clear pathway and incentive for OEM to actively participate as stakeholders. | Provision of data to OEM strengthens expands the number of stakeholders involved in prevention of failure and loss of life or damage to the property of others. |
| 9 | Improve public knowledge of HH dams, risks, and protective measures so individuals have a clear knowledge of risks and can respond appropriately respond during hazard events. | ▪ Conduct social media campaign to discuss risks associated with HH dams.<br>▪ Provide HH dam owners with educational materials that can be distributed to downstream residents. | Ongoing | NDSP, State resources | There is no standardized awareness program to make the public aware of potential hazards associated with HH dams. Additionally, many members of the public erroneously believe that the purpose of all HH dams is to REDUCE flood risk. | Educating the public about potential hazards and how to respond before, during, and after events will lead to effective planning for emergencies related to operational discharges or dam-related infrastructure failure. |

- **Goal 8:** Promote stakeholder participation with County-level emergency managers. Educating the public about potential hazards and how to respond before, during, and after events will lead to effective planning for emergencies related to operational discharges or dam-related infrastructure failure.
- **Goal 9:** Improve public knowledge of HH dams, risks, and protective measures so individuals have a clear knowledge of risks and can respond appropriately respond during hazard events. State will link its social outreach campaign with local government and OEM Facebook pages. State will also provide educational materials that can be distributed to downstream residents.

**Funding for High Hazard Dam Mitigation**

Implementation of the previously delineated mitigation goals will support identification and prioritization of HH dams that pose an unacceptable risk to the public. Priority funding opportunities will be given to:

1. HH dams at which a condition which renders a dam subject to rapid failure has been discovered and for which an Emergency Remedial Order describing actions which must be taken to protect life and property has been issued. Or,
2. HH dams rated in POOR or UNSATISFACTORY condition for five years or more. Note that dam owners unwilling to proceed with mitigation efforts – as demonstrated by failure to respond in a reasonable time to consent decree requirements – will not be considered for priority funding.

State-sponsored emergency funding will be used to address dams meeting the first condition (imminent failure). Use of these funds does not preclude the State from recovery of mitigation costs.

Priority funding for HH dams meeting the second condition will be considered for the Rehabilitation of High Hazard Potential Dam (HHPD) Grant program (see below). Additional funding sources to be considered include:

- **Low-cost loans from the Drinking Water State Revolving Fund program (NRD).** Funds are for water projects that further the goals of the Safe Drinking Water Act.
- Low-cost loan from the Clean Water State Revolving Fund program (NRD). Project must include nonpoint source pollution control.
- **Building Resilient Infrastructure and Communities (BRIC) program (ADEM).** The BRIC program accepts applications once a year, typically in the Fall. Funding availability and priorities are set each year by FEMA and Congress.
- **Hazard Mitigation Grant Program (HMGP), administered by ADEM**. The HMGP grant is available year-round, but funding availability is directly tied to declaration of a federal disaster.
- **The U.S. Army Corps of Engineers' Continuing Authorities Program (CAP).** Through the CAP, the Little Rock, Memphis, and Vicksburg Districts receive annual funding allocations., allowing Districts to plan, design, and implement water resource projects, on a smaller scale, without additional project specific congressional authorization. This is particularly useful for local governments and agencies that need help with anything from streambank protection to storm and flood damage reduction. This is a cost share program.
- **The Watershed Rehabilitation Program (REHAB) administered by NRCS.** (REHAB) helps project sponsors rehabilitate aging dams reaching the end of their design life and/or no longer meet federal or state safety criteria or performance standards. These rehabilitation efforts, authorized by Public Law 83-566 and 78-534, must address critical public health and safety concerns should a dam failure occur.

**Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program**

FEMA's Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program is a competitive pass-through program, providing funding to states in support of technical, planning, design, and construction assistance for activities that reduce dam risk and increase community preparedness. In FY2022, NRD received grant funding to rehabilitate eligible HHPDs that fail to meet minimum state dam safety standards and pose an unacceptable risk to life and property.

The Dam Safety Section conducted a risk assessment of its high hazard dam and identified two potential candidates for the program; one applicant was selected, the City of Little Rock. The subaward is in support of planning and design activities for rehabilitation of Broadmoor Lake Dam.

**High Hazard Dam Risk Assessment**

The high hazard dam risk assessment focused on qualitive review of condition assessment, potential failure mode, prior failures, and potential economic impacts associated with the dam failure. Additional consideration was given to significant impacts to low-to-moderate income populations and historically underrepresented populations.

Per HHPD program requirements, only state-regulated high hazard dams in poor or unsatisfactory condition could be considered for participation in the program. Only two dams in the state met these qualifications, thus NRD limited its risk assessment to Paris Dam (Logan County) and Broadmoor Lake Dam (Pulaski County).

| HIGH HAZARD DAM RISK ASSESSMENT | | |
|---|---|---|
| FACTOR | PARIS DAM | BROADMOOR LAKE DAM |
| Condition Assessment<br>(as of April 1, 2022) | Poor | Poor |
| Potential Failure Mode | **Seepage failure**, potentially due to extreme growth<br><br>**Hydraulic failure**, potentially due to toppling of mature tree growth on top of embankment and upstream and downstream slopes<br><br>**Structural failure** of an upstream or downstream slope, due to displacement of large trees implanted within the earth slope | **Seepage failure**, potentially due to animal burrows and/or extensive tree roots |
| Prior Failures | None noted | None noted |
| Potential Economic Impacts (associated with Probable Maxim Flood failure) | ▪ Loss of use of Paris Lake as drinking water reservoir<br>▪ Inundation of major roadway (Hwy 309/109)<br>▪ Damage and/or inundation of several bridges<br>▪ 79 structures flooded | ▪ Flooding of 51 structures including a shopping mall and university classroom buildings<br>▪ Inundation of major roadway (University Avenue) |
| Impacts to Low-to-Moderate Income Populations<br><br>(Determined based on 2020 CDC/ ATSDR Social Vulnerability Index, socioeconomic status) | Socioeconomic Status Score: **0.5962**<br><br>A score of 0.5962 indicates a **medium to high** level of vulnerability. | Socioeconomic Status Score: **0.822**<br><br>A score of 0.822 indicates a **high** level of vulnerability |
| Impacts to Historically Underrepresented Populations<br><br>Determined based on 2020 CDC/ ATSDR Racial & Ethnic Minority Status Index, socioeconomic status) | Racial & Ethnic Minority Status Score: **0.2227**<br><br>A score of 0.2227 indicates a low level of vulnerability | Racial & Ethnic Minority Status Score: **0.8046**<br><br>A score of 0.8046 indicates a high level of vulnerability |

*Provided as example by ANRC

The qualitative assessment was conducted by Dam Safety Section engineers and the State NFIP Coordinator. The dams were ranked equally at risk as failure of either dam would cause significant economic impacts and both dams exhibited potential for failure due to vegetative overgrowth and animal burrowing.

Both dams were originally awarded grants. However, the grant award for Paris Dam was rescinded as the sponsoring entity (Logan County) was unable to finalize its Hazard Mitigation Plan prior to December 31, 2022.

**High Hazard Dams**

All dams within the State of Arkansas - except those owned by the United States Government - meeting both of the criteria listed below are subject to oversight and regulation by the Arkansas Natural Resources Division. The criteria of relevance are as follows:
§ Dams with height at or above 25 feet.
§ Dams with normal storage at or more than 50 acre-feet.
Additionally, persons who believe themselves or their property to be endangered by failure of a dam which is below the size requirements specified above may file a petition requesting that ANRD require the dam to comply with State dam safety regulations.
Two regulated high hazard dams were identified by the State as potential applicants for the FY21 HHPD Program: Broadmoor Lake Dam and Paris Lake Dam. These dams were the only State regulated High Hazard dams assessed as being in POOR condition at the time of the FY21 HHPD NOFO release.
The State successfully obtained grant support for Broadmoor Lake Dam to pursue a planning project to identify strategies for rehabilitation of the structure. The State did not proceed with Paris Dam as a participant. Paris Dam is located in Logan County and at the time of the application, Logan County did not have an approved Hazard Mitigation Plan.

**DAM RISKS FROM HIGH HAZARD POTENTIAL DAMS (S6)**

**BROADMOOR LAKE DAM**

Broadmoor Lake Dam (State ID AR00130; NID ID: 00130) is a recreational facility located in the Broadmoor subdivision in Little Rock, Arkansas. Built in 1952, it is located immediately upstream of a shopping center and a university campus in a densely developed area. The 70-acre drainage area is mostly residential, while the downstream development is dominated by a mix of commercial and institutional land use.
The dam is 26 feet high and impounds 80 acre-feet. It is rated as a HIGH HAZARD facility and is currently in POOR condition. - Since its construction, the dam has been plagued with design flaws, seepage, and insufficient maintenance. An early protracted ownership dispute contributed to this situation.

**1978**
§ US Army Corps of Engineers: The US Army Corps of Engineers (USACOE) National Dam Safety Program Phase I Report. noted: "The absence of design computations to verify the adequacy of the structure is a matter of concern and is considered to be a project deficiency."

**Figure 1**




**Broadmoor Lake Dam Vicinity Map**

Furthermore, analysis indicated that the spillway failed to meet current design standards. Analysis of spillway capability and contributing drainage area indicated the project was capable of safely passing less than 25 percent of the Probable Maximum Flood (PMF). The target accommodation for the dam and spillway was 50 percent of the PMF.  Thus, the spillway and dam were deemed inadequate, requiring corrective measures.
§ City of Little Rock: The City of Little Rock recommended the Broadmoor Lake spillway be upgraded, and a drawdown structure constructed.
§ State of Arkansas: The State issued an Administrative Consent Decree, requesting the dam owners to submit a dam permit application.
1979-1999
§ Repairs and dam permit application delayed by ownership issues; ownership not established until Fall 1998.
2000 - 2001
§ The Broadmoor Lake Dam spillway is replaced with a labyrinth weir, addressing the historic spillway design flaw.
2001-Current
§ Broadmoor Lake Dam is plagued by ongoing seepage and leaks. Extensive vegetative growth and animal burrows continue to be observed. Maintenance of the embankment is complicated by extreme proximity to downstream development. Immediately downstream from the dam is a commercial strip mall. The University of Arkansas - Little Rock campus is also downstream, across the street from the commercial development. Additionally, downstream development continues to expand, placing more property and people at risk.

**STATEWIDE VULNERABILITIES**

The State has undertaken a high-level assessment of potential vulnerabilities to and from Broadmoor Lake Dam.  This assessment is based on historic documentation including State dam inspection reports and flood risk data developed through the Risk Map program as well as the following information provided in the 2018 Emergency Action Plan:
List of residents, businesses, and roadways at risk;
- Sunny Day and Probable Maximum Flood (PMF) Breach Inundation Maps;
- Sunny Day and PMF Maximum Depth Grids;
- Sunny Day and PMF Maximum Water Surface Elevation Grids; and
- Sunny Day and PMF Maximum Water Velocity Grids.

**Potential cascading impacts of natural disasters**

Precipitation events: Large precipitation events in the Broadmoor Lake Dam drainage area have the greatest impact on downstream development.  Broadmoor Lake discharges into Coleman Creek on the University of Arkansas - Little Rock Campus, approximately 2,200 feet downstream of the dam.  Coleman Creek is a designated floodway and during large precipitation events, the portion of the campus near the dam discharge point experiences significant flooding, at times inundating parking lots and entering campus buildings.

Seismic events: Broadmoor Lake Dam is in Seismic Zone 1 and thus considered at low risk of dam by seismic events.
Other natural events: Broadmoor Lake Dam is at low risk from landslides, wildfires, and other natural disasters.
Potential significant economic, environmental, and social impacts
A major flood caused by a sudden breach of Broadmoor Lake Dam is estimated to inundate or surround fifty-one structures and impact twelve roadways (see Tables 1 and 2).  The structures inundated include commercial establishments, university residential housing, and other university buildings.

**Table 1:**
**Residences, Businesses, and Educational Institutions**
**Potentially Impacted by Breach of Broadmoor Lake Dam**

| Residences, Businesses, and Educational Institutions | Address |
|---|---|
| University Village - UALR Campus | 2 Coleman Ct |
| New Millennium Church | 21 Lakeshore Dr |
| Phoenix Integrative Healthcare | 2800 S University Ave |
| UALR Donaghey College of Engineering and Information Technology | 2801 S University Ave |
| UALR Engineering Technology and Applied Sciences Building | 2801 S University Ave |
| UALR Ottenheimer Library | 280 I S University Ave |
| UALR Student Union | 280 I S University Ave |
| UALR Student Services | 2801 S University Ave |
| UALR Donaghey Student Center | 2801 S University Ave |

| | |
|---|---|
| UALR Stabler Hall | 2801 S University Ave |
| UALR Human Resources/Printing Services | 280 I S University Ave |
| UALR Applied Sciences Building | 2801 S University Ave |
| UALR Fribourgh Hall - Facilities Management | 2801 S University Ave |
| UALR Stella Boyle Smith Concert Hall (Fine Arts Building) | 2801 S University Ave |
| Shipley's Donut Shop | 2900 S University Ave |
| Broadmoor Shopping Center | 2902 S University Ave |
| Goodwill Store and Donation Center | 2904 S University Ave |
| Mary's Candles & Gifts (Broadmoor Shopping Center) | 2906 S University Ave |
| The Pipe & Tobacco Shop | 2908 S University Ave |
| Broadmoor Shopping Center | 2910 S University Ave |
| Pizza Hut | 2912 S University Ave |
| Steve's Specs for Less | 2920 S University Ave |
| Centennial Bank | 2922 S University Ave |
| Faith United Church | 3 Lakeshore Dr |
| Asian Mart | 3002 S University Ave |
| Computer XPe1tz | 3004 S University Ave |
| Boost Mobile | 3010 S University Ave |
| The Jewelers Bench | 3012 S University Ave |
| Town & Country Barber & Style | 3014 S University Ave |
| Rodgers Shoe Services | 3016 S University Ave |
| Old Rugged Cross Holiness Church | 3100 S University Ave |
| Rent A Wheel | 3124 S University Ave |
| Good Old Days Foods, Inc, | 3300 S Polk St |
| Great American Auto LLC | 4501 S University Ave |
| Elrod's Import Service | 4700 Mabelvale Pike |
| Fairview Baptist Church | 5423 W 35th St |
| Mike's Cafe | 5501 Asher Ave |
| West Auto Plus | 5504 W 33rd St |
| UALR Parking Deck | 5515 W32nd Street |
| Chrome City Custom Wheels LLC | 5601 Asher Ave |
| MetroBCM | 5605 W 32nd St |
| Quik Lube & Oil Change Center | 5620 Asher Ave |
| UALR Chapter Kappa Sigma | 5721 W 32nd St |
| UALR Warehouse | 5800 Asher Ave |

**Table 2:**
**Roadways Potentially Impacted by Breach of Broadmoor Lake Dam**

| | |
|---|---|
| South University Avenue | Coleman Place |
| Lakeshore Drive | South Taylor Street |
| Campus Drive East | West 33rd Street |
| Campus Drive West | Mabelvale Pike |
| West 32nd Street | Asher Avenue / US Highway 67/70 |
| University Drive | South University Avenue / US Highway 67/70 |

Review of the 2020 CDC/ATSDR Social Vulnerability Index Socioeconomic Status Score (0.822) indicates commercial businesses downstream of the dam primarily serve a low to moderate income community. Thus, although a breach of the dam would have little impact on low-to-moderate income housing, access to commercial services and businesses for members of the surrounding community would be greatly impacted by failure of Broadmoor Lake Dam.
Further, the 2020 CDC/ATSDR Racial & Ethnic Minority Status Index Racial & Ethnic Minority Status Score (0.8046) indicates a similar impact to members of Historically Underrepresented Populations.

**Population at risk**

A formal analysis of Population at Risk (PARs) has not been conducted for Broadmoor Lake Dam. The PARs determination is complicated by the predominately commercial and institutional nature of the downstream development. A worst-case scenario can be extrapolated using the 2021 UALR total undergraduate enrollment of 6,357 students. Assuming 30% of the students are located within the inundation area and each of the 26 businesses and places of worship is occupied by 5 people (staff and customers), the worst-case PARs is 2,037.

**LOCAL MITIGATION POLICIES, PROGRAMS, AND CAPABILITIES (S13)**

**EXISTING POLICIES**
Per Arkansas Natural Resources Commission Rules Governing Design and Operation of Dams (Title 7), Subtitle 10, owners of State regulated High Hazard Dams are required to prepare an Emergency Action Plans (EAPs). Implementation of EAPs must include at least one tabletop exercise per year and one test drill every three years.

Tabletop exercises and test drills are typically conducted in partnership with local emergency management, first responders, and significant downstream stakeholders.

State regulations also provide for enforcement of mitigation actions. Upon discovery of a deficiency, which does not immediately threaten the dam's safety, the State will specify actions necessary to remedy the problem. Based on mutual agreement with the dam owner, a consent order will be issued outlining required actions and timetable.
In the event remedial measures for non-emergency deficiencies cannot be accomplished through the means of consent orders, a public hearing will be held. After review of findings of the public hearing, the State may issue orders compelling specified mitigation actions.

Upon discovery of a condition which renders a dam subject to rapid failure, the State may issue an Emergency Remedial Order describing actions which must be taken to protect life and property.

**Broadmoor Lake Dam Compliance**

As of May 2023, Broadmoor Lake Dam was not in full compliance with State regulations. The owners have failed to convene either a tabletop exercise or conduct a test drill within the past five years. The dam owners are working with the State and the Little Rock Office of Emergency Management to address these deficiencies as the HHPD effort is implemented.

**CHALLENGES TO IMPLEMENTATION**

Currently, reduction of vulnerabilities to and from High Hazard dams is solely the responsibility of the dam owners as outlined in their operation permit and enforced by the State. There are no regulatory requirements or policies in place at the local level.
To address this challenge, the State has implemented an enhanced training and outreach effort for High Hazard dam owners. This includes:

- Deployment of an updated Dam Owners' Manual;
- Regional Dam Owner Workshops;
- Partnership with the Little Rock and Memphis District Army Corps of Engineers to support and implement tabletop exercises and test drills; and
- Quarterly newsletters focused on vulnerability reduction.

Another significant challenge is "hazard creep". Currently, there are no restrictions on either the State or local level prohibiting or limiting development downstream of dams. The State will convene a meeting of dam safety stakeholders to generate strategies to address this issue as well as the previously identified challenges.

# Section 7 - Coordination of Local Mitigation Planning



## 7.1 - INTRODUCTION

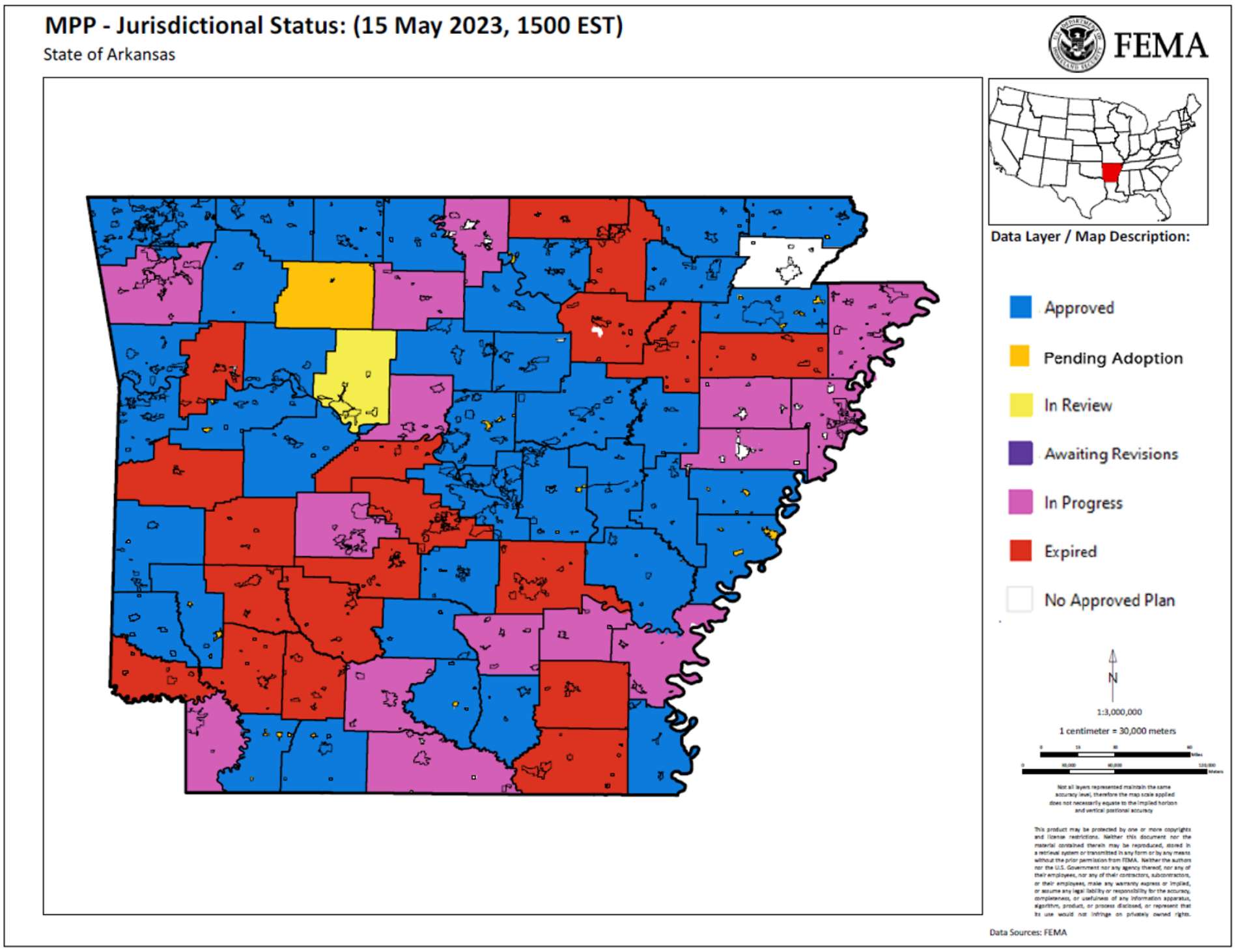
It is the goal of the State of Arkansas to provide all available assistance to local governments in developing and maintaining hazard mitigation plans. In having FEMA approved plans, local governments are available for the mitigation grant funding from HMGP, BRIC, and the SRL program.

## 7.2 - LOCAL PLAN STATUS

The State of Arkansas is actively working with all interested jurisdictions to ensure they have an approved, current hazard mitigation plan. To date:

- 40 jurisdictions had FEMA-approved hazard mitigation plans.
- 1 jurisdictions have plans under revision
- 34 jurisdictions have plans in progress
- 2  jurisdiction has an approved plan awaiting formal adoption
- 3 jurisdictions have expired plans

Using available hazard mitigation plans ADEM can effectively coordinate with local jurisdictions and assess how to most efficiently distribute project funding and technical assistance. The following table shows the status of local hazard mitigation plans.



| State of Arkansas Local Plan Status as of 2023 | |
|---|---|
| Arkansas County | Approved |
| Ashley County | In Progress |
| Baxter County | In Progress |
| Benton County | Approved |
| Boone County | Approved |
| Boone County Educational Co-Op | Pending Adoption |
| Bradley County | Approved |
| Bradley County | In Progress |
| Calhoun County | Approved |
| Carroll County | Approved |
| Carroll County Educational Cooperative | Approved |
| Chicot County | Approved |
| Clark County | In Progress |
| Clay County | Approved |
| Cleburne County | Approved |
| Cleveland County | In Progress |
| Columbia County | Approved |
| Conway County | In Progress |
| Craighead County | Approved |
| Crawford County | Approved |
| Crittenden County | In Progress |
| Dallas County | Approved |
| Desha County | In Progress |
| Drew County | In Progress |
| Faulkner County | Approved |
| Franklin County | In Progress |
| Fulton County | Expired |
| Garland County | In Progress |
| Grant County | Approved |
| Greene County | In Progress |
| Hot Spring County | In Progress |
| Howard County | Approved |
| Independence County | In Progress |
| Izard County | Approved |
| Jackson County | In Progress |
| Jefferson County | In Progress |
| Johnson County | Approved |
| Lafayette County | Approved |
| Lafayette County | In Progress |
| Lawrence County | Approved |
| Lee County | Approved |
| Lincoln County | In Progress |
| Little River County | In Progress |
| Logan County | Pending Adoption |
| Lonoke County | Approved |
| Madison and Newton County | Approved |
| Mammoth Spring | Approved |
| Marion County | Approved |
| Miller County | In Progress |
| Mississippi County | In Progress |
| Montgomery County | In Progress |

| | |
|---|---|
| Mountain View | Approved |
| Nevada County | In Progress |
| Ouachita County | In Review at FEMA |
| Perry County | In Progress |
| Phillips County | Approved |
| Pike County | In Progress |
| Poinsett County | Expired |
| Polk County | Approved |
| Pope County | In Progress |
| Prairie and Monroe County | Approved |
| Pulaski County | Approved |
| Randolph County | Approved |
| Salem | In Progress |
| Saline County | In Progress |
| Scott County | In Progress |
| Searcy County | In Progress |
| Searcy County Educational Co-Op | Expired |
| Sebastian County | Approved |
| Sevier County | Approved |
| Sharp County | In Progress |
| St. Francis County & Cross County | In Progress |
| Stone County | Approved |
| Union County | In Progress |
| Van Buren County | Approved |
| Washington County | In Progress |
| White County | Approved |
| Woodruff County | Approved |
| Yell County | Approved |

## 7.3 - LOCAL MITIGATION FUNDING

44 CFR 201.4 (c)(4)(i) A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.

Many local jurisdictions lack the resources and time to be able to update and maintain a hazard mitigation plan on their own, so they utilize contractors. Most do not have the funding to hire the contractors, so they rely on grant funding. Since planning funds are limited some plans may lapse while waiting for a grant. ADEM tries to prevent this by notifying jurisdictions with upcoming expirations about grant funds that are available to apply for. The planning and development districts across the state also promote the importance of mitigation planning and encourage jurisdictions to have and maintain plans.

The three main grant-funding sources for hazard mitigation planning are the HMGP, BRIC, and the FMA program. The FMA program can fund the flood related portion of the mitigation plan. For planning projects, these grants usually have a federal cost share of 75% and the local jurisdiction is responsible for the remaining 25%.

Under the HMGP, BRIC, and FMA programs, mitigation planning grants are considered the highest priority. The table above demonstrates that most of local mitigation plans are funded by mitigation grants administered by ADEM and ANRC.

Another barrier faced when developing local mitigation plans and or grants is lack of interest or lack of matching funds. Communities that have no interest in applying for grant projects do not see the need to have a plan.

## 7.4 – AVAILABLE TECHNICAL ASSISTANCE

44 CFR 201.4 (c)(4)(ii) A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.

In light of the number of disasters and the significant amount of HMGP funding received, ADEM has placed a renewed emphasis on the completion and adoption of FEMA-approved plans for all Arkansas counties by the time of the next state plan update. Many jurisdictions within the state require assistance in developing and maintaining hazard mitigation plans. As funding for planning purposes is generally minimal, and ADEM is unable to provide planning funds to every jurisdiction, technical assistance is the primary method used to provide planning assistance. ADEM has been actively supporting local jurisdictions and contractors by providing various forms of training and outreach on a regular basis. This available assistance includes:

- Planning workshops
- Trainings
- Planning consultation via phone and email
- On-site visits

In addition, as part of this proactive assistance, ADEM consults with jurisdictions and contractors when they are preparing to submit planning and project grant applications to the state and FEMA. This helps to ensure that the applicant understand the requirements for the grant program they are requesting funding from and that the application contains all necessary information. These proactive reviews have reduced problems and have gained a higher success rate for grant awards for applications.

The state is also working to remove other barriers for grants as well as the planning process. The state continues to look for local partners such as State Universities and the eight Regional Planning and Development Districts as well as other state agencies.

## 7.5 – REVIEW AND APPROVAL OF LOCAL HAZARD MITIGATION PLANS

44 CFR 201.4 (c)(4)(ii) A description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.

When a plan is submitted to ADEM for review, it is first logged in to a spreadsheet with the date received and assigned a reviewer. Any subsequent information regarding the plan will also be entered on the spreadsheet until the plan reaches final FEMA approval.

The plans are reviewed in the order in which they are received. When possible, ADEM will review plans within 30 days of their submission. If revisions are necessary, the period for resubmittal will vary depending on the request for information. ADEM will then submit the plan electronically to FEMA Region 6 where it should be reviewed within 45 days whenever possible.

If revisions are needed, FEMA will notify ADEM and ADEM will notify the jurisdiction within five business days. Depending on the request for information will determine how long the jurisdiction takes to resubmit to ADEM. Once the revised plan is submitted to ADEM, it will be logged in to the spreadsheet again and reviewed in the order that it was received. Whenever possible the plan will be reviewed with 30 days then submitted to FEMA via disc for review where it could take up to 45 days.

If the plan is deemed acceptable, FEMA will notify ADEM that the plan has reached approvable pending adoption (APA) status. ADEM will mail the jurisdiction a copy of the FEMA APA letter, ADEM APA letter, and FEMA Review Tool within five business days whenever possible. The jurisdiction then has 90 days to obtain resolutions from the participating jurisdictions.

Then the final plan with resolutions is submitted to ADEM. ADEM then submits the final mitigation plan to FEMA R6 within five business days. FEMA then issues a final approval letter that is sent to ADEM. ADEM then prepares a final state letter and issues it along with the final FEMA approval letter and Review Tool to the jurisdiction.

## 7.6 – PRIORITIZING LOCAL ASSISTANCE FOR MITIGATION PLANNING

44 CFR 201.4 (c)(4)(iii) Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.

In general, federal and state funding for mitigation planning is limited and often competitive. When reviewing initial requests for assistance with mitigation planning, ADEM considers:

- Availability of funds
- A demonstrated desire and capability to complete the planning process
- The jurisdiction can complete proposed mitigation projects
- Expiration date of current plan, if applicable

When funding becomes available for the HMGP, BRIC, and FMA programs, ADEM and the ANRC first have a notice of intent (NOI) period. NOIs are received for a limited amount of time then graded on various criteria to determine which ones will be selected to develop planning applications.

ADEM considerations for planning projects include the following:

| ADEM Local Mitigation Planning Assistance Request Ranking Criteria | | |
|---|---|---|
| **Ranking Criteria** | **Awarded Points** | |
| Is this project for a mitigation plan development or update? | Update: 0 | Development: 5 |
| Current plan explanation? | < 6 months: 0 | > 6 months: 10 |
| Did the county receive a federal disaster declaration? | No: 0 | Yes: 10 |
| Will the Plan be multi-jurisdictional or single? | Single: 0 | Multi: 5 |
| Has an NOI been submitted under previous grants that went unfunded? | No: 0 | Yes: 5 |
| Is the jurisdiction a participant in CRS? | No: 0 | Yes: 1 |
| Is the jurisdiction a Fire Wise Community? | No: 0 | Yes: 1 |
| Is the jurisdiction a Storm-Ready Community? | No: 0 | Yes: 1 |
| Is the jurisdiction a member of the NFIP? | No: 0 | Yes: 1 |
| Has the jurisdiction participated in training directly related to hazard mitigation? | No: 0 | Yes: 1 |

## 7.7 – PRIORITIZING LOCAL ASSISTANCE FOR MITIGATION PROJECTS

44 CFR 201.4 (c)(4)(iii) Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.

The State of Arkansas prioritizes projects based upon the greatest opportunity for loss reduction. In 2005, the National Institute of Building Sciences (NIBS) calculated that for every $1 spent on mitigation, $4 is saved in future disaster losses ($5 for flood disaster losses). An updated 2018 study increased the overall hazard benefit-cost ratio to 6:1 for federally funded projects. Specifically, for every $1 spent on flood mitigation, $7 is saved in future losses. For wind mitigation such as community safe rooms, $5 is saved for every $1 spent. Over time, the return on investment for long-term mitigation measures will continue to increase.

Under the FMA and BRIC grants, ADEM and the ANRC take in to consideration the priorities outlined in the FEMA Notice of Funding Opportunity when selecting project applications. When funding comes from the HMGP (post-disaster funding), priority is given to mitigation projects which are related to the hazard that necessitated the disaster declaration and those jurisdictions included in the disaster declaration. Flooding and severe storms are the most prevalent hazards in Arkansas, so prioritizing these types of projects aligns with the NIBS study above. If there are not enough eligible projects to use these criteria, ADEM will default to the following priorities:

1. Mitigation planning activities
2. Structural flood control measures
3. Acquisition/relocation of severe repetitive loss properties
    1. Acquisition/relocation of repetitive loss properties
    2. Acquisition/relocation of properties located in floodplain
        - *Priority of acquisition projects will be as follows:
            1. Primary Residence
            2. Secondary/Rental Property
            3. Commercial Property
4. Retrofitting, such as wet and dry floodproofing.
5. Support all activities related to NFIP

6. Community Safe Rooms
7. Structural retrofit of public critical facilities to resist high wind and seismic effects.
8. Non-structural retrofit for seismic effects.
    1. 5% projects such as: window film, Gas Shutoff valves, and NOAA weather radios.
9. Wildland fire suppression measures.
10. Promote mitigation in public information campaigns and public education activities.
11. GIS/spatial data related activities to support mitigation.
12. Mapping projects to assist in planning.
13. Promote legislation to include mitigation actions in all new construction.
14. Any cost-effective activity (structural or nonstructural), which supports the goals of the state and federal hazard mitigation plans.

To further rank projects, ADEM will prioritize projects that protect the most individuals and have the greatest opportunity for risk reduction. To document how specific activities reduce risk, ADEM will determine if the jurisdiction suffered damages from the disaster, if the proposed project has a direct correlation to the disaster, and use the NIBS study to calculate projected benefits.

Other ranking criteria considerations are listed below:

- Participant in a FEMA-Approved Mitigation Plan
- Project is in the Mitigation Plan
- Does the project cost exceed the funding available
- Mitigation Plan Expiration date
- Has the NOI been submitted under previous grants that went unfunded
- How many individuals will the project protect
- Has the jurisdiction received FEMA funding for previous mitigation projects
- Did the county receive a federal declaration due to the disaster
- Has the jurisdiction participated in training directly related to hazard mitigation
- Is the jurisdiction a Fire Wise Community
- Is the jurisdiction a Storm-Ready Community
- Is the jurisdiction a member of the NFIP (mandatory for flood related projects)
- Does the jurisdiction participate in the CRS

Once projects are selected for funding, they are required to submit a benefit cost analysis (BCA). Benefit-Cost Analysis is the method by which the future benefits of a hazard mitigation project are determined compared to its costs. The end result is a Benefit-Cost Ratio (BCR), which is calculated by a project's total benefits divided by its total costs. The BCR is a numerical expression of the "cost-effectiveness" of a project. A project is considered cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs. FEMA requires a BCA to validate cost effectiveness of proposed hazard mitigation projects prior to funding.  The benefits calculated by the BCA also document how risk is reduced.

Primary funding for local hazard mitigation projects comes from the FMA program, HMGP and PDM, which generally require a local funding match. As state general revenue is no longer available, future matching funds will have to come primarily from local sources, including local revenue or in-kind donations.  In addition, the State intends to increase the utilization of the RL Flood Claims and SRL programs for repetitive-loss mitigation in upcoming years.

## 7.8 - LOCAL/STATE PLAN UTILIZATION AND INTEGRATION

Data from State Universities and Planning and Development Districts was incorporated into the state hazard mitigation plan. ADEM contacted various state universities and local planning and development districts to get data for integration purposes. A comprehensive review was conducted of all currently available local data to integrate the various aspects for risk assessments into the state's analysis. Local and state dat for the vulnerability assessment was carefully reviewed and analyzed to compile a loss estimate.  Integrating state and local planning/ data efforts is a collaborative effort between all levels of government working toward the shared goal of reducing the potential impacts of disasters in Arkansas.  By integrating elements from local research and data into the state hazard mitigation plan, and vice versa, each planning effort is stronger, more comprehensive, and provides a better all-inclusive view of the hazards and capabilities of the state.

Collected data was then translated into the unified model. It was necessary to translate the local plans into a unified model due to the high variability in methodologies used across the state. The result of this assessment is more of a total picture of how local jurisdictions perceive threat than an actionable risk assessment. Planners at the local level are limited in scope by analyzing hazard risk to their sole jurisdiction without comparison. This limit creates an effect where, without comprehensive hazard data and unified methodologies, local planners may have a skewed perception of their hazard risks. What one emergency manager perceives as catastrophic could be a seasonal impact for another. With such varying analyses, county by county, we must view this aggregation of local plans as a supplement to the state's risk assessment and not a comprehensive assessment itself.

For this plan revision, each of the above referenced local hazard mitigation plans was reviewed for the following elements, with data incorporated into the state plan:

- Mitigation goals and objectives
- Prioritized hazards
- Risk assessment
- Jurisdictional capabilities
- Mitigation actions

Information from local jurisdictional mitigation plans will be integrated into future state plan updates every five years by using the same process that was utilized in this plan update. All approved current local mitigation plans will be examined to gather data regarding risk assessments, vulnerability, capabilities, actions, etc. The state plan will then be updated to reflect this information.

The State of Arkansas will also make all data from the state hazard mitigation plan available to all local jurisdictions for review and inclusion in their planning efforts.

## 7.9 – SMALL AND IMPOVERISHED COMMUNITIES

Part 201.4(c)(2) Risk assessments that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments.

As defined in 44 CFR 201.2, a small and impoverished community is:

- A community of 3,000 or fewer individuals that is identified by the State as a rural community
- Is not a remote area within the corporate boundaries of a larger city
- Is economically disadvantaged, by having an average per capita annual income of residents not exceeding 80 percent of national, per capita income
- The local unemployment rate exceeds by one percentage point or more, the most recently reported, average yearly national unemployment rate
- Any other factors identified in the State Plan in which the community is located

FEMA regional administrators may waive requirements for small and impoverished communities related to HMGP project funds. In addition, small and impoverished communities that receive grants from the BRIC program may receive a federal cost share of up to 90 percent of the total amount approved under the grant award.

# Section 8 - Plan Maintenance Process



## 8.1 – HAZARD MITIGATION PLAN MONITORING AND EVALUATION

44 CFR 201.4 (c)(5) A plan maintenance process that includes: (i) An established method and schedule for monitoring, evaluating, and updating the plan.

The State of Arkansas Hazard Mitigation Plan will be updated then approved by FEMA every five years. During the five-year cycle, the plan will undergo continuous monitoring and evaluation to ensure that the policies, procedures, priorities, and state environment established in the plan reflect current conditions.

To achieve this, the MPC will meet at a minimum of annually in the first two years after plan approval. If needed, more meetings will take place during this timeframe. The ADEM SHMO will determine the meeting dates and location and is responsible for sending invitations.

In order to monitor the implementation of the plan, team members will report on the following information:

- How the actions from the mitigation strategy are being pursued and completed
- Actions being prioritized
- How the plan goals and objectives are being carried out
- How mitigation funding mechanisms are being utilized
- How local jurisdictions are receiving technical assistance

In addition to these meetings, the Mitigation Branch at ADEM will monitor and evaluate the progress of mitigation projects via quarterly reports, site visits, correspondence, and reimbursements. Completed projects will be evaluated for loss avoidance and alignment with local development plans.

During the evaluation phase, the MPC is responsible for assessing the effectiveness of the plan by:

- Reviewing the hazards and determining if any of them have changed
- Determining if there are new hazards that pose a risk to the state
- Ensuring goals and objectives are still relevant
- Determining if any actions have been completed or are deemed irrelevant
- Determining if new actions should be added
- Determining if capabilities have changed

## 8.2 – PLAN UPDATES

44 CFR 201.4 (c)(5) A plan maintenance process that includes: (i) An established method and schedule for monitoring, evaluating, and updating the plan.

Information from the annual MPC meetings will be incorporated in to the plan update. Starting in calendar year 2024, the formal update process will begin. If necessary, ADEM will seek grant funding for a plan update. A thorough review and revision of the plan will take place, following all requirements detailed in 44 CFR 201.4, FEMA guidance documents, and the Disaster Mitigation Act of 2000. The following breakdown represents general guidelines for subsequent plan revisions.

- 2024 Spring Meeting: The MPC will begin updating the risk assessment portion of the plan. Hazards will be analyzed to determine if they are still relevant, if location should be updated, and if new hazards should be added. Previous occurrences will be reviewed to help determine the probability of future events.
- 2024 Fall Meeting: The MPC will begin updating the vulnerability assessment. The MPC will update the vulnerability assessment portion of the plan. Data will need to be gathered for state assets, critical facilities, building stock values, crop losses, jurisdictional damages, etc.
- 2025 Spring Meeting: The MPC will review information received from the 2022 and 2023 meetings and determine if the goals and objectives are still relevant and if new ones should be added. Actions will be reviewed and determined if they should remain in the plan, have been completed, or are no longer relevant. The MPC will review the potential funding sources for each action.
- 2025 Fall Meeting: The MPC will evaluate the policies, programs, capabilities, and funding sources from the previous plan to determine if they are still accurate and if any new items should be added. During this timeframe the ADEM Mitigation Branch will begin reviewing approved local mitigation plans and incorporating their programs and capabilities in to the plan.
- 2026 Spring Meeting: MPC will review the draft copy of the mitigation plan and make comments and updates if necessary. Before the draft is presented to the MPC, ADEM Mitigation will compile a list of grant recipients over the five-year timeframe and incorporate it into the plan. Formal submittal to FEMA for re-approval will follow.

In addition, it is anticipated that numerous currently unavailable plans and reports will be available for inclusion on to subsequent plans. Research conducted as part of this planning effort indicates that new data should be available concerning the following:

A statewide assessment of vulnerability due to dam failure, including a revision to the current vulnerability ranking system
Inclusion of data from the Drought Contingency Response Network and processes for:

- Monitoring, Early Warning and Prediction
- Risk, Impact and Vulnerabilities
- Mitigation and Response
- Improved HAZUS modelling capabilities
- Inclusion of data from update and revised regional earthquake studies

## 8.3 - MONITORING OF MITIGATION ACTIONS AND PROJECT CLOSEOUTS

44 CFR 201.4 (c)(5) A plan maintenance process that includes: (ii) A system for monitoring implementation of mitigation measures and project closeouts.

The ADEM Mitigation Branch is responsible for monitoring the progress of mitigation activities and projects throughout the state. The progress of federally funded mitigation projects are tracked on a quarterly basis. State funded projects are required to submit monthly progress reports. In addition, the Mitigation Branch selects projects to monitor either on site or by desk review on a quarterly basis. . As part of the plan update process, the MPC reviewed the existing system for tracking mitigation activities. The system for monitoring the initiation, status and completion of actions is described below. This mitigation activity monitoring system has not changed since the approval of the previous state hazard mitigation plan.

The State of Arkansas ensures all HMA grants are implemented in accordance with current FEMA guidance, as detailed in "Hazard Mitigation Assistance Program Policy Guide: Hazard Mitigation Grant Program, Building Resilient Infrastructure and Communities, and Flood Mitigation Assistance Program, March 23, 2023." The State of Arkansas HMGP utilizes its own manual to administer grants.

To facilitate the tracking of all HMA Grants and State of Arkansas Hazard Mitigation Grants, ADEM will compile a list of projects funded throughout the calendar year and add it to a database. Additionally, the MPC will be solicited annually to provide information on any other mitigation projects that were not funded through ADEM, FEMA, or the ANRC. This information will be included in the database as well.

**HMA Grant Monitoring and Closeout**

Upon notification from FEMA that an HMGP or BRIC project has been approved for funding, the Mitigation Branch will notify the subrecipient and will arrange a meeting to provide the subrecipient with appropriate information on regulatory program requirements. Based upon the approved application and work schedule of the project, a record keeping, and financial system will be implemented for the duration of the project.

As the recipient, ADEM recognizes its roll for project management, accountability of funds, and for ensuring that subrecipients meet all program and administrative requirements in accordance with 2 CFR Part 200. Approved applicants are considered subrecipients and are accountable to the recipient for funds awarded them.

ADEM is committed to monitoring and providing technical assistance to all eligible and funded subrecipients. The SHMO, project manager, and/or technical support staff attend subgrantee meetings to ensure the policies and procedures are explained correctly. Numerous worksheets, financial forms, and targeted guidebooks for local officials are provided by ADEM to assist the subrecipient.

To track mitigation projects from initiation to closeout, project tracking spreadsheets that include the following information are used:

- Applicant/Subrecipient
- Grant Identifier
- Contractor
- Total Cost Estimate
- Federal/Local share
- Award Date
- Period of Performance
- Quarterly Reports
- Subrecipient Risk
- Reimbursements

Quarterly progress reports based upon the work schedule will be submitted to the SHMO, who will then submit them to FEMA on January 30th, April 30th, July 30th, and December 30th. Any non-compliance with FEMA approved grant conditions shall be described in a letter to FEMA requesting an extension, change in scope of work, etc.

Under the HMGP Program, should it be determined that the original funded and approved scope of work cannot be accomplished with the grant funds allocated, the subgrantee will submit a request for additional funds.  Upon review and approval, the Governor's Authorized Representative will submit a fully justified request with a recommendation to the FEMA Regional Administrator. The FEMA Regional Administrator will provide written notification as to their determination on the validity of the claim. In no case will the total amount obligated to the State exceed funding limits set forth in 44 CFR §206.432 (b).

Upon completion of a project, a member of the ADEM Mitigation Branch will conduct a closeout site visit to:

- Review all files and all documents related to grant and state general revenue funds
- Review all procurement files and contracts to third parties
- Take photos of the completed project

Closeout packages will generally be submitted 90 days after a project has been completed, and will include the following:

- Summary of Documentation
- Pictures of completed project
- Materials, labor and equipment forms, if required
- Hazard Mitigation Grant Close-Out Certification

On behalf of the subrecipient, the State may appeal any FEMA denial for Federal assistance. All subrecipient appeals to FEMA decisions are administered in accordance with implementing program regulations.

The FMA Grant Program is administered by the ADA NRD and mirrors the grant administration process that ADEM uses for the HMGP and BRIC programs.

### 8.4 - REVIEW OF MITIGATION GOALS, OBJECTIVES AND ACTIONS

44 CFR 201.4 (c)(5) A plan maintenance process that includes: (ii) A system for monitoring implementation of mitigation measures and project closeouts.

As part of the continuous hazard mitigation planning process, each plan revision completes a review of the identified hazard mitigation program goals, objectives and actions.

As part of this review, each goal and objective are measured according to the following:

- Is the goal and objective realistic based on current capabilities and funding mechanisms
- Are the goals and objectives in line with local planning efforts
- Changes in the statewide risk assessment
- Changes and challenges in state and local capabilities
- Analysis of the similarities and differences of the state mitigation plan goals with local mitigation plan goals and objectives

Progress and viability of identified mitigation actions is measured based on the following variables:

- The number of projects successfully implemented
- The breadth of disbursement of mitigation grant funds
- The disaster losses avoided over time
- Public awareness
- Success of completed mitigation projects in helping address and achieve identified goals and objectives
- Have the completed mitigation actions resulted in a safer Arkansas

# Section 9 - Planning Process



## 9.1 – DOCUMENTATION OF THE PLANNING PROCESS

44 CFR 201.4 (b)Planning process. An effective planning process is essential in developing and maintaining a good plan. The mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups, and be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.

44 CFR 201.4(c)(1) Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.

The process established for this planning effort is based on the Disaster Mitigation Act of 2000 planning and update requirements and the FEMA State Mitigation Plan Review Guide. To accomplish this, the following planning process methodology was followed:

- Inform, invite, and involve mitigation plan stakeholders throughout the state, including federal agencies, state agencies, regional groups, businesses, non-profits, and local emergency management organizations.
- Conduct a thorough review of all relevant current and historic planning efforts.
- Collect data on all related state plans and initiatives, local plans' hazard risk, local plans' mitigation strategies and actions, state owned facilities, floodplains, repetitive loss/severe repetitive loss properties, hazard events, on-going and completed mitigation actions, and mitigation program changes since the development of the previous plan. Additionally, all related and relevant state and local plans were reviewed for integration and incorporation.
- Develop the planning and project management process, including methodology, review procedures, details about plan development changes, interagency coordination, planning integration, and the contribution of stakeholders.
- Update the State of Arkansas profile.
- Complete a risk and vulnerability assessment using a Geographic Information System (GIS) driven approach using data from the FEMA and other federal and state agency resources. Analyses were conducted at the state level, county by county, of state owned facilities, and county by county drawing on local assessments.
- Develop a comprehensive mitigation strategy effectively addressing the hazards and mitigation program objectives. This includes identifying state and local capabilities, reviewing pre and post disaster policies and programs, identifying objectives and goals, identifying mitigation actions and projects, and assessing mitigation actions and projects.
- Determine and implement a plan maintenance cycle, including a timeline for plan upgrades and improvements.
- Submit the HMP to FEMA for review and approval and petition the Governor's Office of the State of Arkansas for a letter of formal plan adoption.

## 9.2 – 2023 PLAN CHANGES

44 CFR 201.4 (d)Review and updates. Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years. The Regional review will be completed within 45 days after receipt from the State, whenever possible. We also encourage a State to review its plan in the post-disaster timeframe to reflect changing priorities, but it is not required.

The HMP has been completely redesigned since the 2018 update. Not only has ADEM made efforts to improve the functionality and effectiveness of the plan itself, but it has also improved its hazard mitigation program. The level of analysis and detail included in this risk assessment is far greater than the previous edition of the plan. This grants the state's improved and robust hazard mitigation program a better base to further mold and improve its mitigation strategy over the next five years.

As part of this planning effort, each section of the previous state mitigation plan was reviewed and analyzed. The sections were reviewed against the following elements:

- Compliance with the current regulatory environment
- Completeness of data
- Correctness of data
- Capability differentials
- Current state environment
- Climate Change
- Social Vulnerability
- Economy

## 9.3 – MITIGATION PLANNING COMMITTEE

Upon project initiation, planners from ADEM's mitigation branch met and implemented the formation of a mitigation planning committee (MPC). The MPC consisted of 14 members from a cross section of state agencies and departments, with many of the departments and individuals identified from the 2018 planning effort. From project inception to completion, the MPC was notified

at each major plan development milestone through on-site meetings and electronic communication. Prior to the plan's submission to FEMA, the MPC was invited to review the plan and provide input.

Additionally, the MPC was used as a conduit to solicit section reviews, confirm accuracy of data, information, and analysis, and solicit mitigation strategy ideas. Where appropriate, the MPC solicited the assistance of technical experts from various agencies and groups. When the MPC updated and improved the HMP's mitigation strategy, personnel from strategically selected agencies were interviewed to provide input on their mitigation capabilities.

In general, all MPC members were asked to participate in the following ways:

- Attend and participate in meetings
- Assist with the collection of data and information
- Review planning elements and drafts
- Integrate hazard mitigation planning elements with other planning mechanisms
- Facilitate agency coordination and cooperation
- Assist with the revision and development of mitigation actions

The following table presents the State of Arkansas MPC.

| State of Arkansas MPC Members | |
|---|---|
| Agency/Department | Representative |
| ADEM (Mitigation Branch) | Lacye Blake, SHMO |
| ADEM (Mitigation Branch) | Cody Shreve |
| ADEM (Mitigation Branch) | Kyle Key |
| ADEM (Mitigation Branch) | Jennifer Oakley |
| ADEM (Planning Branch) | Danna Weaver |
| ADEM Earthquake Planner | Hilda Booth |
| Arkansas Department of Aeronautics | Jerry Chism |
| Arkansas Department of Health | Darla Dalsanto |
| Arkansas Department of Health | Eric Kremers |
| Arkansas Department of Transportation | Aaron Adams |
| Arkansas Forestry Division | Fred Burnett |
| Arkansas Forestry Division | Don McBride |
| Arkansas Department of Agriculture Natural Resources Division | Whit Montague |
| Arkansas Department of Agriculture Natural Resources Division | Michael Harcus |
| Arkansas Public Service Commission | Jerry Keever |
| Arkansas Public Service Commission | Robert Henry |

## 9.4 - STAKEHOLDER PARTICIPATION

44 CFR 201.4(b): The mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups...

ADEM acknowledges that effective hazard mitigation planning should involve a diverse group of stakeholders, including government agencies, voluntary organizations, and private sector entities. The coordination and cooperation of these stakeholders assists with all aspects of plan development, including:

- Data collection
- Risk analysis
- Statewide capability assessment
- Mitigation action review, revision and development
- Plan implementation

All identified and vested entities were invited to attend the MPC scheduled meetings.  If unable to attend, stakeholders were kept involved in the planning process through:

- Email or phone updates as to planning progress
- Review and comment opportunities on planning elements

The following entities participated in the planning effort:

| Participating State Level Agencies |
| --- |
| Arkansas Department of Education |
| Arkansas Department of Emergency Management Homeland Security Branch |
| Arkansas Department of Emergency Management Critical Infrastructure Branch |
| Arkansas Department of Emergency Management Recovery Branch |
| Arkansas Department of Environmental Quality |
| Arkansas Department of Human Services |
| Arkansas Department of Information Systems |
| Arkansas Department of Transportation |
| Arkansas Geological Survey |
| Arkansas Geographic Information Office |
| Arkansas Insurance Department |
| Arkansas National Guard |
| Arkansas Natural Resource Commission |
| Arkansas State Police |
| Arkansas State University System |

| Participating Federal Agencies |
| --- |
| FEMA Region VI |
| National Weather Service |
| United States Army Corps of Engineers |
| United States Department of Agriculture |

| Participating Private Sector and Non-Profit Entities |
| --- |
| American Red Cross |
| Arkansas Educational Television Network |
| Arkansas Electric Cooperative |
| Arkansas Wing, Civil Air Patrol |
| Central U.S. Earthquake Consortium |

## 9.5 - PUBLIC PARTICIPATION

As part of the overall planning process, the general public was provided with numerous opportunities to contribute and comment on the creation and adoption of the plan. These opportunities included:

- Open meeting invitations
- An open comment period upon completion of the draft plan

Input from the public can provide a clearer understanding of local concerns, increase the likelihood of citizen buy-in concerning proposed mitigation actions, and provide elected officials with a guide and tool to set policies, ordinances and regulations. Additionally, as citizens are made more aware of potential hazards and the local process to mitigate against their impacts, it is believed that they will take a stronger role in making their homes, neighborhoods, schools, and businesses safer from the potential effects of natural hazards. As of plan submission, no feedback has been received from the public.

## 9.6 - PLANNING MEETINGS

The State of Arkansas MPC held various public and interagency meetings to discuss the HMP process as well as receive input. These meetings provided opportunities for local governments, state agencies, and departments to be involved in the planning process.

MPC members were notified of every primary planning meeting. These meetings were used to establish ADEM's standard operating procedures, update the MPC on plan progress, and solicit input on the HMP's development. In the event an MPC member was not able to attend, meeting information and progress was electronically disseminated among them to maintain a common operating picture.

Four MPC meetings were convened over the course of plan development.  These meetings were held near key project milestones to solicit both feedback and plan consensus.

**Plan Initiation Meeting**

One December 2nd 2020, ADEM conducted an initiation meeting to begin the development of the HMP, foster agency coordination among plan partners, and bring together the MPC. ADEM's Mitigation Branch, presented the HMP's development process, planning expectations, objectives, and proposed timeline to the MPC members.

**Risk Assessment and Mitigation Strategy Review Meeting**

On July 28th, 2021 MPC representatives met to review and revise, as necessary, the state's hazard list and vulnerability assessment. MPC members also reviewed the proposed mitigation strategy to ensure it was in-line with the current planning environment. Finally, each mitigation action item was reviewed, and a determination was made whether the action was still applicable and achievable if not already completed.

**Mitigation Strategy Revision Meeting**

On April 8th, 2022 the ADEM Mitigation Branch met  planning team members to go over the plans new format. Planning team also met to discuss the changes that are required under the new guidance from FEMA. Current list of hazards were also reviewed and team members were requested to gather information that related to mitigation actions take on by their various state agencies.

**Mitigation Status Update**

February 21st 2023 ADEM and various state partners met to meet the current status of the plans revisions. Further information was gathered from various state agencies on activities that their agencies we undertaking that relate to natural hazard mitigation as well as climate change. Social vulnerable populations and how agencies were addressing this information was discussed.

**SHMO Weekly Status Meetings**

Weekly status meetings were convened with the State of Arkansas SHMO to review plan progress, address any data discrepancies or deficiencies, and to refine the plan on an on-going basis.

In addition to MPC meetings, ADEM worked individually with members to gather information used in the plan update.

## 9.7 - HAZARD MITIGATION PROGRAM INTEGRATION

44 CFR 201.4(b): ... be integrated to the extent possible with other ongoing State planning efforts, as well as other FEMA mitigation programs and initiatives.

The HMP is an overarching document that is both comprised of, and contributes to, various other state plans. In creating this HMP, all of the planning documents identified below were consulted and reviewed. In turn, when each of these other plans is updated, they will be measured against the contents of the HMP.

Information from the HMP is often used by local jurisdictions to incorporate into their hazard mitigation plans. This information includes hazard identification and risk assessment, goals and objectives, local capabilities, and mitigation initiatives.

The Hazard Mitigation Grant Program (HMGP), Building Resiling Infrastructure and Communities(BRIC), Earthquake Program, and mitigation planning are all the direct responsibility of ADEM. The Flood Mitigation Assistance (FMA) Program and floodplain management are the responsibility of the ANRC.  ADEM and ANRC work closely to ensure that mitigation goals and initiatives are integrated to the extent possible into all planning activities for federal, state, and local governments.

A primary task in fulfilling ADEM's mission is the development and maintenance of the Arkansas Comprehensive Emergency Management Plan (ARCEMP). The ARCEMP is an all-inclusive, operational document that describes how resources of local, state, and federal governments may be most effectively used to ensure the State is prepared for all hazards. The ARCEMP integrates all federal emergency management plans, programs, initiatives, and policies to keep the state and all state planning activities aligned with

federal goals and objectives. Per these design guidelines, ADEM works with FEMA to administer federal hazard mitigation assistance programs to the State of Arkansas.

Below is a list of the state's various planning efforts, sole or jointly administered programs, and documents. While each plan can stand alone, their review and functional understanding was pivotal in the development of this plan and further strengthens and improves Arkansas' resilience to disasters.

- ARCEMP
- Arkansas Department of Emergency Management Hazard Mitigation Administrative Plan
- Arkansas Economic Development Commission Action Plan for Disaster Recovery
- Arkansas Governor's Earthquake Advisory Council
- Arkansas Hazardous Materials Emergency Response Commission
- Arkansas Influenza Pandemic Response Plan
- Arkansas Natural Resources Commission Floodplain Management Program
- Arkansas Natural Resources Commission State Water Plan
- Arkansas Natural Resources Commission Dam Safety Program
- Critical Infrastructure Protection Program

Information from each of these plans and programs is utilized within the applicable hazard sections to provide data and fully inform decision making and prioritization.

This HMP is available to all state agencies to reference when seeking information and guidance on state mitigation goals and objectives.  The general information in this plan is also intended for use by local governments, universities, businesses, and private associations, in addition to state and federal departments and agencies.  Data from the 2013 hazard mitigation plan was utilized by ANRC on the 2014 Arkansas Water Plan Update and the development of the Drought Contingency Response Network group.

**Federal Level Plan Integration**

State-level mitigation is inherently integrated into a host of federal programs and initiatives. Utilizing federal grant programs, the state and its local jurisdictions have accomplished numerous mitigation activities, mitigating much of the adverse effects associated with hazards. Additionally, participation in some of the lesser utilized federal initiatives (Community Rating System and FireWise) is growing in the State of Arkansas. The following list illustrates federal programs integrated and referenced in the State of Arkansas' mitigation efforts.

- Community Rating System (CRS)
- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance (FMA)
- National Flood Insurance Program (NFIP)
- Building Resilient Infrastructures and Communities
- FireWise Communities Program

**Integration Challenges**

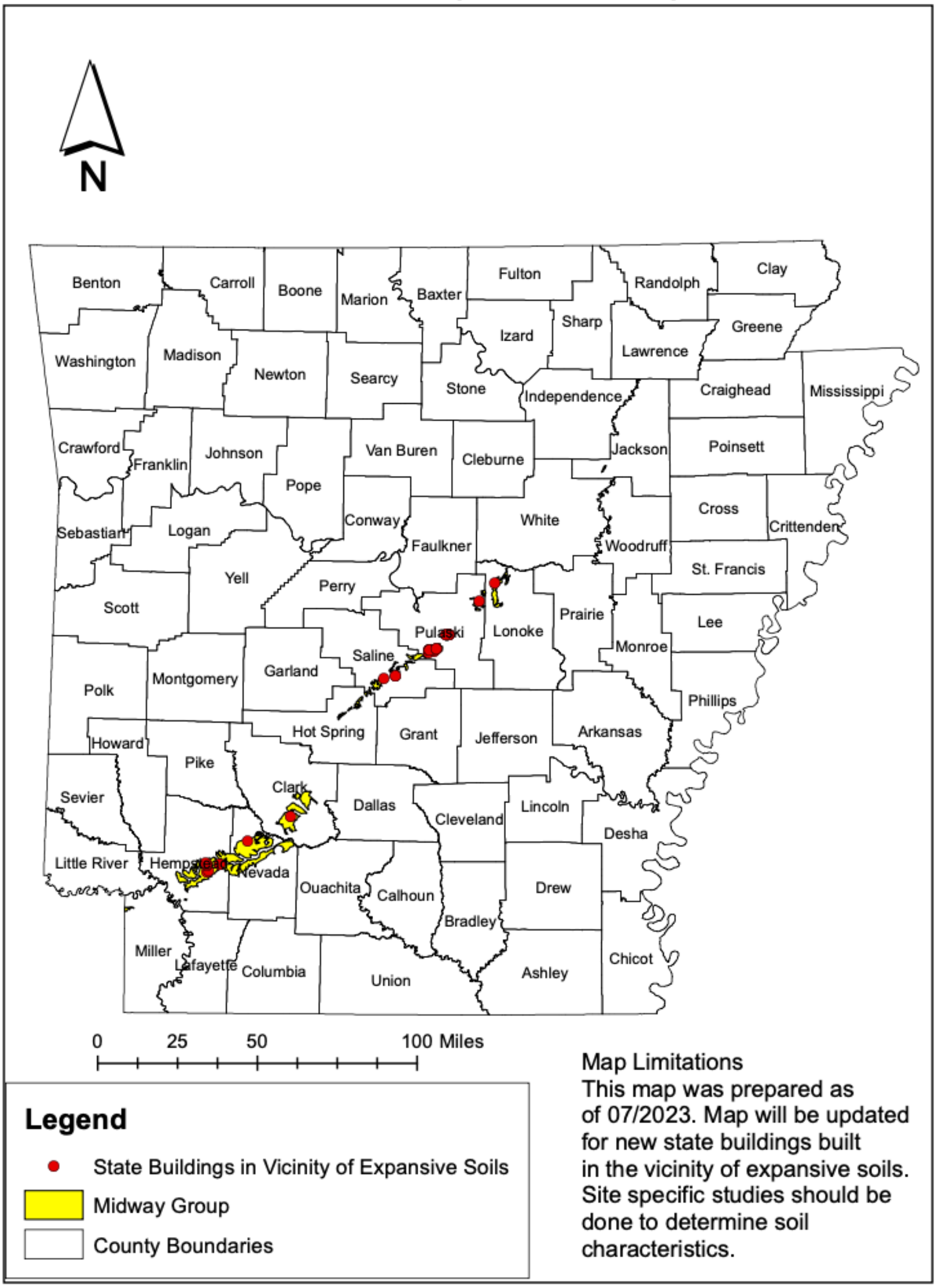
ADEM is responsible for coordinating the development of local mitigation plans by providing grant funding, technical assistance and review. Limited staff as well as funding restrictions cause challenges in local mitigation plan development. There is a high demand for local mitigation plans, but funding is usually contingent upon a grant, which could cause the plan to lapse. It is important to keep local mitigation plans current so that their data may be used in the updates of the HMP.

ADEM is actively working at standardizing the methodology for all local mitigation plans. Currently, jurisdictions use different methodologies and data sets to determine risks and vulnerabilities. This creates a challenge in integrating plans into the HMP as data has to be translated to fit one planning standard.

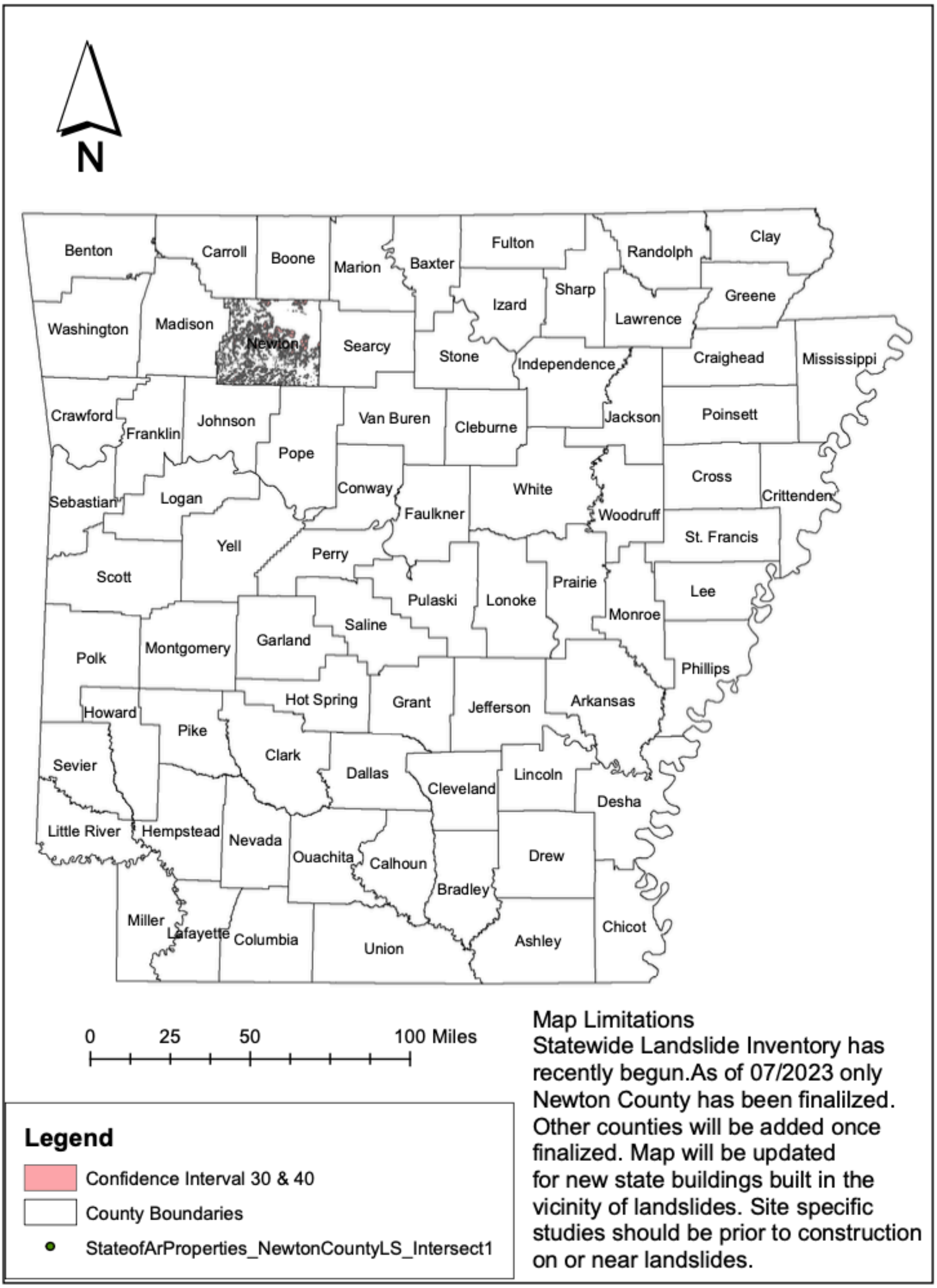
# List of Acronyms

# Ongoing Studies

State Buildings Located in Vicinity of Earth Materials with Expansive Properties



# State Buildings Located in Vicinity of Landslides



# STATE OF ARKANSAS

## EXECUTIVE DEPARTMENT

# PROCLAMATION

EO 23-28

TO ALL TO WHOM THESE PRESENTS SHALL COME - GREETINGS:

**AN EXECUTIVE ORDER ADOPTING THE 2023 STATE OF ARKANSAS HAZARD MITIGATION PLAN, PURSUANT TO SECTION 322 OF THE FEDERAL DISASTER MITIGATION ACT OF 2000**

WHEREAS: The State of Arkansas believes mitigation projects, initiatives, and activities result in the reduction of risk from natural hazards; and

WHEREAS: The State of Arkansas supports mitigation planning and believes that it will result in the judicious selection of cost effective, risk reduction actions; more disaster-resistant, sustainable communities; the building of partnerships among local, state, federal, private, and non-profit shareholders; the identification of financial and technical resources; and a reduction in loss of life, injury recovery time, and costs associated with natural disasters;

NOW, THEREFORE, I, Sarah Huckabee Sanders, acting under the authority vested in me as Governor of the State of Arkansas, as directed by Section 322 of the Federal Disaster Mitigation Act of 2000, formally adopt the 2023 State of Arkansas Hazard Mitigation Plan.

TESTIMONY WHEREOF, I have hereunto set my hand and cause the Great Seal of the State of Arkansas to be affixed this 1st day of September, in the year of our Lord 2023.

Sarah Huckabee Sanders, Governor

GREAT SEAL OF THE STATE OF ARKANSAS

John Thurston, Secretary of State