STATE OF ARKANSAS
ALL- HAZARDS MITIGATION PLAN

SEPTEMBER 2013

ARKANSAS' HOMELAND SECURITY & PREPAREDNESS AGENCY
ARKANSAS DEPARTMENT ADEM EMERGENCY MANAGEMENT

Arkansas Department of
Emergency Management

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OVERVIEW

Across the United States, natural, manmade, and other disasters have led to increasing numbers of deaths, injuries, property damages, and disruptions of business and government services. This can take an immense toll on people, businesses and government, especially in these challenging economic times. The time, money and effort to respond to and recover from disasters divert public resources and attention from other important programs. As of February 2013, Arkansas has had a total of 54 federal declaration and nine emergency federal declaration events since 1957 and ranks 9th in the U.S. for the number of federal declarations during this time period. Arkansas recognizes the consequences of disasters and the need to reduce the impacts of natural, manmade, and other disasters.

Hazard mitigation is defined by the Federal Emergency Management Agency (FEMA) as any action taken to eliminate or reduce the long-term risk to human life and property from hazards and their effects. This is crucial to the residents, businesses, and governments of Arkansas. Hazard Mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

People and property in Arkansas are at risk from a variety of hazard such as tornadoes, floods, drought, earthquakes, severe winter weather, hazardous materials and wildfires that have the potential for causing widespread loss of life and damage to property, infrastructure, and the environment. Arkansas recognizes the potential consequences of disaster events. The need to reduce the impacts through proper planning and preventive measures is of great importance to the State and its residents.

This Arkansas All Hazard Mitigation Plan is an important planning component of state-level programs for management of disasters and their impacts. It takes into account years of mitigation experience and a variety of mitigation initiatives in Arkansas and other state partners. It has also taken advantage of the collective mitigation knowledge of many state, federal, and local officials as well as multiple stakeholders throughout the private sector. As such, it should significantly contribute to the mitigation of future Arkansas disasters.

It also establishes the means the State will use to identify cost-effective mitigation measures, to reduce and/or eliminate the long-term risk to human life and property from all hazards (natural, manmade, and other). The priorities include local community mitigation planning, acquisition of floodprone properties, relocation/retrofitting of floodprone properties, floodplain management, tornado safe rooms, flood and earthquake structural projects, and technical assistance. Both short-term and long-term hazard mitigation measures are identified and prioritized to help all state and local agencies allocate appropriate resources in a responsible manner that will provide for the health, safety, and general welfare of all people in Arkansas.

This plan will continue to provide a general blueprint for hazard mitigation activities in Arkansas and is structured to serve as the basis for specific hazard mitigation efforts for multiple hazards. It is done so in a manner that meets federal requirements for mitigation planning and that complies with collaboratively developed national standards for emergency management. (As such, it is approved by FEMA and accredited by the Emergency Management Accreditation Program (EMAP).) Updates may be required to address specific issues arising from a given hazard event or based on changes in federal or state laws and regulations.

Organization

This plan is organized around FEMA's mitigation planning process and is divided into seven chapters with appendices, briefly summarized below:

- **Chapter 1 Prerequisite** includes the State's adoption of the plan and assurances that the State will comply with all applicable federal statutes and regulations.

- **Chapter 2 Planning Process** explains the planning process, including how it was prepared, who was involved, and how it was integrated with other related planning efforts.

- **Chapter 3 Risk Assessment** features the risk assessment, which identifies the type and location of hazards that can affect Arkansas, analyzes the State's vulnerability to the hazards identified, and serves as the factual basis for the mitigation strategy.

- **Chapter 4 Comprehensive State Hazard Mitigation Program** provides the State's mitigation blueprint. Specifically, it includes goals and objectives, state and local capabilities, mitigation activities, and funding sources.

- **Chapter 5 Coordination of Local Mitigation Planning** describes the State's role in funding, developing, coordinating, and approving local mitigation plans, and how the State prioritizes funding for local mitigation plans and projects.

- **Chapter 6 Plan Maintenance** presents the method Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC) uses to monitor, evaluate, and update the plan. It also introduces how the team monitors project implementation and closeouts and reviews progress on achieving goals.

- **Chapter 7 Enhanced Plan** is the "enhanced" portion of the plan and documents Arkansas' project implementation capability and commitment to a comprehensive mitigation program.

- **Appendix A** – Planning Documentation

- **Appendix B** – GIS Datasets for State-Owned and Leased Facilities and Critical Facilities

1.0 PREREQUISITES

Hazard mitigation has become an increasingly important component of disaster recovery since 1988 when the Disaster Relief Act of 1974, Public Law 93-288, was amended by Public Law 100-707, the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Greater emphasis was placed on hazard mitigation and pre-disaster mitigation (Section 203) with the enactment of another amendment, the Disaster Mitigation Act of 2000 (P.L. 106-390). This Arkansas All Hazard Mitigation Plan is a direct result of the latter amendment to the Stafford Act.

The Disaster Mitigation Act (DMA) of 2000 enacted the following provisions relative to mitigation planning:

Standard State Mitigation Plans (§201.4 of the Rule): To receive federal mitigation funds, states must develop and submit for approval to FEMA a Standard Hazard Mitigation Plan that includes details of the State's natural hazards risks, vulnerabilities, and mitigation goals, objectives, and priorities. States with an approved Standard Hazard Mitigation Plan are eligible for Hazard Mitigation Grant Program (HMGP) funding based on 15 percent for disaster assistance not more than $2 billion, 10 percent for disaster assistance of more than $2 billion and not more than $10 billion, and 7.5 percent for disaster assistance more than $10 billion and not more than $35.3 billion of the total estimated eligible Stafford Act disaster assistance as a result of a presidential major disaster declaration.

Enhanced State Mitigation Plans (§201.5 of the Rule): States that have an approved Enhanced State Mitigation Plan at the time of a disaster declaration will qualify to receive HMGP funds based on up to 20 percent of the total estimated eligible Stafford Act disaster assistance.

This document is the scheduled 2013 update to Arkansas' 2010 standard state hazard mitigation plan and also addresses the requirements of an enhanced plan.

Section 404 (Hazard Mitigation Grant Program (HMGP)) allows the federal government to contribute up to 75 percent of the cost of cost-effective hazard mitigation measures that substantially reduce the risk of future damage, hardship, loss, or suffering in any area affected by a major disaster. Such mitigation measures shall be identified following the evaluation of natural hazards under Section 322 of the Disaster Mitigation Act. Section 404 funds may be used for a variety of eligible projects that may or may not be related to the disaster and, if the State allows, in counties that were not in the declared disaster area.

In addition, to the HMGP, other funding mechanisms are available in Arkansas with an approved standard state plan. These programs listed below are further described in Chapter 4 of this plan:

- FEMA Public Assistance (Categories C-G);
- Flood Mitigation Assistance Program;

- Pre-Disaster Mitigation Program;
- Repetitive Flood Claims Grant; and
- Severe Repetitive Loss Program.

1.1 Adoption by the State

Requirement §201.4(c)(6): The plan must be formally adopted by the State prior to submittal to [FEMA] for final review and approval.

Plan Update: An appropriate body in the State must adopt the updated plan regardless of the degree of modifications to the original plan.

The Arkansas All Hazard Mitigation Plan is the result of the systematic evaluation of the nature and extent of vulnerability to the effects of all hazards (natural, manmade, and other) present in Arkansas and includes the actions needed to minimize future vulnerability to those hazards. It sets forth the policies, procedures, and philosophies that will be used to establish and implement hazard mitigation activities within the State. Effective and consistent implementation of this plan is crucial to the hazard mitigation program and the State's efforts to reduce or eliminate the threat of future disasters. This plan incorporates all changes associated with the implementation of the federal/state hazard mitigation program, including the applicable sections of the DMA 2000 and is in compliance with the mitigation standards for accreditation outlined in the EMAP.

Overall administration of the hazard mitigation program is the responsibility of the Arkansas Department of Emergency Management (ADEM) Mitigation Branch. This branch will review the plan annually or as needed if hazard mitigation regulations or guidelines change. The plan will be updated every three years or as required. Additionally, the plan or update will be submitted to FEMA Region VI following a presidential disaster declaration if the State's priorities change.

The Arkansas All Hazard Mitigation Plan has been developed over several years and through several updates. Each version of the plan has been adopted by the State and approved by FEMA as follows:

- **Version 1 (2004) -** The plan was approved by FEMA Region VI on November 4, 2004.
- **Version 2 (2005/2006) –** Internal revision, no submittal to FEMA Region VI.
- **Version 3 (2007) -** The plan was approved by FEMA Region VI on October 26, 2007.
- **Version 4 (2010) -** was adopted by the State on July 23, 2010. The plan was approved by FEMA Region VI on September 21, 2010.
- **Version 5 (2013) -** This 2013 update of the Arkansas All Hazard Mitigation Plan was submitted by the director of ADEM to the Governor of Arkansas, for his approval. The Governor approved the plan on September 11, 2013 and declared the document to be officially adopted by the State. The plan was approved, pending adoption, by FEMA Region VI on September 4, 2013.

1.2 Compliance with Federal and State Laws and Regulations

Requirement §201.4(c)(7): 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, in compliance with 44 CFR 13.11(c). The State will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

1.2.1 General Compliance Assurance Statements

This plan is prepared to comply with the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (as amended by the DMA); all pertinent presidential directives associated with the U.S. Department of Homeland Security and FEMA; all aspects of 44 CFR pertaining to hazard mitigation planning and grants pertaining to the mitigation of adverse effects of disasters (natural, manmade, and other); interim final rules and final rules pertaining to hazard mitigation planning and grants, as described above; all planning criteria issued by FEMA; and all Office of Management and Budget circulars and other federal government documents, guidelines, and rules.

The State of Arkansas agrees to comply with all federal statutes and regulations in effect with respect to mitigation grants it receives, in compliance with 44 CFR 13.11 (c). As stated in Section 1.1 Adoption by the State, the plan will be updated every three years or as required and amendments will be made as necessary to address changes in federal or state statutes, regulations, and policies. Such amendments will be submitted to FEMA for approval. Additional information about how the plan will be reviewed and updated is in Chapter 6 Plan Maintenance. The next update of the plan is scheduled for 2016 or as required.

ADEM intends to comply with all administrative requirements outlined in 44 CFR 13 and 206 in their entirety and to monitor all subgrant supported activities to ensure compliance with 44 CFR 13 and 206 in their entirety.

ADEM also, requires all subgrantees receiving $500,000 or more in federal assistance to have an audit conducted in accordance with the Single Audit Act under 44 CFR 14, Administration of Grants: Audits of State and Local Governments . Such reports by an independent certified public accountant will be maintained by ADEM. All general audit requirements in 44 CFR 14 will be adhered to by ADEM as well as subgrantees receiving FEMA hazard mitigation grant awards.

1.2.2 Authorities

The Arkansas All Hazard Mitigation Plan is an important component of state-level programs for management of disasters and their impacts. As such, the strategy relies on the authorities given to the state agencies and their programs herein incorporated for implementation of its strategies and assignments. Further, the plan is intended to be consistent with and supportive of the policies, plans, and implementation procedures that govern mitigation-related state agency programs. In the event of any inconsistency, state agency policies and programs supersede the provisions of the plan. The State's mitigation strategy relies upon and is intended to be consistent with the following specific state and federal authorities as well as EMAP mitigation standards:

Statutes

State

- Constitution of the State of Arkansas, as amended
- 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

*Federal**

- The National Security Act of 1947
- Public Law 84-99 (33 USC 701n) for flood emergencies
- Public Law 85-256, Price-Anderson Act
- Public Law 89-665 (16 USC 470 et seq.), National Historic Preservation Act
- Public Law 90-448, National Flood Insurance Act of 1968 (42 USC 4001 et seq.)
- Public Law 91-646, Uniform Relocation Assistance and Peal Property Acquisition Policies Act of 1970 (42 U.S.C. 4601 et seq.)
- Public Law 93-288, as amended by Public Law 100-707, The Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 6121 et seq.)
- Public Law 93-234, Flood Disaster Protection Act of 1973
- Public Law 95-124, as amended by Public Laws 96-472 and 99-105, Earthquake Hazards Reduction Act of 1977 (42 USC 7701 and 7704)
- Public Law 96-295, The Nuclear Regulatory Commission Appropriations Authorization Act
- Public Law 96-510, Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Section 104(i),(42 USC 9604(i))
- Public Law 99-499, Superfund Amendments and Reauthorization Act of 1986

- Public Law 101-615, Hazardous Materials Transportation Uniform Safety Act
- Public Law 101-549, Clean Air Amendments of 1990
- Public Law 107-296, Homeland Security Act of 2002

*As amended where applicable

Administrative Rules

Federal

- 44 CFR Part 9, Floodplain Management and Protection of Wetlands
- 44 CFR Part 10, Environmental Considerations
- 44 CFR Part 13 (The Common Rule), Uniform Administrative Requirements for Grants and Cooperative Agreements
- 44 CFR Part 14, Audits of State and Local Governments
- 44 CFR Parts 59-76, National Flood Insurance Program and related programs
- 44 CFR Part 201, Mitigation Planning
- 44 CFR Part 206, Federal Disaster Assistance for Disasters Declared after November 23, 1988
- 49 CFR Part 24, Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs

Executive Orders

Federal

- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands
- Executive Order 12656, Assignment of Emergency Preparedness Responsibilities
- Executive Order 12148, Federal Emergency Management
- Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations Homeland Security Presidential Directive 5, Management of Domestic Incidents, February 28, 2003
- Homeland Security Presidential Directive 8, National Preparedness, December 17, 2003.

Other

Emergency Management Accreditation Program

- Hazard Identification and Risk Assessment Standards 5.3.1, 5.3.2, and 5.3.3
- Hazard Mitigation Standards 5.4.1, 5.4.2, and 5.4.3

2.0 PLANNING PROCESS

2.1 Documentation of the Planning Process

Requirement §201.4(c)(1): [The State plan must include a] 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.

Plan Update: A description of the planning process is required for the update. The update must describe the process used to review and analyze each section of the plan. If the planning team or committee finds that some sections of the plan warrant an update, and others do not, the process the team undertook to make the determination must be documented in the plan.

The process established for this planning effort is based on the Disaster Mitigation Act of 2000 (DMA 2000) planning and update requirements and FEMA's associated guidance for state hazard mitigation plans. The primary steps in the planning process were:

- Identify the types of hazards (natural, manmade, and other) that affect the State and develop a brief history of each;
- Determine the present and future risk and vulnerability of Arkansas residents to these hazards;
- Assess the capabilities at the local, state, and federal levels to mitigate hazards and disasters;
- Establish and prioritize the major hazard mitigation issues that should be addressed in the Arkansas All Hazard Mitigation Plan; and
- Identify goals, objectives, and actions for addressing these issues to reduce the State's vulnerability to present and future hazards.

2.1.1 Evolution of the Arkansas All Hazard Mitigation Plan

The Arkansas All Hazard Mitigation Plan has been developed over several years and through several updates. The evolution of the plan is as follows:

- **Version 1 (2004)** - The first version of the State of Arkansas Mitigation Plan to be approved by FEMA was completed in 2004. This plan addressed only natural hazards. The core planning team for this effort was the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC). The APDMAC was originally formed to support FEMA's Project Impact Program in 1999.

- **Version 2 (2005/2006)** - Since October of 2004, the APDMAC made significant strides to not only update data within the plan, but also strengthen the context. This update to the Mitigation Plan focused on the additional planning initiatives of: (1) following EMAP criteria; (2) encouraging broader agency participation; and (3) adding manmade/technological hazards to the risk assessment. Highlights included:

- *Greater Agency Participation* - State agencies' representatives participated in a web-based questionnaire that determined agency-based risk assessment. The data in this questionnaire was collated and added to the mitigation strategies section of the Arkansas All-Hazards Mitigation Plan. The Governor's cabinet reviewed and participated in the emergency management planning process. National Guard members also assisted in the information gathering phase.
- *Diverse Agency Participation* - State agencies such as the Arkansas Chemical Stockpile Emergency Preparedness Program (CSEPP) and Radiological Departments were referenced in-depth as they are experts in man-made hazard vulnerability across the State of Arkansas. Public Health officials, as well as the private sector, joined in the planning process.
- *EMAP Assessment Team Participation* - Peers from leading Emergency Management Associations reviewed in detail data from the original FEMA approved State of Arkansas Natural Hazard Mitigation Plan. All recommended revisions were completed by the planning team for the Version 2 final plan.
- *DHS Direct Participation* - The Department of Homeland Security participated in the process of adding man-made and technological hazards into the mitigation plan. All DHS participation was documented throughout the updated plan. DHS guidelines were followed at each step of the planning process. Since ADEM has merged to become a part of the Department of Homeland Security, this participation will grow stronger over time.

- **Version 3 (2007) -** The 2007 State of Arkansas All-Hazards Mitigation Plan Update included federal and state agency coordination improvements. Highlights included:
  - *Continued Advisory Council Review* - The APDMAC continued to review and steer state priorities in accordance with current mitigation plan goals and objectives. The Advisory Council was briefed and updated on all plan maintenance items. Feedback was encouraged.
  - *Local Plan Integration* - Data from county and city mitigation plans were incorporated into the plan through a collated vulnerability assessment.
  - *State Agency Review* - Each lead Arkansas State agency that participated in the previous two planning initiatives were contacted to review and update pertinent data.
  - *Federal DHS Participation* - The federal branch of the Homeland Security Department added vital input for HAZUS analysis.
  - *GIS Agency Participation* - Field teams were dispersed throughout each county in Arkansas to collect state-owned and operated facility data. This data is vital for accurate risk assessment calculations. Continuity of Operations Plans were reviewed by the Arkansas Technology Office to verify critical facilities were assessed in the GIS collection initiative. The Arkansas Geographic Information Office also played a vital role in data review.

- **Version 4 (2010) -** The 2010 plan update process was initiated to meet FEMA's three-year revision requirement listed in DMA 2000. This version includes the following coordination improvements since the 2007 All Hazard Mitigation Plan:
  - *Continued Advisory Council Review* - The APDMAC continued to review and steer state priorities in accordance with current state mitigation plan goals and objectives. The Advisory Council was briefed and updated on all plan maintenance items. Feedback was encouraged.
  - *Local Plan Integration* - Data from county and city mitigation plans were incorporated into the plan through a collated vulnerability assessment. ADEM was contacted to obtain all of the Local Mitigation Plans for integration purposes.
  - *Repetitive Loss Data* - *S*evere repetitive loss information for the State was incorporated. This included the types and numbers of repetitive loss properties.
  - *Updated Flood Maps* - Through contact with the Arkansas Natural Resource Commission, the planning team was able to present maps of the map modification progress across the State.

Arkansas employs a continuous improvement process to ensure that the State's mitigation planning and program efforts are effective. Arkansas' planning and program successes to date are demonstrated throughout this document.

2.1.2 Plan Update Process for 2013

In December 2012, Arkansas initiated the planning process to update the Arkansas All Hazard Mitigation Plan. The Arkansas Department of Emergency Management (ADEM) took the lead role, under the direction of the Mitigation Branch, with the State Hazard Mitigation Officer as the planning lead. For assistance in development of the plan update, ADEM contracted with AMEC Environment and Infrastructure, Inc. (AMEC).

AMEC's role was to:

- Assist in coordination with representatives of the APDMAC, as defined by the DMA 2000; and integration of the plan update process with the ongoing APDMAC meeting schedule:
- Meet the DMA requirements as established by federal regulations and following FEMA's state *enhanced* plan guidance,
- Meet the EMAP standards for hazard mitigation as established by EMAP Commission,
- Facilitate the entire planning process,
- Identify the data requirements that APDMAC participants should provide and conduct the research and documentation necessary to augment that data,

- Complete tasks as such incorporating HAZUS-MH flood loss estimations, integrating local level risk assessments, improving statewide vulnerability assessment, and improving vulnerability analysis of state owned and/or leased facilities,
- Assist in development of a statewide repetitive loss strategy;
- Produce the draft and final plan documents, and
- Coordinate with the FEMA Region VI plan reviewers.

Coordination with the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC)

Pre-Disaster Mitigation (PDM), as federal law and a program activity, began in 1997. Congress established a pilot program, which FEMA named "Project Impact," to test the concept of investing prior to disasters to reduce the vulnerability of communities to future disasters. The Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC) was originally formed in 1999 to support FEMA's pilot program. Although Project Impact has been eliminated as a program, the APDMAC continues to provide guidance and participate in the Arkansas mitigation planning process.

The APDMAC is comprised of representatives from state and federal departments, the Governor's Earthquake Advisory Council (AGEAC), universities, local county representatives, private non-profit associations, and members of the insurance and engineer consulting industry. The name, title, and contact information for each APDMAC representative is presented in Appendix A *Planning Process Documentation*. In addition to the planning process for the All Hazards Mitigation Plan update, the APDMAC and AGEAC meet twice a year for a summer and winter meeting. Table 2.1 provides the list of entities invited to attend as well as those represented at the planning meetings for the 2013 update of the State Mitigation Plan.

Table 2.1. Agencies Solicited and Representative Attended Planning Meetings in the 2013 Plan Update Process

Agency/ Division	2013 Plan Solicitation	2013 Meeting #1	2013 Meeting #2	2013 Meeting #3
STATE AND FEDERAL				
Arkansas Department of Emergency Management	X	X	X	X
Arkansas Department of Environmental Quality	X	X	X	X
Arkansas Department of Human Services	X	X		X
Arkansas Department of Information Systems	X	X	X	X
Arkansas Department of Education	X	X		X
Arkansas Archeological Survey	X	X		X
Arkansas Geological Survey	X	X	X	X
Arkansas Highway & Transportation	X	X	X	X
Arkansas Insurance Department	X	X		X
Arkansas National Guard	X	X		X

Agency/ Division	2013 Plan Solicitation	2013 Meeting #1	2013 Meeting #2	2013 Meeting #3
Arkansas Natural Resource Commission	X		X	
Arkansas Ready Mix Conc. Assoc.	X	X		X
Arkansas State Police	X	X		X
Arkansas State University	X	X		X
Arkansas State University-Jonesboro	X	X		X
Arkansas Electric Cooperative	X	X		X
Arkansas Educational Television Network	X	X		X
American Red Cross	X	X		X
Central U.S. Earthquake Consortium	X	X		X
National Weather Service	X		X	
USDA Natural Resources Conservation	X	X	X	X
VA Medical Center	X	X		X
US Air Force	X	X		X
AR Wing Civil Air Patrol	X	X		X
US Army	X	X		X
US Representative Berry's Office	X	X		X
US Navy	X	X		X
UNIVERSITIES				
University of Arkansas, Little Rock	X	X		X
University of Arkansas, Fayetteville	X	X		X
University of Memphis	X	X		X
Arkansas State University, Searcy	X	X		X
CITY AND COUNTY REPRESENTATIVES				
City of Little Rock, AR	X	X		X
Clay County, AR	X	X		X
Craighead County, AR	X	X		X
Crittenden County, AR	X	X		X
Mississippi County, AR	X	X		X
Poinsett County, AR	X	X		X
Pulaski County, AR	X	X		X
INDUSTRY REPRESENTATIVES				
State Farm Insurance	X	X		X
Code Camey and Associates, Inc.	X	X		X
Bold Planning Solutions	X	X		X
Engineering Consultants, Inc.	X	X		X
IEM, Inc.	X	X		X
James Engstrom and Associates	X	X		X

The kickoff meeting for the 2013 All Hazard Plan Update was held on January 24th, 2013 in Jonesboro, Arkansas in conjunction with the APDMAC and AGEAC winter meeting. The kickoff meeting included a review of the purpose and process for state mitigation planning; the anticipated changes for the 2013 plan; the project schedule; current project status; and notice of information and data needs from Council members. Guidance on participation was discussed at the kickoff meeting. The guidance included a schedule of the two additional planning meetings for the Risk Assessment and Mitigation Strategy and delivery of the draft document.

Table 2.2 lists the dates and purposes of the APDMAC meetings during the 2013 update planning process. Representatives were invited via e-mail to attend all the planning process meetings. Agendas, sign-in sheets, and other meeting hand-outs are compiled Appendix A *Planning Process Documentation*. The results of these meetings are incorporated into the remaining chapters of this plan.

Table 2.2. APDMAC Planning Meetings for the 2013 Update Process

Meeting	Date	Purpose
Kickoff Meeting	01/24/2013	• Introduction to planning team consultant • Review of mitigation planning purpose and process • Moving forward from 2010 plan to 2013 update • Project Schedule • Current Project Status – project needs and APDMAC participation
Risk Assessment / Mitigation Strategy Review	03/26/2013	• Discuss methodology and review risk assessment summaries all hazards • Discuss hazard probability and severity ratings • Progress on integrating local plans • Updating state agency capabilities • Review and update the mitigation strategy including goals, objectives, and actions. • Plan Update Timelines • Next Steps in the Process
Presentation of Draft 2013 All Hazards Plan	07/18/2013	• Guide the APDMAC through the format of the 2013 Plan Draft All Hazard Mitigation Plan • Gather APDMAC member comments on the draft plan

Each agency was engaged and contributed to the planning process. Some examples of these contributions include feedback from the Arkansas Natural Resources Commission concerning the flood hazard and repetitive loss properties. There was also input from various agencies at planning team meetings; direct response from multiple agencies to emails, and phone requests for information related to the process. The results are incorporated throughout this plan as appropriate. Additional participation and contribution efforts are presented in Section 4.2 *State Capability Assessment* and Appendix A *Planning Process Documentation*.

Plan Section Review and Analysis

In the 2013 planning process, the ADEM updated each section of the previously approved plan, including improving organization and formatting of the plan's content. Each section was analyzed using FEMA's state plan update guidance to ensure that it met those requirements. The Emergency Management Accreditation Program (EMAP) standards for mitigation were also considered.

Once a complete first draft of the updated plan was available, ADEM reviewed it. The resulting second draft was distributed to the APDMAC for their review and comment. Team members were given the opportunity to comment and provide input. Feedback was received in the form of emailed comments, written comments on the draft, or documents with information relative to the plan or the appropriate agency's section. Feedback was collected and reviewed by the planning contractor and ADEM and incorporated into the plan, as appropriate, to create a third draft for state adoption, which was then submitted to FEMA Region VI for review and approval.

During the review by the ADEM, it was determined that every section of the plan required updating and revision to meet FEMA's state plan update guidance or to change information that was no longer current. Table 2.3 briefly summarizes how each section of the plan was reviewed and analyzed to reflect changes that occurred since the previous plan was approved. More detailed documentation on update methodology and process is provided at the beginning of each plan section.

Table 2.3. Summary of 2013 Update Review and Analysis of Each Plan Section

2010 Plan Section	2013 Update Review and Analysis
Section 1 – Adoption by the State	• Reorganized as ***Chapter 1.0 Prerequisites*** to coincide with FEMA planning requirements. Adoption dates of all previous versions added. Federal and State Laws and Regulations expanded.
Section 2 – Introduction	• Incorporated into ***Chapter 1.0 Prerequisites***
Section 3 – Planning Process	• Reorganized as ***Chapter 2.0 Planning Process*** • Described planning process for the 2013 update, including coordination among agencies and integration with other planning efforts. Meeting minutes from the APDMAC moved to Appendix A.
Section 4 – Risk Assessment	• Reorganized as Chapter ***3.0 Risk Assessment***. This Chapter is divided into several sections: 3.1 Overview; 3.2 Exposure and Analysis of State Development Trends; 3.3 Identifying Hazards; 3.4 Hazard Profiles and State Risk Assessment; 3.5 Integration of Local Plans; 3.6 Assessment of State Owned Facilities; and 3.6 References.
Section 4.1 – Identifying Hazards	• This section is divided into 3.3.1 Natural Hazards; 3.3.2 Manmade and Other Hazards; 3.3.3 Presidential Declarations. • Inserted Dam and Levee Failure as separately profiled hazards. Expanded Severe Thunderstorms to include detailed vulnerability and

2010 Plan Section	2013 Update Review and Analysis
	loss estimation information for damaging winds, hail, and lightning. • Updated declarations table and figure as well as tables providing Individual and Public Assistance information.
Section 4.1 – Profiling Hazard Events	• Reorganized as section 3.4 Hazard Profiles and State Risk Assessment • Each profile was updated to include: Description/Location; Previous Occurrences; Probability of Future Hazard Events; State Vulnerability Analysis; State Estimates of Potential Losses; Development in Hazard Prone Areas; and Consequence Analysis. • Added USDA Risk Management Agency insured crop losses for all natural hazards. • Completed vulnerability and risk assessment methodologies to quantify losses for all profiled hazards where data was available. • Dam and Levee Failure profile hazard was added • Severe Thunderstorms profile detailing damaging winds, hail, and lightning was added • Used FEMA's HAZUS-MH average annualized loss data for flood hazard
Section 4.3 – Assessing Vulnerability by Jurisdiction	• Reorganized as Section 3.5 Integration of Local Plans. • Reviewed risk assessments from 55 local plans (currently approved) to summarize how local governments ranked hazards in their jurisdictions associated with all natural hazards. This differs from the 2010 State Plan Update which utilized the hazard ranking from local plans as the State Vulnerability and Loss Estimation Analysis.
Section 4.4 – Assessing Vulnerability of State Facilities	• Reorganized as Section 3.6 Assessment of State Owned Facilities • For this 2013 update the following inventories were included: – State owned and leased facilities – Public Schools – Elementary, Middle, and High Schools – Department of Higher Education/Public Colleges – County or State Correctional Institutions – Arkansas State Bridges • Vulnerability overview analysis and loss estimates were provided for all the profiled hazards
Section 4.5 – Estimating Potential Losses by Jurisdiction	• Reorganized and included in Section 3.5 Integration of Local Plans.
Section 4.6 – Estimating Potential Losses of State Facilities	• Reorganized as Section 3.6 Assessment of State Owned Facilities
Section 5 – Mitigation Strategies	• Reorganized as ***Chapter 4.0 Mitigation Strategies*** • Updated based on the results of the updated risk assessment, data from the local plans, completed mitigation actions, and implementation obstacles and opportunities over the last three years.
Section 5.1 – Hazard Mitigation Goals	• Reorganized as Section 4.1 Mitigation Goals and Objectives • Reviewed goals and objectives to the APDMAC Meeting on March 26, 2013.

2010 Plan Section	2013 Update Review and Analysis
Section 5.2 – State Capability Assessment	• Reorganized as Section 4.2 State Capability Assessment • Updated the state capabilities, both pre and post disaster, and how these capabilities have changed since the previously approved plan.
Section 5.3 – Local Capability Assessment	• Reorganized as Section 4.3 Local Capability Assessment • Reviewed capability assessments and effectiveness in local plans to develop a general description of local capabilities.
Section 5.4 – Mitigation Actions	• Reorganized as Section 4.4 Mitigation Actions • Reviewed mitigation actions from the 2010 plan • Documented progress of actions since the previously approved plan and identified new actions.
Section 5.5 – Funding Sources	• Reorganized as Section 4.5 Funding Sources • Identified funding sources used since previously approved plan. • Updated primary funding sources with more detail and updated list of other potential funding sources.
Severe Repetitive Loss Strategy	• Incorporated this new element into Chapter 4 • Described the State's Severe Repetitive Flood Loss Strategy
Section 5.6 – Local Funding and Technical Assistance	• Reorganized as ***Chapter 5.0 Coordination of Local Mitigation Planning*** • Reviewed process for and progress in coordinating local mitigation planning. • Updated information on the status of local plan completion. • Described how the State provided planning and technical assistance to local governments over the last three years. • Updated the process for providing local assistance to focus resources on the local plan update process. • Summarized current status of counties with completed and approved local plans, those in process, and those without plans.
Section 5.7 – Local Plan Integration	• Reorganized as Section 5.2 Local Plan Integration • Described how local risk assessments, goals and objectives, mitigation actions, and capabilities were integrated into the updated state plan. • Assessed the challenges and success of this integration.
Section 5.8 – Prioritizing local Assistance	• Reorganized as Section 5.3 Prioritizing Local Assistance • Reviewed criteria for prioritizing communities and local jurisdictions that would receive planning and project grants and determined it should remain the same.
Section 6, 6.1, and 6.2 – Plan Maintenance	• Reorganized as ***Chapter 6.0 Plan Maintenance Process***. Reviewed procedures for monitoring, evaluating, and updating the plan.
Chapter 7.0 – Enhanced Plan	• New chapter developed based upon FEMA's guidance for enhanced plans to describe the Arkansas comprehensive hazard mitigation planning program.

2.2 Coordination Among Agencies

Requirement §201.4(b): The [state] mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups, and …

Plan Update: The updated plan should describe how the State interacted with all levels of government as indicated above. It should also describe how coordination among agencies changed since approval of the previous plan.

The State recognizes the importance of coordinating with local, state, and federal agencies and other interested groups involved in hazard mitigation in the planning process for the update of the Arkansas All Hazard Mitigation Plan. This coordination is necessary to enhance data collection, mitigation strategy development, plan implementation, and overall investment in Arkansas' mitigation program. The planning efforts for Versions 1, 2, 3, and 4 involved other agencies through the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC), and follow-up phone conversations and email communication with key planning team members. One addition to the process for Version 2 included the introduction of the EMAP mitigation standards to the other agencies on the team so that they understand their role in meeting and upholding those standards.

As the agency designated by the Arkansas Governor to coordinate statewide emergency preparedness, response, recovery, and hazard mitigation activities, ADEM works with other state, federal, and local agencies to develop and implement the strategies outlined in this document, obtain interagency feedback on the mitigation steps taken, and use of information to update this plan. ADEM acted as the coordinator of and participant on the APDMAC during the planning process for the previously approved plans and for the 2013 update.

The previous section, Section 2.1 Documentation of Planning Process, listed the members that participate on the APDMAC for the 2013 plan update. These members of the APDMAC were kept involved in the update process by being invited to the three planning meetings, attending planning meetings when available, being sent emails of the meeting minutes, providing data and information, and commenting on the draft version of the plan.

As hazard mitigation planning continuously involves multiple government agencies, private voluntary organizations, and commerce and industry, it is assumed the role of other entities in updating this plan will increase over time. This plan will be adjusted accordingly to reflect new participants and their roles during the next review process. The attendance of state agency representatives to the planning meetings and coordination among agencies increased for this 2013 plan update Arkansas agency representatives understand the importance of this planning process and having an approved State Mitigation Plan in Arkansas.

2.3 Program Integration

Requirement §201.4(b): [The State mitigation planning process should] be integrated to the extent possible with other ongoing State planning efforts, as well as other FEMA mitigation programs and initiatives.

Plan Update: In addition to discussing what integration efforts have taken place to date, the update should discuss State planning integration efforts and opportunities that were identified in the previously approved plan, and any unforeseen obstacles that emerged since approval of the previous plan.

The State of Arkansas is fully committed to an effective and comprehensive mitigation program. The Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Earthquake Program, and mitigation planning are all the direct responsibility of ADEM. Flood Mitigation Assistance Repetitive Flood Claims, Severe Repetitive Loss, and floodplain management are the responsibility of the Arkansas Natural Resources Commission (ARNC). In order for these programs to achieve their full potential, state activities should complement appropriate mitigation goals and strategies. The best way to accomplish this is to ensure that mitigation goals and initiatives are integrated to the extent possible into all planning activities for federal, state, and local governments. Over the years, the works of ADEM and ARNC have been incorporated into the Arkansas All-Hazards Mitigation Plan as well as planning activities of other state agencies.

Additional examples of mitigation-related plans and programs of other State agencies participating on the APDMAC are provided in Section 4.2.1.

2.3.1 Integration of Local Plans

ADEM is the primary state coordinating agency for all local hazard mitigation plans. The Mitigation Branch is responsible for working with local governments to develop, review, and update local hazard mitigation plans and integrate them with the state plan. As of January 2013, 55 of 75 Arkansas counties had approved hazard mitigation plans that meet the requirements of both the Disaster Mitigation Act of 2000 and the Flood Mitigation Assistance Program. Another 14 counties are in the process of updating their plan and/or in process of their first plan.

It is understood by all levels of government that the success of the Arkansas mitigation program depends on the degree to which everyone works together toward the common goal of reducing future disaster losses in Arkansas. It is also widely acknowledged that the local plans can benefit from data in the state plan, and the state plan can benefit from data in local plans. For this plan update, the APDMAC reviewed, summarized, and incorporated information from the local plans. This information included hazard identification and risk assessment, goals and objectives, local capabilities, and mitigation initiatives. More information about the integration of local plans is in Section 3.5 Assessing Vulnerability and Estimating Losses by Jurisdiction: Integration of Local Plans and Section 5.2 Local Plan Integration.

This plan and its hazard identification and risk assessment provide a baseline reference for communities to use in completing local mitigation plans.

2.3.2 Integrating Planning Information with Other Mitigation Partners

The Arkansas All Hazard Mitigation Plan Update identifies Arkansas's hazards, risks, vulnerabilities, goals, objectives, priorities, and strategies for mitigation. The plan is the basic document that ADEM uses to focus efforts to improve the lives of Arkansas residents. Over the years, ADEM has worked continuously to identify partners (federal, state, local, and non-profit entities) interested in participating in the State's mitigation efforts.

Integration of federal, state, and local agencies; and private non-profit organizations into the state mitigation program has been an ongoing process that has helped educate these agencies and organizations about the importance of mitigation. This educational process resulted in use of mitigation in their programs and plans over time. These discussions and/or meetings have involved reviews of current programs and policies that promote or could potentially promote mitigation initiatives throughout the State and reviews of existing and proposed plans to identify mitigation opportunities. The lessons learned through these programs and activities have contributed to the development of this plan and have been integrated into separate plans and programs.

Examples integration and promotion of mitigation efforts with federal, state, and local agencies; and private non-profit organizations include the following:

- Arkansas Department of Emergency Management (ADEM) Hazard Mitigation Administrative Plan
- ADEM Emergency Management Five-Year Strategic Plan
- ADEM Threat and Hazard Identification and Risk Assessment
- ADEM Arkansas Emergency Operations Plan
- Arkansas Disaster Resistant Home Coalition
- Arkansas Natural Resources Commission (ANRC) Floodplain Management Program
- ANRC State Water Plan
- ANRC Dam Safety Program
- Arkansas Forestry Commission's Arkansas FireWise Program
- National Weather Service StormReady Program
- Arkansas Earthquake Program
- County Emergency Management Programs
- FEMA's National Mitigation Strategy
- U.S. Geological Survey National Landslide Mitigation Strategy
- Earthquake Vulnerability of Transportation Systems in the Central United States
- The New Madrid Housing Recovery Initiative Plan

- National Flood Insurance Program's (NFIP) Community Rating System (CRS)
- Arkansas Governor's Earthquake Advisory Council (GEAC or AGEAC)
- Arkansas Regulatory Partnership Program
- Chemical Stockpile Emergency Preparedness Program (CSEPP)
- Arkansas One-Call
- National Fire Protection Association
- Arkansas Geographic Information Office, GeoStor
- Emergency Management Accreditation Program
- National Incident Management System (NIMS)
- Buffer Zone Protection Program
- Arkansas Hazardous Materials Emergency Response Commission (SERC)
- Transportation Community Awareness Emergency Response (TRANSCAER)
- National Strategy for Pandemic Influenza
- Central Arkansas Veterans Healthcare System – Bioterrorism Readiness Plan
- Arkansas Animal Disease Emergency Response Plan
- The Arkansas State Disaster Insurance Coalition Plan
- The Center for Disease Control Emergency Planning
- Arkansas Influenza Pandemic Plan
- Federal Animal Disease Risk Assessment, Prevention and Control Act of 2001 – Final Report
- Arkansas Fire Prevention Code
- Arkansas Continuity of Operations Program (ACOOP)
- CUSEC Earthquake Awareness Month
- New Madrid Catastrophic Planning Initiative

Each initiative is further detailed in Section 4.2 State Capability Assessment.

This Arkansas All Hazard Mitigation Plan 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 interested local governments, universities, businesses, and private associations, in addition to state and federal departments and agencies.

2.3.3 Challenges in Planning Integration

This 2013 update reflects the successful integration of 55 currently approved local plans. Since Arkansas has 75 counties and 502 incorporated places, ADEM was challenged with how to effectively and efficiently develop plans for each of the jurisdictions. ADEM streamlined the process by encouraging local governments to participate in multi-jurisdictional county-level plans, which reduced the number of plans that needed to be reviewed and integrated and brings local communities together to focus on mitigation.

ADEM provides local mitigation planning guidance and technical assistance for the multi-jurisdictional county-level plans while allowing for local flexibility. This results in local risk assessments prepared using different methods and interpretations to determine vulnerability and different measures to assess risk based on the various levels of data availability. Therefore, it was challenging to compare the counties to see where one might be more vulnerable to a particular hazard than another. (More information about the challenges of the local risk assessment integration can be found in Section 3.5 Assessing Vulnerability and Estimating Potential Losses by Jurisdiction: Integration of Local Plans, Section 4.1 Mitigation Goals and Objectives, Section 4.3 Local Capability Assessment, and Section 4.4 Mitigation Actions.)

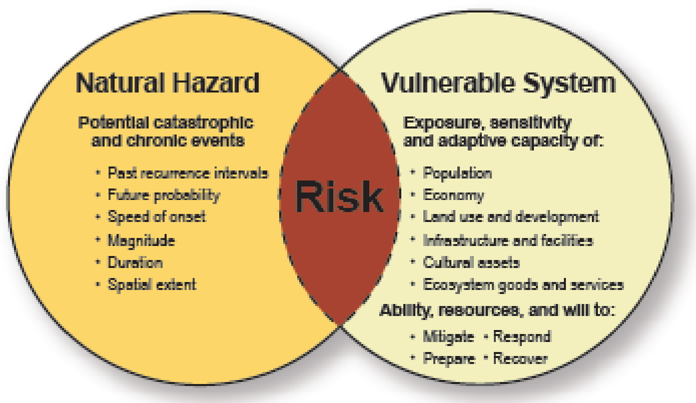
Traditionally, the State of Arkansas has had great success in integrating with other state planning efforts as well as FEMA mitigation programs and initiatives. Challenges in integration that exist relate to lack of staff, meeting schedule conflicts, lack of travel funds for meetings, and lack of time to focus on other plans and programs in addition to daily work duties.

3.0 Risk Assessment

3.1 Risk Assessment Overview

People and property in Arkansas are at risk from a variety of natural and man-made hazards that have the potential for causing widespread loss of life and damage to property, infrastructure, and the environment. The figure below, as prepared by the USGS, demonstrates risk as the intersection of the natural hazard and the vulnerable system. As the components of the vulnerable system grow, such as population; so can the area of intersection or risk. Risk is a function both of exposure to the natural hazard and the human decisions and policies before, during, and after a hazard event.

Figure 3.1.a. Understanding Risk to Natural Hazards



Sources: USGS, http://pubs.usgs.gov/fs/2011/3008/fs2011-3008.pdf

For man-made hazards, events generally occur at a specific location such as a building rather than encompassing a wide area such as a floodplain. Risk is assessed for identified critical facilities and systems which may be widely distributed throughout the State. Vulnerability is specific to each critical facility or system and identifies the most exploitable weakness of each asset.

This chapter has been compiled to identify the multiplicity of natural and manmade hazards that exist at varying locations and degrees of magnitude throughout the State and to determine the potential impacts of these hazards on residents, property, and the environment. In addition, this chapter first presents the analysis of vulnerable system, i.e. the State population and development trends.

3.2 Analysis of State Population and Development Trends

This section begins with an inventory of the buildings and population that could be vulnerable to hazards within the State followed by an analysis of growth trends, including recent changes in population growth and housing unit development at the county level.

This section quantifies the population and buildings exposed to potential hazards, by county. **Table 3.2.a** and **Table 3.2.b** provide numeric breakdowns of this information that form the basis of the vulnerability and risk assessment presented in this plan. This information was derived from inventory data associated with FEMA's loss estimation software HAZUS-MH 2.1 (February 2012). Building inventory counts are based on the 2000 census data adjusted to 2006 numbers using the Dun & Bradstreet Business Population Report. Inventory values reflect 2006 valuations, based on RSMeans (a supplier of construction cost information) replacement costs. Population counts are the 2010 Census from the U.S. Census Bureau. **Figure 3.2.a** presents the U.S. Census profile for Arkansas.

Figure 3.2 a. Arkansas 2010 Census Profile

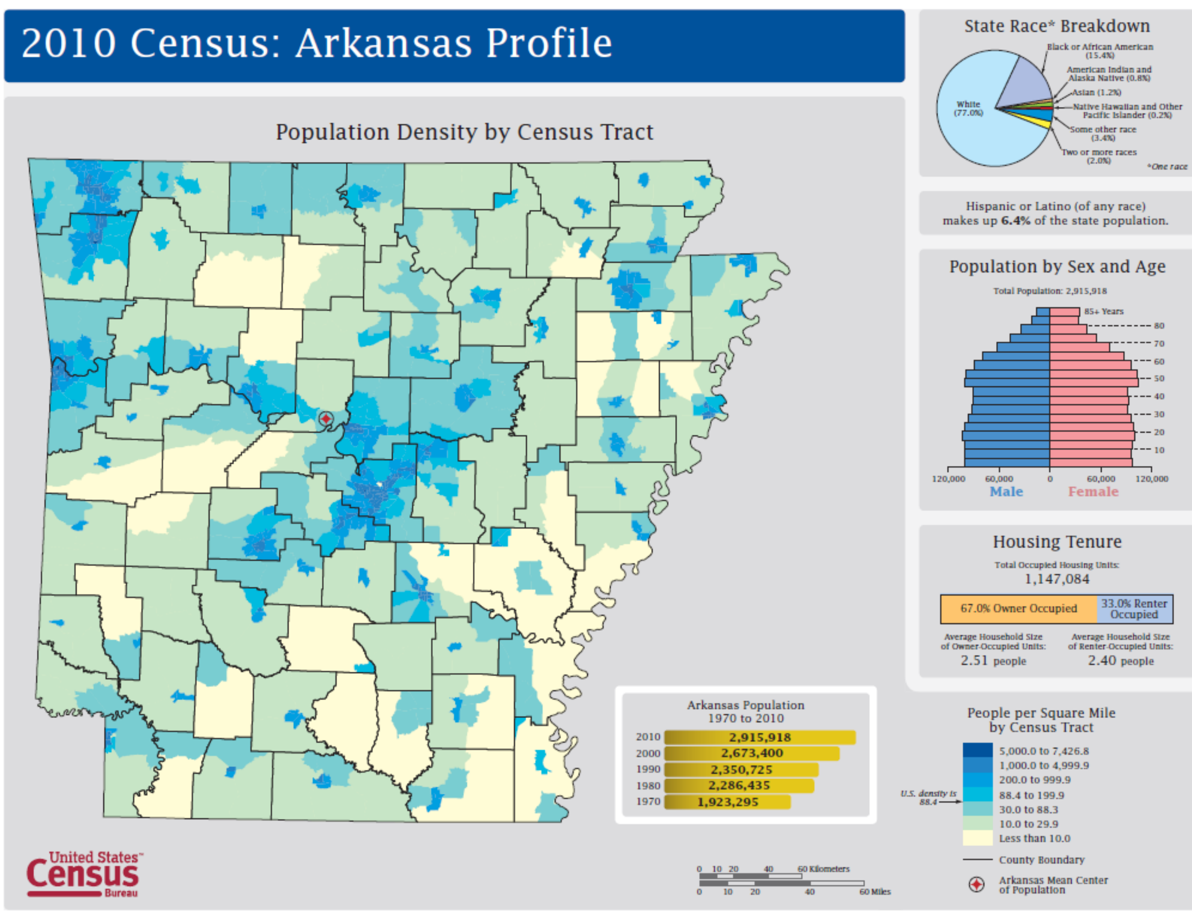


Table 3.2.a. Population and Building Count

County	Population 2010 Census	Building Count (HAZUS-MH 2.1)							
		Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
ARKANSAS	19,019	10563	584	120	176	55	32	15	11545
ASHLEY	21,853	11466	434	132	49	75	26	18	12200
BAXTER	41,513	21615	883	266	43	75	54	17	22953
BENTON	221,339	66388	3095	1117	250	263	73	77	71263
BOONE	36,903	17066	853	237	75	83	33	19	18366
BRADLEY	11,508	6665	265	64	28	46	19	8	7095
CALHOUN	5,368	3362	49	13	3	10	7	3	3447
CARROLL	27,446	12842	667	181	58	66	29	18	13861
CHICOT	11,800	7130	273	49	72	49	17	10	7600
CLARK	22,995	10741	497	127	37	76	23	41	11542
CLAY	16,083	10354	353	62	110	34	25	11	10949
CLEBURNE	25,970	15123	598	190	61	58	24	13	16067
CLEVELAND	8,689	4412	92	42	25	25	14	5	4615
COLUMBIA	24,552	12408	515	143	52	80	24	18	13240
CONWAY	21,273	10052	418	115	57	50	25	15	10732
CRAIGHEAD	96,443	34496	1818	466	234	158	56	54	37282
CRAWFORD	61,948	22816	912	308	82	100	34	26	24278
CRITTENDEN	50,902	20000	866	181	87	100	40	32	21306
CROSS	17,870	8716	372	70	80	45	25	16	9324
DALLAS	8,116	5444	162	48	10	28	14	8	5714
DESHA	13,008	7533	338	53	66	42	17	11	8060
DREW	18,509	8543	374	123	54	59	15	16	9184
FAULKNER	113,237	34488	1610	560	131	160	40	51	37040
FRANKLIN	18,125	8874	273	64	42	34	25	13	9325
FULTON	12,245	6770	147	45	16	12	16	9	7015
GARLAND	96,024	45621	1868	637	102	188	61	28	48505
GRANT	17,853	7209	275	104	27	33	18	8	7674

County	Population 2010 Census	Building Count (HAZUS-MH 2.1)							
		Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
GREENE	42,090	17149	735	206	117	59	19	23	18308
HEMPSTEAD	22,609	11824	481	118	69	56	38	18	12604
HOT SPRING	32,923	14554	480	142	37	70	23	16	15322
HOWARD	13,789	7294	312	105	57	41	17	14	7840
INDEPENDENCE	36,647	17026	758	246	85	87	47	29	18278
IZARD	13,696	8413	192	56	14	18	19	11	8723
JACKSON	17,997	8844	385	62	88	44	24	11	9458
JEFFERSON	77,435	36558	1581	327	112	255	60	61	38954
JOHNSON	25,540	11164	313	91	21	35	21	15	11660
LAFAYETTE	7,645	5727	126	34	28	21	10	9	5955
LAWRENCE	17,415	9636	352	86	100	33	43	10	10260
LEE	10,424	4899	163	20	58	32	19	8	5199
LINCOLN	14,134	5353	126	22	23	17	17	8	5566
LITTLE RIVER	13,171	7191	254	53	36	45	24	13	7616
LOGAN	22,353	11486	422	111	57	60	39	17	12192
LONOKE	68,356	22962	898	274	194	114	37	26	24505
MADISON	15,717	7045	135	51	15	18	18	10	7292
MARION	16,653	9727	284	99	18	26	22	10	10186
MILLER	43,462	17772	738	162	43	105	27	21	18868
MISSISSIPPI	46,480	23213	906	184	173	138	57	42	24713
MONROE	8,149	6076	230	40	42	38	16	10	6452
MONTGOMERY	9,487	5841	144	62	28	18	21	5	6119
NEVADA	8,997	5691	114	35	12	18	9	8	5887
NEWTON	8,330	5046	88	27	8	13	12	5	5199
OUACHITA	26,120	14813	513	167	28	118	28	20	15687
PERRY	10,445	5427	116	33	21	15	14	8	5634
PHILLIPS	21,757	11531	413	86	94	58	28	25	12235
PIKE	11,291	6745	221	59	26	26	20	7	7104
POINSETT	24,583	11552	507	127	156	67	32	20	12461

County	Population 2010 Census	Building Count (HAZUS-MH 2.1)							
		Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
POLK	20,662	11126	460	144	49	54	25	15	11873
POPE	61,754	23493	1146	330	110	112	34	37	25262
PRAIRIE	8,715	6454	131	20	33	9	12	7	6666
PULASKI	382,748	139947	8606	1849	353	818	450	265	152288
RANDOLPH	17,969	9088	314	88	70	26	24	8	9618
SAINT FRANCIS	28,258	11730	494	126	68	71	31	17	12537
SALINE	107,118	35033	1377	485	82	125	39	17	37158
SCOTT	11,233	5583	147	38	18	17	19	10	5832
SEARCY	8,195	5047	88	39	11	12	17	8	5222
SEBASTIAN	125,744	47319	2643	798	102	227	79	58	51226
SEVIER	17,058	7578	307	83	51	32	16	13	8080
SHARP	17,264	10342	337	85	25	31	28	15	10863
STONE	12,394	6522	181	55	19	16	21	7	6821
UNION	41,639	21355	1033	321	64	161	50	40	23024
VAN BUREN	17,295	10126	231	57	15	30	20	7	10486
WASHINGTON	203,065	58263	3373	972	318	275	77	101	63379
WHITE	77,076	29777	1334	384	151	138	55	39	31878
WOODRUFF	7,260	4989	155	20	30	13	17	6	5230
YELL	22,185	10455	235	68	24	28	31	10	10851

Sources: U.S. Census Bureau, HAZUS-MH 2.1

Table 3.2 b. Building and Content Values for the Key Occupancies (Uses) for the State of Arkansas
All dollar values are in thousands

County	Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
ARKANSAS	$1,706,066	$457,150	$148,402	$58,872	$59,350	$29,751	$17,486	$2,477,077
ASHLEY	$1,753,619	$355,079	$217,135	$18,766	$72,014	$23,554	$33,742	$2,473,909
BAXTER	$3,217,240	$599,366	$205,669	$10,682	$70,260	$62,149	$31,698	$4,197,064
BENTON	$13,449,419	$2,872,727	$1,178,050	$105,112	$296,120	$85,377	$137,845	$18,124,650
BOONE	$2,578,572	$647,916	$253,426	$15,210	$88,198	$32,564	$45,244	$3,661,130
BRADLEY	$942,322	$154,351	$46,799	$9,010	$35,998	$11,345	$19,230	$1,219,055
CALHOUN	$405,024	$40,269	$12,140	$724	$18,192	$6,213	$4,838	$487,400
CARROLL	$1,918,233	$476,691	$152,022	$19,222	$74,932	$24,051	$30,118	$2,695,269
CHICOT	$816,843	$179,098	$86,846	$30,308	$35,882	$16,604	$16,503	$1,182,084
CLARK	$1,652,241	$319,365	$125,103	$11,390	$67,036	$15,186	$263,925	$2,454,246
CLAY	$1,419,556	$294,716	$88,692	$34,012	$37,034	$16,863	$22,888	$1,913,761
CLEBURNE	$2,369,972	$453,745	$209,106	$13,224	$58,386	$15,117	$38,977	$3,158,527
CLEVELAND	$630,739	$36,745	$17,943	$7,570	$21,460	$19,967	$10,590	$745,014
COLUMBIA	$1,754,500	$352,236	$208,159	$27,270	$77,816	$24,709	$43,109	$2,487,799
CONWAY	$1,587,785	$300,386	$109,734	$14,284	$49,140	$16,626	$32,024	$2,109,979
CRAIGHEAD	$6,215,438	$2,024,932	$725,208	$65,234	$184,788	$47,770	$100,404	$9,363,774
CRAWFORD	$3,740,214	$837,021	$296,835	$34,108	$100,704	$30,909	$54,762	$5,094,553
CRITTENDEN	$3,801,193	$790,446	$221,395	$29,690	$112,876	$47,184	$68,525	$5,071,309
CROSS	$1,288,848	$253,166	$64,243	$34,338	$46,292	$25,175	$23,862	$1,735,924
DALLAS	$698,415	$110,668	$61,802	$2,908	$34,160	$7,178	$16,000	$931,131
DESHA	$1,008,015	$295,570	$63,289	$29,650	$42,266	$10,542	$24,454	$1,473,786
DREW	$1,350,576	$314,681	$233,364	$15,742	$66,572	$16,108	$46,366	$2,043,409
FAULKNER	$6,884,246	$1,443,561	$752,634	$29,976	$205,070	$53,127	$124,546	$9,493,160
FRANKLIN	$1,301,318	$143,905	$80,942	$17,618	$29,032	$18,971	$23,450	$1,615,236
FULTON	$874,249	$104,867	$55,089	$3,576	$14,210	$14,282	$14,080	$1,080,353

County	Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
GARLAND	$7,873,478	$1,777,659	$688,892	$26,118	$215,084	$90,512	$65,338	$10,737,081
GRANT	$1,207,519	$157,335	$105,487	$4,352	$26,582	$13,020	$21,774	$1,536,069
GREENE	$2,931,064	$627,454	$293,759	$30,310	$68,994	$13,951	$56,120	$4,021,652
HEMPSTEAD	$1,490,239	$311,460	$164,114	$33,198	$46,556	$30,738	$29,756	$2,106,061
HOT SPRING	$2,233,529	$337,957	$164,854	$9,816	$71,498	$30,315	$36,936	$2,884,905
HOWARD	$939,134	$257,522	$178,178	$18,982	$40,156	$13,032	$20,337	$1,467,341
INDEPENDENCE	$2,640,887	$584,750	$602,759	$29,258	$84,614	$36,473	$58,553	$4,037,294
IZARD	$908,181	$162,826	$47,693	$3,580	$20,754	$12,357	$23,660	$1,179,051
JACKSON	$1,335,719	$326,214	$152,837	$31,166	$33,192	$17,053	$23,395	$1,919,576
JEFFERSON	$6,547,176	$1,301,657	$507,180	$29,200	$277,698	$66,917	$121,754	$8,851,582
JOHNSON	$1,511,656	$261,138	$193,218	$6,518	$38,908	$16,517	$31,484	$2,059,439
LAFAYETTE	$626,681	$60,758	$21,480	$9,664	$18,548	$5,008	$9,460	$751,599
LAWRENCE	$1,305,420	$219,246	$76,181	$31,278	$29,084	$46,793	$37,320	$1,745,322
LEE	$609,249	$90,316	$8,712	$16,466	$25,258	$14,225	$19,699	$783,925
LINCOLN	$841,344	$94,529	$41,657	$11,892	$20,286	$21,706	$28,026	$1,059,440
LITTLE RIVER	$1,055,310	$146,317	$99,015	$10,020	$42,530	$21,917	$20,845	$1,395,954
LOGAN	$1,651,278	$249,872	$112,791	$13,806	$59,074	$42,223	$34,456	$2,163,500
LONOKE	$4,377,649	$571,558	$227,220	$64,384	$138,378	$34,344	$58,346	$5,471,879
MADISON	$1,004,882	$84,200	$33,943	$5,648	$18,068	$10,156	$17,850	$1,174,747
MARION	$1,261,547	$153,970	$143,384	$4,322	$22,526	$26,833	$14,782	$1,627,364
MILLER	$2,791,308	$533,738	$191,757	$13,654	$130,028	$26,903	$51,622	$3,739,010
MISSISSIPPI	$3,704,337	$865,973	$414,146	$99,584	$125,102	$42,874	$115,143	$5,367,159
MONROE	$745,839	$173,114	$46,856	$20,836	$32,128	$8,857	$17,446	$1,045,076
MONTGOMERY	$720,964	$62,625	$29,142	$7,190	$12,308	$22,376	$12,904	$867,509
NEVADA	$659,620	$60,485	$22,573	$4,126	$18,550	$6,782	$14,712	$786,848
NEWTON	$613,741	$237,017	$17,682	$3,430	$11,776	$10,516	$14,410	$908,572
OUACHITA	$2,014,065	$304,480	$167,660	$5,256	$98,750	$22,596	$37,682	$2,650,489

County	Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
PERRY	$804,312	$50,417	$23,910	$12,678	$13,690	$9,381	$15,608	$929,996
PHILLIPS	$1,582,544	$358,642	$137,805	$35,182	$57,020	$24,167	$51,025	$2,246,385
PIKE	$780,006	$142,949	$30,895	$8,154	$21,334	$13,750	$10,316	$1,007,404
POINSETT	$1,750,281	$503,543	$254,226	$60,832	$64,578	$22,037	$38,820	$2,694,317
POLK	$1,257,822	$341,949	$131,334	$11,926	$57,256	$29,528	$53,037	$1,882,852
POPE	$4,325,070	$1,049,200	$353,340	$26,420	$135,472	$37,850	$67,563	$5,994,915
PRAIRIE	$823,198	$83,830	$36,180	$27,350	$8,350	$5,167	$10,496	$994,571
PULASKI	$35,016,858	$13,318,057	$2,375,016	$99,954	$1,151,932	$786,561	$875,548	$53,623,926
RANDOLPH	$1,305,300	$193,432	$82,442	$14,534	$21,452	$21,892	$19,892	$1,658,944
SAINT FRANCIS	$1,790,964	$426,600	$187,486	$23,442	$61,660	$23,718	$50,144	$2,564,014
SALINE	$6,803,999	$1,001,682	$333,602	$15,398	$149,676	$50,589	$45,640	$8,400,586
SCOTT	$702,769	$86,549	$34,299	$10,200	$19,176	$15,060	$11,714	$879,767
SEARCY	$578,647	$87,832	$83,772	$7,012	$12,102	$16,602	$14,066	$800,033
SEBASTIAN	$9,933,637	$3,206,763	$1,385,649	$30,806	$266,760	$107,473	$156,646	$15,087,734
SEVIER	$940,404	$193,228	$51,382	$13,600	$24,484	$12,678	$42,180	$1,277,956
SHARP	$1,402,229	$230,565	$83,054	$5,590	$37,620	$23,377	$21,662	$1,804,097
STONE	$788,394	$145,645	$46,971	$4,424	$29,016	$21,200	$10,238	$1,045,888
UNION	$3,331,362	$1,139,674	$574,815	$21,012	$169,878	$52,638	$87,359	$5,376,738
VAN BUREN	$1,367,851	$181,495	$46,753	$7,018	$39,368	$21,730	$13,386	$1,677,601
WASHINGTON	$12,027,927	$3,346,120	$1,136,454	$93,646	$297,566	$81,161	$229,587	$17,212,461
WHITE	$5,014,875	$1,015,816	$401,669	$31,538	$155,762	$50,632	$155,312	$6,825,604
WOODRUFF	$623,648	$131,016	$27,551	$11,354	$13,576	$9,971	$14,952	$832,068
YELL	$1,450,442	$196,857	$81,174	$15,600	$35,206	$30,235	$18,630	$1,828,144

Sources: HAZUS-MH 2.1
Note: *All $ values are in thousands

As part of the plan update process, the State looks at changes in growth and development and examines these changes in the context of the State's hazard-prone areas and how the changes in growth and development affect loss estimates and vulnerability. When the population in a hazardous area increases, so does the vulnerability of people and property associated with the hazards unless mitigation measures are taken. When a population in a hazard area decreases, the burden for assuming the loss to vulnerable property may exceed the resources of the declining population

As part of the update process, the State reviewed baseline information from the original local hazard mitigation plans, paying particular attention to the high-growth counties. Since these plans were first generation plans, trend information beyond baseline data (e.g., population, land area) was generally not discussed. Notable and important development trends illustrated in future local hazard mitigation plan updates (e.g., changes in land use in hazardous areas, mitigation successes), where discussed, will be captured in future state plan updates. The discussion here focuses on population growth and increases in housing units and density by county, based on 2010 U.S. Census Bureau data.

3.2.1 Population

In the 2010 population counts released by the U.S. Census Bureau (April 1, 2010), Arkansas ranked 32nd among the 50 states in population with 2,915,918 persons, 27th in land area with 52,035 square miles, 22nd in rate of growth at 9.1%, and 36th in population density with 56 persons per square mile.

In 1840, after more than 3 years of statehood and 21 years of being a Territory, Arkansas had a population of 97,574. Decennial census findings from the last few decades, and the most recent estimate of Arkansas's population growth are shown below on **Table 3.2.c**. Other general Arkansas characteristics are presented in **Table 3.2.d**, Arkansas Quick Facts.

Table 3.2.c. Arkansas' Population Growth

Census	Total Population	10-Year Percent Change	Average Annual Percent Change
1970	1,923,295	--	--
1980	2,286,435	18.88%	1.888%
1990	2,350,725	2.81%	0.281%
2000	2,673,400	13.73%	1.373%
2010	2,915,918	9.07%	0.907%

Source: US Census Bureau

Table 3.2.d. Arkansas Quick Facts

Population, 2010	2,915,918
Population, percent change, April 1, 2000 to April 1, 2010	9.1%
Land area in square miles, 2010	52,035
Persons per square mile, 2010	56
Number of Incorporated Cities, Towns, and Municipalities	503
Housing Units	1,316,299
Housing Units per square mile, 2010	25.3
Number of Counties	75
Counties with a 2010 population estimate: • **Greater than 125,000**	4 (Benton, Pulaski, Sebastian, and Washington)
• **75,000 to 124,999**	6 (Craighead, Faulkner, Garland, Jefferson, Saline, and White)
• **30,000 to 74,999**	12
• **15,000 to 29,999**	29
• **1 to 14,999**	24

Source: US. Census Bureau, State of Arkansas (www.local.arkansas.gov)

An illustration of Arkansas's population by county based on the 2010 census is provided in **Figure 3.2.b.**

Figure 3.2.b. Counties by Population, 2010

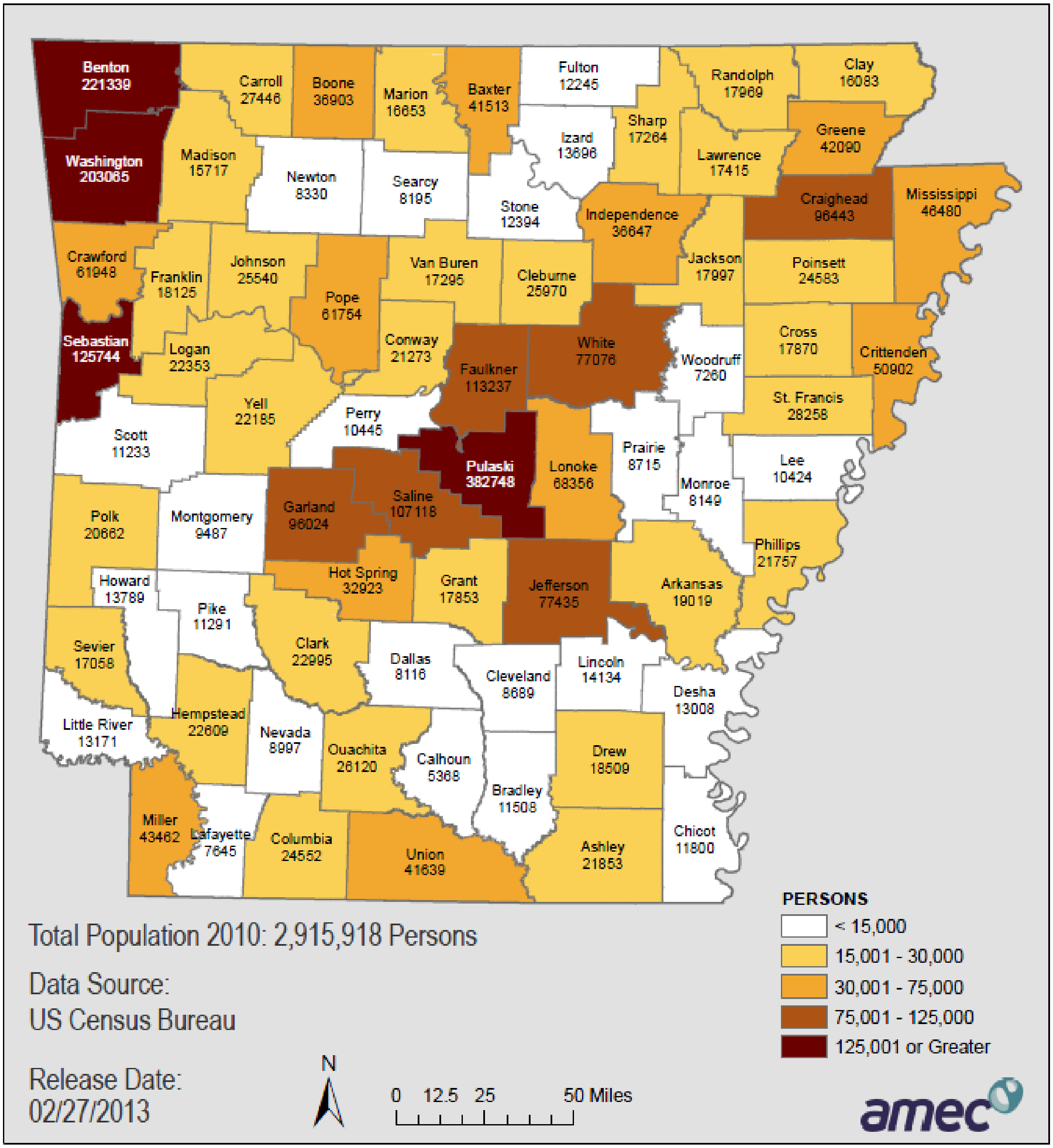


Table 3.2.e, Arkansas County Population Changes, lists the population changes for all Arkansas counties based upon the 2000 and 2010 census data by percentage and in numerical form.

Table 3.2.e. Arkansas County Population Changes 2000 to 2010

County	2000	2010	Percent Change 2000 to 2010	Population Change
Arkansas Statewide	**2,673,400**	**2,915,918**	**9.1%**	**242,518**
Arkansas County	20,749	19,019	-8.3%	-1,730
Ashley County	24,209	21,853	-9.7%	-2,356
Baxter County	38,386	41,513	8.1%	3,127
Benton County	153,406	221,339	44.3%	67,933
Boone County	33,948	36,903	8.7%	2,955
Bradley County	12,600	11,508	-8.7%	-1,092
Calhoun County	5,744	5,368	-6.5%	-376
Carroll County	25,357	27,446	8.2%	2,089
Chicot County	14,117	11,800	-16.4%	-2,317
Clark County	23,546	22,995	-2.3%	-551
Clay County	17,609	16,083	-8.7%	-1,526
Cleburne County	24,046	25,970	8.0%	1,924
Cleveland County	8,571	8,689	1.4%	118
Columbia County	25,603	24,552	-4.1%	-1,051
Conway County	20,336	21,273	4.6%	937
Craighead County	82,148	96,443	17.4%	14,295
Crawford County	53,247	61,948	16.3%	8,701
Crittenden County	50,866	50,902	0.1%	36
Cross County	19,526	17,870	-8.5%	-1,656
Dallas County	9,210	8,116	-11.9%	-1,094
Desha County	15,341	13,008	-15.2%	-2,333
Drew County	18,723	18,509	-1.1%	-214
Faulkner County	86,014	113,237	31.6%	27,223
Franklin County	17,771	18,125	2.0%	354
Fulton County	11,642	12,245	5.2%	603
Garland County	88,068	96,024	9.0%	7,956
Grant County	16,464	17,853	8.4%	1,389
Greene County	37,331	42,090	12.7%	4,759
Hempstead County	23,587	22,609	-4.1%	-978
Hot Spring County	30,353	32,923	8.5%	2,570
Howard County	14,300	13,789	-3.6%	-511
Independence County	34,233	36,647	7.1%	2,414
Izard County	13,249	13,696	3.4%	447
Jackson County	18,418	17,997	-2.3%	-421
Jefferson County	84,278	77,435	-8.1%	-6,843

County	2000	2010	Percent Change 2000 to 2010	Population Change
Johnson County	22,781	25,540	12.1%	2,759
Lafayette County	8,559	7,645	-10.7%	-914
Lawrence County	17,774	17,415	-2.0%	-359
Lee County	12,580	10,424	-17.1%	-2,156
Lincoln County	14,492	14,134	-2.5%	-358
Little River County	13,628	13,171	-3.4%	-457
Logan County	22,486	22,353	-0.6%	-133
Lonoke County	52,828	68,356	29.4%	15,528
Madison County	14,243	15,717	10.3%	1,474
Marion County	16,140	16,653	3.2%	513
Miller County	40,443	43,462	7.5%	3,019
Mississippi County	51,979	46,480	-10.6%	-5,499
Monroe County	10,254	8,149	-20.5%	-2,105
Montgomery County	9,245	9,487	2.6%	242
Nevada County	9,955	8,997	-9.6%	-958
Newton County	8,608	8,330	-3.2%	-278
Ouachita County	28,790	26,120	-9.3%	-2,670
Perry County	10,209	10,445	2.3%	236
Phillips County	26,445	21,757	-17.7%	-4,688
Pike County	11,303	11,291	-0.1%	-12
Poinsett County	25,614	24,583	-4.0%	-1,031
Polk County	20,229	20,662	2.1%	433
Pope County	54,469	61,754	13.4%	7,285
Prairie County	9,539	8,715	-8.6%	-824
Pulaski County	361,474	382,748	5.9%	21,274
Randolph County	18,195	17,969	-1.2%	-226
St. Francis County	29,329	28,258	-3.7%	-1,071
Saline County	83,529	107,118	28.2%	2,3589
Scott County	10,996	11,233	2.2%	237
Searcy County	8,261	8,195	-0.8%	-66
Sebastian County	115,071	125,744	9.3%	10,673
Sevier County	15,757	17,058	8.3%	1,301
Sharp County	17,119	17,264	0.8%	145
Stone County	11,499	12,394	7.8%	895
Union County	45,629	41,639	-8.7%	-3990
Van Buren County	16,192	17,295	6.8%	1,103
Washington County	157,715	203,065	28.8%	45,350
White County	67,165	77,076	14.8%	9,911
Woodruff County	8,741	7,260	-16.9%	-1,481
Yell County	21,139	22,185	4.9%	1,046

Source: US Census Bureau

The Change in Population by County, **Figure 3.2.c** and the Percent Change in Population by County, **Figure 3.2.d**, illustrate the population changes from 2000 to 2010 per county, numerically and by percent change, statewide.

The population increases by county in Arkansas between 2000 and 2010 is provided in **Table 3.2.f.** In Arkansas, 40 of the 75 counties gained population, 27 of which (36% of all counties) gained more than 5% each. In the counties that showed an increase in population, 45% of the increases are attributed to natural increase (number of births exceeding the number of deaths), and 55% is attributed to migration into the State (UALR-CSDC). An illustration of the Natural Increase of Arkansas Population by County is provided in **Figure 3.2.e.**

Table 3.2.f. Arkansas Counties with Population Increases 5% or Greater 2000 to 2010

County	Percent Increase 2000-2010	County	Percent Increase 2000-2010
Arkansas Statewide	**9.1%**	Garland County	9.0%
Benton County	44.3%	Boone County	8.7%
Faulkner County	31.6%	Hot Spring County	8.5%
Lonoke County	29.4%	Grant County	8.4%
Washington County	28.8%	Sevier County	8.3%
Saline County	28.2%	Carroll County	8.2%
Craighead County	17.4%	Baxter County	8.1%
Crawford County	16.3%	Cleburne County	8.0%
White County	14.8%	Stone County	7.8%
Pope County	13.4%	Miller County	7.5%
Greene County	12.7%	Independence County	7.1%
Johnson County	12.1%	Van Buren County	6.8%
Madison County	10.3%	Pulaski County	5.9%
Sebastian County	9.3%	Fulton County	5.2%

Source: US Census Bureau

Figure 3.2.c. Change in Population by County, 2000-2010

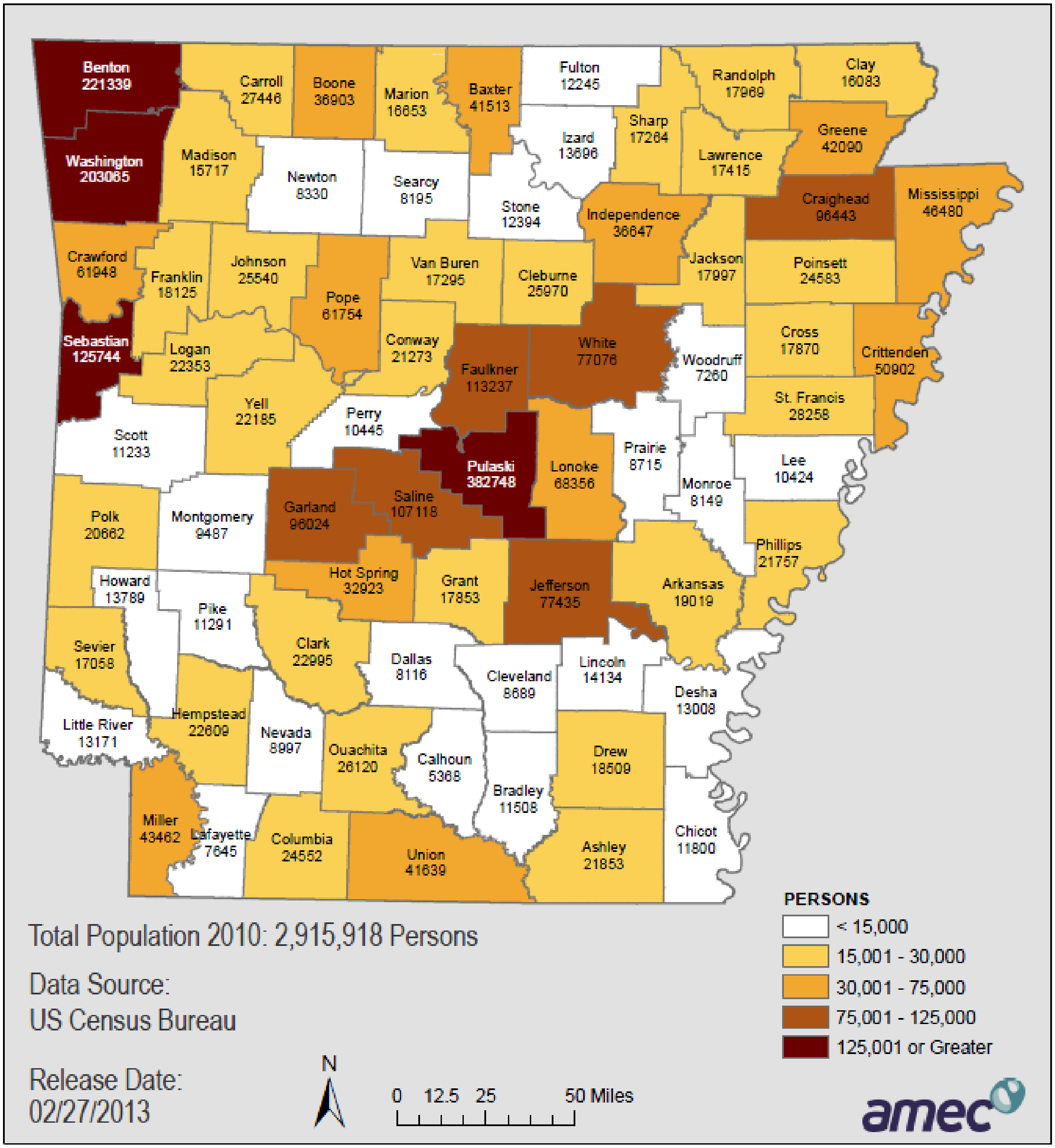


Figure 3.2.d. Percent Change in Population by County, 2000-2010

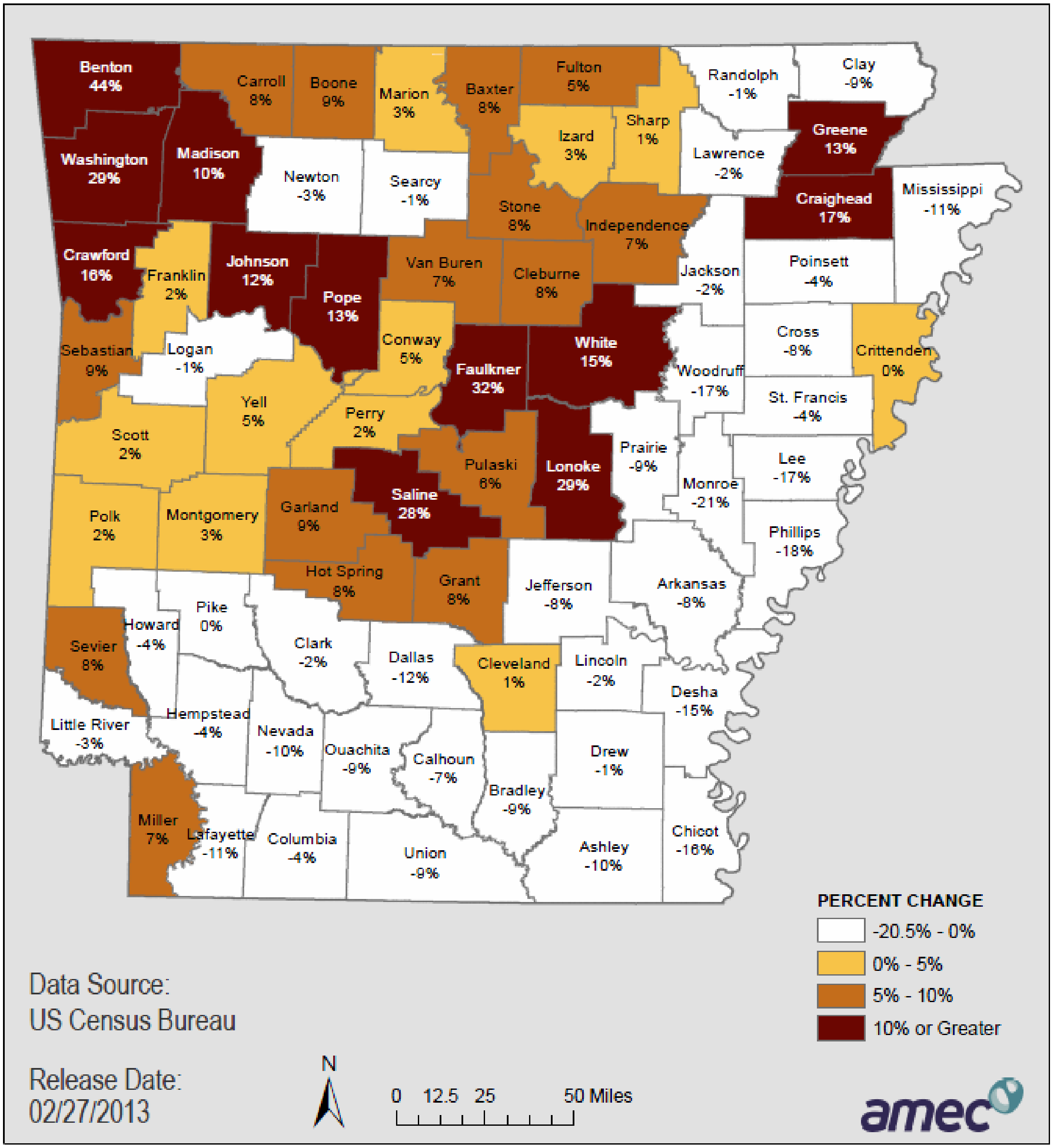
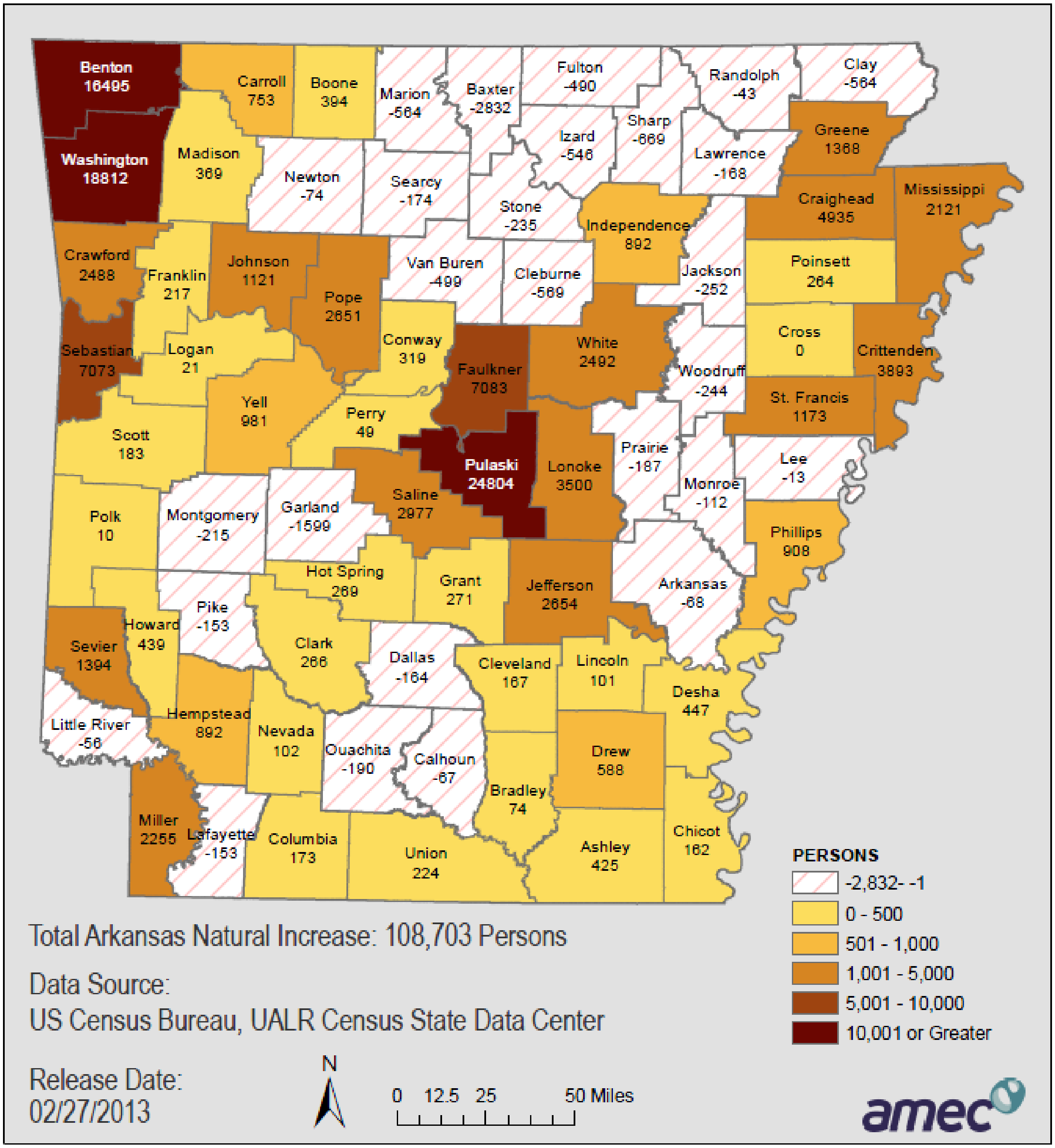


Figure 3.2.e. Natural Increase of Population by County, 2000-2010



In the latest rankings of the most populous counties in the U.S. no Arkansas counties are included among the nation's top 100 most populous counties in 2010. In Arkansas, the 10 most populated counties are identified in **Table 3.2.g**.

Table 3.2.g. Top 10 Most Populated Arkansas Counties, 2000-2010

County	2010 Population	2000 Population	Percent Change 2000 to 2010
Pulaski County	382,748	361,474	5.9%
Benton County	221,339	153,406	44.3%
Washington County	203,065	157,715	28.8%
Sebastian County	125,744	115,071	9.3%
Faulkner County	113,237	86,014	31.6%
Saline County	107,118	83,529	28.2%
Craighead County	96,443	82,148	17.4%
Garland County	96,024	88,068	9.0%
Jefferson County	77,435	84,278	-8.1%
White County	77,076	67,165	14.8%

Source: US Census Bureau

The population growth in Arkansas counties over the past decade has also been primarily in the "metro areas" of Little Rock-North Little Rock-Conway, (Faulkner, Pulaski, and Saline Counties) and Fayetteville-Springdale-Rogers (Benton and Washington Counties). Although these growth factors have been dampened by the recent economic slowdown, not every county has been affected to the same extent. **Table 3.2.h** lists the ten counties with the greatest population growth.

Table 3.2.h. Counties with Greatest Population Gains (Numerical) 2000-2010

County	Population Increase 2000-2008	Percent Increase 2000-2008	2010 Population
Benton County	67,933	44.3%	221,339
Washington County	45,350	28.8%	203,065
Faulkner County	27,223	31.6%	113,237
Saline County	23,589	28.2%	107,118
Pulaski County	21,274	5.9%	382,748
Lonoke County	15,528	29.4%	68,356
Craighead County	14,295	17.4%	96,443
Sebastian County	10,673	9.3%	125,744
White County	9,911	14.8%	77,076
Crawford County	8,701	16.3%	61,948

Source: US Census Bureau

Benton County ranked 36th among the nation's 100 fastest growing counties with populations greater than 10,000 from 2000-2009. Located in the extreme northwest corner of the state, Benton County can attribute its growth partially to the growth of the Latino immigration (Winthrop Rockefeller Foundation, 2013). Population growth can also be attributed to the economic impact of the corporate headquarters of Walmart, the world's largest retailer, within the county. Walmart headquarters is the largest employer in Bentonville with over 2,500 direct jobs. (Bentonville/Bella Vista Chamber of Commerce, 2013).

Counties with the Greatest Population Gains, **Table 3.2.i**, lists the ten counties that have the highest growth rates (percent change from 2000 to 2010). These top growing counties are responsible for 93% of Arkansas's population increase during the period.

Table 3.2.i. Counties with Greatest Population Gains (Percent) 2000-2010

County	2010 Population	2000 Population	Population Change	Percent Change 2000-2010
Benton County	153,406	221,339	67,933	44.3%
Faulkner County	86,014	113,237	27,223	31.6%
Lonoke County	52,828	68,356	15,528	29.4%
Washington County	157,715	203,065	45,350	28.8%
Saline County	83,529	107,118	23,589	28.2%
Craighead County	82,148	96,443	14,295	17.4%
Crawford County	53,247	61,948	8,701	16.3%
White County	67,165	77,076	9,911	14.8%
Pope County	54,469	61,754	7,285	13.4%
Greene County	37,331	42,090	4,759	12.7%
Subtotal of Ten Counties	827,852	1,052,426	224,574	27.1%
Arkansas Statewide	**2,673,400**	**2,915,918**	**242,518**	**9.1%**

Source: US Census Bureau

Not all of Arkansas's counties are growing, however, referring back to **Figures 3.2.c, d, and e**, a large number of Arkansas counties experienced a negative change in population from 2000 to 2010 and/or have not experienced a natural increase in population. The Delta Region and Coastal Plains Region of Arkansas continue to lose population (Rural Profile of Arkansas, University of Arkansas, 2011). The following tables, **Table 3.2.j and k** show the counties with the greatest number and largest percentage of losses in population respectively. The counties of Monroe and Woodruff in the Delta Region, and Dallas and Lafayette in the Coastal Plains Region, rank among Arkansas's 10 least populous counties (see **Table 3.2.l**). In addition, Monroe County is also in the list of top 10 counties with population lost numerically and largest percentage of population lost during the 2000 – 2010 period.

Table 3.2.j. Counties with Greatest Population Losses (Numerical) 2000-2010

County	Population Decrease (#)	Percent Decrease
Jefferson County	-6,843	-8.1%
Mississippi County	-5,499	-10.6%
Phillips County	-4,688	-17.7%
Union County	-3,990	-8.7%
Ouachita County	-2,670	-9.3%
Ashley County	-2,356	-9.7%
Desha County	-2,333	-15.2%
Chicot County	-2,317	-16.4%
Lee County	-2,156	-17.1%
Monroe County	-2,105	-20.5%

Source: US Census Bureau

Table 3.2.k. Counties with Greatest Population Losses (Percent) 2000-2010

County	Population Decrease (#)	Percent Decrease
Monroe County	-2,105	-20.5%
Phillips County	-4,688	-17.7%
Lee County	-2,156	-17.1%
Woodruff County	-1,481	-16.9%
Chicot County	-2,317	-16.4%
Desha County	-2,333	-15.2%
Dallas County	-1,094	-11.9%
Lafayette County	-914	-10.7%
Mississippi County	-5,499	-10.6%
Ashley County	-2356	-9.7%

Source: US Census Bureau

Table 3.2.l. Ten Least Populated Arkansas Counties, 2010 Census

County	2010 Population	Population Decrease (#)	Percent Decrease
Calhoun County	5,368	-376	-6.5%
Woodruff County	7,260	-1,481	-16.9%
Lafayette County	7,645	-914	-10.7%
Dallas County	8,116	-1,094	-11.9%
Monroe County	8,149	-2,105	-20.5%
Searcy County	8,195	-66	-0.8%
Newton County	8,330	-278	-3.2%
Cleveland County	8,689	118	1.4%
Prairie County	8,715	-824	-8.6%
Nevada County	8,997	-958	-9.6%

Source: US Census Bureau

Population projections issued by the UALR Census State Data Center suggest that Arkansas's population will grow at a rate equal to or greater than 1% every year over the next decade (see **Table 3.2.m**). Based on this projection the state will grow by 12.7% over the next decade versus 9.1% actual growth over the previous decade.

Table 3.2.m. Interim Arkansas Population Projections, 2010 - 2020

Year	Population	Percent Change	Population Change
2010	2,915,918	--	--
2011	2,951,522	1.2%	35,604
2012	2,980,938	1.0%	29,416
2013	3,011,207	1.0%	30,269
2014	3,042,351	1.0%	31,144
2015	3,107,353	2.1%	65,002
2016	3,141,259	1.1%	33,906
2017	3,176,134	1.1%	34,875
2018	3,212,005	1.1%	35,870
2019	3,248,897	1.1%	36,892
2020	3,286,838	1.2%	37,941

Source: US Census Bureau, UALR Census State Data Center

Another indicator of growth is the number of housing units. The census defines a housing unit as a house, an apartment, a mobile home or trailer, a group of rooms, or a single room that is occupied, or, if vacant, is intended for occupancy as separate living quarters. According to the U.S. Census Bureau, the number of estimated housing units in Arkansas increased 145,320 units, or 11% between 2000 (1,179,049 units) and 2011 (1,324,369 units). Arkansas ranked 31st among the 50 states in number housing units and 32nd in total population. Benton County, Arkansas topped the list for percent growth and is the 100th fastest growing county in the nation in terms of housing unit percent change 2000-2009 estimates (released September 2010).

Table 3.2.n provides a list of the top 10 counties with the greatest housing unit gains numerically, **Table 3.2.o** provides the top 10 counties with the greatest housing gains by percentage of increase from 2000 - 2010, and **Table 3.2.p** lists the top 10 counties ranked by number of housing units in 2010. All three tables include the largest metro area counties of Benton, Washington, Faulkner, Pulaski, and Saline, which are among the top 10 most populous counties, as shown in previously referenced **Table 3.2.g**, Top 10 Most Populated Arkansas Counties. Housing unit growth generally tracks with population growth, although not quite as closely. **Figures 3.2.f, g, and h** illustrate the housing units values included in the aforementioned tables but include the entire State of Arkansas by county.

Table 3.2.n. Counties with Greatest Housing Unit Gains (Numerical), 2000-2010

County	Housing Unit Increase	Percent Increase Housing Unit
Benton County	28,803	44.8%
Washington County	23,478	36.5%
Pulaski County	14,420	8.9%
Faulkner County	12,066	34.9%
Saline County	10,986	32.5%
Lonoke County	6,490	31.3%
Garland County	5,595	12.4%
Craighead County	5,382	15.3%
Sebastian County	5,340	10.8%
White County	4,875	17.7%

Table 3.2.o. Counties with Greatest Housing Unit Gains (Percent), 2000-2010

County	Percent Increase Housing Unit	Housing Unit Increase
Benton County	44.8%	28,803
Washington County	36.5%	23,478
Faulkner County	34.9%	12,066
Saline County	32.5%	10,986
Lonoke County	31.3%	6,490
Crawford County	22.5%	4,800
White County	17.7%	4,875
Stone County	17.4%	997
Craighead County	15.3%	5,382
Cleburne County	15.2%	2,094

Source: US Census Bureau

Table 3.2.p. Top 10 Counties Ranked by Number of Housing Units (2010)

County	2010 Housing Units	2010 Population
Pulaski County	175,555	382,748
Benton County	93,084	221,339
Washington County	87,808	203,065
Sebastian County	54,651	125,744
Garland County	50,548	96,024
Faulkner County	46,612	113,237
Saline County	44,811	107,118
Craighead County	40,515	96,443
Jefferson County	33,006	77,435
White County	32,488	77,076

Source: US Census Bureau

Figure 3.2.f. Change in Housing Units by County, 2000-2010

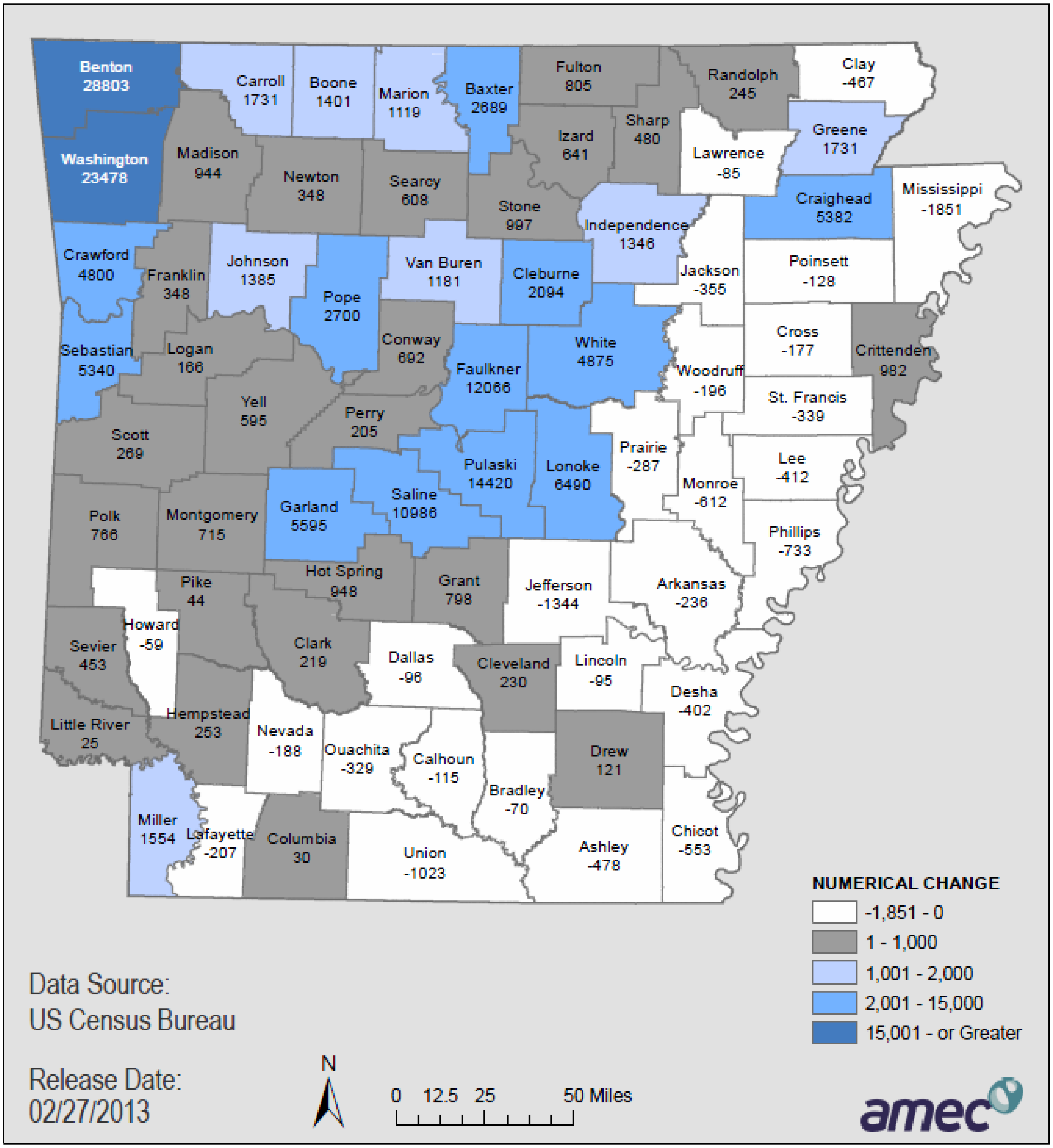


Figure 3.2.g. Percent Change in Housing Units by County, 2000-2010

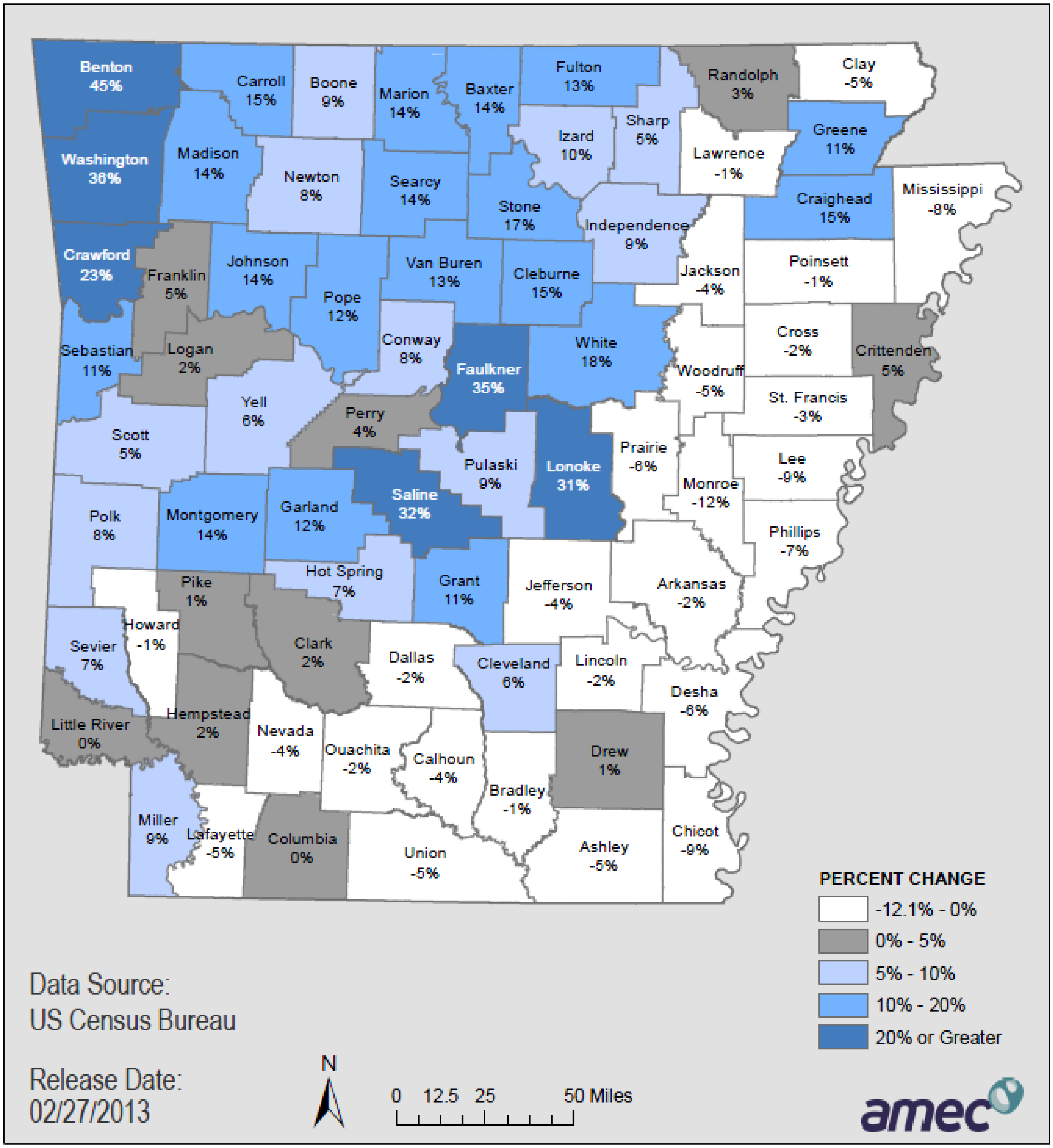
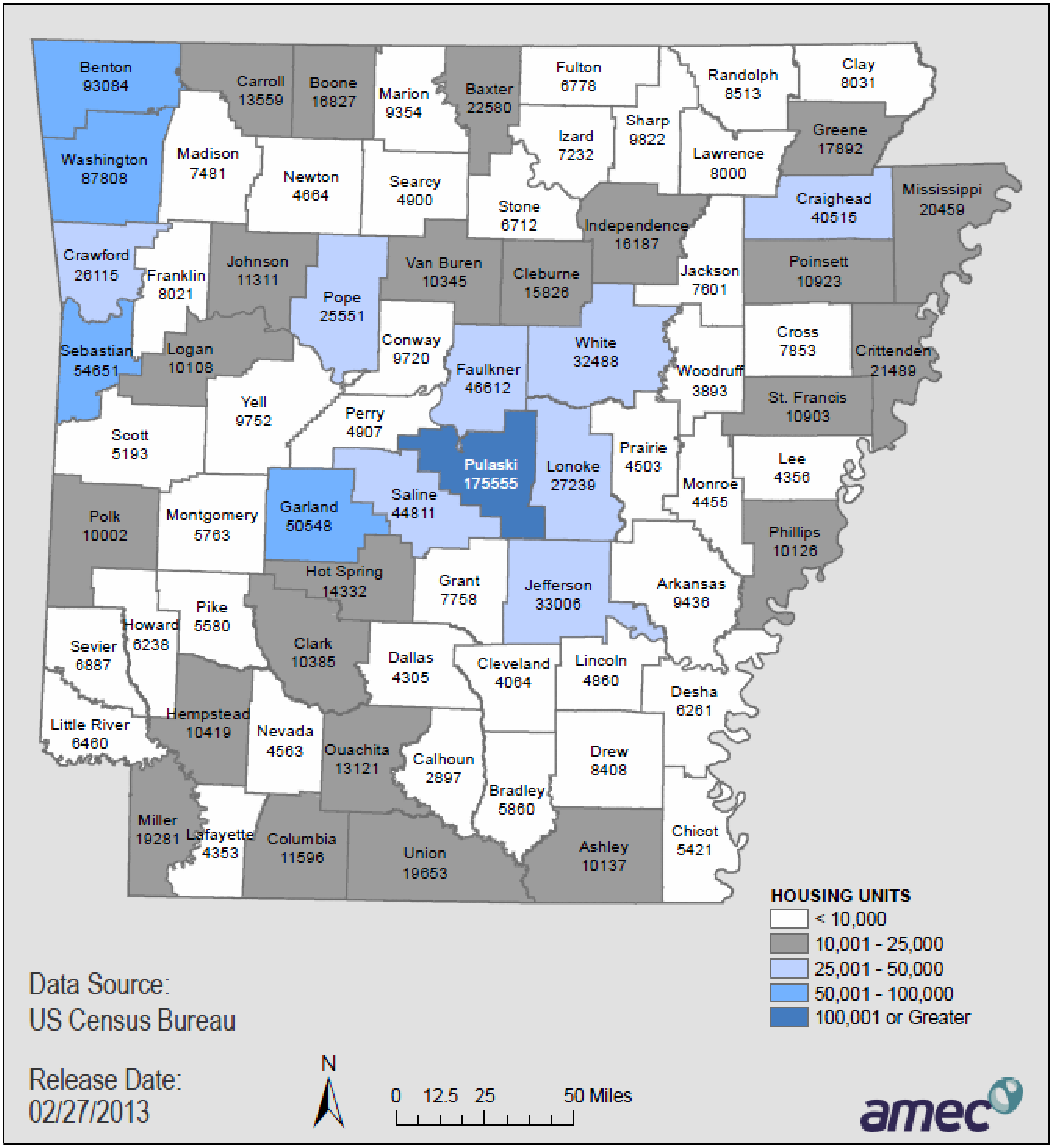


Figure 3.2.h. Housing Units by County, 2010



3.2.2 Density

Arkansas has a surface land area of 52,035 square miles (2010 census) and a population of 2,915,918 (2010 Census). Based on the 2010 Census, Arkansas ranked 36th in population density and 34th in housing density among the 50 states. **Table 3.2.q** lists the 10 counties ranked highest in terms of both population density and housing density. Nine of these counties, excluding Crawford, also ranked among Arkansas's top 10 most populous counties, see Table **3.2.g,** Top 10 Most Populated Arkansas Counties 2000 - 2010. The population density statewide by county is provided on **Figure 3.2.i.**

Table 3.2.q. Top 10 Counties Ranked by Population/Housing Density, 2010

County	2010 Population Density	Population Density Change (%) 2000-2010	2010 Housing Density	Housing Density Change (%) 2000-2010
Pulaski County	503.8	7.4%	231.1	10.6%
Benton County	261.2	44.1%	109.9	44.6%
Sebastian County	236.4	10.2%	102.7	11.6%
Washington County	215.6	29.8%	93.2	37.7%
Faulkner County	174.8	31.5%	71.9	34.6%
Saline County	148	28.1%	61.9	32.3%
Garland County	141.7	9.0%	74.6	12.3%
Craighead County	136.4	18.0%	57.3	16.0%
Crawford County	104.4	16.8%	44	22.9%
Jefferson County	88.9	-6.6%	37.9	-2.3%

Source: US Census Bureau, *Density is reported as people per square mile and is based on the square mileage of land in the 2000/2010 census.

The percent change in population density tracks with the percent change in population growth. The fastest growing counties are also seeing their population density increase more rapidly than the other counties as shown on **Table 3.2.r,** Counties with Greatest Population Density Gains, and on **Figure 3.2.j**, Percent Change in Population Density by County from 2000 - 2010.

Table 3.2.r. Counties with Greatest Population Density Gains (%), 2000-2010

County	Population Density Gains (%) 2000-2010
Benton County	44.1%
Faulkner County	31.5%
Washington County	29.8%
Lonoke County	28.6%
Saline County	28.1%
Craighead County	18.0%
Crawford County	16.8%
White County	14.6%
Pope County	13.3%
Greene County	12.8%

Source: US Census Bureau, *Density is reported as people per square mile and is based on the square mileage of land in the 2000/2010 census.

Figure 3.2.i. Population Density by County, 2010

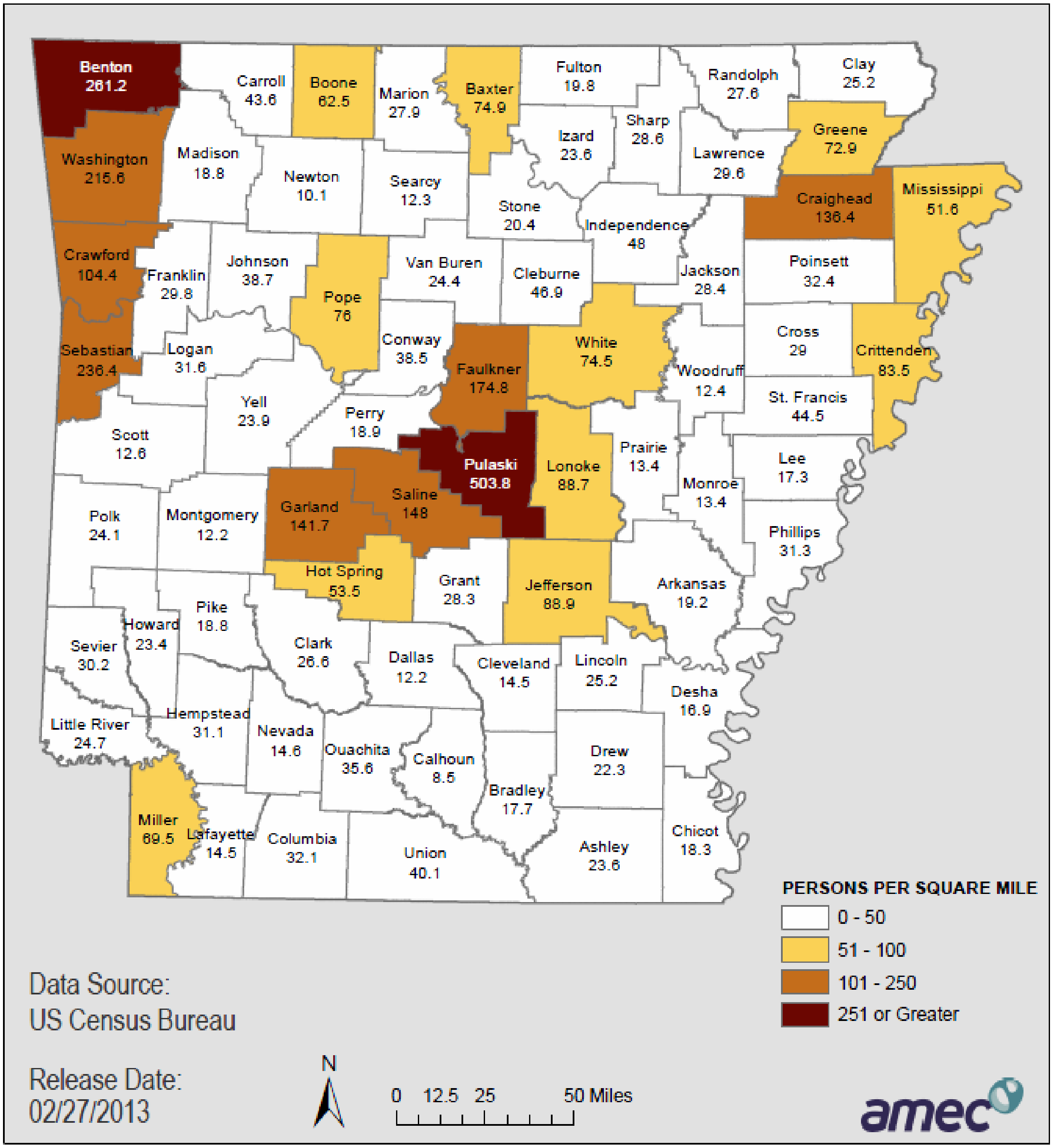
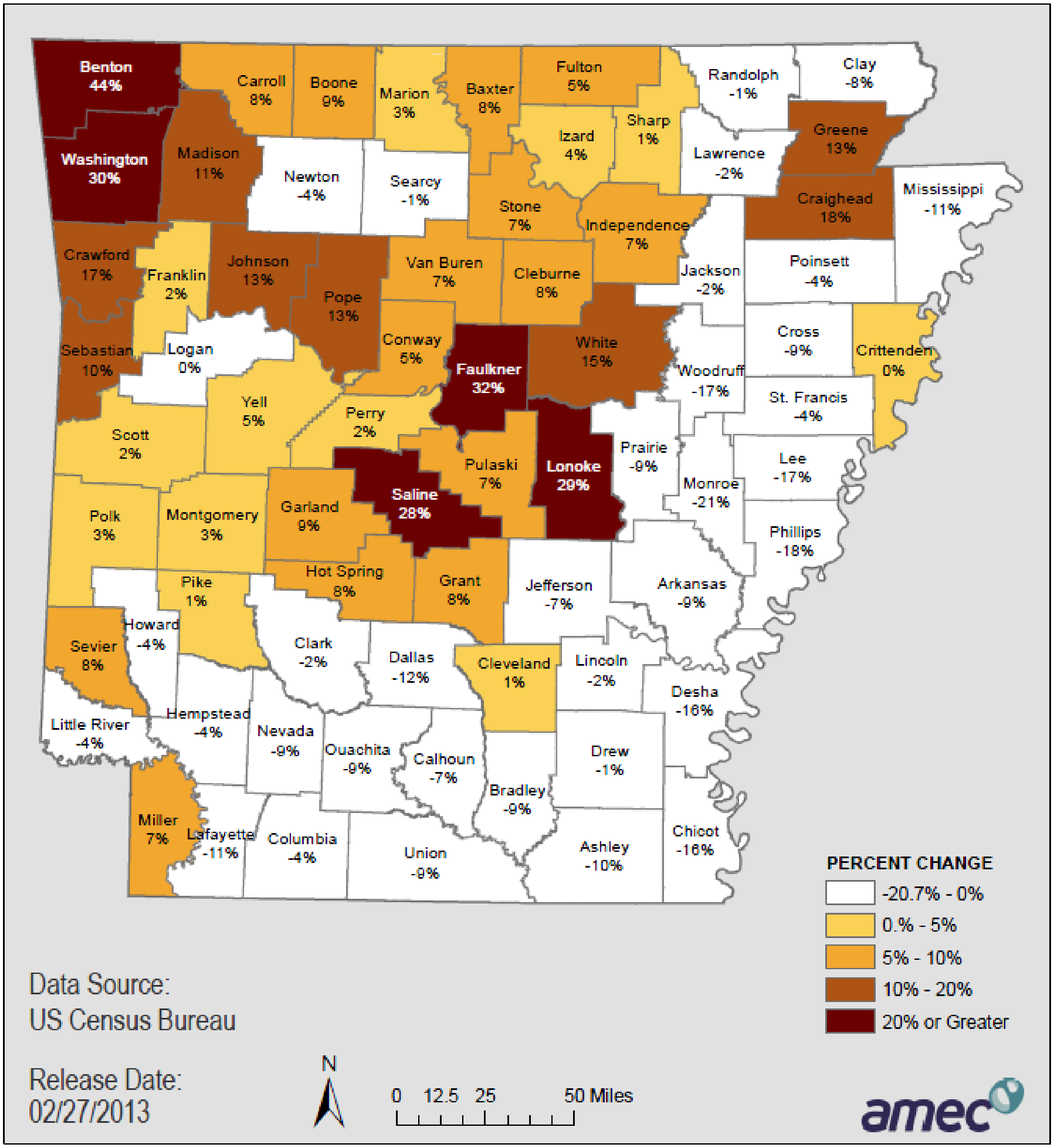


Figure 3.2.j. Percent Change in Population Density by County, 2000-2010



Summary of Impact of Growth and Development Trends on Vulnerability and Loss Estimates

Increased population growth and development can also increase the risk, vulnerability, and loss estimates of counties as property values increase and areas that may once have been undeveloped are now developed. The counties in Arkansas with the greatest population and housing gains (See **Tables 3.2.i and 3.2.o**) are located in Northwest Arkansas, in the area around the Ozarks National Forest, and Central Arkansas in the area around Little Rock. These counties are also in the "metro-areas" or on the edges of existing metropolitan areas (See **Figure 3.2.k**). Growth and development is often connected to employment opportunity increases from larger corporations bringing in business. These large corporations seem to target both metropolitan areas and any area that is considered a major tourism sector. Impacts to vulnerability and loss estimates were noted for each natural hazard as follows:

- It is not known if development is occurring within dam inundation zones. Most counties within Arkansas do not have ordinances prohibiting or limiting development in dam inundation areas.

- Growth and development have created greater demands on public water suppliers, thus have increased the vulnerability and loss estimates to drought.

- In the Northwest Arkansas, Craighead and Greene Counties also noted population and housing gains. This growth is located within the identified critical area for earthquakes. Building codes within these communities help to reduce this increased vulnerability and loss estimates to earthquakes.

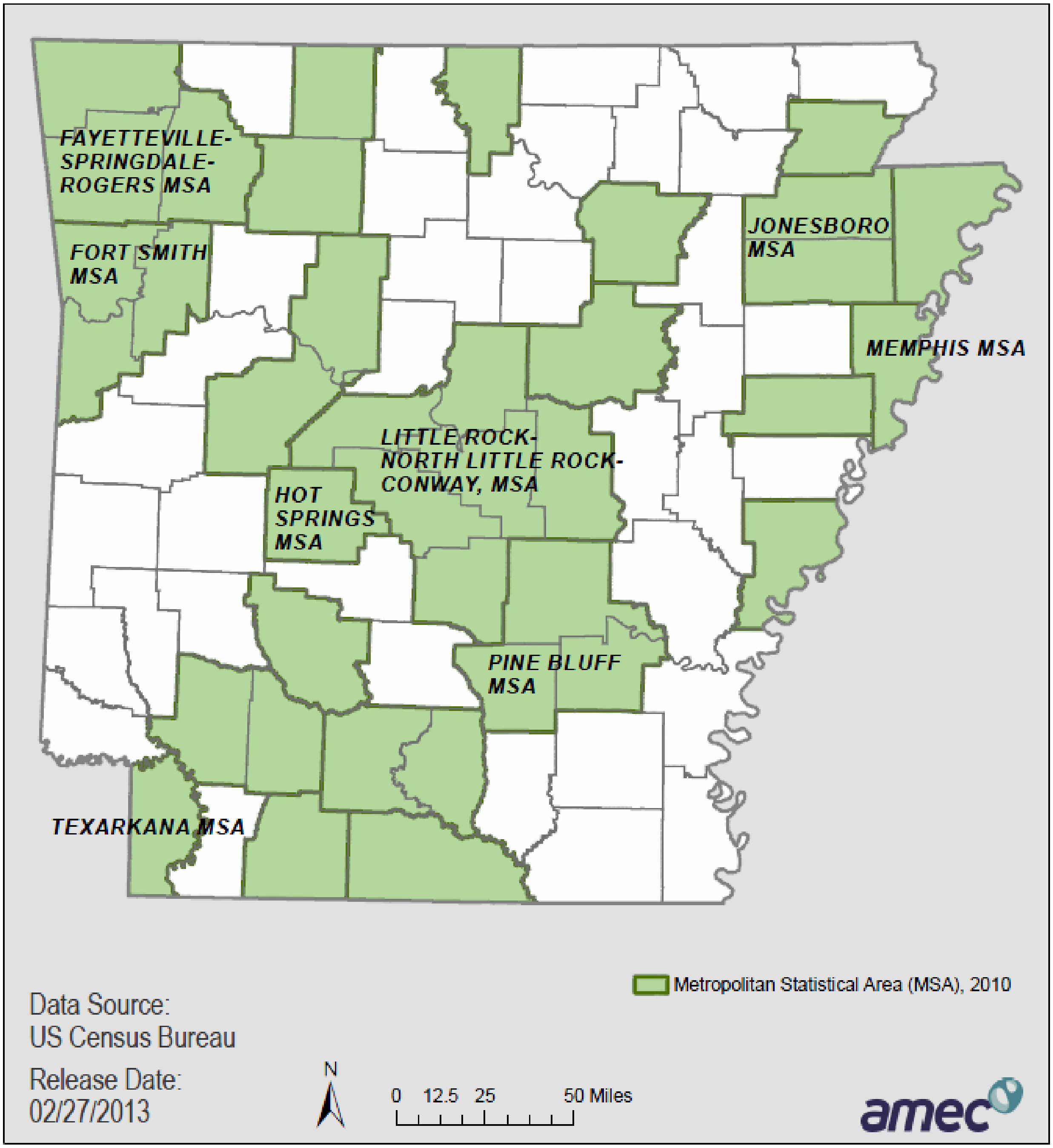
- Growth has expanded into areas with expansive soils as well as landslide prone areas increasing vulnerability and loss estimates to these hazards. The development and implementation of building codes which address expansive soils and landslide prone soils is a recommended mitigation action for each identified County.

- The counties experiencing the most development pressures all participate in the National Flood Insurance Program, thus flood risk and loss estimates should not have increased in these counties since the last All-Hazards Mitigation Plan; assuming that floodplain ordinances are being effectively implemented and wise use of floodplains is being encouraged.

- For those hazards without a defined boundary, such as severe thunderstorms and severe winter weather it is difficult to project changes in vulnerability and loss estimates based solely on population and growth. Increasing residential property value has also increased loss estimates from these hazards.

- Craighead, Faulkner, Pulaski, and Saline Counties were noted as having significant concentrations of both wildland-urban interface and wildland-urban intermix. Growth and development within these areas has increased vulnerability and loss estimates to wildfires.

Figure 3.2.k. Metropolitan Statistical Areas (MSAs), 2010



Vulnerability of human populations to certain diseases is impacted and determined by the overall health, age and ethnicity of the people in the affected areas. Older people, infants, and children tend to be more susceptible to pandemic events. These groups are considered special populations with respect to many of the profiled hazards such as influenza and West Nile Virus. Also some additional diseases are more prevalent in certain ethnicities or in specific population sectors such as the rural poor with limited access to immediate medical attention.

The following tables, **Table 3.2.s and t** provide a listing of the top 10 counties with elderly (over 65 years old) populations numerically and by percentage respectively based on the 2010 census, and **Figure 3.2.l** illustrates the elderly populations statewide. A listing of the top 10 counties with young (under 5 years old) populations numerically and by percentage are provided in **Tables 3.2.u and v,** and **Figure 3.2.m** illustrates the populations of younger than 5 distributed by county statewide. The APDMAC considers high levels of special populations to be vulnerable with respect to many potential pandemic scenarios especially influenza and West Nile Virus.

Table 3.2.s. Top 10 Counties with Population Over 65 Years Old (Numerical), 2010

County	2010 Population	Population > 65 Years Old
Pulaski County	382,748	45,908
Benton County	221,339	26,986
Garland County	96,024	20,108
Washington County	203,065	19,641
Sebastian County	125,744	16,518
Saline County	107,118	15,875
Craighead County	96,443	11,740
Baxter County	41,513	11,659
Faulkner County	113,237	11,318
White County	77,076	10,848

Source: US Census Bureau

Table 3.2.t. Top 10 Counties with Population Over 65 Years Old (Percentage), 2010

County	2010 Population	Population Percent > 65 Years Old
Baxter County	41,513	28.1%
Sharp County	17,264	23.9%
Marion County	16,653	23.8%
Izard County	13,696	23.6%
Cleburne County	25,970	23.6%
Stone County	12,394	22.8%

Van Buren County	17,295	22.7%
Montgomery County	9,487	22.4%
Fulton County	12,245	22.4%
Searcy County	8,195	21.3%

Source: US Census Bureau

Table 3.2.u. Top 10 Counties with Population Younger Than 5 Years Old (Numerical), 2010

County	2010 Population	Population <5 Years Old
Pulaski County	382,748	26,731
Benton County	221,339	17,850
Washington County	203,065	15,232
Sebastian County	125,744	9,099
Faulkner County	113,237	7,931
Craighead County	96,443	7,040
Saline County	107,118	7,019
Garland County	96,024	5,408
White County	77,076	5,117
Jefferson County	77,435	4,957

Source: US Census Bureau

Table 3.2.v. Top 10 Counties with Population Younger Than 5 Years Old (Percentage), 2010

County	2010 Population	Population Percent <5 Years Old
Sevier County	17,058	8.9%
Benton County	221,339	8.1%
Crittenden County	50,902	8.0%
Hempstead County	22,609	7.8%
Mississippi County	46,480	7.6%
Phillips County	21,757	7.6%
Desha County	13,008	7.6%
Washington County	203,065	7.5%
Howard County	13,789	7.4%
Craighead County	96,443	7.3%

Source: US Census Bureau

Figure 3.2.I. County Population and Percentages of Residents 65 yrs and Older, 2010

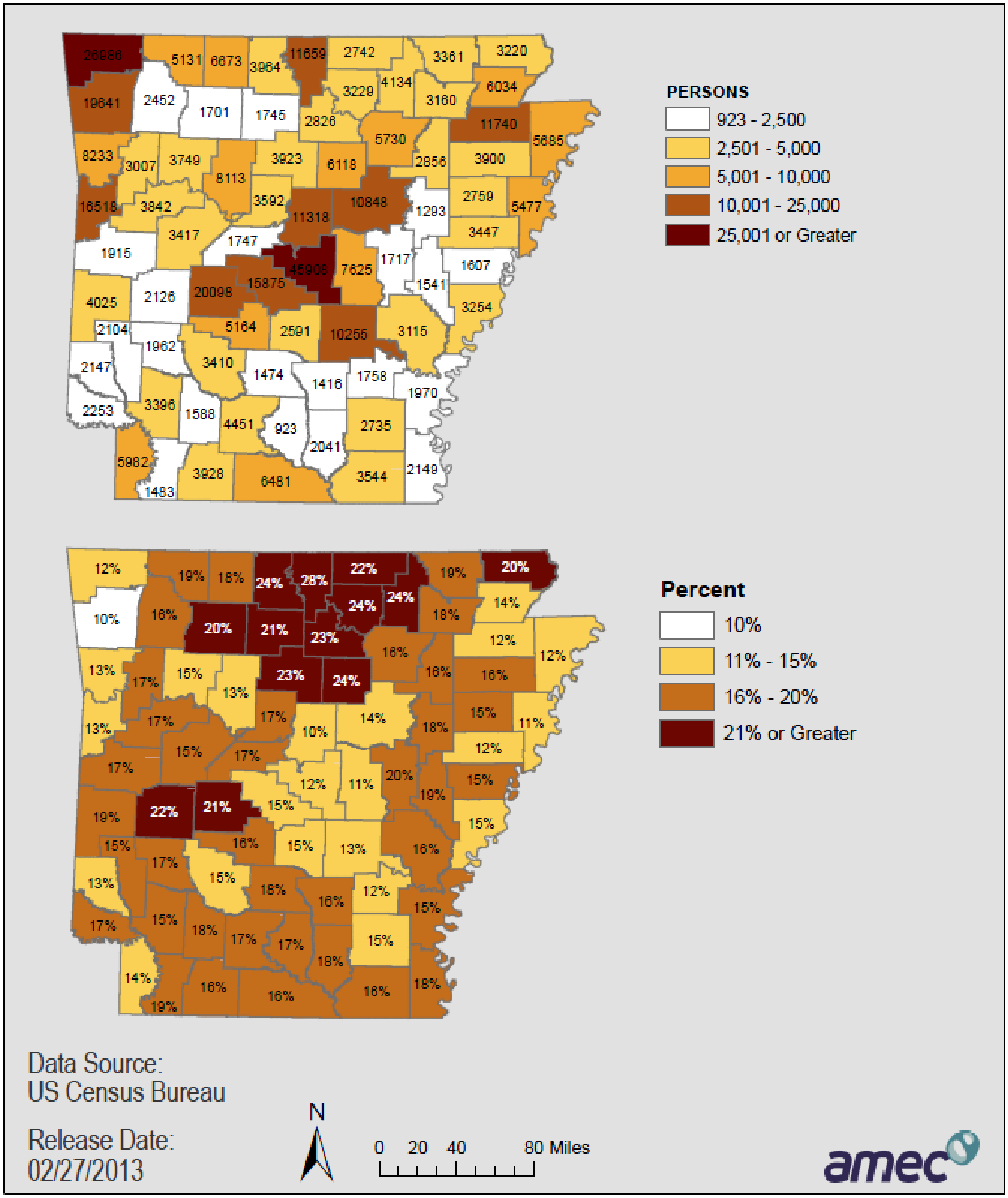
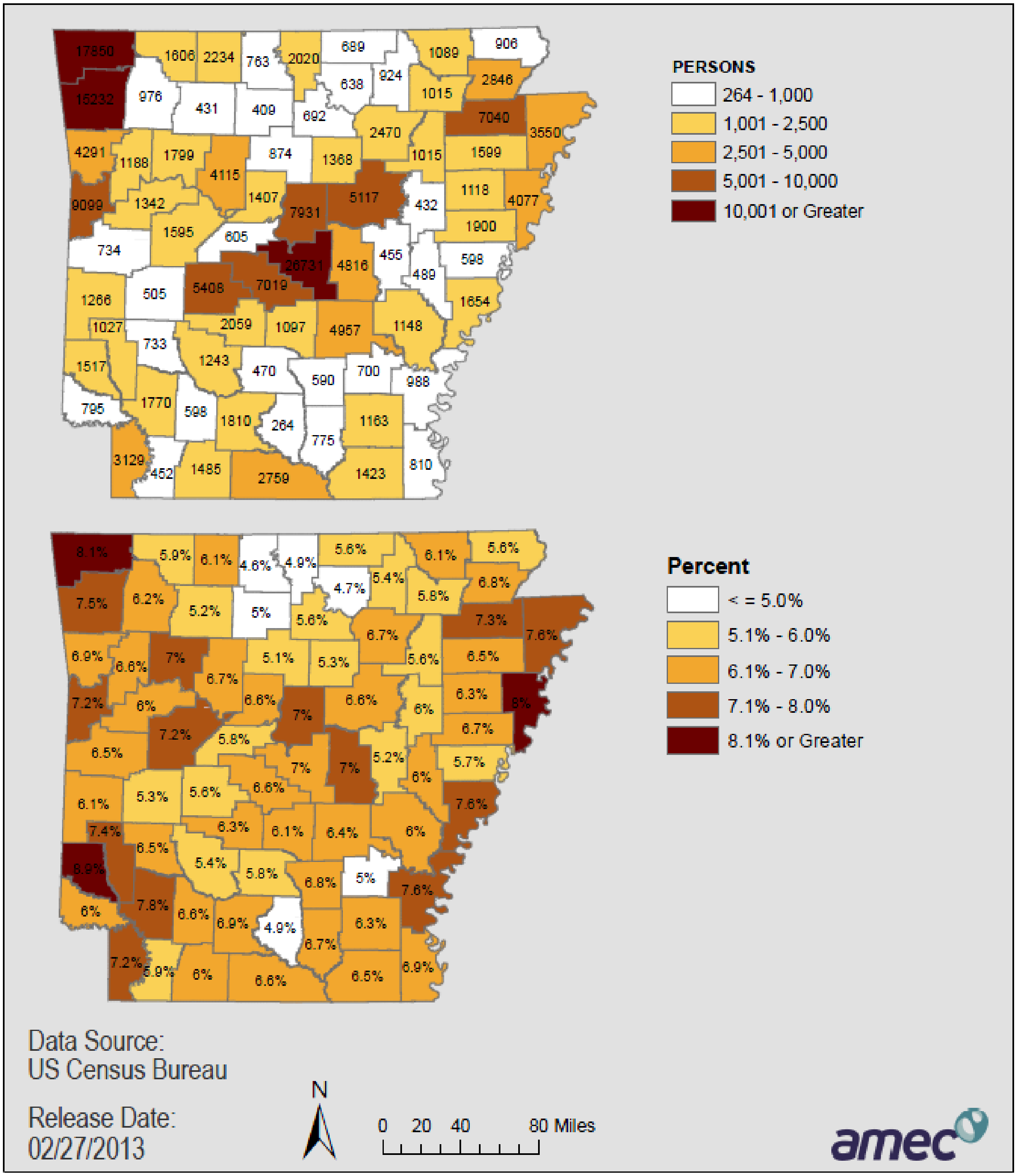


Figure 3.2.m. County Population and Percentages of Residents 5 yrs and Younger, 2010



3.2.3 Social Vulnerability

A Social Vulnerability Index compiled by the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina measures the social vulnerability of U.S. counties to environmental hazards for the purpose of examining the differences in social vulnerability among counties. Based on national data sources, primarily the 2010 census and the five-year American Community Survey, it synthesizes 30 socioeconomic variables, which the research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards (i.e., social vulnerability). Seven significant components explain 72% of the variance in the data. These components include race and class, wealth, elderly residents, Hispanic ethnicity, special needs individuals, Native American ethnicity, and service industry employment.

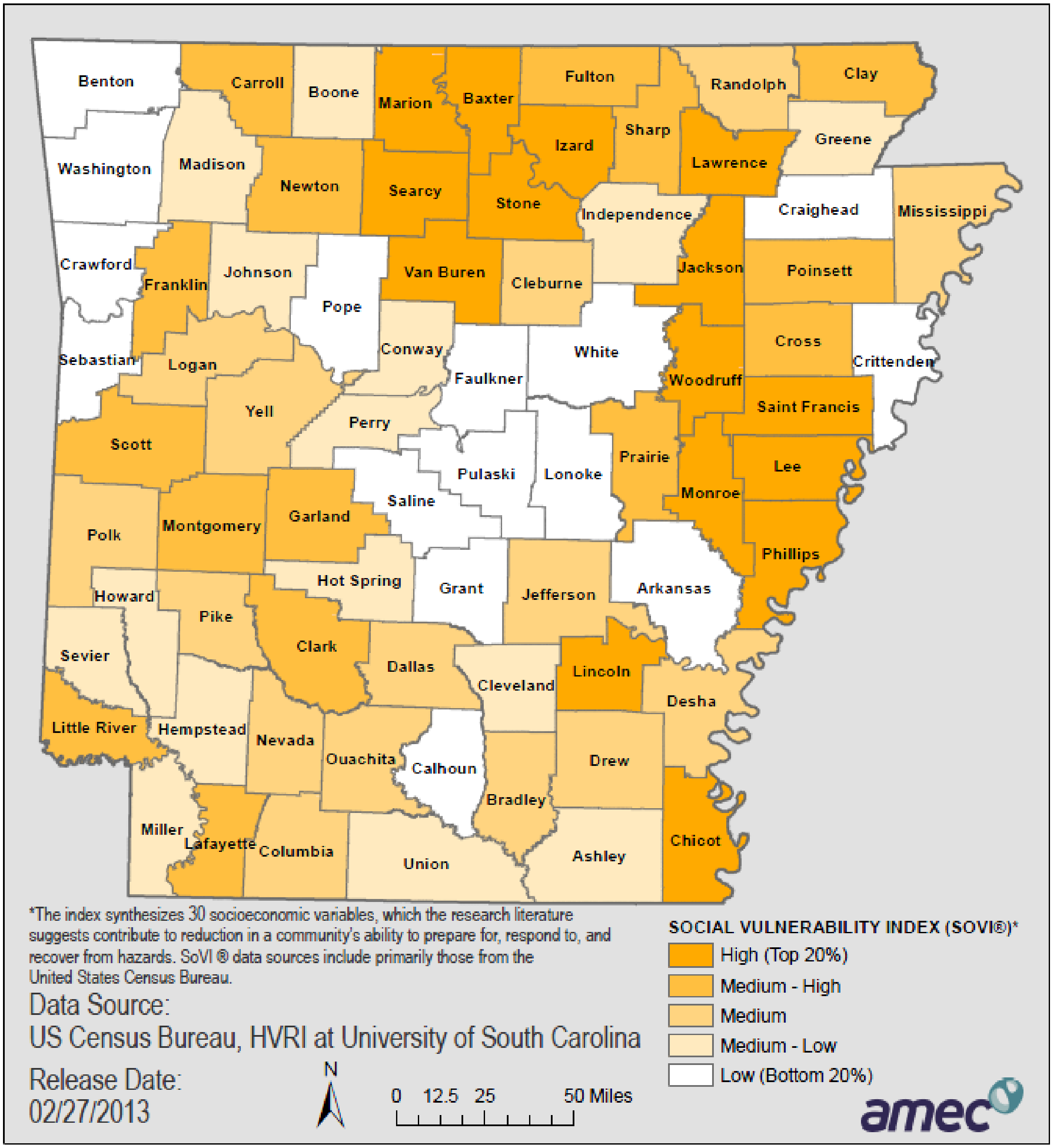
The index can be used by the State to help determine where social vulnerability and exposure to hazards overlaps and how and where mitigation resources might best be used. **Table 3.2.w** lists the highest ranking counties at risk in Arkansas. **Figure 3.2.n,** Social Vulnerability to Environmental Hazards, Comparison within the State, 2006-2010, illustrates Arkansas's geographic variation in social vulnerability. According to the index, the following, listed in order from highest, are Arkansas's most vulnerable counties (i.e., they rank in the top 20% in the State—and the nation): Chicot, Lee, Woodruff, Izard, Lincoln, Stone, Van Buren, St. Francis, Phillips, Searcy, Jackson, Lawrence, Monroe, Marion, and Baxter. It is worth noting that seven counties, Chicot, Lee, Woodruff, Izard, Lincoln, Stone, and Van Buren, also rank in the top 10% of the nation.

Table 3.2.w. 3 High (Top 20%) Ranking at Risk Counties, SoVI Score, 2006-2010

County	SoVI Score	National Percent
Chicot	5.492302	97.36%
Lee	5.33295	97.17%
Woodruff	3.717429	93.00%
Izard	3.66176	92.78%
Lincoln	3.612265	92.43%
Stone	3.533421	91.92%
Van Buren	3.172686	90.01%
St. Francis	3.155053	89.82%
Phillips	3.06332	88.96%
Searcy	2.9917	88.32%
Jackson	2.80558	87.24%
Lawrence	2.62177	85.75%
Monroe	2.47321	84.51%
Marion	2.328987	83.39%
Baxter	2.293043	83.04%

Source: US Census Bureau

Figure 3.2.n. Social Vulnerability to Environmental Hazards, 2006-2010



3.3 Identifying Hazards

Requirement §201.4(c)(2)(i): [The state risk assessment shall include an] overview of the type…of all natural hazards that can affect the state.

Plan Update: The updated plan must addressed newly identified hazards or hazards that have been determined to pose a more significant threat than was apparent when the previously approved plan was prepared. If improved descriptions of hazards identified in the previous plan are available, they must be incorporated into this section.

3.3.1 Natural Hazards

Natural hazards can be complex, occurring with a wide range of intensities. Some events are instantaneous and offer no window of warning, such as earthquakes. Some offer a short window in which to alert the public to take actions, such as tornadoes or severe thunderstorms. Others occur less frequently and are typically more expansive, with some warning time to allow the public time to prepare, such as flooding. The following natural hazards threaten Arkansas:

- Dam and Levee Failure
- Droughts
- Earthquake
- Expansive Soils
- Flood
- Landslides
- Severe Thunderstorms (Damaging Winds, Hail, and Lightning)
- Severe Winter Storm
- Tornadoes
- Wildfires

During the planning process for the 2013 plan update, it was noted that levee failures may warrant profiling as a separate hazard in future updates to this plan. As a result, levee failure is profiled as a separate hazard in this update. It should be noted that ADEM did not profile levee failure separate from riverine flooding in the 2009 Hazard Analysis update.

The following natural hazards are not included in this analysis because they do not threaten Arkansas: avalanches, coastal erosion, coastal storms, hurricanes, tsunamis, and volcanoes. While expansive soils and landslides are recognized as hazards in Arkansas, they occur infrequently and their impacts are minimal; so they will not be profiled further in this document.

3.3.2 Man-made and Other Hazards

Each year there are increases in manmade incidents, which can be just as devastating as natural disasters. The following hazards could also affect Arkansas:

- Hazardous Materials Incidents;
- Nuclear Events;
- Terrorism; and
- Major Disease Outbreak.

3.3.3 Presidential Declarations

In the United States, 95 percent of all presidentially declared disasters have been related to weather or flood events. In Arkansas, 100 percent of the presidentially declared disasters since 1957 have also been related to weather or flood events. Since the 2010 update of the All Hazard Mitigation Plan, there have been 3 presidentially declared disasters beginning with the May 2011 severe storms and flooding. Of the 3 new disasters since the last update, all have been major disaster declarations.

Table 3.3.a summarizes presidential declarations for Arkansas since 1957. Additional information on declared disasters can be found at http://www.fema.gov/disasters.

Table 3.3.a. Presidential Declarations for Arkansas from 1957 to 2013

Declaration Date	Disaster No.	Incident Type	No. of Counties Designated
5/29/1957	77	Tornadoes, Rain, Hail, Floods	NA
5/15/1958	83	Heavy Rainstorms, Floods	NA
5/28/1960	102	Tornadoes, Floods	NA
5/16/1961	112	Tornadoes, Floods	NA
8/2/1963	157	Heavy Rains, Flooding	NA
3/20/1964	166	Severe Storms, Flooding	NA
5/3/1968	236	Tornado, Severe Storm	2
5/29/1968	239	Tornadoes, Severe Storms & Flooding	26
2/15/1969	254	Severe Storms, Flooding	36
1/27/1972	321	Severe Storms, Flooding	27
4/27/1973	375	Severe Storms, Flooding	43
5/29/1973	389	Severe Storms, Flooding	5
5/31/1974	435	Heavy Rains, Flooding	1
6/8/1974	437	Severe Storms, Flooding	8
4/1/1975	463	Severe Storms, Tornadoes	1
6/7/1975	471	Heavy Rains, Flooding	7
4/1/1976	498	Tornadoes	4
12/3/1976	3019	Drought	32
1/20/1978	3054	Tornadoes	3
4/22/1978	3062	Tornadoes	1
9/15/1978	564	Severe Storms, Flooding	2
4/11/1979	574	Tornado	8

Declaration Date	Disaster No.	Incident Type	No. of Counties Designated
4/16/1980	617	Severe Storms, Tornadoes	5
4/23/1982	3085	Severe Storms and Tornadoes	12
12/13/1982	673	Severe Storms, Tornadoes, Flooding	38
8/1/1983	688	Severe Storms, Flooding	5
12/17/1987	806	Tornadoes	1
12/31/1987	807	Severe Storms, Flooding	11
11/23/1988	817	Severe Storms, Tornadoes	24
5/15/1990	865	Flooding, Severe Storm	37
5/30/1991	907	Flooding, Severe Storm	21
7/24/1992	950	Severe Storm, Thunderstorms	5
2/28/1994	1011	Ice Storm, Winter Storm, Severe Storm	17
4/23/1996	1111	Severe Storms/Tornadoes	6
3/2/1997	1162	Severe Storms/Tornadoes	25
4/14/1997	1176	Severe Storms/Flooding	28
4/22/1998	3125	Severe Storms, Tornadoes and Flooding	1
1/23/1999	1266	Severe Storms, Tornadoes, High Winds and Flooding	22
12/28/2000	3159	Severe Winter Storm	52
12/29/2000	1354	Severe Winter Storm	67
3/13/2001	1363	Severe Storms & Flooding	22
1/24/2002	1400	Severe Storms & Flooding	20
1/6/2003	1450	Severe Ice Storm	18
6/6/2003	1472	Severe Storms, Tornadoes, and Flooding	23
5/7/2004	1516	Severe Storms, Flooding and Landslides	14
6/30/2004	1528	Severe Storms and Flooding	14
9/2/2005	3215	Hurricane Katrina	75
4/12/2006	1636	Severe Storms and Tornadoes	7
2/7/2008	1744	Severe Storms, Tornadoes, and Flooding	12
3/26/2008	1751	Severe Storms, Tornadoes, and Flooding	59
5/20/2008	1758	Severe Storms, Flooding, and Tornadoes	12
9/18/2008	1793	Severe Storms and Flooding associated with Hurricane Gustav	18
10/22/2008	1804	Tropical Storm Ike	20
1/28/2009	3301	Severe Winter Storm	48
2/6/2009	1819	Severe Winter Storm	30
4/27/2009	1834	Severe Storms and Tornadoes	5
6/16/2009	1845	Severe Storms, Tornadoes, and Flooding	38
12/3/2009	1861	Severe Storms, Tornadoes, and Flooding	38
2/4/2010	1872	Severe Storms and Flooding	25
5/2/2011	1975	Severe Storms, Tornadoes, and Associated Flooding	60
7/8/2011	4000	Severe Storms, Tornadoes, and Flooding	3
1/29/2013	4100	Severe Winter Storm	8

Table 3.3.b. Emergency Declarations for Arkansas from 1974 to 2013

Declaration Date	Disaster No.	Incident Type	No. of Counties Designated
09/14/1974	3003	Power Failure	--
12/03/1976	3019	Drought	32
01/20/1978	3054	Tornadoes	--
04/22/1978	3062	Tornadoes	1
04/23/1982	3085	Severe Storms and Tornados	--
04/22/1998	3125	Severe Storms, Tornados and Flooding	1
12/28/2000	3159	Severe Winter Weather	52
09/02/2005	3215	Hurricane Katrina	75
01/28/2009	3301	Severe Winter Storm	48

Figure 3.3.a illustrates the declared disasters in Arkansas, 1957 to 2013.

Table 3.3.c shows the total amount of Public Assistance eligible for disaster declarations in Arkansas from 1957 through 2013. Public Assistance includes state and federal assistance for uninsured losses to public property and infrastructure within those counties included in the disaster declaration.

Figure 3.3.a. Number of Disaster Declarations by County

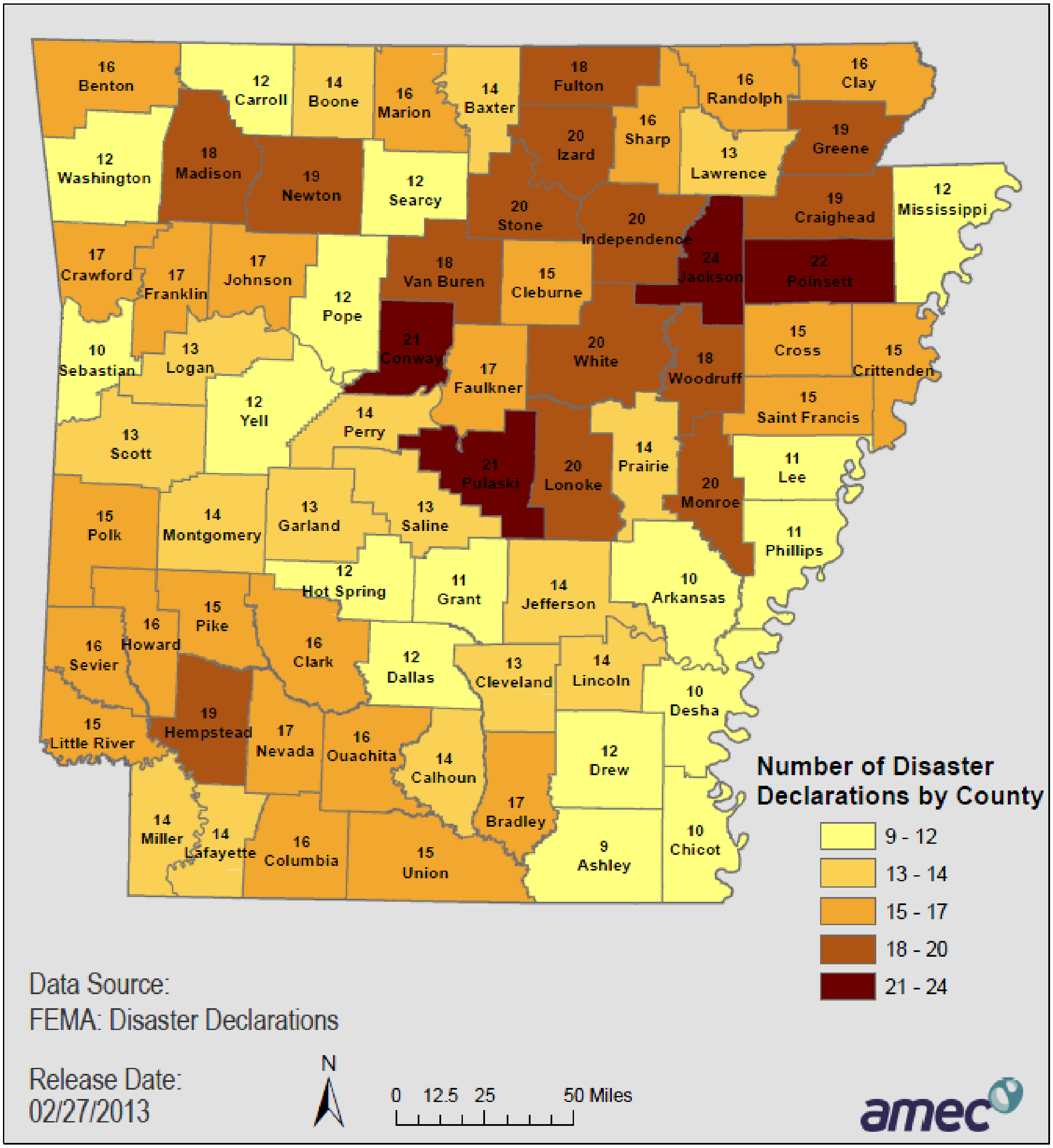


Table 3.3.c. Public Assistance for Arkansas Disasters from 1957 to 2013

Declaration Date	Disaster No.	Number of Applicants by County	Damage Survey Reports/Project Worksheets	Total Amount Eligible
5/29/1957	77	NA	N	NA
5/15/1958	83	NA	N	NA
5/28/1960	102	NA	N	NA
5/16/1961	112	NA	N	NA
8/2/1963	157	NA	N	NA
3/20/1964	166	NA	N	NA
5/3/1968	236	2	N	NA
5/29/1968	239	26	N	NA
2/15/1969	254	36	N	NA
1/27/1972	321	27	N	NA
4/27/1973	375	43	N	NA
5/29/1973	389	5	N	NA
5/31/1974	435	1	N	NA
6/8/1974	437	8	N	NA
9/14/1974	3003	NA	N	NA
4/1/1975	463	1	N	NA
6/7/1975	471	7	N	NA
4/1/1976	498	4	N	NA
12/3/1976	3019	32	N	NA
1/20/1978	3054	NA	N	NA
4/22/1978	3062	1	N	NA
9/15/1978	564	2	N	NA
4/11/1979	574	5	N	NA
4/16/1980	617	NA	N	NA
4/23/1982	3085	NA	N	NA
12/13/1982	673	20	N	NA
8/1/1983	688	5	N	NA
12/17/1987	806	1	N	NA
12/31/1987	807	NA	N	NA
11/23/1988	817	NA	N	NA
5/15/1990	865	35	N	NA
5/30/1991	907	21	N	NA
7/24/1992	950	5	N	NA
2/28/1994	1011	17	N	NA
4/23/1996	1111	4	N	NA
3/2/1997	1162	18	N	NA
4/14/1997	1176	26	N	NA
4/22/1998	3125	NA	N	NA
1/23/1999	1266	16	N	$7,265,330.40
12/29/2000	1354	65	N	$171,802,016.45
3/13/2001	1363	22	N	$3,019,659.14
1/24/2002	1400	20	N	$2,225,170.96
1/6/2003	1450	18	N	$9,586,323.53
6/6/2003	1472	16	N	$5,305,933.78
5/7/2004	1516	14	N	$7,197,835.44
6/30/2004	1528	14	N	$3,348,750.68

Declaration Date	Disaster No.	Number of Applicants by County	Damage Survey Reports/Project Worksheets	Total Amount Eligible
4/12/2006	1636	4	N	$2,286,579.47
2/7/2008	1744	12	Y	$5,020,005.70
3/26/2008	1751	55	N	$41,116,383.43
5/20/2008	1758	8	Y	$2,752,278.34
9/18/2008	1793	18	Y	$3,994,226.94
10/22/2008	1804	20	Y	$2,616,027.82
2/6/2009	1819	30	Y	$216,042,435.90
4/27/2009	1834	5	Y	$5,972,957.01
6/16/2009	1845	38	Y	$9,594,421.12
12/3/2009	1861	38	Y	$15,550,792.78
2/4/2010	1872	25	Y	$9,933,649.26
5/2/2011	1975	57	Y	$47,127,415.76
7/8/2011	4000	3	Y	$2,648,119.09
1/29/2013	4100	8	NA	NA

Table 3.3.d shows the total amount of Individual Assistance (IA) for IA-declared disasters in Arkansas from 1957 through 2013. IA includes state and federal assistance to individuals and families for uninsured losses within those counties included in the disaster declaration.

Table 3.3.d. Individual Assistance for Arkansas Disasters from 1957 to 2013

Declaration Date	Disaster No.	Individual Assistance	Number of Applicants by County	Number of Applicants (Approved)
5/29/1957	77	NA	0	NA
5/15/1958	83	NA	0	NA
5/28/1960	102	NA	0	NA
5/16/1961	112	NA	0	NA
8/2/1963	157	NA	0	NA
3/20/1964	166	NA	2	NA
5/3/1968	236	NA	26	NA
5/29/1968	239	NA	25	NA
2/15/1969	254	NA	36	NA
1/27/1972	321	NA	0	NA
4/27/1973	375	NA	43	NA
5/29/1973	389	NA	5	NA
5/31/1974	435	NA	1	NA
6/8/1974	437	NA	8	NA
9/14/1974	3003	NA	0	NA
4/1/1975	463	NA	1	NA
6/7/1975	471	NA	7	NA
4/1/1976	498	NA	4	NA
12/3/1976	3019	NA	0	NA

Declaration Date	Disaster No.	Individual Assistance	Number of Applicants by County	Number of Applicants (Approved)
1/20/1978	3054	NA	0	NA
4/22/1978	3062	NA	1	NA
9/15/1978	564	NA	2	NA
4/11/1979	574	NA	8	NA
4/16/1980	617	NA	5	NA
4/23/1982	3085	NA	0	NA
12/13/1982	673	NA	31	NA
8/1/1983	688	NA	0	NA
12/17/1987	806	NA	1	NA
12/31/1987	807	NA	11	NA
11/23/1988	817	NA	24	NA
5/15/1990	865	NA	37	NA
5/30/1991	907	NA	0	NA
7/24/1992	950	NA	0	NA
2/28/1994	1011	NA	0	NA
4/23/1996	1111	NA	6	NA
3/2/1997	1162	NA	21	NA
4/14/1997	1176	NA	14	NA
4/22/1998	3125	NA	1	NA
1/23/1999	1266	$0.00	15	0
12/29/2000	1354	$0.00	65	0
3/13/2001	1363	$0.00	0	0
1/24/2002	1400	$0.00	0	0
1/6/2003	1450	$0.00	0	0
6/6/2003	1472	$7,297,676.37	19	3,219
5/7/2004	1516	$0.00	0	0
6/30/2004	1528	$0.00	0	0
4/12/2006	1636	$1,230,390.88	7	346
2/7/2008	1744	$4,360,723.47	10	541
3/26/2008	1751	$11,675,465.18	50	3,201
5/20/2008	1758	$2,474,245.11	12	381
9/18/2008	1793	$0.00	0	0
10/22/2008	1804	$0.00	0	0
2/6/2009	1819	$0.00	0	0
4/27/2009	1834	$1,864,525.69	4	282
6/16/2009	1845	$0.00	0	0
12/3/2009	1861	$0.00	0	0
2/4/2010	1872	$0.00	0	0
5/2/2011	1975	$24,301,705.18	37	4,291
7/8/2011	4000	$1,754,570.75	3	182
1/29/2013	4100	$0.00	0	0

3.4 Hazards Profiles and State Risk Assessment

Requirement §201.4(c)(2)(i): [The state risk assessment shall include an overview of the] 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.

Plan Update: The plan update must continue to include occurrences of hazards profiled in the previous plan, and discuss new occurrences of hazard events. The updated plan must incorporate any new studies or technical information related to profiling hazards, such as new National Flood Insurance Program maps or studies, HAZUS studies, or reports from other Federal or State agencies that relate to

- **Location of natural hazards;**
- **Past hazard events;**
- **Probability of future hazard events.**

While maps are not required, any maps included in the updated plan must be consistent with the updated information.

This Hazard Analysis assesses various risks facing the State and its communities in order to evaluate and rank them. This process is then used to characterize hazards for emergency planning. It estimates the probability of occurrence and the severity of consequences for each hazard and provides a method of comparison. The evaluation involves many interrelated variables (toxicity, demographics, topography, etc.), and should be used by state and local officials in planning and prioritizing allocation of resources.

For this 2013 Mitigation Plan update, the vulnerability assessment and loss estimates have been expanded for all hazards addressed in the plan where sufficient data is available. Hazards are profiled alphabetically. Natural hazards precede the manmade and other hazards. Each hazard profile contains the following sections:

❖ *Description/Location*

This section provides an overall hazard description and overview of the geographic location within the State which would be affected by the identified hazard.

❖ *Previous Occurrences*

This section provides a discussion of previous hazard events. This data serves to define historic hazard trends and provides a reference point for understanding the potential impacts from future predicted events. Reviewing historic data assists in evaluating hazard event profiles, which focus on answering the following questions: How often might a particular disaster occur? Where are we most likely to be affected? And, How bad can it get?

❖ *Probability of Future Hazard Events*

The hazards covered in the analysis are listed in **Table 3.4.a** and **Table 3.4.b** along with the probability ratings have been validated by the APDMAC. The hazards listed are those that have been experienced by, or pose a potential threat to, Arkansas. However, local or isolated problems that constitute potential disasters should not be overlooked. The ratings are situational dependent.

Table 3.4.a. Natural Hazards Profiled in the All-Hazards Mitigation Plan

Natural Hazards	Probability
Dam and Levee Failure	Unlikely
Droughts	Possible
Earthquakes	Likely
Expansive Soils	Unlikely
Flood	Highly Likely
Landslides	Possible
Severe Thunderstorms (Damaging Winds, Hail, and Lightning)	Highly Likely
Severe Winter Storm	Highly Likely
Tornadoes	Highly Likely
Wildfires	Highly Likely

Table 3.4.b. Manmade and Other Hazards Profiled in the All-Hazards Mitigation Plan

Natural Hazards	Probability
Commercial Facility Incidents	Highly Likely
Superfund Site Incidents	Unlikely
Pine Bluff Arsenal Incidents	Unlikely
Methamphetamine Lab Incidents	Highly Likely
Transportation Incidents - Highway	Highly Likely

Natural Hazards	Probability
Transportation Incidents - Rail	Possible
Transportation Incidents - Air	Possible
Transportation Incidents - Water	Unlikely
Pipeline Incidents	Possible
Nuclear Events	Unlikely
Terrorism	Unlikely
Major Disease Outbreak	Possible

The following definitions explain the probability and severity ratings for each hazard:

Table 3.4.c. Probability – Likelihood that the hazard will occur

Probability	
Unlikely	Event is possible within the next 10 years. Event has up to 1 in 10 years chance of occurring (1/10=10%). History of events is less than or equal to 10% likely per year. Event is "Unlikely" but is possible of occurring.
Possible	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring (1/5=20%). History of events is greater than 10% but less than or equal to 20% likely per year. Event could "Possibly" occur.
Likely	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring (1/3=33%). History of events is greater than 20% but less than or equal to 33% likely per year. Event is "Likely" to occur.
Highly Likely	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring (1/1=100%). History of events is greater than 33% likely per year. Event is “Highly Likely” to occur.

❖ *State Vulnerability Analysis*

This section will be discussed for each hazard and will provide an overview and analysis of the State‘s vulnerability to the hazards which will serve to describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. The overview vulnerability analysis was completed using a variety of methods, including, HAZUS, other GIS-based risk modeling, statistical analysis of exposure, census data, and past historic losses.

❖ *State Estimates of Potential Losses*

Where data is available, this overview and analysis of potential losses to the identified vulnerable structures is provided utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. The methods utilized are described in greater detail for each hazard where data is available. For those hazards for which data is not available, the limitations which preclude analysis of potential losses will be described.

❖ *Development in Hazard Prone Areas*

Where applicable, changes in development will be discussed as they pertain to identified hazard-prone areas. Loss estimates provided herein are based on available data, and the methodologies applied resulted in an approximation of risk. These estimates are used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss-estimation methodology, arising in part from incomplete observed data and scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (such as incomplete inventories, demographics, or economic parameters).

❖ *Consequence Analysis*

An analysis of the potential for detrimental impacts of hazards was conducted for the Emergency Management Accreditation Program (EMAP). This analysis was completed based on the EMAP Standard published in September 2010. The results of the EMAP impact analysis are presented in each profile‘s discussion of impact.

HAZUS-MH Loss Estimation Methodology

HAZUS-MH is FEMA‘s standardized loss-estimation software program built upon an integrated geographic information system platform. The HAZUS-MH risk assessment methodology is parametric in that distinct hazard, vulnerability, and inventory parameters (earthquake spectral ordinates, building construction, and building classes) are modeled using the HAZUS-MH software to determine the impact on the built environment (damage and losses). This risk assessment referenced HAZUS-MH models to produce regional profiles and estimate losses for two hazards: earthquakes and riverine flooding.

GIS-based risk modeling

For some hazards such as dam and levee failure, expansive soils, and landslides, geographic locations of areas at risk to the hazard are known. However, these hazards are outside the scope of HAZUS-MH. For these hazards, the known locations of areas at risk are mapped utilizing geographic information systems to show areas of the State that are at greatest risk.

Statistical Risk Assessment Methodology

The statistical risk assessment methodology was applied to analyze hazards of concern that are outside the scope of HAZUS-MH or other GIS-based risk-modeling. This approach is based on different principals than HAZUS-MH and does not rely on readily available automated software. It uses a statistical approach and mathematical modeling of risk to predict a hazard‘s frequency of occurrence and estimated impacts based on recorded or historic damage information. Historical data for each hazard are used and statistical evaluations are performed using manual calculations. The general steps used in the statistical risk assessment methodology are summarized below:

- Compile data from national and local sources;
- Conduct statistical analysis of data to relate historical patterns within data to existing hazard models (minimum, maximum, average, and standard deviation);
- Categorize hazard parameters for each hazard to be modeled;
- Develop model parameters based on analysis of data, existing hazard models, and risk engineering judgment ;
- Apply hazard model including:
    - Analysis of frequency of hazard occurrence
    - Analysis of intensity and damage parameters of hazard occurrence
    - Development of intensity and frequency tables and curves based on observed data
    - Development of simple damage function to relate hazard intensity to a level of damage (e.g., one flood = $ in estimated damage)
    - Development of exceedence and frequency curves relating a level of damage for each hazard to an annual probability of occurrence
    - Development of annualized loss estimates.

Hypothetical Scenario-based Estimates

Specific scenario-based loss estimates are provided for several of the manmade and other hazards of concern that are outside the scope of HAZUS-MH, GIS-based risk-modeling, and statistical analysis. For these hazards information on historical losses was not available. In addition since there are so many variables involved with manmade hazards, it is difficult to make generalized assumptions for future events. In these instances, specific scenarios were chosen to analyze to establish an acceptable loss estimation methodology.

Economic Impact

The State Estimate of Potential Losses is presented as annualized losses, whenever possible. In general, presenting results in the annualized form is very useful for three reasons:

1. Contribution of potential losses from all (long term) future disasters is accounted for with this approach;
2. Results in this form for different hazards are readily comparable and hence easier to rank; and
3. When evaluating mitigation alternatives, use of annualized losses is an objective approach.

The economic loss results are presented here using two interrelated risk indicators: the annualized expected loss (AEL), which is the estimated expected long-term value of losses to the general building stock for a specified geographic area (i.e., county); and the annualized loss ratio (ALR), which expresses estimated annualized loss as a fraction of the building inventory replacement value.

The estimated AEL addresses key components of risk: the probability of a hazard event occurring in the study area, the consequences of the event (largely a function of building construction type and quality), and the intensity of the event. By annualizing estimated losses, the AEL factors in historic patterns of frequent small events with infrequent larger events to provide a balanced presentation of the risk.

The ALR represents the AEL as a fraction of the replacement value of the local building inventory. It gauges the relationship between average annualized loss and building replacement value. This ratio can be used as a measure of relative risk between areas and, since it is normalized by replacement value, it can be directly compared across different geographic units such as metropolitan areas or counties. It can also be used as a measure of community sustainability following a disaster.

Annualized losses for the hazards where the parametric approach is used are computed automatically using a probabilistic approach. For hazards where the statistical approach was used, the computations are based primarily on the observed historical losses.

3.4.1 Dam and Levee Failure

❖ *Description/Location*

Arkansas is a state with many dams, impoundments, and levees. The failure of these structures could result in injuries, loss of life and property, and environmental and economic damage. While levees are built solely for flood protection, dams often serve multiple purposes, one of which may be flood control. Severe flooding and other storms can increase the potential that dams and levees will be damaged and fail as a result of the physical force of the flood waters or overtopping.

Dams and levees are usually engineered to withstand a flood with a computed risk of occurrence. If a larger flood occurs, then that structure will likely be overtopped. If during the overtopping the dam or levee fails or is washed out, the water behind it is released as a flash flood. Failed dams and levees can create floods that are catastrophic to life and property because of the tremendous energy of the released water.

Dams

A dam is defined by the National Dam Safety Act as an artificial barrier that impounds or diverts water and (1) is more than 6 feet high and stores 50 acre feet or more or (2) is 25 feet or more high and stores more than 15 acre feet. Based on this definition, there are approximately 80,000 dams in the United States. Over 95 percent of these dams are non federal, with most being owned by state governments, municipalities, watershed districts, industries, lake associations, land developers, and private citizens. Dam owners have primary responsibility for the safe design, operation, and maintenance of their dams. They also have responsibility for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials.

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

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

The failure of a dam may also result in a flood event. A dam impounds water in the upstream area, referred to as the reservoir. The amount of water impounded is measured in acre-feet. An acre-foot of water is the volume that covers an acre of land to a depth of one foot. As a function of upstream topography, even a very small dam may impound or detain many acre-feet of water. Dam failures are not routine, but the results can be devastating. Two factors influence the potential severity of full or partial dam failure: (1) the amount of water impounded, and (2) the density, type, and value of development downstream.

A number of outside forces can cause dam failures. Included in these are prolonged periods of rain or flooding, landslides into reservoirs, failure of dams upstream, high winds and earthquakes. The most common cause of dam failure is prolonged rainfall that produces flooding. Failure, due to natural events, such as earthquakes or landslides, is significant because there is little to no advance warning. It is important to note that dam failures can result from natural events, human-induced events or a combination of events. Improper design and maintenance, inadequate spillway capacity or internal erosion or piping within a dam may also cause failure. People, property and infrastructure downstream of dams are subject to devastating damage in the event of failure.

National statistics show that overtopping of dams due to inadequate spillway design, debris blockage of spillways or settlement of the dam crest, account for 34% of all dam failures. Foundation defects, including settlement and slope instability, account for 30% of all failures. Piping and seepage cause 20% of national dam failures. This includes internal erosion caused by seepage, seepage and erosion along hydraulic structures, leakage through animal burrows and cracks in the dam. The remaining 16% of failures are caused by other means.

The map on the following page shows 1,260 federal and state-regulated dams within the state. The areas below dams are at risk to sudden and intense flooding in the event of a dam breach. A current inventory of all dams is available from the Dam Safety and Floodplain Management Division of the Arkansas Natural Resources Commission.

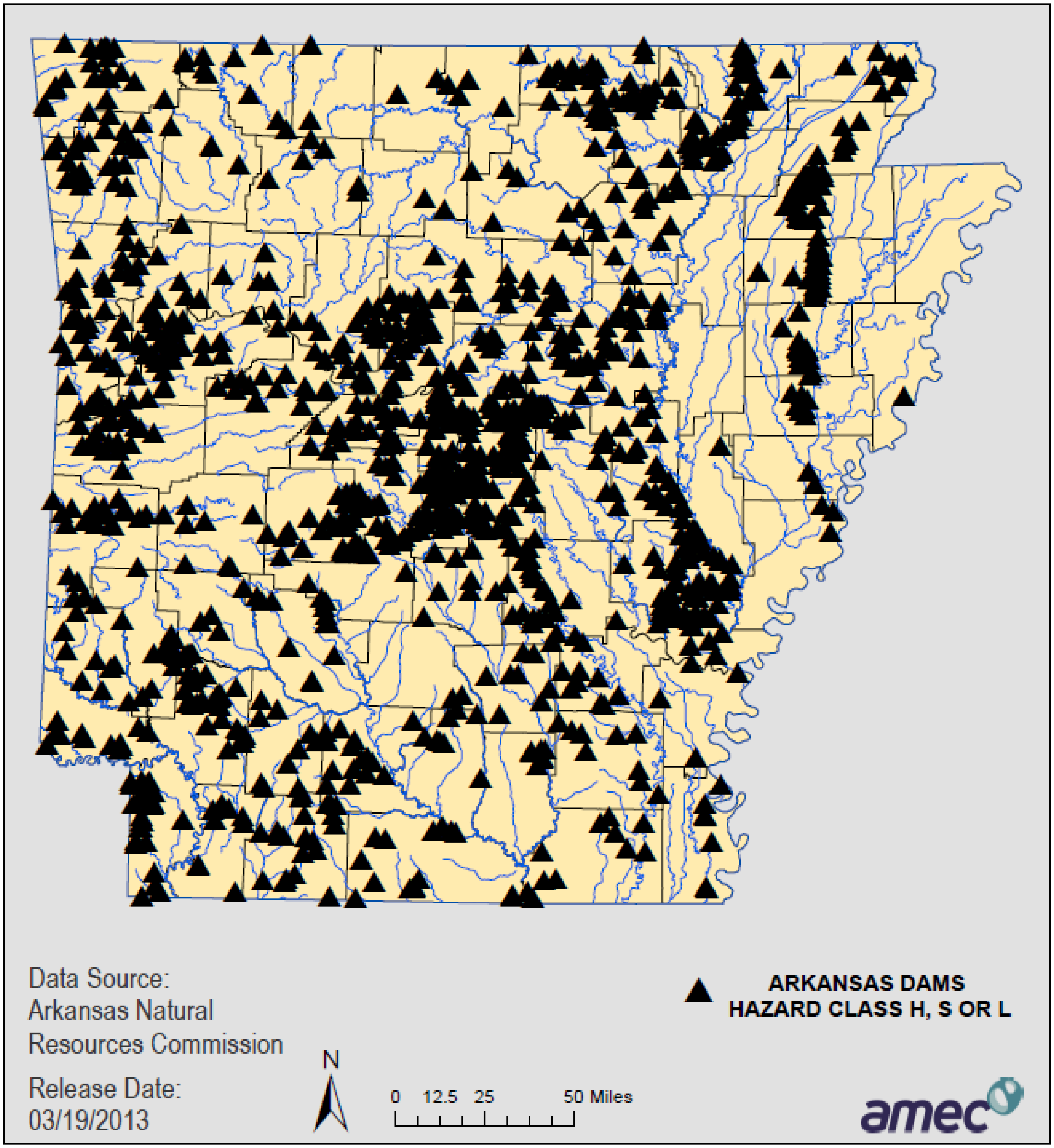
Dams in Arkansas are located throughout the state but are most common in the Ouachita Mountains and the Arkansas Valley Physiographic Provinces of central and western Arkansas where the topography is conducive to deep impoundments. Dams are also common on the north-south trending Crowley's Ridge of eastern Arkansas, the only area of significant topographic relief in the Mississippi Alluvial Plain. There are also a large number of dams in southeastern Arkansas, largely in Arkansas County, related to agricultural activity.

State-Regulated Dams

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. As such, the Arkansas Natural Resources Commission (ANRC) has regulatory jurisdiction over non-federal dams that meet the following definition of a "jurisdictional" dam:

> *All dams with height of 25 or more feet and containing 50 acre-feet or more of storage at normal pool must have a valid construction and operation permit from the Commission, unless they are owned by the United States Government. If smaller dams pose a threat to life or property, they may also require regulation by the State based on petition by downstream landowners and results of public hearings.*

Figure 3.4.1.a Arkansas Dam Locations



Dam classifications have been developed by the ANRC to describe the level of risk and severity associated with dam failure. These classifications do not reflect the physical condition of the dams, but rather describe areas downstream of the dams that could be impacted in the event of failure, which is generally unlikely. The ANRC classifies jurisdictional dams as follows:

- High Hazard—Potential for loss of human life and/or excessive public, industrial, commercial, or agricultural development in inundation areas. Losses could be over $500,000. Emergency Action Plans are required for all High Hazard Dams.
- Significant Hazard—No potential for loss of human life. But, significant structures, industrial, or commercial development, or cropland in inundation areas. Losses could be $100,000 to $500,000.
- Low Hazard-- No potential for loss of human life. No significant structures in inundation areas. Primarily pastures, woodland, or undeveloped land. Losses expected to be less than $100,000

At the time this plan was developed there were 1,179 state-regulated jurisdictional dams in Arkansas. Of those, 150 were High Hazard Dams, 208 were Significant Hazard Dams, and 821 were Low Hazard Dams.

Table 3.4.1.a provides the numbers of state-regulated low, significant and high hazard dams for each county in Arkansas.

Table 3.4.1.a. Number of State-Regulated Dams in Each County by Hazard Class

County	Low	Significant	High	Total
Arkansas	66	1	0	67
Ashley	9	0	0	9
Baxter	1	2	1	4
Benton	10	8	4	22
Boone	2	0	0	2
Bradley	7	0	0	7
Calhoun	7	0	0	7
Carroll	6	1	2	9
Chicot	5	0	0	5
Clark	6	0	2	8
Clay	9	0	1	10
Cleburne	11	2	1	14
Cleveland	8	0	0	8
Columbia	17	1	0	18
Conway	21	9	3	33
Craighead	11	5	12	28
Crawford	10	1	5	16
Crittenden	1	0	0	1
Cross	6	5	4	15
Dallas	2	1	0	3
Desha	1	1	0	2
Drew	7	1	1	9

County	Low	Significant	High	Total
Faulkner	34	4	0	38
Franklin	15	3	0	18
Fulton	21	2	2	25
Garland	16	10	8	34
Grant	8	2	0	10
Greene	5	2	4	11
Hempstead	31	0	1	32
Hot Spring	3	2	2	7
Howard	9	2	1	12
Independence	10	3	0	13
Izard	6	1	0	7
Jackson	2	0	0	2
Jefferson	18	4	0	22
Johnson	3	1	2	6
Lafayette	9	1	0	10
Lawrence	13	4	1	18
Lee	1	0	0	1
Lincoln	9	1	0	10
Little River	8	3	1	12
Logan	8	10	5	23
Lonoke	15	8	0	23
Madison	4	0	0	4
Marion	1	0	0	1
Miller	22	3	2	27
Mississippi		0	0	0
Monroe	5	0	0	5
Montgomery	3	3	2	8
Nevada	10	1	0	11
Newton	6	0	0	6
Ouachita	13	3	3	19
Perry	16	5	4	25
Phillips	2	0	0	2
Pike	5	2	0	7
Poinsett	21	7	7	35
Polk	13	2	6	21
Pope	10	5	2	17
Prairie	18	0	1	19
Pulaski	45	28	17	90
Randolph	14	6	0	20

County	Low	Significant	High	Total
Saint Francis	2	4	2	8
Saline	40	11	6	57
Scott	15	5	3	23
Searcy	0	2	0	2
Sebastian	6	4	7	17
Sevier	8	0	0	8
Sharp	7	2	13	22
Stone	3	0	0	3
Union	12	0	1	13
Van Buren	9	1	0	10
Washington	12	7	5	24
White	25	6	2	33
Woodruff	0	0	0	0
Yell	7	0	4	11
Total	**821**	**208**	**150**	**1179**

Source: Arkansas Natural Resources Commission, 2013

The map in **Figure 3.4.1.b** provides the point locations of Significant and High Hazard State-regulated dams in Arkansas.

Federal Dams/Reservoirs

There are also 62 dams in Arkansas that are maintained and operated by the federal government. **Table 3.4.1.b** lists the number of dams by federal agency/department that maintains and operates the dam in Arkansas. **Table 3.2.1.c** inventories the number of federal dams by county and hazard class.

Table 3.4.1.b. Federal Dams in Arkansas by Federal Agency/Department

Federal Agency	# of Dams Maintained and Operated in Arkansas
Department of Defense-US Air Force	1
Department of Defense-US Army	8
Department of Interior-Fish & Wildlife	3
Department of Interior-National Park Service	2
US Department of Agriculture-Forest Service	12
USACE-Little Rock District	23
USACE Vicksburg District	13
Total	**62**

Figure 3.4.1.b Significant and High Hazard State-Regulated Dams in Arkansas

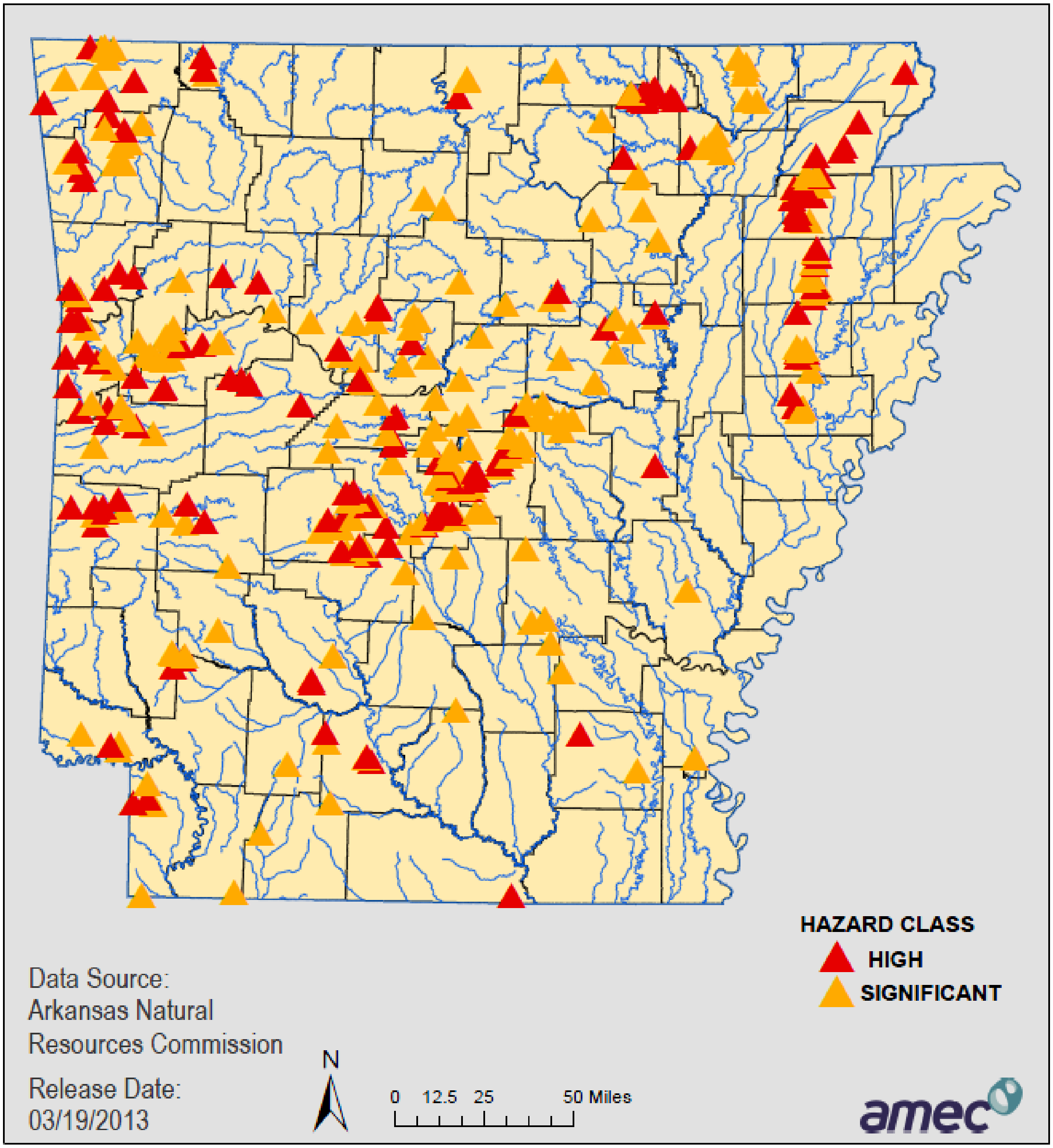
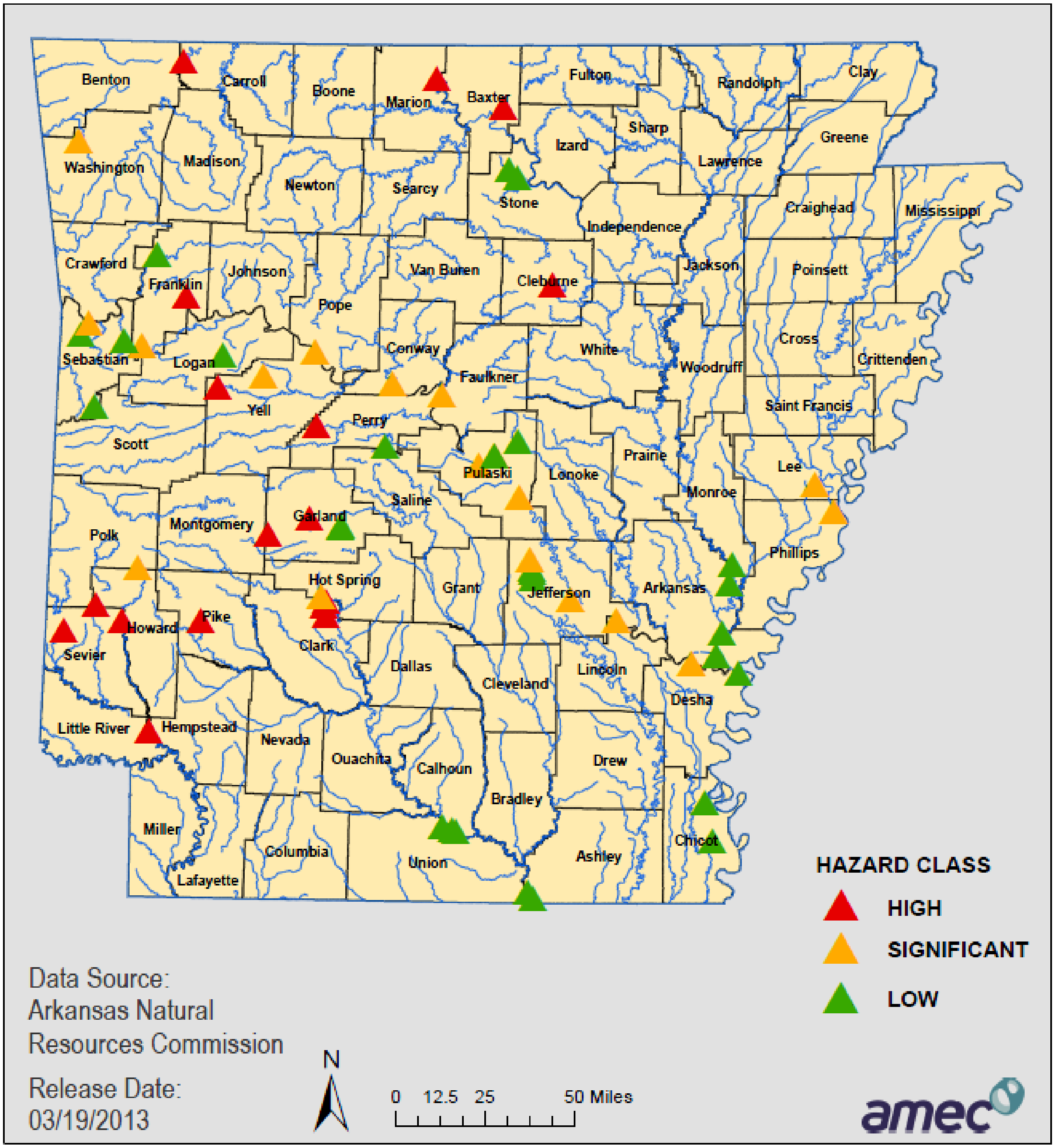


Table 3.4.1.c. Federal Dams in Arkansas by County and Hazard Class

County	Low	Significant	High	Total
Arkansas	3	1		4
Ashley	1			1
Baxter			2	2
Calhoun	1			1
Carroll			1	1
Chicot	2			2
Clark			3	3
Cleburne			1	1
Conway		1		1
Desha	1			1
Faulkner		1		1
Franklin	1	1	1	3
Garland	2		2	4
Hot Spring		1		1
Howard			1	1
Jefferson	3	3		6
Lee		1		1
Little River			1	1
Logan	1			1
Monroe	1			1
Perry	1			1
Phillips		1		1
Pike			1	1
Polk		1		1
Pulaski	2	3		5
Sebastian	3	1		4
Sevier			2	2
Stone		2		2
Union	3			3
Washington		1		1
Yell		2	2	4
Total	**25**	**20**	**17**	**62**

Source: Arkansas Natural Resource Commission

Figure 3.4.1.c Federal Dams in Arkansas



Levees

Levees are earth embankments constructed along rivers and coastlines to protect adjacent lands from flooding. Floodwalls are concrete structures, often components of levee systems, designed for urban areas where there is insufficient room for earthen levees. Levees are usually engineered to withstand a flood with a computed risk of occurrence. When a larger flood occurs and/or levees and floodwalls and their appurtenant structures are stressed beyond their capabilities to withstand floods, levee failure can result in loss of life and injuries as well as damages to property, the environment, and the economy. In Arkansas, there are hundreds of levees ranging in size from small agricultural levees that were constructed primarily to protect farmland from high frequency flooding to large urban levees that were constructed to protect people and property from larger, less frequent flooding events, such as the 100-year and 500-year flood events. For purposes of this plan, the levee failure hazard will refer to both overtopping and breach of a levee as defined in FEMA's publication "So You Live Behind a Levee" (http://content.asce.org/ASCELeveeGuide.html)

- Overtopping: When a Flood Is Too Big—Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee.
- Breaching: When a Levee Gives Way—A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

Levees are usually engineered to withstand a flood with a computed risk of occurrence. Many levees in Arkansas were largely constructed to protect agricultural land and are not built to design standards established to protect people and property. Their presence can, in some cases, generate a false sense of security.

Levee Inventories

Levees have been constructed across the State by public and private entities with varying levels of protection, inspection oversight, and maintenance. Currently there is no one comprehensive database of all levees in the State. However, significant strides have been made toward compiling such an inventory.

- The U.S. Army Corps of Engineers (USACE) has developed the National Levee Database (NLD). At this time, the NLD contains only levees that are currently enrolled in the USACE National Levee Safety Program.
- FEMA has developed the Mid-Term Levee Inventory (MLI) which contains levee data gathered primarily for structures that were designed to provide protection from at least the base (1-percent-annual-chance) flood, as this standard is the minimum level of protection

recognized by the national Flood Insurance Program (NFIP) for accreditation. Some levees that are not designed to meet, or have not been engineer-certified to meet, the minimum NFIP criteria for accreditation are also included in the MLI.

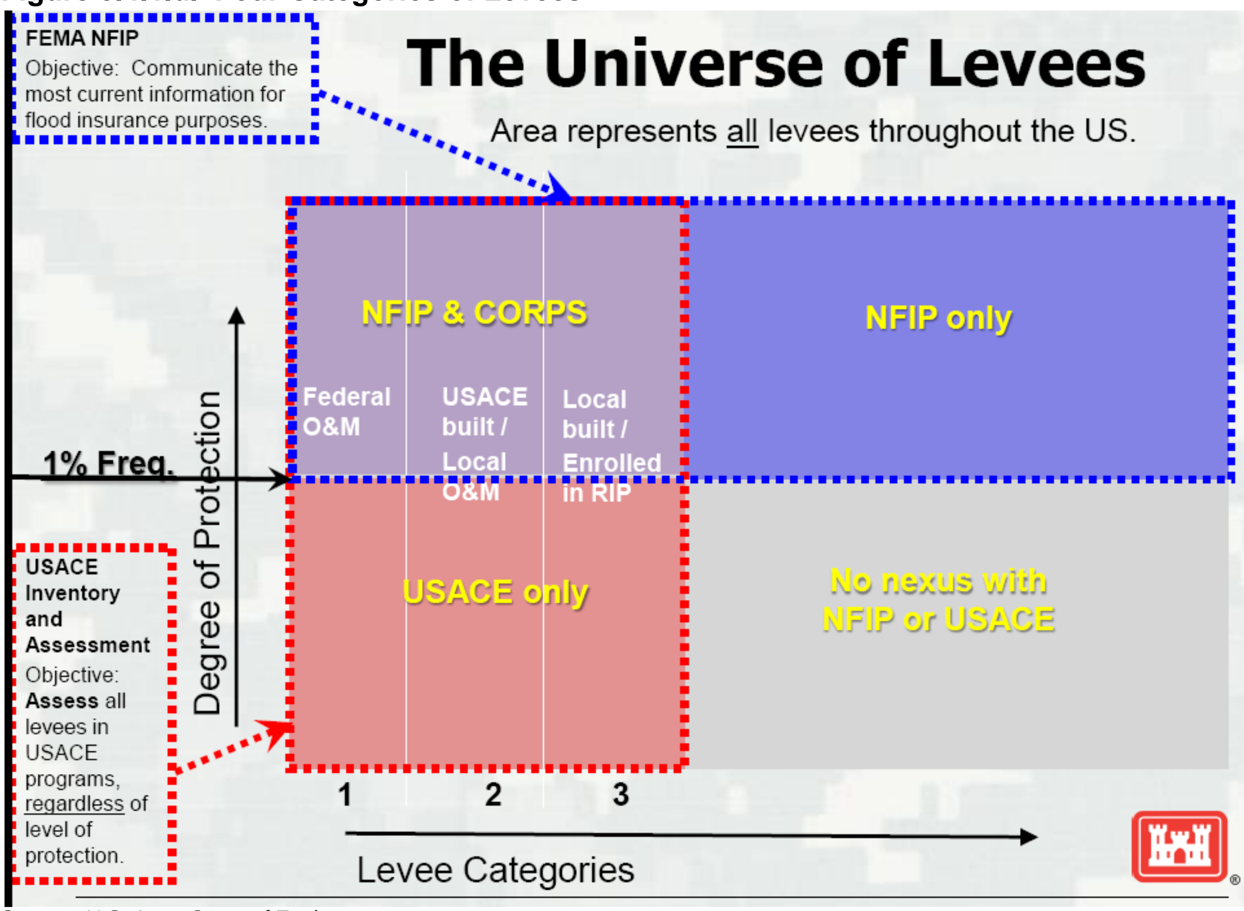
Categories of Levees

For purposes of the levee failure hazard profile and risk assessment in this hazard mitigation plan, levees in Arkansas will be discussed in four categories:

1. Levees in the USACE Levee Safety Program
2. FEMA Accredited Levees
3. Levees that are both in the USACE Levee Safety Program and Accredited by FEMA
4. All other levees

The graphic in **Figure 3.4.1.d** displays the four levee categories described above. In terms of assessing risk and severity, levees in categories 1, 2, and 3 all undergo or have undergone some sort of inspection, certification, or accreditation that indicates the level of protection and/or structural integrity of the levee system. However, the levees in the category 4 may not be regularly monitored or inspected.

Figure 3.4.1.d. Four Categories of Levees



Source: U.S. Army Corps of Engineers

Levees in the USACE Levee Safety Program

USACE created the Levee Safety Program (LSP) in 2006 to assess the integrity and viability of levees and to make sure that levee systems do not present unacceptable risks to the public, property, and environment. Under the Levee Safety Program, USACE conducts levee inspections (routine, periodic and special event). During these inspections, deficiencies may be identified such as unsatisfactory culverts, non-compliant vegetation, encroachments, and animal burrows. USACE uses inspection findings to "rate" levee systems to determine compliance with operation and maintenance requirements, understand the overall levee condition, and determine eligibility for federal rehabilitation assistance under P.L. 84-99

According to the National Levee Database managed by USACE, there are currently 66 levees in Arkansas in the USACE Levee Safety Program. The Little Rock District Office manages 46 of LSP levees, the Memphis District manages 10 of the LSP levees, and the Vicksburg District Office manages the remaining 10 LSP levees in Arkansas. See **Table 3.4.1.d**, on the following page, for additional information on the Arkansas levees in the USACE Levee Safety Program.

USACE has recently finalized development of a Levee Screening Tool (LST) to understand the risks associated with each levee system and assist with developing risk management solutions. The screening results will support the assignment of a Levee Safety Action Classification (LSAC) to denote the level of risk associated with each system. The Arkansas levees in the USACE LSP are in preliminary stages of screening and assignment of an LSAC rating. **Table 3.4.1.e** provides the descriptions of the five LSAC levels that will be assigned to each levee in the LSP.

Table 3.4.1.e. USACE Levee Safety Action Classifications.

Levee Safety Action Classification		
Class	**Characteristics**	**Actions**
Very High Urgency	Likelihood of inundation with associated consequences characterizing each class, emphasis on life-safety.	Actions recommended for each class and level of urgency grouped by responsible O&M entity.
High Urgency		
Moderate Urgency		
Low Urgency		
Normal		

Source: U.S. Army Corps of Engineers

Table 3.4.1.d. USACE Levee Safety Program Levees in Arkansas

USACE District	Levee System Name	State(s)	County(ies)	Segment(s)	Length (miles)	Inspection Rating	Inspection Date
Little Rock	Western Clay Drainage District No. 2 and 5	Arkansas, Missouri	Butler County, Clay County	2	22.49	Unacceptable	22-Apr-10
Little Rock	West of Morrilton	Arkansas	Conway County, Pope County	3	14.05	Unacceptable	15-Mar-10
Little Rock	Village Creek White River Mayberry Levee District	Arkansas	Jackson County, Woodruff County	1	22.84	Unacceptable	18-May-10
Little Rock	Van Buren Levee District No. 1/Crawford County Levee District	Arkansas	Crawford County, Sebastian County	2	21.5	Minimally Acceptable	23-May-10
Little Rock	T.A. Gibson Private Levee	Arkansas	Jefferson County	1	3.99	Unacceptable	12-Sep-88
Little Rock	Stalling Private Levee	Arkansas	Conway County	1	0.22	Unacceptable	13-Oct-06
Little Rock	Southern Enterprise Private Levee	Arkansas	Sebastian County	1	3.05	Minimally Acceptable	12-Sep-07
Little Rock	Sloan Private Levee	Arkansas	Conway County	1	0.91	-	-
Little Rock	Russellville Dike and Pumping Station	Arkansas	Pope County	1	1.2	Minimally Acceptable	19-Feb-10
Little Rock	Running Water Levee District	Arkansas	Randolph County	1	8.76	Unacceptable	15-Sep-10
Little Rock	Roland Drainage District	Arkansas	Pulaski County	1	4.09	Unacceptable	14-Oct-10
Little Rock	Rock Creek Levee	Arkansas	Pulaski County	1	0.59	Minimally Acceptable	14-Mar-12
Little Rock	Riverdale Private Levee	Arkansas	Pulaski County	1	2.89	Minimally Acceptable	7-Jul-10
Little Rock	Pulaski County Farm Private Levee	Arkansas	Pulaski County	1	1.89	Unacceptable	5-Jan-11
Little Rock	Point Remove Creek Drainage and Levee District	Arkansas	Conway County	1	7.2	Unacceptable	20-Sep-10
Little Rock	Perry County Levee District No. 1	Arkansas	Perry County	1	2.9	Unacceptable	4-Mar-87
Little Rock	Padgett Island Levee District	Arkansas	Independence County	1	2.76	Unacceptable	30-Sep-10
Little Rock	Ormand Peters Private Levee	Arkansas	Conway County	1	0.35	Unacceptable	13-Oct-06
Little Rock	Okay Levee	Arkansas	Howard County	1	2.72	Minimally Acceptable	21-Dec-05

USACE District	Levee System Name	State(s)	County(ies)	Segment(s)	Length (miles)	Inspection Rating	Inspection Date
Little Rock	North Little Rock to Gillette	Arkansas	Jefferson County, Lonoke County, Pulaski County	3	53.28	Unacceptable	18-Mar-10
Little Rock	North Little Rock Levee and Floodwall	Arkansas	Pulaski County	1	2.97	Minimally Acceptable	14-Feb-12
Little Rock	Newport Levee District	Arkansas	Jackson County	1	8.5	Minimally Acceptable	18-Oct-10
Little Rock	McLean Bottom	Arkansas	Logan County	3	12.29	Minimally Acceptable	4-May-10
Little Rock	Massey Alexander Levee District	Arkansas	Jackson County	1	6.51	Minimally Acceptable	11-Oct-10
Little Rock	Lower Hartman Bottom Levee	Arkansas	Johnson County	1	10.21	Minimally Acceptable	22-Sep-10
Little Rock	Little Rock to Pine Bluff (Tucker Lake)	Arkansas	Jefferson County	1	8.77	Unacceptable	16-May-12
Little Rock	Little Rock Flood Protection	Arkansas	Pulaski County	1	7.51	Unacceptable	25-Mar-10
Little Rock	Little Red River Levee District No. 2	Arkansas	White County	1	10.91	Unacceptable	13-Dec-10
Little Rock	Little Red River Levee District No. 1	Arkansas	White County	1	6.51	Minimally Acceptable	20-Sep-11
Little Rock	Little Private Levee	Arkansas	Faulkner County	1	2.05	Unacceptable	27-Jul-11
Little Rock	Honeysuckle White Levee	Arkansas	Franklin County	1	0.5	Minimally Acceptable	16-Jun-11
Little Rock	Holly Bend Levee District No. 1	Arkansas	Pope County, Yell County	1	3.52	Unacceptable	27-Jul-11
Little Rock	Holla Bend Drainage and Levee District No. 2	Arkansas	Pope County	1	1.3	Unacceptable	16-Jun-11
Little Rock	Head of Fourche Island to Pennington Bayou	Arkansas	Grant County, Jefferson County, Pulaski County, Saline County	2	21.38	Unacceptable	21-Apr-10
Little Rock	Fort Smith Levee District No. 1	Arkansas	Sebastian County	1	1.8	Minimally Acceptable	6-Apr-10
Little Rock	Faulkner County Levee District No. 1	Arkansas	Faulkner County	1	6.73	Minimally Acceptable	24-May-10

USACE District	Levee System Name	State(s)	County(ies)	Segment(s)	Length (miles)	Inspection Rating	Inspection Date
Little Rock	East of Morrilton	Arkansas	Conway County	3	13.64	Unacceptable	19-Apr-10
Little Rock	Dardanelle Levee/Carden Bottom Levee	Arkansas	Yell County	2	28.84	Unacceptable	7-May-10
Little Rock	Curia Creek Drainage District	Arkansas	Independence County	1	5.3	Unacceptable	30-Sep-10
Little Rock	Conway County Levee District No. 6	Arkansas	Conway County	1	4.39	Minimally Acceptable	20-Apr-10
Little Rock	Conway County Drainage & Levee District No. 1	Arkansas	Conway County	1	2.61	Minimally Acceptable	21-Apr-10
Little Rock	Clarksville Levee and Floodwall	Arkansas	Johnson County	1	1.15	Minimally Acceptable	22-Sep-10
Little Rock	Central Clay Drainage District	Arkansas, Missouri	Butler County, Clay County	1	12.3	Unacceptable	5-Apr-10
Little Rock	Big Gum Drainage District	Arkansas	Clay County	1	8.86	Unacceptable	8-Apr-10
Little Rock	Batesville Levee and Floodwall	Arkansas	Independence County	1	0.99	Minimally Acceptable	29-Sep-09
Little Rock	Bateman Levee District No. 3	Arkansas	Jackson County	1	3.03	Unacceptable	30-Sep-10
Memphis	White River Levee System	Arkansas	Lee County, Monroe County, Prairie County, Saint Francis County, Woodruff County	2	39.31	-	-
Memphis	West Bank St. Francis Floodway System	Arkansas	Clay County, Craighead County, Cross County, Greene County, Poinsett County	5	118.05	Unacceptable	29-Apr-12
Memphis	St. Francis East to Big Lake West System	Arkansas, Missouri	Craighead County, Dunklin County, Mississippi County, New Madrid County, Pemiscot County, Poinsett County	5	112.75	Unacceptable	6-Jun-12
Memphis	Mississippi and White Rivers Below Helena System	Arkansas	Desha County, Monroe County, Phillips County	6	114.62	Unacceptable	15-May-12
Memphis	Little River Drainage District Levee of Missouri System	Arkansas, Missouri	Bollinger County, Cape Girardeau County, Clay County, Dunklin County, New Madrid County, Scott County, Stoddard County	1	19.29	Unacceptable	19-Apr-12
Memphis	Des Arc Levee System	Arkansas	Prairie County	1	1.31	-	-

USACE District	Levee System Name	State(s)	County(ies)	Segment(s)	Length (miles)	Inspection Rating	Inspection Date
Memphis	De Valls Bluff Levee System	Arkansas	Prairie County	1	0.09	-	-
Memphis	Commerce MO - St. Francis River System	Arkansas, Missouri	Cape Girardeau County, Clay County, Craighead County, Crittenden County, Cross County, Dunklin County, Greene County, Lee County, Mississippi County, New Madrid County, Pemiscot County, Phillips County, Poinsett County, Saint Francis County, Scott County, Stoddard County	8	277.29	Minimally Acceptable	24-Apr-12
Memphis	Clarendon Levee System	Arkansas	Monroe County	1	6.18	Minimally Acceptable	14-Sep-10
Memphis	Big Lake and St. Francis Floodway East System	Arkansas	Crittenden County, Cross County, Lee County, Mississippi County, Poinsett County, Saint Francis County	1	119.5	Minimally Acceptable	26-Apr-12
Vicksburg	Red River LB AR	Arkansas	Lafayette County	1	28.09	Unacceptable	10-Aug-09
Vicksburg	RR RB Miller-Garland	Arkansas, Texas	Bowie County, Hempstead County, Miller County	2	62.59	Unacceptable	6-Aug-09
Vicksburg	McKinney Bayou - South	Arkansas	Miller County	1	15.08	Unacceptable	24-Jun-09
Vicksburg	McKinney Bayou - Mid - North	Arkansas	Miller County	2	13.94	Unacceptable	22-Jun-09
Vicksburg	Long Prairie AR	Arkansas, Louisiana	Bossier Parish, Lafayette County	2	20.23	-	-
Vicksburg	Hempstead County AR	Arkansas	Hempstead County	1	8.68	Minimally Acceptable	4-Aug-09
Vicksburg	Calion Protection Works AR	Arkansas	Union County	1	3.92	Acceptable	15-Nov-08
Vicksburg	Caddo North LA	Arkansas, Louisiana	Caddo Parish, Miller County	1	48.2	Minimally Acceptable	18-Sep-08
Vicksburg	AR-LA MS River	Arkansas, Louisiana	Ashley County, Avoyelles Parish, Caldwell Parish, Catahoula Parish, Chicot County, Concordia Parish, Desha County, Drew County,	5	359.64	Minimally Acceptable	29-Sep-09

USACE District	Levee System Name	State(s)	County(ies)	Segment(s)	Length (miles)	Inspection Rating	Inspection Date
			East Carroll Parish, Franklin Parish, Jefferson County, La Salle Parish, Lincoln County, Madison Parish, Morehouse Parish, Ouachita Parish, Rapides Parish, Richland Parish, Tensas Parish, West Carroll Parish, West Feliciana Parish				
Vicksburg	AR River North Bank	Arkansas	Arkansas County, Jefferson County	4	56.16	Minimally Acceptable	21-Oct-09

Source: USACE National Levee Database, http://nld.usace.army.mi

A primary purpose for assessing and classifying the risk associated with levee systems is to inform responsible parties on appropriate actions that should be taken to reduce risk. Risk assessments, including levee screenings, will identify risk drivers associated with a particular levee. Risk assessments will also identify actions that may be taken to reduce those risks. Actions may be permanent in nature (e.g., replacing defective components or constructing physical improvements to a levee). In many cases Interim Risk Reduction Measures (IRRMs) may be warranted as a means of reducing risk in the interim while permanent measures are planned and implemented. IRRMs for a particular levee system may be developed and implemented by multiple authorities depending on the nature of the risk and the distribution of authorities for that levee system. Parties that could be involved with developing and implementing IRRMs could include: individuals (i.e., the general public); levee boards; local communities; county, state and federal emergency management agencies; USACE; and others. The USACE Engineering and Construction Bulletin (ECB) 2012-01 provides additional information on this subject. Although the ECB is intended for application only on USACE-program levees the general concepts apply to levees of all kinds.

FEMA Accredited Levees

Many levees shown on effective Flood Insurance Rate Maps (FIRM) were mapped in the 1970s and 1980s and have never been remapped by FEMA. Prior to 1986, levees were shown on FIRMs as providing protection from the base flood when they were designed and constructed in accordance with sound engineering practices. Since 1986, levees have been shown as accredited on FIRMs only when they meet the requirements of 44 CFR 65.10 “Mapping Areas Protected by Levee Systems”, including certification by a registered professional engineer or a Federal agency with responsibility for levee design.

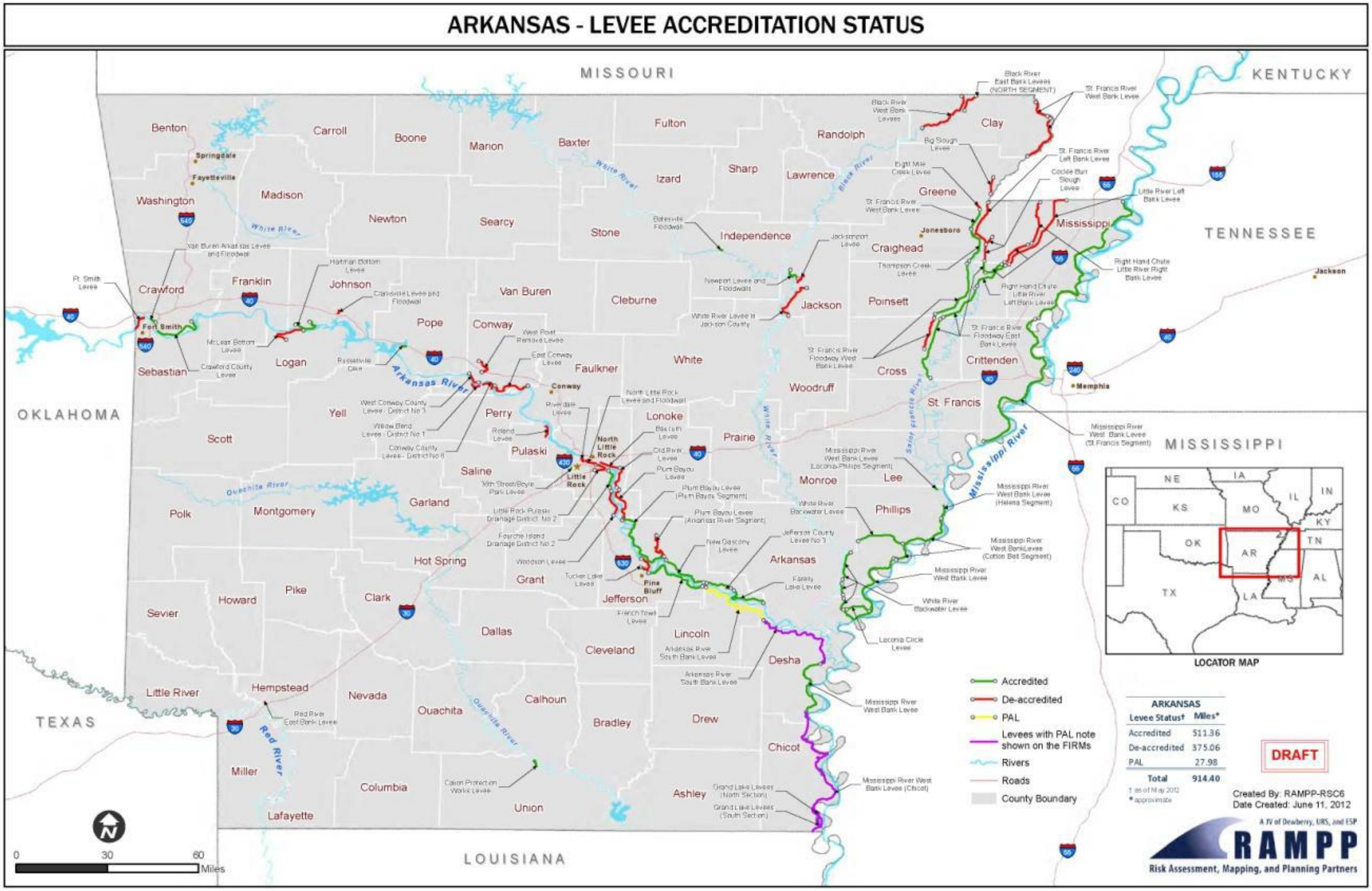
Levees that do not meet the requirements of 44 CFR 65.10 cannot be shown as accredited on a FIRM. Furthermore, floodplain areas behind the levee are at risk to base flood inundation and are mapped as high risk areas subject to FEMA’s minimum floodplain management regulations and mandatory flood insurance purchase requirement.

In 2004, as it initiated work under the Flood Map Modernization Initiative (Map Mod), FEMA determined that analysis of the role of levees in flood risk reduction would be an important part of the mapping efforts. A report issued in 2005 noted that the status of the Nation‘s levees was not well understood and the condition of many levees and floodwalls had not been assessed since their original inclusion in the NFIP. As a result, FEMA established policies to address existing levees. As levees are assessed according to these policies, they fall under one of the three following categories:

1) Accredited Levee - With the except of areas of residual flooding (interior drainage), if the data and documentation specified in 44 CFR 65.10 is readily available and provided to FEMA, the area behind the levee will be mapped as a moderate-risk area. There is no mandatory flood insurance purchase requirement in a moderate-risk area, but flood insurance is strongly recommended.
2) Provisionally Accredited Levee (PAL) - If data and documentation is not readily available, and no known deficiency precludes meeting requirements of 44 CFR 65.10, FEMA can allow the party seeking recognition up to two years to compile and submit full documentation to show compliance with 44 CFR 65.10. During this two-year period of provisional accreditation, the area behind the levee will be mapped as moderate-risk with no mandatory flood insurance purchase requirement.
3) De-Accredited Levees – If the information established under 44 CFR 65.10 is not readily available and provided to FEMA, and the levee is not eligible for the PAL designation, the levee will be de-accredited by FEMA. If a levee is de-accredited, FEMA will evaluate the level of risk associated with each non-accredited levee through their Levee Analysis Mapping Procedures (LAMP) criteria to consider how to map the floodplain and which areas on the dry side of the levee will be shown as high risk. The mapping will then be updated to reflect this risk.

Figure 3.4.1.e is a map showing the Levee Accreditation Status based on the Mid-term Levee Inventory Status Report dated November 30, 2012.

Figure 3.4.1.e. Arkansas Levee Accreditation Status Map



Source: FEMA Midterm Levee inventory Project Summary Report, November 30, 2012

A comparison of the counties with levees in the map above with the DFIRM status of Arkansas Counties indicates that there are 5 Arkansas Counties with levees that do not have effective DFIRMs. Those counties are:

- Clay County
- Craighead County
- Cross County
- Jackson County
- Pulaski

Pulaski County does have a Preliminary DFIRM. The Study status for all five of the counties above indicates "Levee on Hold".

Levees that are both in the USACE Levee Safety Program and Accredited by FEMA

USACE and FEMA are working to integrate the MLI into the NLD. When complete, this integrated inventory will provide a comprehensive inventory of the levees in the now separate inventories. At this time, it is not possible to provide a list of the levees in Arkansas that are both in the USACE Levee Safety Program and Accredited by FEMA due to the inconsistencies in levee names, segment lengths, etc. tracked by both programs. As part of the USACE and FEMA levee integration effort, these differences are being resolved. The goal is to have the FEMA MLI integrated with the NLD by the end of December 2013.

All Other Levees

There are also levees throughout the State that are intended to mitigate low-level flooding and/or protect agricultural land that are not in the USACE Levee Safety program. Additionally, since these levees are not intended to protect populations or development from flooding from the 1% annual chance flood, they are not, nor seek to be accredited by FEMA for flood insurance purposes. These levees may provide a false sense of security to residents behind these levees. Additionally, these levees may not be routinely inspected by levee owners. There is no agency with regulatory authority over these levees.

Although there is no comprehensive inventory that includes these "other levees", the FEMA Mid-term Levee Inventory includes information about some of the levees that fall into this category. Again, this information is targeted to be available by the end of December 2013.

❖ *Previous Occurrences*

This section discusses previous occurrences for dam and levee failure in Arkansas.

Dam Failure

According to Stanford University's National Performance of Dams Program, there were 5 dam incidents in Arkansas captured in the database as of February 2013. Two incidents involved the same dam, Carpenter Hamilton Dam.

Table 3.4.1.f. Dam Incidents in Arkansas

Dam Name	Hazard Class	Height (Ft)	Nearest Town / Distance (miles)	River	Incident Date	Incident Type	Failure
Paris Dam	High	55.3	Paris / 1	Short Mountain Creek	1939	Inflow Flood - Hydrologic Event	Yes
Tupelo Bayou Site 1	Low	48	None	Tupelo Bayou	1973	Piping	Yes
Carpenter (Hamilton)	High	115	Antioch & Sulphur Townships / 0	Ouachita River	May 1994	Inflow Flood - Hydrologic Event	No
Carpenter (Hamilton)	High	115	Antioch & Sulphur Townships / 0	Ouachita River	March 2000	Gate Mis-operation	No
Ponca Dam	N/A	N/A	N/A	N/A	June 2000	Inflow Flood - Hydrologic Event	Yes

Source: Stanford University's National Performance of Dams Program, http://ce-npdp-serv2.stanford.edu/DamDirectory/DamIncidentQuery/IncidentForm.jsp

Additional Details about notable dam failure incidents are provided below:

- **June 2000 Ponca Dam Failure**: Flooding on Ponca Creek (about four inches in eight hours) and in the headwaters of the Buffalo River (six inches) caused the small (non-state permitted) earthen Ponca Dam to fail on June 17. This, and the general flooding, caused the Buffalo River to rise eight feet in one hour just below the confluence with Ponca Creek. Fortunately, the river was already closed to floaters and no one was washed away at the Ponca launch. The washout resulted in the earthen fill (which was previously leaking) to wash into a park and Buffalo National River.
- **July 2004 Decatur Dam Failure**: Floodwaters damaged several businesses in Decatur in western Benton County when an earthen dam, too small to be permitted by the state, broke shortly after midnight on July 3, 2004. Five to six inches of rain had fallen in the area earlier in the day. One business, an auto parts store approximately 500 yards from the dam, was

damaged by four feet of water. Six service-bay doors were destroyed when the water swept equipment within the shop into them. Equipment from the business was found up to a half-mile away.

- **May 1990 Carpenter Dam Bridge Wash Out:** The dam that holds the water in Carpenter Lake did not fail. However the Carpenter Dam Bridge ½ mile downstream was washed out. Water released from Lake Hamilton flooded homes on Lake Catherine. Over 300 homes outside the Hot Springs area had to be evacuated.

Levee Failure

- **2011 Flooding**: A 50 to 75 foot breach in the levee along the Black River near Pocahontas, Arkansas broke on Highway 304. This expanded local flooding and resulted in closure of portions of U.S. 67. The Randolph County Jail had to evacuate prisoners as the flood water began to swell around the jail. The flooding also forced the Randolph County 911 Dispatch Center to evacuate. Additional sections of the Black River levee broke in this event flooding 100 homes in the Robil subdivision as well as the Black River Technical College (Arkansas Online http://www.arkansasonline.com/news/2011/apr/30/river-floods-100-homes-states-death-toll--20110430/?print) .

Figure 3.4.1.f Pocahontas, Arkansas Levee Breach, April 28, 2011

Source: KAIT News Crew, http://www.kait8.com/story/14523747/prisoners-to-be-evacuated-due-to-pocahontas-flood

- **2008 Flooding**: Sections of the Black River levee east of Pocahontas gave way flooding an apartment complex east of the Robil Subdivision.

- **1927 Mississippi River Flood**: This tremendous region-wide flood extended over nearly 26,000 square miles, killed more than 500 people and drove more than 700,000 people from their home. Thirteen crevasses in the main Mississippi River levees occurred. Levee overtopping and failure was so widespread during this flood that sometimes there was no dry land left except atop the levees. The photograph below shows flood victims camping on a levee in Arkansas City, Arkansas.

Figure 3.4.1.g Arkansas City, Arkansas Levee, 1927 Mississippi River Flood

Source: U.S. Army Corps of Engineers

❖ *Probability of Future Hazard Events*

Dam Failure

The variability of the size and construction of the dams in Arkansas makes estimating the probability of dam failure difficult on any scale less than a case-by-case basis. The limited data on previous occurrences indicates that in the last 74 years (1939 to 2013), there have been 5 recorded dam failure events in Arkansas which averages to less than 1 event every 15 years. Therefore, this hazard's probability is "**Unlikely**" (event is possible within the next 10 years).

Levee Failure

Although both federal and nonfederal levees have been damaged in previous regional flood events, the damage has not resulted in catastrophic failure and/or damages. Levees in Arkansas that have been constructed to protect development and populations from the 1-percent annual chance flood are routinely inspected and maintained. Based on current historical data pertaining to damaging/significant Levee Failure incidents in the State of Arkansas, This hazard's probability is "**Unlikely**".

❖ *State Vulnerability Analysis*

Dam Failure

The state requires emergency action plans (EAP) for all high hazard dams. Of the 150 state-regulated high hazard dams, 90 have emergency action plans, leaving 60 without an EAP. This is a concern because if a dam without an EAP were to fail, Emergency Management Officials would not have a formal action plan to guide notification and evacuation in the areas that would be inundated.

The average age of the 1,167 dams with completion dates in the state's inventory database is 50 years old, and some of them are exhibiting structural deficiencies. Common problems with older dams include:

- Deteriorating metal pipes and structural components,
- Inadequate hydrologic capacity,
- Increased runoff because of upstream development, and
- Increased failure hazard because of downstream development.

Nationally, there is growing concern that many small flood control dams, which were built by local watershed districts with U.S. Department of Agriculture technical and financial assistance are at or near the end of their 50-year planned design life.

To complete an analysis of vulnerability to dam failure as well as attempt to describe vulnerability in terms of the jurisdictions most threatened by dam failure, points were assigned to each type of dam and then aggregated for a total point score for each county. Points were assigned as follows for each dam:

- Low Hazard Dams, 1 point,
- Significant Hazard Dams, 2 points,
- High Hazard Dams, 3 points,
- High Hazard Dams without an EAP, an additional 2 points.

This analysis does not intend to demonstrate vulnerability in terms of dam structures that are likely to fail, but rather provides a general overview of the counties that have a high number of dams, with weighted consideration given to dams whose failure would result in greater damages.

Table 3.4.1.g shows the results of this analysis for each county and **Figure 3.4.1.h.** displays the results in a statewide map. **Table 3.4.1.h** shows the top eleven counties (# 10 and #11 have the same score) by dam failure vulnerability rating based on the vulnerability analysis methodology described above.

Table 3.4.1.g. Dam Failure Vulnerability Analysis Results Table

County	# of Low Hazard Dams (X 1 point)	# of Significant Hazard Dams (X2 points)	# of High Hazard Dams (X3 points)	# of High Hazard Dams w/o EAP (X2 points)	Weighted Vulnerability Analysis Score
Arkansas	66	1	0	0	68
Ashley	9	0	0	0	9
Baxter	1	2	1	1	10
Benton	10	8	4	1	40
Boone	2	0	0	0	2
Bradley	7	0	0	0	7
Calhoun	7	0	0	0	7
Carroll	6	1	2	1	16
Chicot	5	0	0	0	5
Clark	6	0	2	2	16
Clay	9	0	1	1	14
Cleburne	11	2	1	1	20
Cleveland	8	0	0	0	8
Columbia	17	1	0	0	19
Conway	21	9	3	1	50
Craighead	11	5	12	8	73
Crawford	10	1	5	1	29
Crittenden	1	0	0	0	1
Cross	6	5	4	1	30

County	# of Low Hazard Dams (X 1 point)	# of Significant Hazard Dams (X2 points)	# of High Hazard Dams (X3 points)	# of High Hazard Dams w/o EAP (X2 points)	Weighted Vulnerability Analysis Score
Dallas	2	1	0	0	4
Desha	1	1	0	0	3
Drew	7	1	1	0	12
Faulkner	34	4	0	0	42
Franklin	15	3	0	0	21
Fulton	21	2	2	1	33
Garland	16	10	8	1	62
Grant	8	2	0	0	12
Greene	5	2	4	3	27
Hempstead	31	0	1	0	34
Hot Spring	3	2	2	0	13
Howard	9	2	1	0	16
Independence	10	3	0	0	16
Izard	6	1	0	0	8
Jackson	2	0	0	0	2
Jefferson	18	4	0	0	26
Johnson	3	1	2	0	11
Lafayette	9	1	0	0	11
Lawrence	13	4	1	0	24
Lee	1	0	0	0	1
Lincoln	9	1	0	0	11
Little River	8	3	1	0	17
Logan	8	10	5	0	43
Lonoke	15	8	0	0	31
Madison	4	0	0	0	4
Marion	1	0	0	0	1
Miller	22	3	2	2	38
Mississippi	0	0	0	0	0
Monroe	5	0	0	0	5
Montgomery	3	3	2	1	17
Nevada	10	1	0	0	12
Newton	6	0	0	0	6
Ouachita	13	3	3	2	32
Perry	16	5	4	2	42
Phillips	2	0	0	0	2
Pike	5	2	0	0	9
Poinsett	21	7	7	1	58

County	# of Low Hazard Dams (X 1 point)	# of Significant Hazard Dams (X2 points)	# of High Hazard Dams (X3 points)	# of High Hazard Dams w/o EAP (X2 points)	Weighted Vulnerability Analysis Score
Polk	13	2	6	2	39
Pope	10	5	2	0	26
Prairie	18	0	1	1	23
Pulaski	45	28	17	13	178
Randolph	14	6	0	0	26
Saint Francis	2	4	2	2	20
Saline	40	11	6	4	88
Scott	15	5	3	0	34
Searcy	0	2	0	0	4
Sebastian	6	4	7	2	39
Sevier	8	0	0	0	8
Sharp	7	2	13	1	52
Stone	3	0	0	0	3
Union	12	0	1	1	17
Van Buren	9	1	0	0	11
Washington	12	7	5	1	43
White	25	6	2	2	47
Woodruff	0	0	0	0	0
Yell	7	0	12	0	19

Source: Analysis by AMEC utilizing data from: Arkansas Natural Resources Commission

Figure 3.4.1.h Dam Failure Vulnerability Analysis Results Map

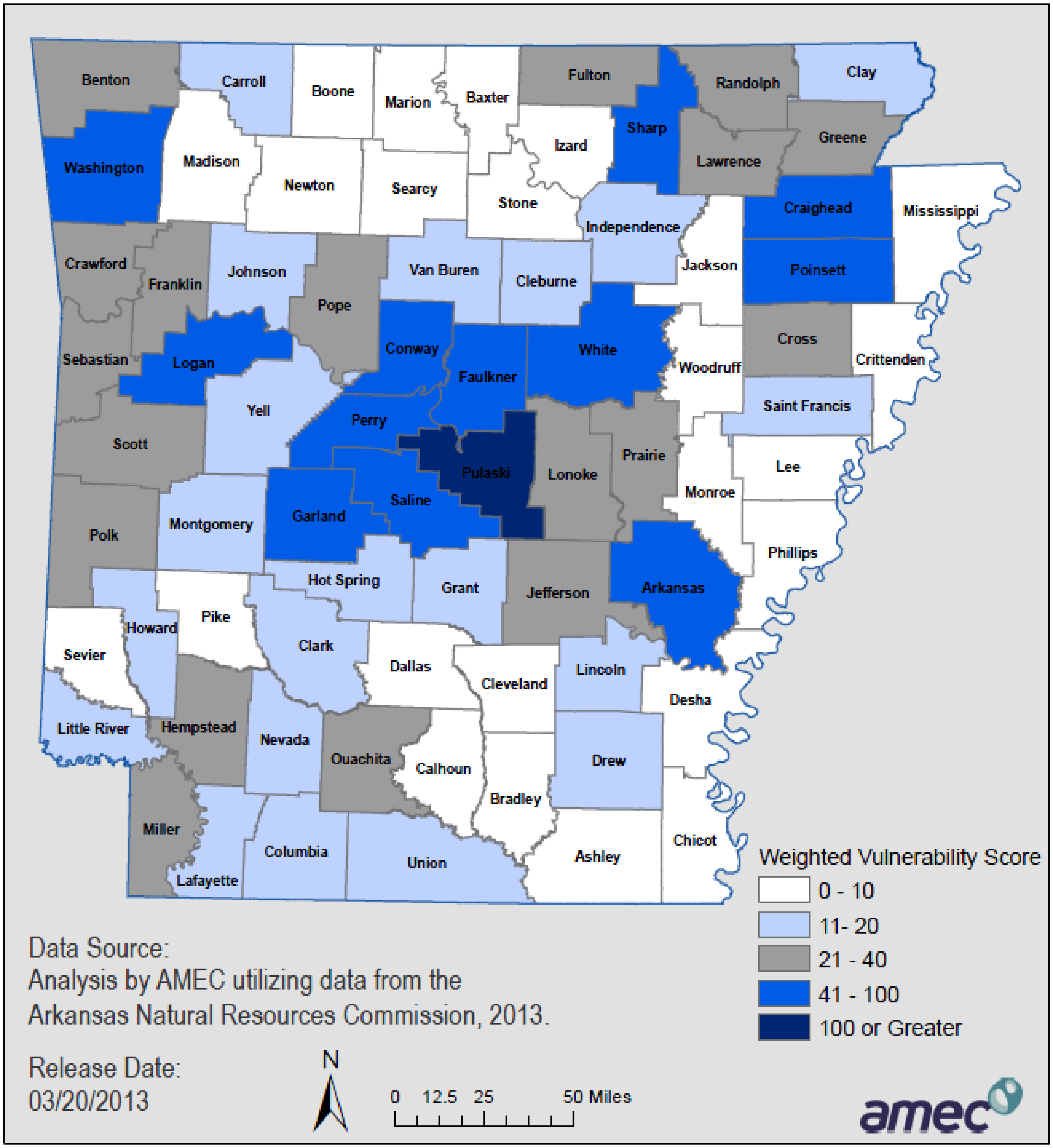


Table 3.4.1.h. Top 11 Counties by Dam Failure Vulnerability Rating

County	Weighted Vulnerability Analysis Score
Pulaski	178
Saline	88
Craighead	73
Arkansas	68
Garland	62
Poinsett	58
Sharp	52
Conway	50
White	47
Logan	43
Washington	43

Levee Failure

According to the FEMA MLI Status Report dated November 30, 2012, there are 33 counties in Arkansas that have levees that are accredited by FEMA as providing protection from the base (1-percent-annual-chance) flood event. Of those, 16 have Digital Flood Insurance Rate Maps (15 effective/1 Preliminary) that include levee protected areas. There are a total of 499.9 miles of levees that comprise levee protected areas in the 16 DFIRM counties with levees. These levee protected areas are indicated the DFIRM as “Zone X, Protected by Levee”. **Figure 3.4.1.i.** depicts the 16 counties with Preliminary/Effective DFIRMS and the Zone X, Protected by Levee areas in these counties.

To complete an analysis of vulnerability to levee failure as well as attempt to describe vulnerability in terms of the jurisdictions most threatened by levee failure, this data was used, along with census block data available in HAZUS MH 2.1 to determine the number of people and the value of development in these identified levee protected areas. This methodology consisted of calculating the percentage of the census block areas inside the Zone X, Protected by Levee Areas. This percentage was then applied to the census block population and building and contents values. This analysis does not attempt to evaluate which levees are more prone to overtopping or failure, but rather provide a general picture of those counties that have more people and property protected by levees and therefore the potential for more damage if failure or overtopping were to occur.

Figure 3.4.1.i DFIRM Counties With Zone X, Protected by Levee Areas

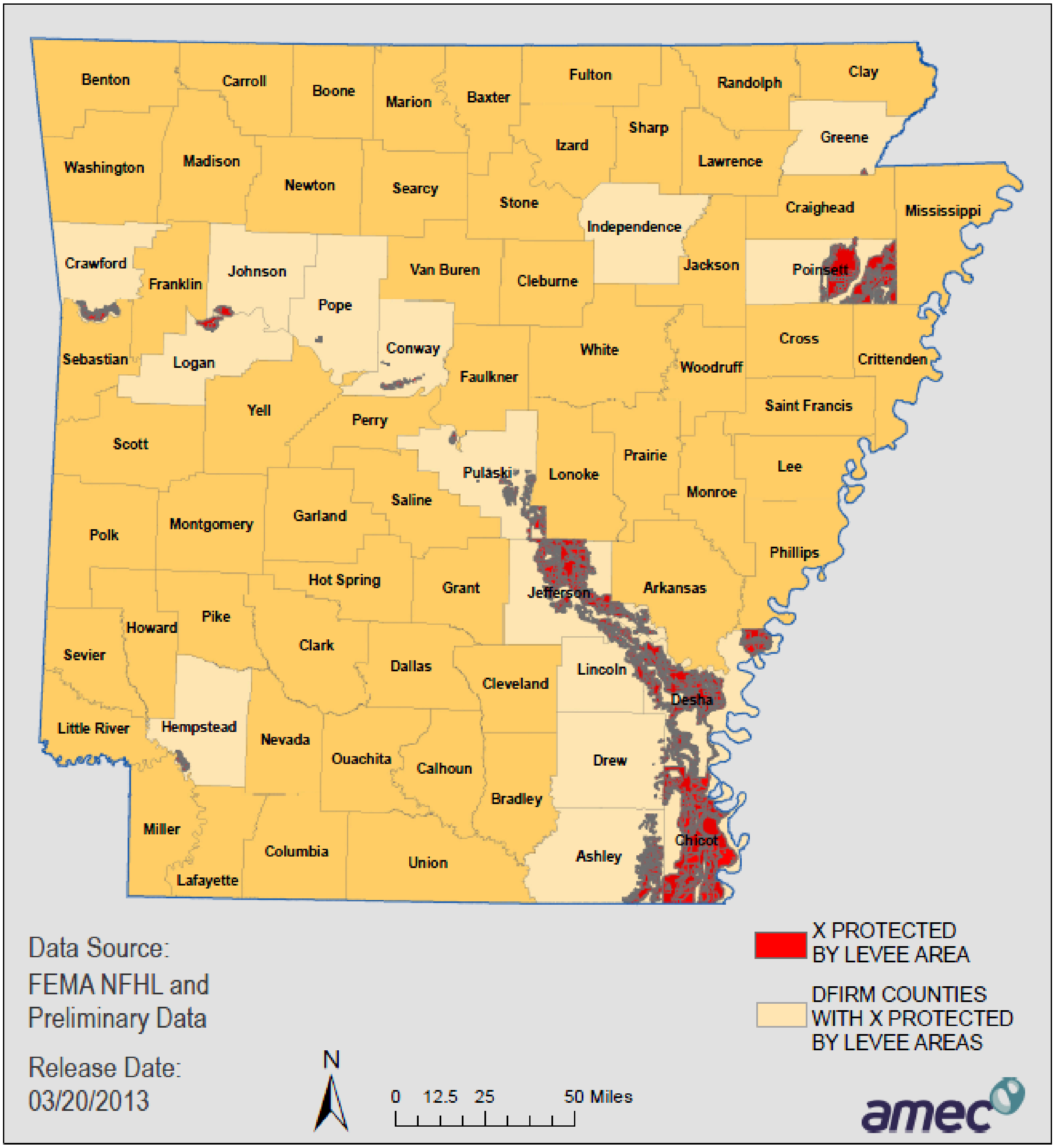


Table 3.4.1.i provides a breakdown by county of the estimated population, structure value, contents value, and total value in levee protected areas for the available Zone X, Protected by Levee areas. This data is to be used only for general determination of those areas within available DFIRM counties that *could* suffer the greatest losses in the event of levee failure events. Data limitations prevent a more accurate analysis including: lack of delineation of protected areas for all levees in all counties and, lack of statewide parcel-type data which would

provide more accurate results in determining structures and values within levee protected areas. As indicated previously, there are additional counties that have levees (various accreditation statuses) that do not have preliminary or effective DFIRM data.

Table 3.4.1.i Populations and Values Protected by Levees in Arkansas Counties with DFIRMs

County	Miles of levees in "Zone X, Protected by Levee" Areas	Population Exposure in "Zone X Protected by Levee" Areas	Structure Value Exposure in "Zone X, Protected by Levee" Areas	Contents Value Exposure in "Zone X, Protected by Levee" Areas	Total Building Exposure Value in "Zone X, Protected by Levee" Areas
Ashley	**	2,025	$90,417,041	$54,887,525	$145,304,566
Chicot	65	10,668	$535,779,147	$339,737,073	$875,516,220
Conway	24.5	91	$5,189,401	$3,044,115	$8,233,515
Crawford	19.7	560	$59,224,356	$54,859,121	$114,083,477
Desha	87.5	11,231	$674,064,449	$453,435,319	$1,127,499,767
Drew	***	12	$1,566,828	$1,142,285	$2,709,113
Greene	1.8	15	$2,191,680	$1,827,172	$4,018,852
Hempstead	9.9	189	$10,443,626	$6,879,162	$17,322,788
Independence	0.9	4	$64,477,246	$94,091,943	$158,569,188
Jefferson	115.5	8,632	$528,549,908	$337,432,611	$865,982,519
Johnson	10.3	5	$73,877	$38,499	$112,376
Lincoln	28	3,550	$97,729,334	$57,529,574	$155,258,908
Logan	12.3	28	$1,396,451	$765,581	$2,162,031
Poinsett	60.7	9,056	$536,082,856	$354,988,268	$891,071,125
Pope	1.2	1,049	$56,762,947	$31,588,147	$88,351,094
Pulaski*	62.6	4,275	$1,057,999,543	$977,416,293	$2,035,415,836
Total	499.9	**51,390**	**$3,721,948,690**	**$2,769,662,686**	**$6,491,611,376**

Source: FEMA NFHL and HAZUS MH 2.1; *Analysis based on Preliminary DFIRM; **levees associated with these areas are in Chicot County; ***levees associated with these areas are in Desha and Chicot Counties.

According to this analysis, the greatest number of people in Zone X, Protected by Levee Areas within the Effective/Preliminary DFIRM Counties is Desha County and the highest value of development protected by accredited levees is in Pulaski County, followed by Desha County.

Table 3.4.1.j Top 10 Counties--Development and Populations Protected by Levees

County	Population Exposure in "Zone X Protected by Levee" Areas	Structure Value Exposure in "Zone X, Protected by Levee" Areas	Contents Value Exposure in "Zone X, Protected by Levee" Areas	Total Building Exposure Value in "Zone X, Protected by Levee" Areas
Pulaski County*	4,275	$1,057,999,543	$977,416,293	$2,035,415,836
Desha County	11,231	$674,064,449	$453,435,319	$1,127,499,767
Poinsett County	9,056	$536,082,856	$354,988,268	$891,071,125
Chinot County	10,668	$535,779,147	$339,737,073	$875,516,220
Jefferson County	8,632	$528,549,908	$337,432,611	$865,982,519
Independence County	4	$64,477,246	$94,091,943	$158,569,188
Lincoln County	3,550	$97,729,334	$57,529,574	$155,258,908
Ashley County	2,025	$90,417,041	$54,887,525	$145,304,566

Source: FEMA NFHL and HAZUS MH 2.1; *Analysis based on Preliminary DFIRM

❖ *State Estimates of Potential Losses*

Dam Failure

GIS analysis of populations and development in dam inundation areas would provide the most accurate results in terms of estimates of potential loss in the unlikely event of failure. However, GIS-based inundation maps for state-regulated and federal dams are not readily available to determine loss estimates based on inundation areas. As inundation maps are developed for significant and high hazard dams, local hazard mitigation plans should work to develop potential loss estimates for dam failure events.

Since GIS-based inundation maps are not readily available, loss estimates were derived from the Hazard Class Definitions that the Arkansas Natural Resources Commissions assigns to all state-regulated dams.

- High Hazard—Potential for loss of human life and/or excessive public, industrial, commercial, or agricultural development in inundation areas. Losses could be over **$500,000**. Emergency Action Plans are required for all High Hazard Dams.
- Significant Hazard—No potential for loss of human life. But, significant structures, industrial, or commercial development, or cropland in inundation areas. Losses could be **$100,000 to $500,000.**

- Low Hazard. No potential for loss of human life. No significant structures in inundation areas. Primarily pastures, woodland, or undeveloped land. Losses expected to be less than **$100,000**

With these definitions in mind, loss estimates were calculated for each county as follows:

- ($500,000) * the number of High Hazard Dams,
- ($250,000) * the number of Significant Hazard Dams, and
- ($50,000) * the number of Low Hazard Dams.

Please note, this loss estimate analysis is only for state-regulated dams. Federal agencies with jurisdictional authority over the federal dams in Arkansas maintain separate loss estimate analysis for those dams. Additionally, this analysis is not intended to indicate that all dams in a county would fail simultaneously. **Table 3.4.1.k** provides the potential loss estimate results by county based on this analysis.

Levee Failure

To estimate potential losses associated with levee failure, the FEMA 500-year flood scenario (.02-percent-annual-chance-flood) HAZUS Run for the State of Arkansas was utilized in conjunction with the Zone X, Protected by Levee Areas on the Preliminary/Effective DFIRMs. The .02-percent-annual chance flood was chosen as a level that would be more likely to overtop or cause failure of the accredited levees. The layer of estimated losses by census block for the 500-year event was clipped to include only those losses that would be incurred in the Zone X, Protected by Levee Areas. Again, this analysis does not intend to make a determination as to specific levees that are prone to failure, but rather demonstrate a specific flood scenario for those counties.

Table 3.4.1.k. Dam Failure Loss Estimates by County

County	Loss Estimates	County	Loss Estimates
Arkansas	$3,550,000	Lee	$50,000
Ashley	$450,000	Lincoln	$700,000
Baxter	$1,050,000	Little River	$1,650,000
Benton	$4,500,000	Logan	$5,400,000
Boone	$100,000	Lonoke	$2,750,000
Bradley	$350,000	Madison	$200,000
Calhoun	$350,000	Marion	$50,000
Carroll	$1,550,000	Miller	$2,850,000
Chicot	$250,000	Mississippi	$0
Clark	$1,300,000	Monroe	$250,000
Clay	$950,000	Montgomery	$1,900,000
Cleburne	$1,550,000	Nevada	$750,000
Cleveland	$400,000	Newton	$300,000
Columbia	$1,100,000	Ouachita	$2,900,000
Conway	$4,800,000	Perry	$4,050,000
Craighead	$7,800,000	Phillips	$100,000
Crawford	$3,250,000	Pike	$750,000
Crittenden	$50,000	Poinsett	$6,300,000
Cross	$3,550,000	Polk	$4,150,000
Dallas	$350,000	Pope	$2,750,000
Desha	$300,000	Prairie	$1,400,000
Drew	$1,100,000	Pulaski	$17,750,000
Faulkner	$2,700,000	Randolph	$2,200,000
Franklin	$1,500,000	Saint Francis	$2,100,000
Fulton	$2,550,000	Saline	$7,750,000
Garland	$7,300,000	Scott	$3,500,000
Grant	$900,000	Searcy	$500,000
Greene	$2,750,000	Sebastian	$4,800,000
Hempstead	$2,050,000	Sevier	$400,000
Hot Spring	$1,650,000	Sharp	$7,350,000
Howard	$1,450,000	Stone	$150,000
Independence	$1,250,000	Union	$1,100,000
Izard	$550,000	Van Buren	$700,000
Jackson	$100,000	Washington	$4,850,000
Jefferson	$1,900,000	White	$3,750,000
Johnson	$1,400,000	Woodruff	$0
Lafayette	$700,000	Yell	$2,350,000
Lawrence	$2,150,000		

❖ *Development in Hazard Prone Areas*

Dam Failure

Of the top 11 counties with the highest vulnerability rating for dam failure, six were also in the top 10 for greatest housing unit gains from 2000 to 2010. Those counties, in order of housing unit gains are: Pulaski, Washington, Garland, Saline, Craighead, and White. It is not known if development is occurring within dam inundation zones. Most counties within Arkansas do not have ordinances prohibiting or limiting development in dam inundation areas. If additional development does occur in inundation areas, the vulnerability to this hazard also increases.

Levee Failure

An analysis of population and development growth in counties with available Zone X, Protected by Levee Areas, revealed the following counties had housing unit gains from 2000 to 2010 (in order of # of increase): Pulaski and Jefferson. Only Pulaski and Independence Counties showed population gains from 2000 to 2010. If additional development and population growth begins to occur in levee protected areas, this will increase the vulnerability if levee failures or overtopping occur.

Table 3.4.1.l compares the loss estimates from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for the noted counties with housing unit gains.

Table 3.4.1.l Dam and Levee Loss Estimates[1]

County	Loss Estimates 2010 Plan	Dam Loss Estimate 2013 Plan	Levee Loss Estimate 2013 Plan	Comparison
Craighead	N/A	$7,800,000	Not applicable	Comparison not available.
Garland	N/A	$7,300,000	Not applicable	Comparison not available.
Independence	N/A	$1,250,000	$2,300,663	Comparison not available.
Jefferson	N/A	$1,900,000	$135,041,932	Comparison not available.
Pulaski	N/A	$17,750,000	$362,334,477	Comparison not available.
Saline	N/A	$7,750,000	Not applicable	Comparison not available.
Washington	N/A	$4,850,000	Not applicable	Comparison not available.
White	N/A	$3,750,000	Not applicable	Comparison not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

Table 3.4.1.m. 500-Year Flood Scenario Estimates of Potential Losses in Zone X, Protected by Levee Areas for Counties with Preliminary/Effective DFIRMs

County	Business Disruption	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Building Total Losses	Contents Total Losses	Total Losses
Ashley	$303,548	$2,545,545	$1,632,801	$216,223	$1,282,376	$373,576	$977,325	$3,135,344	$3,892,503	$7,331,394
Chicot	$402,627	$4,135,634	$2,644,653	$868,315	$2,159,718	$239,042	$971,555	$5,242,991	$5,775,926	$11,421,544
Conway	$67,957	$1,114,870	$664,115	$0	$387,960	$0	$115,789	$1,114,870	$1,167,864	$2,350,690
Crawford	$1,750,913	$2,836,543	$2,212,410	$1,334,350	$7,907,774	$983,476	$5,340,499	$5,154,370	$15,460,683	$22,365,965
Desha	$353,677	$13,303,598	$8,578,353	$193,759	$741,337	$188,103	$445,320	$13,685,460	$9,765,010	$23,804,147
Drew	$0	$2,451	$1,507	$0	$0	$0	$0	$2,451	$1,507	$3,957
Green	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Hempstead	$261,088	$19,179	$21,059	$855	$1,670,662	$0	$381,050	$20,033	$2,072,771	$1,461,241
Independence	$259,618	$0	$0	$0	$1,664,953	$0	$376,093	$0	$2,041,046	$2,300,663
Jefferson	$6,254,055	$48,074,357	$33,563,245	$3,261,978	$23,369,836	$900,062	$19,618,399	$52,236,397	$76,551,481	$135,041,932
Johnson	$0	$36,114	$26,614	$0	$0	$0	$0	$36,114	$26,614	$62,728
Lincoln	$1,343,006	$14,572,090	$18,350,803	$100,339	$1,710,523	$90,114	$3,726,316	$14,762,544	$23,787,641	$39,893,191
Logan	$39,195	$108,706	$67,845	$0	$916	$0	$97,253	$108,706	$166,014	$313,914
Poinsett	$308,508	$5,336,452	$3,412,716	$641,782	$896,276	$378,875	$1,223,895	$6,357,108	$5,532,888	$12,198,504
Pope	$23,899	$663,617	$322,208	$289,872	$157,801	$78,988	$151,178	$1,032,477	$631,188	$1,687,564
Pulaski	$33,831,769	$3,855,318	$2,649,316	$87,274,615	$219,126,591	$3,927,095	$11,669,764	$95,057,028	$233,445,671	$362,334,477

❖ *Consequence Analysis*

When a dam fails, the stored water can be suddenly released and have catastrophic effects on life and property downstream. Homes, bridges, and roads can be demolished in minutes. At least 5 dam failures have occurred in Arkansas since 1939. Residents near a Significant or High Hazard dam should become familiar with the dam's emergency actions plans, if available. Emergency plans written for dams include procedures for notification and coordination with law enforcement and other governmental agencies, information on the potential inundation area, plans for warning and evacuation, and procedures for making emergency repairs.

As previously mentioned, the impact of levee failure during a flooding event can be very similar to a dam failure in that the velocity of the water caused by sudden release as a result of levee breach can result in a flood surge or flood wave that can cause catastrophic damages.

The information in **Table 3.4.1.n.** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.1.n. EMAP Consequence Analysis: Dam and Levee Failure

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas.
Health and Safety of Persons Responding to the Incident	Localized impact expected to limit damage to personnel in the inundation area at the time of the incident.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the inundation area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads and/or utilities may postpone delivery of some services.
The Environment	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of investigation.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Reputation of or Confidence in the Entity.	Localized impact expected to primarily adversely affect dam owner and local entities. Localized impact expected to adversely affect confidence in local, state, and federal government, regardless of the levee owner.

3.4.2 Drought with Soil Erosion and Dust

❖ Description/Location

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. It can also be defined in terms of meteorology, agricultural, hydrological and socio-economic.

Meteorological drought is defined on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. A meteorological drought must be considered as region-specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evaporation, soil water deficits, reduced ground water or reservoir levels, and so forth. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil. Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectare and a reduction of final yield. However, if topsoil moisture is sufficient for early growth requirements, deficiencies in subsoil moisture at this early stage may not affect final yield if subsoil moisture is replenished as the growing season progresses or if rainfall meets plant water needs.

Hydrological drought is associated with the effects of periods of precipitation shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors.

Socioeconomic drought refers to when physical water shortage begins to affect people.

The four different definitions all have significance in Arkansas. A meteorological drought is the easiest to determine based on rainfall data and is an easier drought to monitor from rain gauges and reports. A hydrological drought means that stream and river levels are low, which also has an impact for surface water and ground water irrigation. An agricultural drought represents difficulty for Arkansas's agriculture and is also relatively easy to monitor based on crop viabilities in different regions of the State.

The National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln provides drought monitoring and technical assistance to all areas of the world. NDMC's website is found at http://www.drought.unl.edu/. Specific drought impacts by county are recorded at http://droughtreporter.unl.edu/.

The impacts of drought can be categorized as economic, environmental, or social. Many economic impacts occur in agriculture and related sectors, including increasing food prices globally. In addition to obvious losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Drought also brings increased problems with insects and disease to forests and reduces growth. The incidence of wildfires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected.

Although environmental losses are difficult to quantify, increasing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality, wildfires, degradation of landscape quality, loss of biodiversity, and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, with increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape.

Although drought is not predictable, long-range outlooks may indicate an increased chance of drought, which can serve as a warning (P.L. 109-430 established a National Integrated Drought Information System within the National Oceanic and Atmospheric Administration to improve drought monitoring and forecasting capabilities http://www.drought.gov/drought/). A drought period can last for months, years, or even decades. It is rarely a direct cause of death, though the associated heat, dust, and stress can all contribute to increased mortality.

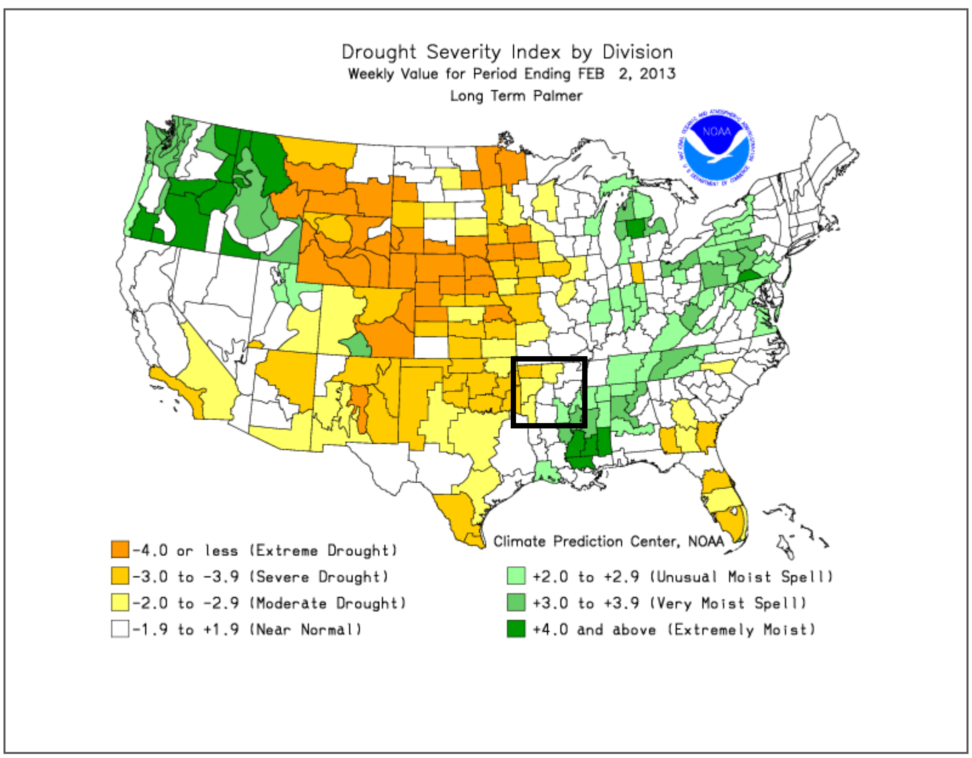
In 1965, W.C. Palmer developed an index to measure the departure of the moisture supply. Palmer based his index on the supply-and-demand concept of the water balance equation, taking into account more than just the precipitation deficit at specific locations. The objective of the Palmer Drought Severity Index (PDSI) (see in **Table 3.4.2.a**), as this index is now called, was to provide measurements of moisture conditions that were standardized so that comparisons using the index could be made between locations and between months. The advantage of the Palmer Index is that it is standardized to the local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions.

Table 3.4.2.a. Palmer Drought Severity Index (PDSI)

Palmer Classifications	
4.0 or more	Extremely Moist
3.0 to 3.99	Very Moist Spell
2.0 to 2.99	Unusual Moist Spell
1.0 to 1.99	Slightly Moist
0.5 to 0.99	Incipient Moist Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

Figure 4.3.2.a. shows the updated drought conditions in the U.S. and in particular Arkansas.

Figure 3.4.2.a Palmer Drought Severity Index, February 2, 2013



Source: U.S. Drought Monitor, www.drought.gov
Note: Black square outlines Arkansas

Drought can affect the amount of ground water available for users. Arkansas is the fourth largest user of ground water in the U.S after California, Texas, and Nebraska according to the USGS. The ground water in Arkansas supplies 33 percent of the population's drinking water, but the main user of ground water is irrigation. Irrigation accounts for 94 percent of the ground water withdrawals in the State. **Figure 3.4.2.b** shows the principal aquifers in Arkansas. The Mississippi Embayment contains the largest aquifers in Arkansas which are the Alluvial Aquifer and the Sparta Aquifer. According to the *Arkansas Groundwater Protection and Management Report for 2012*, a Supplement of the *Arkansas Water Plan*, Arkansas' long-term water level change is that the groundwater levels are declining in response to continued withdrawals at a rate which is not sustainable.

Figure 3.4.2.c shows the annual precipitation normals for the State of Arkansas from 1981 to 2010. This figure shows the variations in precipitation across Arkansas and how significantly the differences are from the northern counties averaging only 20 to 25 inches of precipitation annually to the southeastern counties averaging 35 inches of precipitation annually.

Soil Erosion and Dust

Soil erosion is largely associated with periods of drought, when winds are able to move tremendous quantities of exposed dry soil (wind erosion), and flooding (streambank erosion). Improper agricultural and grazing practices can also contribute to soil erosion.

The United States is losing soil 10 times faster than the natural replenishment rate, and related production losses cost the country about $37.6 billion each year. On average, wind erosion is responsible for about 40 percent of this loss and can increase markedly in drought years. Wind erosion physically removes the lighter, less dense soil constituents such as organic matter, clays and silts. Thus it removes the most fertile part of the soil and lowers soil productivity, which can result in lower crop yields or poorer grade pastures and increase economic costs.

Figure 3.4.2.b Principal Aquifers in Arkansas

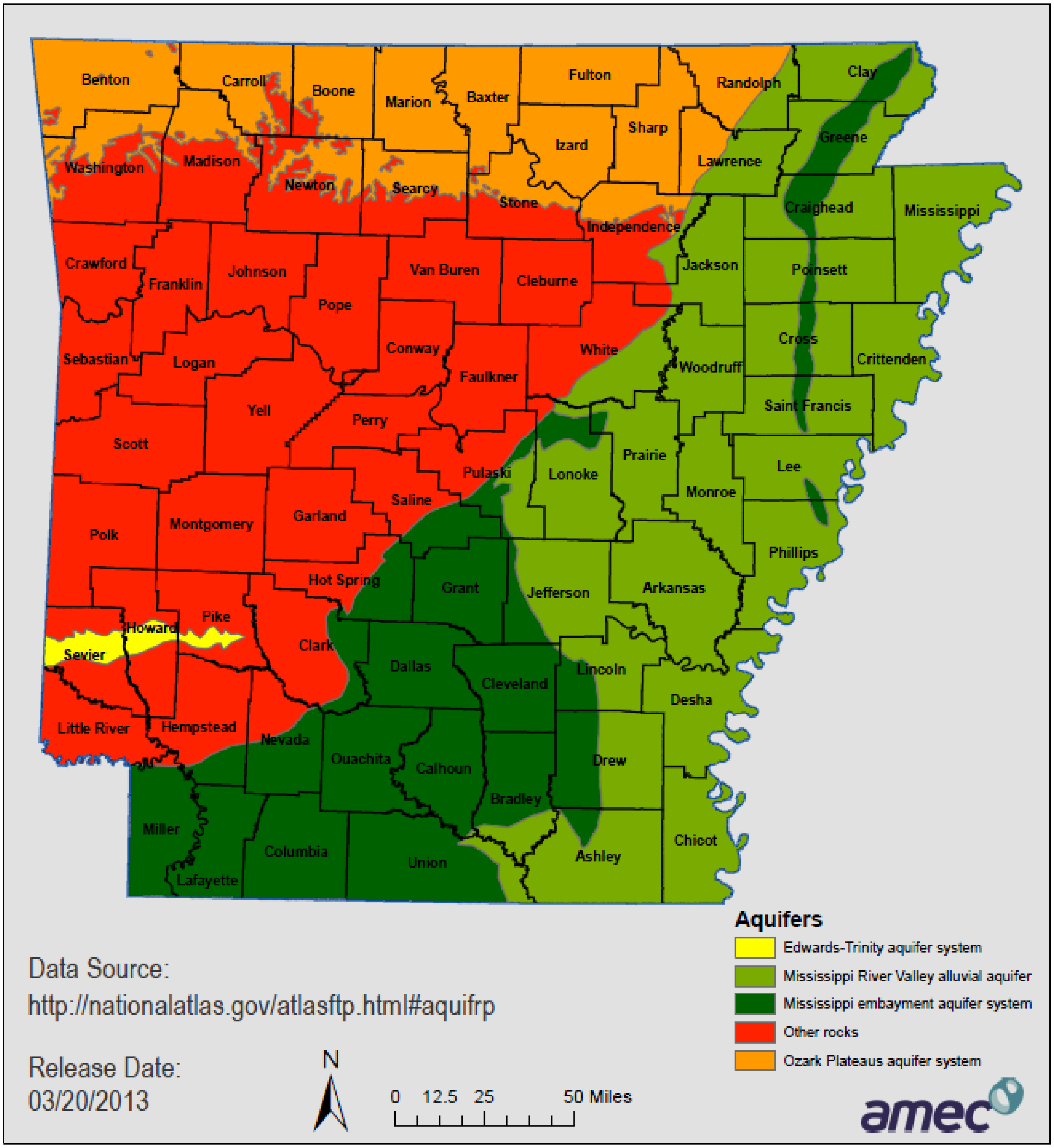
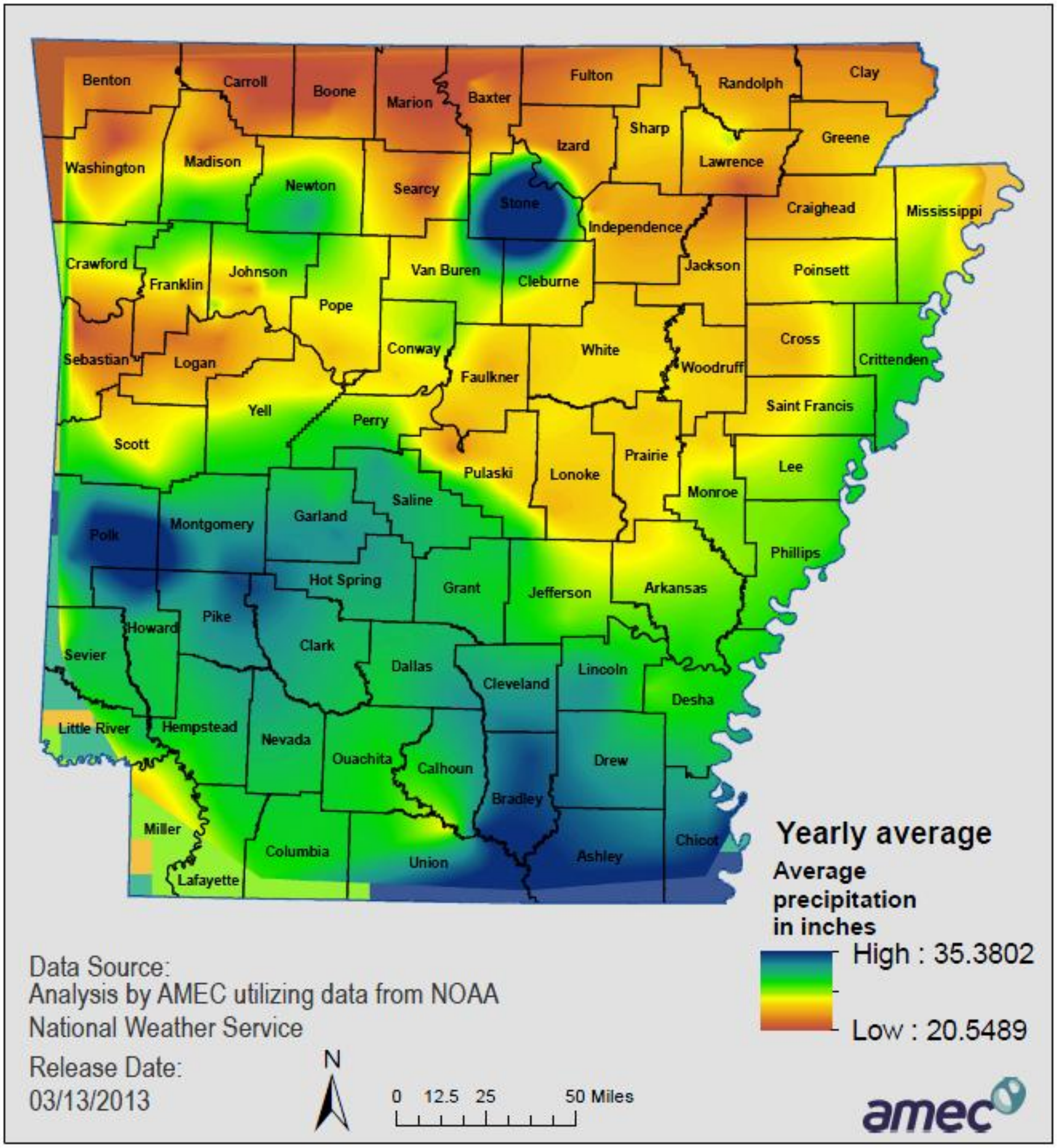


Figure 3.4.2.c Arkansas Annual Precipitation Normals, 1981-2010



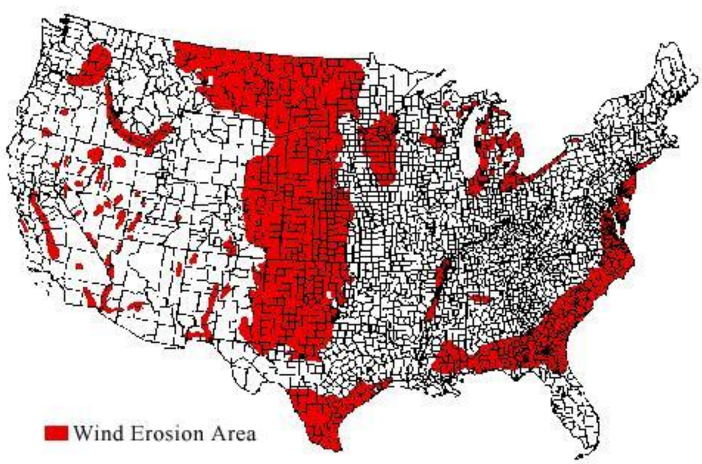
❖ *Previous Occurrences*

Along with these NCDC listed events; the APDMAC has provided details about the following previous drought events.

- **The Dust Bowl Drought:** Arkansas was involved in a prolonged drought during the 1930s that resulted in dust storms and much economic misery to go along with the depression. Many summers from 1930 through 1939 were hot and dry. The worst dust storms in Arkansas came during 1934. The first dust storm was on April 11 and several others followed through the spring and summer. Ozark had 54 consecutive days of 100-degree weather during 1934. That is the state record for the most consecutive 100-degree days.

  Wind erosion was a big concern across the U.S. during the Dust Bowl years. **Figure 3.4.2.d** shows the risk rating for dust or wind erosion during the 1930s as relatively low for Arkansas, with a high risk defined for the Mississippi River Region of the State.

Figure 3.4.2.d United States Wind Erosion Areas During Dust Bowl of 1930's



Source: U.S. Department of Agriculture Agricultural Research Service, http://www.ars.usda.gov/Main/docs.htm?docid=18371

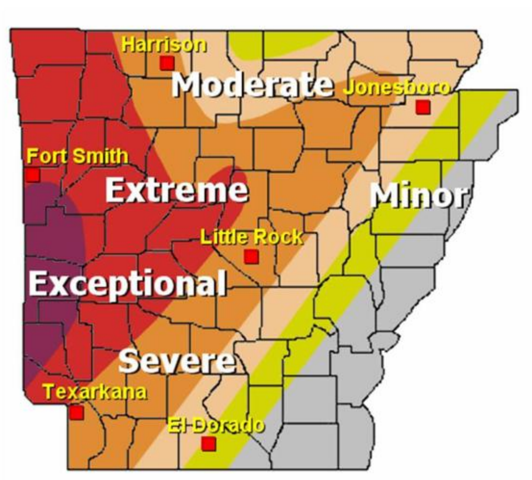
- **1953 and 1954:** A statewide drought during the summer and fall of 1953 resulted in 100-degree weather through the month of September and even into early October in some areas. Wilson, in Mississippi County, went 101 days — from July 18 through October 26 — without measurable rainfall which is the longest dry spell in the State. In 1954, a heat wave covered Arkansas from June 7 through September 10 and there was an accompanying drought. It was the hottest summer on record in Little Rock and there were a record 46 days of 100-degree weather and 115 days of 90-degree weather. There was 100-degree weather on 16 out of 17 days and 10 consecutive 100-degree days during that period.

- **1980:** A heat wave and accompanying drought covered Arkansas from June 22 through September 17. It produced the hottest month on record in Little Rock. There was a record 20 consecutive days of 100-degree weather that included 10 consecutive days of 105 degrees. There were 41 days of 100-degree weather and 103 days of 90-degree weather in Little Rock this time. Spatial Hazard Events and Losses for the United States (SHELDUS) data indicate that this drought cost $50,000,000 in property damage and $450,000,000 in crop damage in Arkansas.

- **2000:** A dry period began at the beginning of July and continued through October in most of Arkansas. This was part of a long-term drought that began in the spring of 1998. A heat wave set in by mid-August with widespread 100-degree temperatures across the state through early September. Little Rock had its hottest month on record in August. There were 11 consecutive days of 100 degrees from August 25 through September 4 and Little Rock reached an all-time record high temperature of 111 degrees on August 30. Only 67 inches of rain was measured in July and August combined. A severe thunderstorm brought some rain to the Little Rock area on September 1st ending 27 straight days with no precipitation (a record). On September 8th, the governor of Arkansas asked that all 75 counties in Arkansas be declared agricultural disaster areas. With foliage drying, grass fires became numerous. A 1,200-acre fire spread through the Petit Jean State Park in Conway County in early September, with several forested areas completely burned. The Spatial Hazard Events and Losses Database for the U.S. (SHELDUS) maintained at the University of South Carolina, estimates losses for this drought at $50,000,000 for property damage and $450,000,000 for crop damage.

- **2005 and 2006:** Based on information provided by the Drought Monitor, much of western Arkansas was affected by a severe to exceptional drought in 2005 and early 2006. The Arkansas map below shows the conditions as of February 16, 2006. The drought continued through 2006 as detailed **Figure 3.4.2.e.** The conditions improved to abnormally dry in 2007.

Figure 3.4.2.e Drought Conditions as of February 16, 2006



Source: Climate Prediction Center

Arkansas saw only 34 inches of rainfall during 2005 as opposed to the 50 inches of rain that the state usually receives each year. Preliminary estimates show 2005 as the second-driest year on record for most of Arkansas. All of the state's 75 counties were declared disaster areas because of the drought. The rice crop wasn't affected much by the drought in 2005, but farmers and cattlemen experienced continuing impacts during the on-going drought in 2006.

The drought increased the risks and dangers related to fire. The Arkansas Forestry Commission posted burn bans in 52 of the state's 75 counties. Experts described the wildfire conditions as ideal. Fourteen western Arkansas counties were on the "extreme fire danger" list. The counties in northeast, eastern and south-central Arkansas were the least affected by these on-going drought conditions. By early January 2006 there had been 256 reported fires in Arkansas whereas the 10-year average was about 67 for this time of the year.

- **2010-2013:** Drought has been a common theme in Arkansas from 2010 through 2013. **Table 3.4.2.b** shows the southwest area of Arkansas has fared the worst, with a four and a half foot (54.39 inches) rainfall deficit at Texarkana (Miller County) in a three year span.

Table 3.4.2.b. Arkansas Precipitation Statistics (2010-2012)

Site	2012	+/-	2011	+/-	2010	+/-
Fayetteville (Northwest AR)	34.29	-13.93	56.15	+9.82	42.15	-3.87
Harrison (North Central AR)	29.53	-14.61	52.01	+7.87	46.12	+0.92
Jonesboro (Northeast AR)	33.57	-14.53	58.05	+9.95	32.22	-13.96
Fort Smith (West Central AR)	33.94	-11.52	46.56	+1.10	35.27	-8.60
Little Rock (Central AR)	42.25	-7.50	60.23	+10.48	36.52	-14.41
West Memphis (East Central AR)	39.08	-13.15	55.95	+2.37	51.83	-0.97
Texarkana (South West AR)	32.07	-17.58	30.69	-18.96	29.53	-17.85
El Dorado (South Central AR)	44.41	-8.51	37.62	-15.30	34.23	-19.88
Pine Bluff (South East AR)	45.69	-5.46	48.70	-2.45	31.97	-20.51

Source: National Weather Service, Little Rock, AR, Monitoring Drought in Arkansas http://www.srh.noaa.gov/lzk/?n=drought.htm

- **2011:** Dry conditions remained across the south portion of the State through much of 2011. By the end of October, rainfall at El Dorado (Union County) and Texarkana (Miller County) was close to eighteen inches below normal.

The Arkansas Forestry Commission issued burn bans in 48 of the 75 counties as of August 10, 2011. Several counties in the northwest, western and south western portions of the State were deemed as having “extreme” burning conditions.

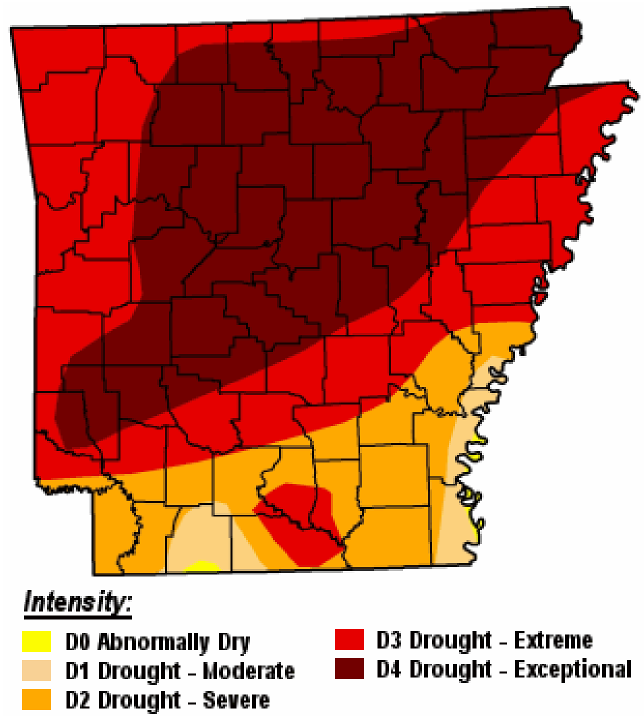
- **2012:** Arkansas experienced their driest April to June on record with six to twelve inch rainfall deficits and warmer than normal temperatures. Over 74 percent of the land area in Arkansas is under extreme or exceptional drought and 97 percent of the state is under at least severe drought as seen in **Figure 3.4.2.f**. All 75 counties in Arkansas have been declared drought disaster areas by the U.S. Department of Agriculture. In these areas, up to 75 percent of the grass in pastures is considered severely impacted and may not recover. Livestock watering ponds are dry or so stagnant they are dangerous for the health of the herd. Eighty-three percent of pastures in the State are rated as poor or very poor by the National Agricultural Statistic Service.

  The University of Arkansas Division of Agriculture, Research and Extension Service prepared the *Impact of the 2012 Drought on Field Crops and Cattle Production in Arkansas Preliminary Report.* It reports ranchers in Arkansas lost at least $128 million due to drought conditions from August, 2011 through July, 2012. The losses were mostly the result of a short supply of hay and rising hay costs. It became too expensive to feed cattle, and ranchers were forced to sell their cows. At one time, 85 percent of pastures were in poor or very poor condition. This led to lackluster hay production and the smallest hay yields since the mid 1950s. While shipping hay from surrounding areas was an option, red fire ants complicated the process. Many hay growers in the southeast United States live in fire ant quarantined counties. Despite good intentions, hay could not be transported from a quarantined region to a non-quarantined region unless the hay was certified as fire ant free and stored properly (above ground). While the cattle industry suffered, most crops survived the drought. Early planting due to a mild winter and ample supplemental water through irrigation led to good plant development and decent yields.

  The Arkansas Forestry Commission issued burn bans in 55 of the 75 counties as of June 27, 2012 as the fire danger was rated as “High” across the State. On July 11th, the United States Department of Agriculture (USDA) designated 69 of 75 Arkansas counties as disaster areas to help farmers recover from losses caused by the drought. That was bumped to 72 counties (all but Chicot, Desha and Drew Counties) by August 8th.

  On August 3, 2012, the Governor declared a drought emergency to assist with the transport of hay during Arkansas’ severe drought.

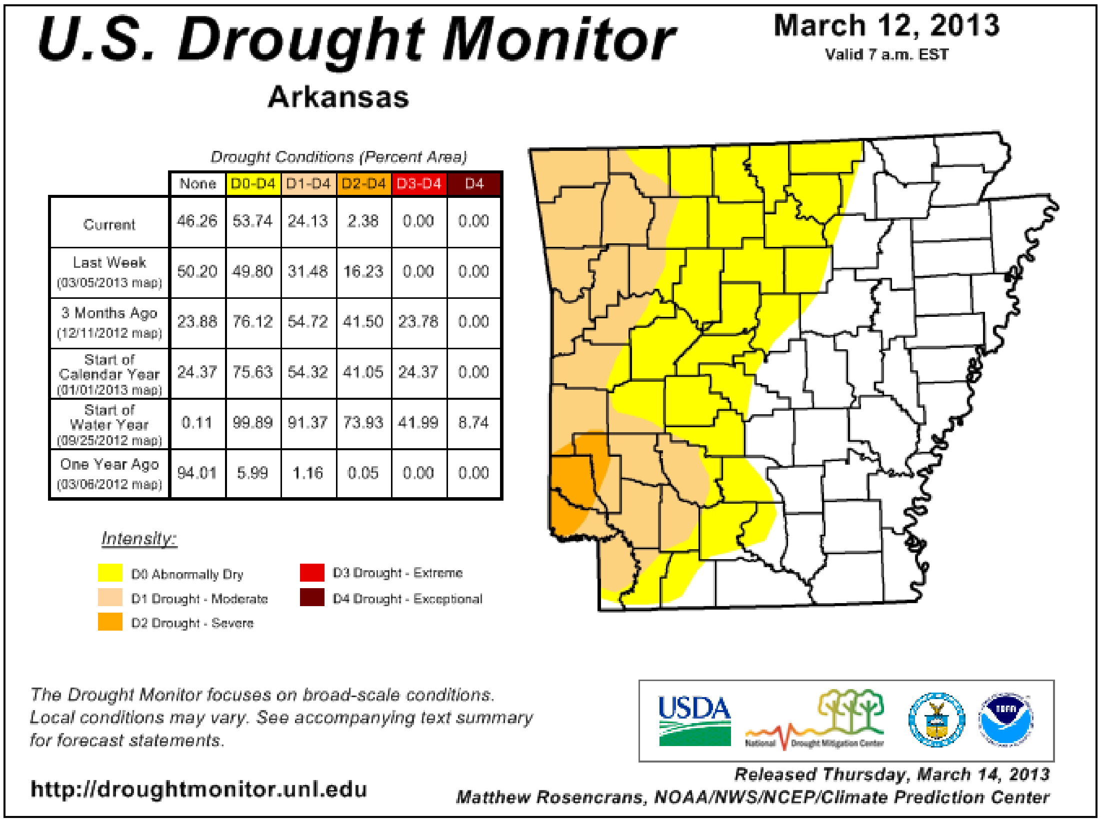
Figure 3.4.2.f Arkansas Drought Conditions on July 31, 2012



Source: National Weather Service, Little Rock, AR, 2012 Yearly Climate Summary http://www.srh.noaa.gov/lzk/?n=2012.htm

The U.S. Drought Monitor is a composite of several observed weather variables and drought indices that is updated weekly. It is the primary drought monitoring tool. The March 12, 2013, map (see **Figure 3.4.2.g**), shown here, indicated that the State does not have any extreme drought conditions whereas in July 2012 less than a year ago, the extreme and exceptional drought conditions were prevalent throughout the State.

Figure 3.4.2.g Arkansas Drought Conditions, March 12, 2013



Source: U.S. Drought Monitor, http://www.droughtmonitor.unl.edu/monitor.html

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. The Drought Impact Reporter maps the effects of drought, based on reports from media, observers and other sources. Impacts are an observable loss or change at a specific place and time due to drought. The Drought Impact Reporter is not a comprehensive set of data, but is useful in tracking drought, if submissions are adequate, to aid in better understanding and response to drought impacts. The main emphasis is for drought planning.

The Drought Impact Reporter contains information on 328 drought impacts from droughts that affected Arkansas between January 2003 and December 2012. Thirty-seven percent of them are from media reports. Most of the impacts, 160, were classified as "agriculture." Other impacts include "energy" (1), "plants and wildlife" (31), "society and public health" (33), "water supply and quality" (86), "business and industry" (27), "fire" (55), "relief, response, and restrictions" (66), and "tourism and recreation" (8). These categories of agriculture, energy, plants and wildlife, society and public health, water supply and quality, business and industry, fire, relief, response, and restrictions, and tourism and recreation are described on the National Drought Mitigation Center, Drought Impact Reporter website http://droughtreporter.unl.edu/.

Insured Crop Loss Data

According to the USDA Risk Management Agency, insured crop losses through the State of Arkansas as a result of drought conditions for the ten year period of 2003-2012 totaled $79,487,759 as shown in **Table 3.4.2.c.** It shows the highest year of crop losses as the most recent years of 2010- 2012. This information is also reported and annualized by county in **Table 3.4.2.d** in the State Estimates of Potential Losses Section. Please note that this data only applies to insured crops. According to the *2011 Arkansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 79 percent of Arkansas' row crops were insured in 2011.

Table 3.4.2.c. Total Insured Crop Insurance Paid by Year, 2003-2012

Year	Crop Insurance Paid
2012	$14,349,712
2011	$15,544,487
2010	$12,165,477
2009	$253,135
2008	$9,463,371
2007	$8,319,294
2006	$8,821,636
2005	$6,856,914
2004	$1,448,884
2003	$2,264,849
Total	**$79,487,759**

Source: USDA Risk Management Agency

❖ *Probability of Future Hazard Events*

Using annual PDSI maps from 1730 through 1995 developed by the NOAA Pale climatology Program, it was found that Arkansas experienced severe to extreme drought conditions 23 times over this 265-year period, approximately one drought every 11.5 years. Drought years included: 1736, 1737, 1767, 1772, 1801, 1855, 1874, 1901, 1911, 1913, 1914, 1918, 1925, 1930, 1934, 1936, 1941, 1953, 1954, 1955, 1956, 1963, and 1964, 1980, 2000, 2005-2007 and 2010-2012.

As of the date of this revision (2013), Arkansas is currently experiencing long-term drought conditions and based on the previous occurrences of drought conditions in the State; the probability of drought events occurring with some frequency is considered **"Possible"**. As the State continues to develop with higher populations and more economic activity related to agriculture, livestock and poultry, these drought conditions and drier trends may begin to have a profound impact.

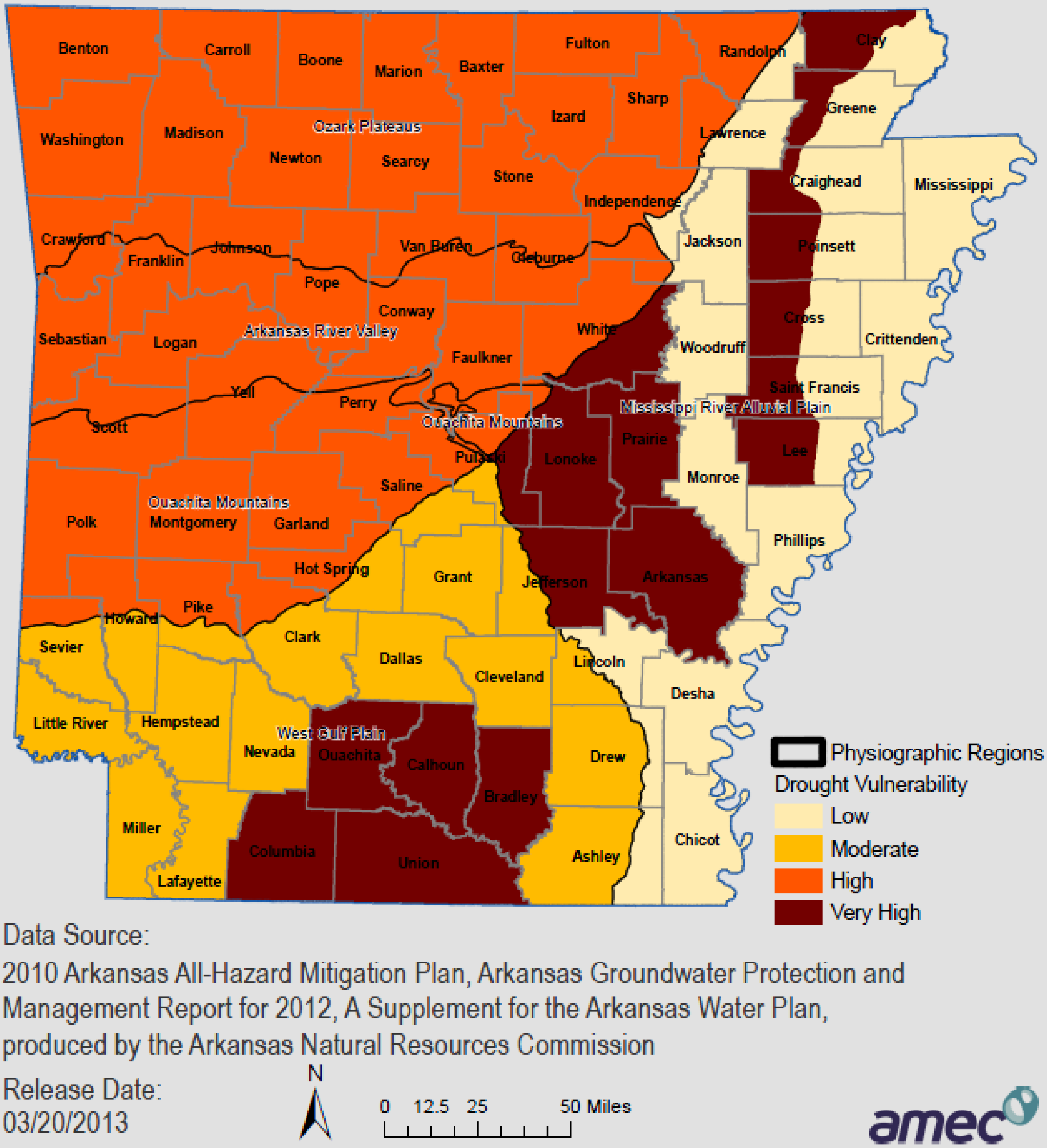
In recent years, drought has affected certain counties and regions of the State on a more recurring basis. With the possibility of climate change, this hazard may affect more regions of the State even more often. The Arkansas Natural Resources Commission will have completed the update of the *Arkansas Water Plan* by November 2014 and projections indicate irrigation and drinking water needs using surface and ground water will more than double again by the year 2020. Careful planning and management is essential to assure continued availability of quality surface and ground water. This will be accomplished by identifying and evaluating water problems and presenting specific solutions and recommendations to meet future water needs.

❖ State Vulnerability Analysis

Availability of ground water during drought conditions is controlled largely by the topography, geology, hydrogeology, and hydrology of an area. Because these factors vary considerably by physiographic region in Arkansas, drought vulnerability can be generally assessed by physiographic region (see **Figure 3.4.2.h**). There are six geographic sub-regions, three in both the uplands and the lowlands. Local conditions, such as the availability of a large impoundment for water storage, may affect drought vulnerability on a local scale.

Low Vulnerability to Drought: This is the area of the Mississippi River Alluvial Plain physiographic province. The area is underlain by the high yielding Mississippi River Valley alluvial aquifer. The extensive alluvial aquifer is the principal source of water for irrigation in Arkansas. This region is the primary agricultural area in the State for crops, a large majority of which is irrigated. The Mississippi River Valley alluvial aquifer system is capable of yielding large quantities of water to wells. Properly constructed wells capable of yielding 500 gallons per minute can be completed almost anywhere within this aquifer. Some irrigation wells yield from 1,000 gallons to as much as 5,000 gallons per minute. Because of overuse by irrigation, however, parts of the alluvial aquifer have become so depleted that they have been designated critical groundwater areas by the State. Counties within this region with critical groundwater designations are excluded from this low vulnerability region because of the potentially limited groundwater availability during a drought. Other deeper, less productive aquifers underlying parts of this region include the Cockfield, Sparta, Wilcox, and Nacatoch aquifers. The low relief of most of the area makes it unsuitable for large surface water impoundments.

Figure 3.4.2.h Overall Drought Vulnerability in Arkansas Based on Groundwater



Data Source:
2010 Arkansas All-Hazard Mitigation Plan, Arkansas Groundwater Protection and Management Report for 2012, A Supplement for the Arkansas Water Plan, produced by the Arkansas Natural Resources Commission

Release Date:
03/20/2013

Moderate Vulnerability to Drought: This area includes the Gulf Coastal Plain physiographic province. Several significant aquifers lie under parts of this region including the Ouachita–Saline Rivers alluvial, Red River alluvial, Cockfield, Sparta, Wilcox, and Nacatoch aquifers. None of these aquifers, however, consistently approaches the yield of the Mississippi River Valley alluvial aquifer. The Sparta aquifer is the most productive aquifer in this region and is capable of producing water to properly constructed wells at a rate of 300 gallons to over 1000 gallons per minute. Although well yields can be high, the Sparta has a much lower storage capacity than the alluvial aquifer. The Sparta is therefore used primarily for industrial, municipal and domestic purposes rather than for large-scale irrigation of crops. Because of the overuse of the Sparta, primarily by industrial users, five counties have been designated as critical groundwater areas by the State and are excluded from the moderate vulnerability designation because of the potentially limited groundwater availability during a drought. This region has slightly higher relief than the Mississippi Alluvial Plain and is therefore more conducive to surface water impoundments such as Millwood Lake. The Ouachita River and Red River found within this region both have safe yield available.

High Vulnerability to Drought: This area includes the Ozark Plateaus, Arkansas River Valley and Ouachita Mountains physiographic provinces. Groundwater in this region occurs primarily in fractures, solution openings, and along bedding planes. With the exception of the narrow Arkansas River alluvial aquifer occurring along the Arkansas River, low yields of water wells, generally less than 10 gallons per minute, characterize the area. The Ouachita Mountains aquifer only has limited quantities of water for domestic and non-irrigation farms from wells. Most wells yield less than 50 gallons per minute, and many wells yield less than 10 gallons per minute. The high relief in this region allows for the construction of large surface water impoundments including Lake Ouachita, Lake Maumelle, Greers Ferry Lake, Beaver Lake, Bull Shoals Lake, among others. The only river in this region with safe yields available is the White River.

Very High Vulnerability to Drought: These are areas designated by the State as critical groundwater areas in the Mississippi Alluvial Plain (western Clay, western Greene, western Craighead, western Poinsett, western Cross, western Saint Francis, western Lee, southeastern White, Lonoke, southeastern Pulaski, Prairie, Jefferson and Arkansas Counties) and Gulf Coastal Plain (Columbia, Ouachita, Union, Calhoun, and Bradley Counties) provinces. In these areas, groundwater is being depleted faster than the rate of recharge resulting in large cones of depression in once highly productive aquifers. If water use in these areas continues at the same rate as today, permanent damage to the aquifers and serious water shortages would result. A drought would hasten these conditions and may result in dry wells.

❖ *State Estimates of Potential Losses*

Researchers at the University of Arkansas Division of Agriculture, Research & Extension Service have compiled the direct and indirect economic impact of the cow-calf section income losses in Arkansas due to the 2012 drought (August 2011 to July 2012). (Source: Smith, Stephen A., Michael P. Popp and Nathan P. Kemper (2012), Special Report, September 2012) According to their research, the economic losses to commercial cow-calf operations from increased hay purchases, reduced hay sales, and decreased calf sales revenue resulted in an estimated loss of $141 per bred cow for cow-calf producers or $128 million for the cow-calf section. The top five industries (outside of agriculture) with impacted losses were: 1) real estate & rental, 2) health & social services, 3) retail trade, 4) finance & insurance, 5) wholesale trade.

Figure 3.4.2.d and **Figure 3.4.2.i** show the USDA Risk Management Agency's insured crop insurance payments for drought-related damages, as well as the annualized estimated crop damages for each county over the 10-year period from 2003 to 2012. The drought-related crop insurance payments have been extrapolated to estimate total damages to insurable crops. This is based on the percent of insurable crops that are covered by crop insurance. According to the *2011 Arkansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 79 percent of Arkansas' row crops were insured in 2011. The crop exposure value from the 2007 Census of Agriculture is provided as the basis for a ratio of annualized losses to crop exposure.

Overall, these drought crop insurance payments are low compared to other states mainly because of the high percentage of crops in Arkansas grown on irrigated acreage.

Table 3.4.2.d. Drought Crop Insurance Payments Analysis, 2003-2012

County Name	Crop Exposure Value (2007 Census of Agriculture)	Drought-Related Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio
Arkansas	$179,522,000	$36,015	$45,589	$4,559	0.0000
Ashley	$55,231,000	$1,448,582	$1,833,648	$183,365	0.0033
Baxter	$741,000	$0	$0	$0	0.0000
Benton	$6,942,000	$582,567	$737,427	$73,743	0.0106
Boone	$2,081,000	$0	$0	$0	0.0000
Bradley	$3,526,000	$0	$0	$0	0.0000
Calhoun	(D)	$0	$0	$0	Not Available
Carroll	$2,273,000	$28,895	$36,576	$3,658	0.0016
Chicot	$84,944,000	$3,205,508	$4,057,605	$405,761	0.0048
Clark	$2,258,000	$925,996	$1,172,147	$117,215	0.0519
Clay	$139,431,000	$329,568	$417,175	$41,717	0.0003

County Name	Crop Exposure Value (2007 Census of Agriculture)	Drought-Related Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio
Cleburne	$1,618,000	$0	$0	$0	0.0000
Cleveland	$363,000	$0	$0	$0	0.0000
Columbia	$9,772,000	$0	$0	$0	0.0000
Conway	$10,926,000	$376,073	$476,042	$47,604	0.0044
Craighead	$153,368,000	$322,984	$408,841	$40,884	0.0003
Crawford	$10,801,000	$771,308	$976,339	$97,634	0.0090
Crittenden	$99,333,000	$7,266,802	$9,198,484	$919,848	0.0093
Cross	$110,773,000	$2,246,386	$2,843,527	$284,353	0.0026
Dallas	(D)	$0	$0	$0	Not Available
Desha	$137,184,000	$1,773,435	$2,244,854	$224,485	0.0016
Drew	$35,925,000	$394,125	$498,892	$49,889	0.0014
Faulkner	$5,830,000	$463,160	$586,278	$58,628	0.0101
Franklin	$3,238,000	$158,522	$200,661	$20,066	0.0062
Fulton	$649,000	$0	$0	$0	0.0000
Garland	$2,379,000	$0	$0	$0	0.0000
Grant	$955,000	$0	$0	$0	0.0000
Greene	$105,774,000	$665,302	$842,154	$84,215	0.0008
Hempstead	$5,000,000	$0	$0	$0	0.0000
Hot Spring	$1,496,000	$0	$0	$0	0.0000
Howard	$1,809,000	$0	$0	$0	0.0000
Independence	$21,754,000	$830,324	$1,051,043	$105,104	0.0048
Izard	$1,165,000	$0	$0	$0	0.0000
Jackson	$102,272,000	$2,471,419	$3,128,378	$312,838	0.0031
Jefferson	$117,532,000	$2,077,369	$2,629,581	$262,958	0.0022
Johnson	$3,648,000	$196,012	$248,116	$24,812	0.0068
Lafayette	$16,175,000	$1,079,008	$1,365,833	$136,583	0.0084
Lawrence	$83,668,000	$308,314	$390,271	$39,027	0.0005
Lee	$126,190,000	$7,221,757	$9,141,465	$914,146	0.0072
Lincoln	$57,061,000	$138,438	$175,238	$17,524	0.0003
Little River	$8,744,000	$1,866,798	$2,363,035	$236,304	0.0270
Logan	$5,502,000	$1,289,926	$1,632,818	$163,282	0.0297
Lonoke	$118,946,000	$320,190	$405,304	$40,530	0.0003
Madison	$2,787,000	$0	$0	$0	0.0000

County Name	Crop Exposure Value (2007 Census of Agriculture)	Drought-Related Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio
Marion	$755,000	$0	$0	$0	0.0000
Miller	$20,408,000	$13,409,685	$16,974,285	$1,697,428	0.0832
Mississippi	$194,984,000	$5,506,392	$6,970,116	$697,012	0.0036
Monroe	$90,551,000	$1,368,960	$1,732,861	$173,286	0.0019
Montgomery	$1,127,000	$0	$0	$0	0.0000
Nevada	$1,266,000	$0	$0	$0	0.0000
Newton	$927,000	$0	$0	$0	0.0000
Ouachita	$1,514,000	$0	$0	$0	0.0000
Perry	$6,276,000	$0	$0	$0	0.0000
Phillips	$184,599,000	$13,571,577	$17,179,211	$1,717,921	0.0093
Pike	$750,000	$0	$0	$0	0.0000
Poinsett	$153,325,000	$1,345,562	$1,703,243	$170,324	0.0011
Polk	$1,687,000	$0	$0	$0	0.0000
Pope	$6,105,000	$137,793	$174,422	$17,442	0.0029
Prairie	$95,794,000	$360,002	$455,699	$45,570	0.0005
Pulaski	$18,618,000	$553,156	$700,197	$70,020	0.0038
Randolph	$43,265,000	$0	$0	$0	0.0000
Saint Francis	$89,406,000	$2,383,578	$3,017,187	$301,719	0.0034
Saline	$2,822,000	$0	$0	$0	0.0000
Scott	$1,430,000	$0	$0	$0	0.0000
Searcy	$719,000	$0	$0	$0	0.0000
Sebastian	$1,834,000	$26,807	$33,933	$3,393	0.0019
Sevier	$883,000	$0	$0	$0	0.0000
Sharp	$805,000	$0	$0	$0	0.0000
Stone	$1,012,000	$0	$0	$0	0.0000
Union	$921,000	$0	$0	$0	0.0000
Van Buren	$1,276,000	$0	$0	$0	0.0000
Washington	$7,904,000	$0	$0	$0	0.0000
White	$34,241,000	$95,416	$120,780	$12,078	0.0004
Woodruff	$89,377,000	$1,654,829	$2,094,720	$209,472	0.0023
Yell	$5,557,000	$279,219	$353,442	$35,344	0.0064
Total	**$2,899,724,000**	**$79,487,759**	**$100,617,416**	**$10,061,742**	**0.0035**

Source: USDA Risk Management Agency; 2007 USDA Census of Agriculture; (D) = Crop Exposure was not published to avoid disclosing data for individual operations. Thus an estimated crop damage ratio is not available in those counties.

Soil Erosion and Dust

There have not been any state-wide studies to estimate the dollar value of top soil lost to soil erosion and dust.

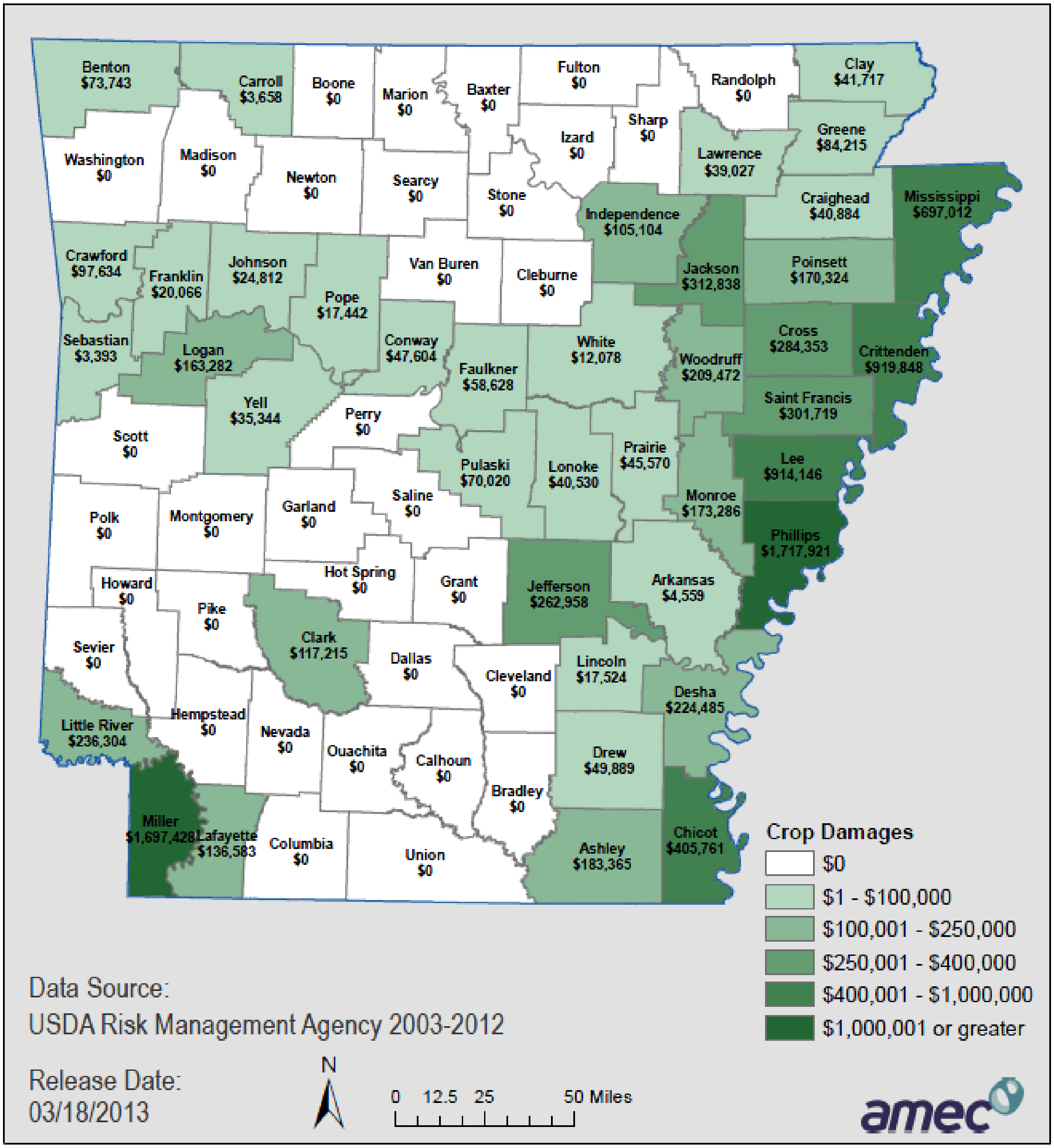
The 2007 Natural Resources Inventory (NRI) by the Natural Resources Conservation Service (**Table 3.4.2.e**) shows the historical estimates for tons per acres soil lost annually for cultivated cropland, non-cultivated cropland, Conservation Reserve Program (CRP) land and pastureland. The year of 1987 shows the highest total soil losses with 6.2 tons per acre lost. These estimates can continue as potential soil losses in Arkansas.

Table 3.4.2.e. Arkansas Average Wind Erosion in Tons/Acre/Year by Broad Cover/Use and Year

Broad Cover/Use	1982	1987	1992	1997	2002	2007
Cultivated Cropland	3.9	3.8	3.5	3.5	3.3	3.4
Non-cultivated Cropland	.7	.6	.6	.6	.6	.6
CRP Land	n/a	.6	.6	.6	.7	.5
Pastureland	1.1	1.2	1.2	1.2	1.2	1.1
Total	**5.7**	**6.2**	**5.9**	**5.9**	**5.8**	**5.6**

Source: Natural Resources Conservation Service, Summary Report 2007 National Resources Inventory, http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1041379.pdf , dated December 2009
Note: N/A - Not Available, Conservation Reserve program (CPR) land was not implemented until 1985.
Estimated average annual wind erosion is tons per acre per year with margins of error.

Figure 3.4.2.i Annualized Estimated Crop Losses from Drought, by County, 2003-2012



❖ Development in Hazard Prone Areas

The Arkansas Natural Resources Commission is in the process of updating the *Arkansas Water Plan* by November 2014 that will concentrate on the most vulnerable areas to drought for planning, management and mitigation activities. While drought does not usually cause damage to buildings and critical facilities, work and living locations do affect people. Soil erosion can create an unstable building, bridge or infrastructure.

Also, as counties experience significant increases in population it will create greater demands on public water suppliers. Of the counties that were determined to be in the high vulnerability category to drought as a result of this analysis, 7 are in the top 10 Arkansas counties for population growth: Benton, Washington, Faulkner, Saline, Pulaski, Sebastian, White, and Crawford Counties. **Table 3.4.2.f** compares the annualized crop loss from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these counties.

Table 3.4.2.f Comparison of Annualized Crop Loss[1]

County	Annualized Loss 2010 Plan	Annualized Loss 2013 Plan	Comparison
Benton	N/A	$73,743	Comparison not available.
Crawford	N/A	$97,634	Comparison not available.
Faulkner	N/A	$58,628	Comparison not available.
Pulaski	N/A	$70,020	Comparison not available.
Saline	N/A	$0	Comparison not available.
Sebastian	N/A	$3,393	Comparison not available.
Washington	N/A	$0	Comparison not available.
White	N/A	$12,078	Comparison not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

❖ Consequence Analysis

Drought is often associated with periods of long and intense heat. Drought usually does not affect humans directly but extreme heat can cause injury and even death particularly with children, elderly citizens and other special needs populations. Injuries and potential deaths are most likely to impact rural, poor areas that lack air conditioning and immediate medical care.

The largest impact of prolonged drought is the financial impact to farmers with crops and livestock. Arkansas has a significant agriculture industry and a serious drought would damage or possibly destroy annual crops and limit the number of livestock that could be properly cared for.

The financial impact could be widespread over the area of the drought particularly if it lasts for a long time or occurs at vital times in crop development.

Drought has no real effect on houses, facilities or state infrastructure. The impacts would be minimal in terms of landscaping. Rationing water supplies would most likely be the worst case scenario impact.

Prolonged drought over a number of years could have long-term environmental impacts on the area including species endangerment and necessary changes to the local agricultural makeup.

Wind erosion can cause crop loss, fertility loss, moisture loss and loss of valuable top soil. Blowing soil causes dirt clouds, and drifting sand. Blowing soil cuts off growing crops, covers fences, and closes roads

The information in **Table 3.4.2.g** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.2.g. EMAP Consequence Analysis: Drought

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Most damage expected to be agricultural in nature. However, water supply disruptions may adversely affect people.
Health and Safety of Persons Responding to the Incident	Nature of hazard expected to minimize any serious damage to properly equipped and trained personnel.
Continuity of Operations	Unlikely to necessitate execution of the Continuity of Operations Plan.
Property, Facilities, and Infrastructure	Nature of hazard expected to minimize any serious damage to facilities.
Delivery of Services	Nature of hazard expected to minimize serious damage to services, except for moderate impact on water utilities.
The Environment	May cause disruptions in wildlife habitat, increasing interface with people, and reducing numbers of animals.
Economic and Financial Condition	Local economy and finances dependent on abundant water supply adversely affected for duration of drought.
Regulatory and Contractual Obligations	Regulatory waivers unlikely, but permits expedited. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Reputation of or Confidence in the Entity.	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.3. Earthquake

❖ *Description/Location*

Earthquakes are caused by movement along geologic faults, or fractures in the earth's crust. When a fault moves, energy is released and transfers through the earth causing the shaking that is experiences during an earthquake. Arkansas has hundreds, if not thousands of faults. Most of these faults are considered inactive. However, faults associated with the New Madrid Seismic Zone (NMSZ) are active, and deeply buried beneath many layers of unconsolidated sediment and sedimentary rock, making them almost impossible to identify on the earth's surface. These faults exist within a failed rift zone, known as Reelfoot Rift, which developed in the earth's crust over 600 million years ago.

The focus of an earthquake is the point within the earth where the initial rupture of the rock occurs and where the seismic waves are first released. The epicenter of an earthquake is the point on the earth's surface directly above the focus.

Figure 3.4.3.a Arkansas earthquake damage

The size of an earthquake is expressed in terms of its cause, or magnitude, and its effect, or intensity. Magnitude is a measure of the energy released from the source beneath the earth's surface where a fault has suddenly ruptured. The magnitude scale is objective, measured by instruments at various distances and directions from the epicenter of an earthquake. A single magnitude value can be calculated for any given earthquake from seismograph readings at stations near and far from the source, even though the amplitudes of the measured waves usually diminish with distance. Magnitude scales are expressed in Arabic numbers to one decimal place. Because the magnitude classification is based on a logarithmic scale, a magnitude eight earthquake is not twice as big as a magnitude four earthquake, but rather 10,000 times larger. The amplitude of ground motion for any scale unit (e.g., 5.0) is 10 times larger than its previous unit (4.0). In terms of energy, each unit on the magnitude scale represents approximately 32 times more energy released at the source than the next lower unit. Hence, a magnitude 6.5 earthquake is actually 32 times larger than a magnitude 5.5. At present, at least four different magnitude scales are commonly used to classify earthquakes.

Earthquake Intensity is a measure of the severity of the ground shaking as reflected in the degree of damage to man-made structures, the amount of disturbance to the surface of the ground, and the reaction of animals to the shaking. Intensity is measured in the United States by the Modified Mercalli Scale (**Table 3.4.3.a**). This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects. Although earthquakes have only one magnitude, they have variable intensities that generally decrease with increasing distance away from the source. However, other factors such as local geology, shallow ground water and building type may affect the intensities of earthquakes. For example, greater intensities are associated with poorly consolidated alluvial soils, high ground water levels and poor construction practices, such as un-reinforced masonry structures.

Table 3.4.3.a Abbreviated Description of the Modified Mercalli Intensity Scale

Mercalli Intensity	Damage Description (average peak acceleration)
I	Not felt except by a very few under especially favorable conditions. (Negligible)
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing. (Negligible)
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated. (Negligible)
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed, walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. (0.015g-0.02g)
V	Felt by nearly everyone; many awakened. Some dishes, windows broken, cracked plaster in a few places, unstable objects overturned. Disturbances of trees, poles, and other objects sometimes noticed. Pendulum clocks may stop. (0.03g-0.04g)
VI	Felt by all, many frightened. Some heavy furniture moved, a few instances of fallen plaster and damaged chimneys. Damage slight. (0.06g-0.07g)
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, considerable damage in poorly built or badly designed structures, some chimneys broken. Noticed by persons driving cars. (0.10g-0.15g)
VIII	Damage slight in specially designed structures, considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving cars disturbed. (025g-0.30g)

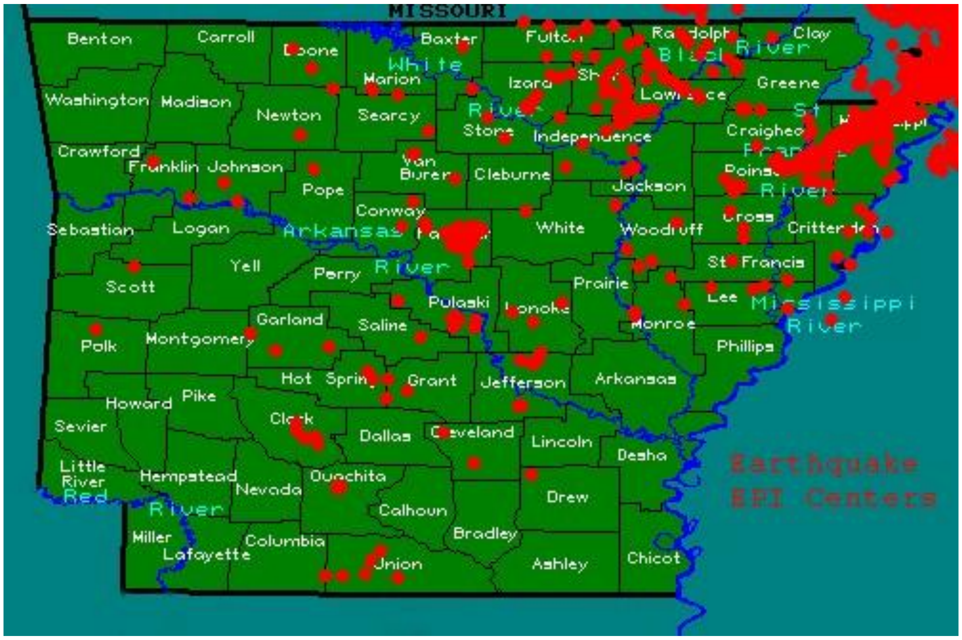
Mercalli Intensity	Damage Description (average peak acceleration)
IX	Damage considerable in specially designed structures, well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken. (0.50g-0.55g)
X	Some well-built wooden structures destroyed, most masonry and frame structures destroyed with foundations, ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks. (More than 0.60g)
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and landslips in soft ground. Rails bent greatly.
XII	Damage total. Waves seen on ground. Lines of sight and level are distorted. Objects thrown into the air.

Most earthquakes, such as those occurring in California, Alaska and Japan, occur along the boundaries of rigid tectonic plates that are in slow but constant motion near the surface of the earth. Much less commonly, earthquake zones develop within the rigid plate itself resulting in interplate seismicity. Earthquakes of this type arise from a more localized system associated with structural complexities from earlier geological conditions or from variations in the strength of the lithosphere. The New Madrid Seismic Zone (NMSZ), an area of high seismic activity within the central United States (including northeastern Arkansas), is the most important example of interplate seismicity in North America.

A map of historical and instrumentally located earthquakes that have occurred in Arkansas from 1811 through 2003 is presented in **Figure 3.4.3.b**. Note the uneven distribution of earthquakes and that not all counties have experienced a recorded earthquake during this time period. This earthquake distribution can be misleading because, unlike other hazards, the event does not have to occur in a jurisdiction for that jurisdiction to be affected by it (large earthquakes can cause damage 100s of kilometers from the epicenter). Additionally, earthquakes in Arkansas are infrequent, having recurrence intervals on the order of hundreds of years or more. This relatively short earthquake record is therefore incomplete, and the entire State must be considered vulnerable to the effects of earthquakes. It is clear, however, that northeastern Arkansas has the most earthquake activity in the State.

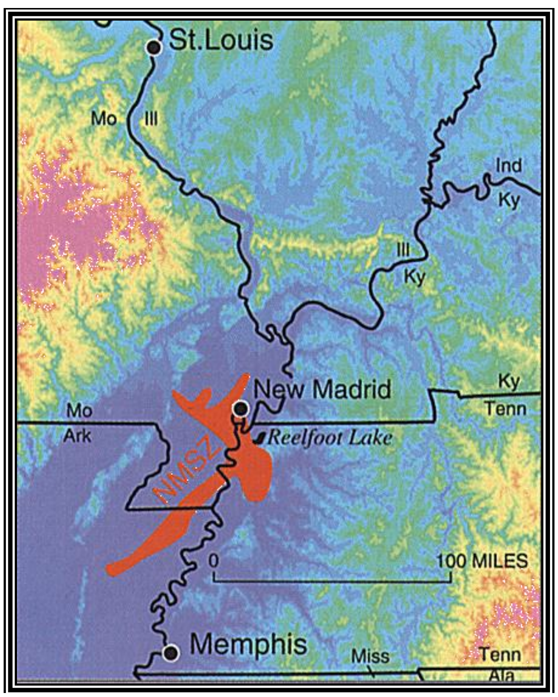
The cluster of earthquakes in northeastern Arkansas in Mississippi, Craighead and Poinsett Counties is the southern end of the NMSZ.

Figure 3.4.3.b Seismic Activity History in Arkansas



Source: USGS

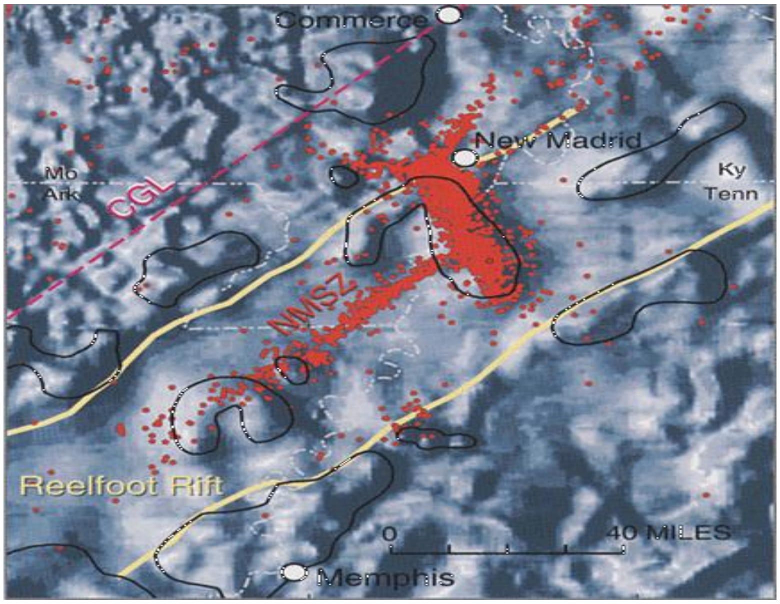
Figure 3.4.3.c New Madrid Seismic Zone Affecting North East Arkansas



Source: USGS

Earthquake

Figure 3.4.3.d New Madrid Seismic Zone Magnetic Intensity Map



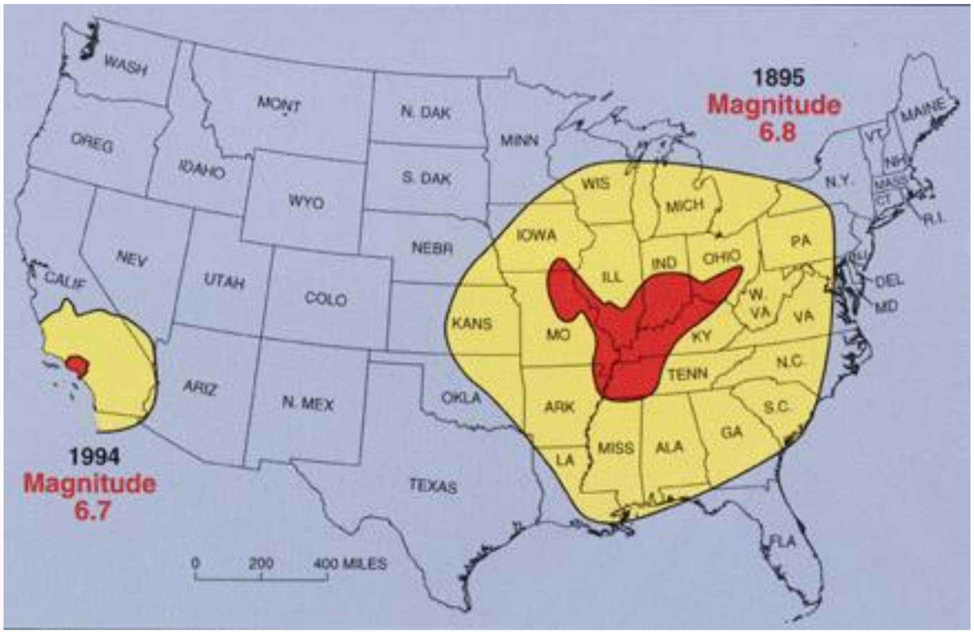
Source: USGS

Figure 3.4.3.d is the shaded-relief magnetic map of the region surrounding the NMSZ. This shows areas of high magnetic intensity as "hills" and those of low intensity as "valleys." The deeply buried Reelfoot Rift is expressed as a smoother appearing area between the yellow lines and the Commerce Geophysical Lineament (CGL), paralleling the rift, is traced. Red dots show the locations of the many earthquakes recorded in the NMSZ since 1974, and major igneous bodies, which show up as prominent "hills," are outlined in black.

In addition to earthquake location and recurrence, earthquake hazards also depend on how amplitudes of seismic waves die out as they move away from the earthquake source to the affected site. Research by the United State Geological Survey (USGS) and others has demonstrated that seismic wave energy decreases much more slowly in the central and eastern United States than in the west. For the same size earthquake, this leads to greater shaking and higher hazard over larger areas in the central and eastern United States.

Although earthquakes in the central and eastern United States are less frequent than in the western United States, they affect much larger areas. This is shown in **Figure 3.4.3.e** by two areas affected by earthquakes of similar magnitude - the 1895 Charleston, Missouri, earthquake in the New Madrid seismic zone and the 1994 Northridge, California, earthquake. Red indicates minor to major damage to buildings and their contents. Yellow indicates shaking felt, but little or no damage to objects, such as dishes.

Figure 3.4.3.e 1895 and 1994 Magnitude Map

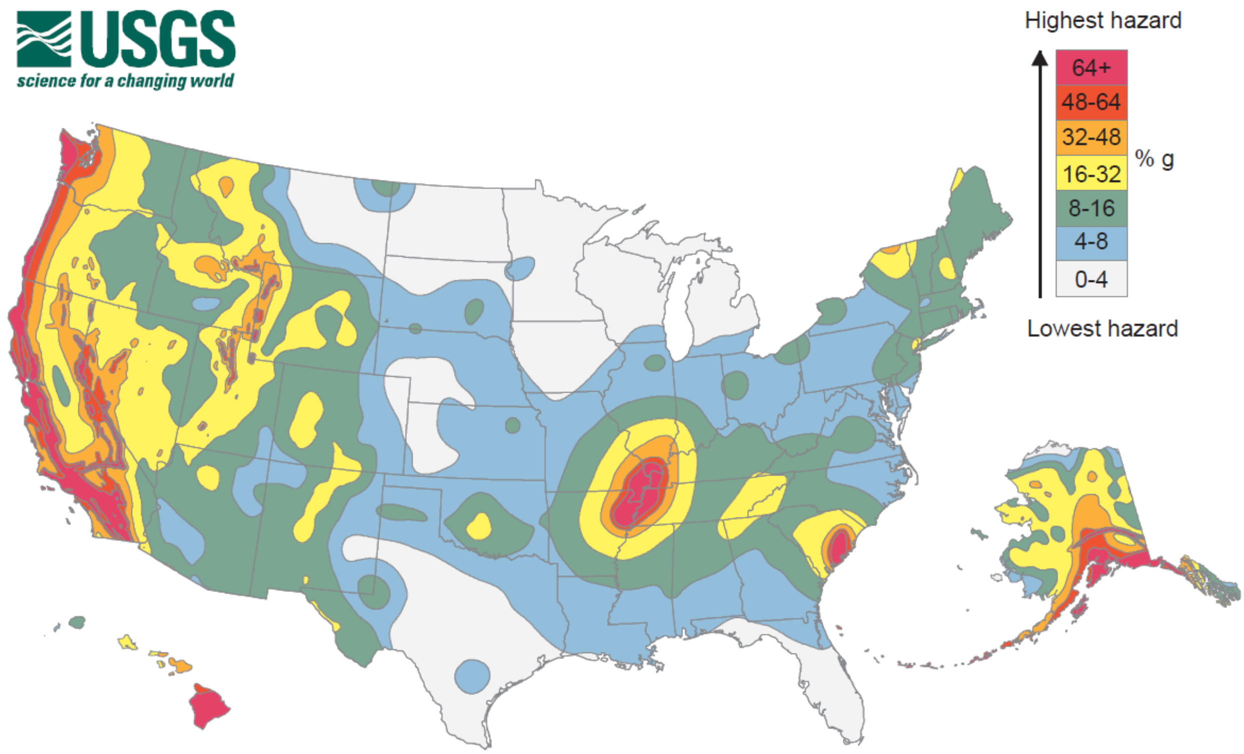


Source: USGS

Earthquake shaking may also be significantly amplified or dampened by the soils or rock immediately beneath the site. This is particularly true for thick sediments that underlie most of eastern and southern Arkansas.

Variation in earthquake risk in the State can be shown on USGS Seismic Hazard Maps. These maps are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from earthquake sources. The earthquake ground motions that have a given probability of being exceeded in 50 years are shown using contour intervals. A map of Arkansas showing peak ground acceleration expressed as a percentage of g (g is the acceleration of a falling object due to gravity) with 2% probability of exceedance in 50 years, is shown in **Figure 3.4.3.f.** Again, one of the most prominent areas on this map is the high hazard New Madrid Seismic Zone.

Figure 3.4.3.f Seismic Hazard Map of the United States



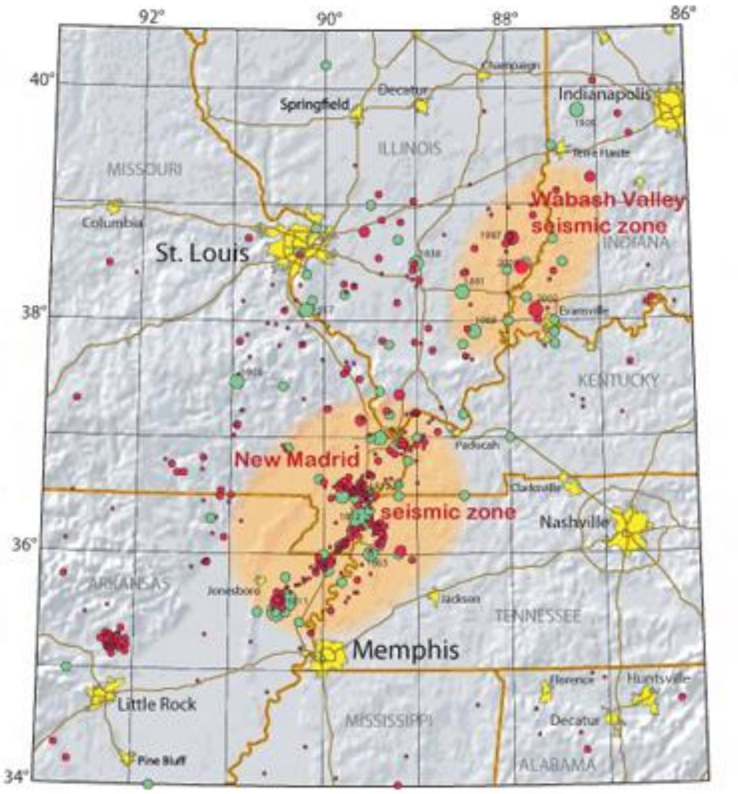
Source: USGS; http://earthquake.usgs.gov/hazards/products/

❖ *Previous Occurrences*

The APDMAC is constantly monitoring the seismic activity in the State in coordination with the Central United States Earthquake Consortium (CUSEC). The NMSZ is constantly active; however, no large magnitude events have occurred recently. The following data profiles the previous occurrences.

The 1811 - 1812 series of earthquakes, commonly known as the New Madrid Earthquakes, produced damaging intensities over areas far greater than any historical earthquake in the conterminous United States. These and other historical earthquakes, as well as recent seismic activity, indicate that the New Madrid Seismic Zone has a high potential for generating damaging earthquakes. Considering the isoseismal map for the 1811 - 1812 earthquake sequence, a conclusion is easily drawn that with the current distribution of population and infrastructure within the region, a repetition of the sequence similar to that in 1811-1812 would likely cause widespread destruction of property and loss of life.

Figure 3.4.3.g Earthquakes Recorded in the New Madrid Zone (1974-2002)



Source: Central U.S. Earthquake Consortium (CUSEC)

During the winter of 1811-1812, a sequence of the three largest earthquakes in the recorded history of this region occurred. The three main shocks, which occurred on December 16, 1811, January 23, 1812 and February 7, 1812, had epicentral Modified Mercalli (**Table 3.4.3.a**) intensities of XI, X-XI and XI-XII, estimated body-wave magnitudes (mb) of 7.2, 7.1, and 7.4, and estimated surface-wave magnitudes (Ms) of 8.5, 8.4, and 8.8, respectively. The first of these events (December 16, 1811) occurred on the southern branch of the fault system in eastern Arkansas near Marked Tree in Poinsett County. On the same date, two other large events occurred on the same fault in Arkansas. Historic documents (e.g. newspapers, letters, and diaries) and geological field studies established that there was relative uplift and subsidence of the land by as much as 3m - 6m over an area of approximately 2,600 km^2. Arkansas' 40-mile-long, half-mile-wide Lake Saint Francis was formed by these earthquakes.

Since 1812, only two large earthquakes of surface-wave magnitude greater than 6.0 have occurred in the central United States, both in the NMSZ. The first earthquake, which struck on January 4, 1843, was centered in Arkansas at the extreme southern end of the Arkansas branch of the NMSZ (near Marked Tree). It had a surface-wave magnitude of 6.3, and an area of Modified Mercalli intensity of VI or greater that encompassed about 60,000 square miles. The earthquake caused structural damage in Memphis, Tennessee, northeast Arkansas, and the extreme northwest corner of Mississippi. The second earthquake occurred near Charleston, Missouri, at the northern end of the NMSZ on October 31, 1895. This earthquake had a surface-wave magnitude of 6.7.

In addition to the New Madrid Earthquakes, the United States Geological Survey has documented the following significant historic earthquakes in Arkansas:

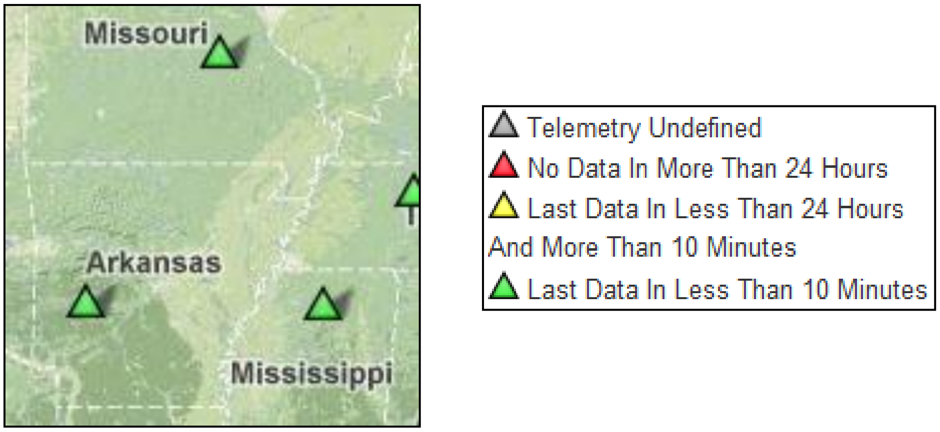
- Outside the Mississippi Embayment, the earliest shock listed for Arkansas occurred in October 1882. Since few reports were received from the region most affected, the epicenter of this shock is not well known. Several investigators have placed the origin near El Reno, Oklahoma, rather than western Arkansas. The shock threw bricks from chimneys at Sherman, Texas, and shook houses strongly at Fort Smith, Arkansas. It was felt in areas covering parts or all of Arkansas, Oklahoma, Kansas, Texas and Missouri, about 135,000 square miles.
- An earthquake also occurred near Melbourne, about 95 miles northeast of Little Rock, in December 1883. Rockslides occurred on a railroad cut and thunderous earth noises were heard. Glassware and crockery broke and buildings shook at Melbourne.
- A shock in March, 1911, about 40 miles south of Little Rock, was so severe at Pine Bluff that hundreds of excited residents crowded into the streets in panic, and windows were broken in several sections of the city. At one school, walls cracked and plaster fell on students. "Glasses were shaken from counters in confectionery stores and dishes were broken in many kitchens," the record notes. The shock was felt throughout southeastern Arkansas and in adjacent states.
- From 1911 to 1933, two local intensity V earthquakes centered in the Black Rock - Pocahontas area of northeastern Arkansas; two additional intensity V tremors were noted, one near Little Rock, the other near Marked Tree, and both were felt over 30,000 square mile areas. None of these caused property damage, but they alarmed much of the populations near their centers.
- The early morning of December 9, 1933, brought another minor tremor to Arkansas. Many residents of Manila, in Mississippi County, were awakened by a sharp earthquake that broke windows in several homes.
- Very light tremors in 1937 and 1938 in the northeastern part of Arkansas were felt over 25,000 and 90,000 square miles of Arkansas and several surrounding states. Neither was damaging. This region is noted for relatively light-intensity shocks being felt over extremely large areas.
- One of the few earthquakes centered in southwestern Arkansas occurred in June 1939. It cracked plaster in buildings at Arkadelphia and was felt throughout the southern portion of Arkansas.
- After the 1939 earthquake, only light tremors (all under intensity V) were noted until January 25, 1955. The 1955 tremor was centered in northeastern Arkansas near the Missouri - Tennessee border and caused some property damage in the bordering states. At Dyersburg,

Tennessee, a brick pillar supporting a porch was thrown down; at Finley, plaster, walls and ceilings cracked. Windows cracked in the small town of Hayti, Missouri. Thousands of residents over a 30,000 square mile area were awakened by this early morning event.

- Arkansas was again relatively quiet seismically for 14 years, until New Year's Day of 1969. During this period, however, three shocks in northeastern Texas and southern Missouri caused some damage in Arkansas. The strongest of the three was centered in southeastern Missouri in March 1963. It cracked windows, plaster, concrete and walls in several Arkansas towns.
- On January 1, 1969, a tremor centered about 19 miles northwest of Little Rock caused much commotion in the area. In Little Rock, plaster cracked and furniture was moved about in some homes. Trees and utility wires swayed and shook throughout a wide area. Residents in southern Missouri and western Tennessee also noted the shock.
- In January of 1982 Faulkner County was jolted by a small earthquake that initiated a series of seismic events that lasted multiple years and produced over 40,000 earthquakes. Most of the seismic events were too small to be felt but at least 93 earthquakes were felt in the local area by at least one person during that first year. Three earthquakes of the 1982 Enola series were magnitude four or greater, with the largest being 4.5.
- On September 17, 1997 a magnitude 3.8 earthquake occurred at about 1:17 p.m. The tremor was centered in an area about 20 miles southeast of Jonesboro, Arkansas in the Trumann - Caraway area. Minor damage at a day-care center and a piano company in the Trumann - Caraway area was reported by the Arkansas State Police.
- In May of 2001, central Arkansas was shaken by an earthquake with a 4.4 magnitude. The epicenter of this earthquake was located in Faulkner County, about three miles northwest of Enola, the same area as the 1982 series of earthquakes. This event was felt widely in central Arkansas and some people were awakened by it. Reports of shaking ranged as far away as Ft. Smith, southeast of Stuttgart, and the Missouri border region. The trembler did not cause any structural damage, but a fallen mirror and some broken china were reported in the epicenter area.
- On February 27, 2011, a magnitude 4.7 earthquake struck near Greenbrier, Arkansas. The epicenter was located away from the NMSZ, but near an area that has experienced higher seismic activity since October of 2010. The event was felt in at least seven states by nearly 5,000 people. Although this is the largest earthquake to strike Arkansas since 1969, there were no reports of causalities or damage to facilities.

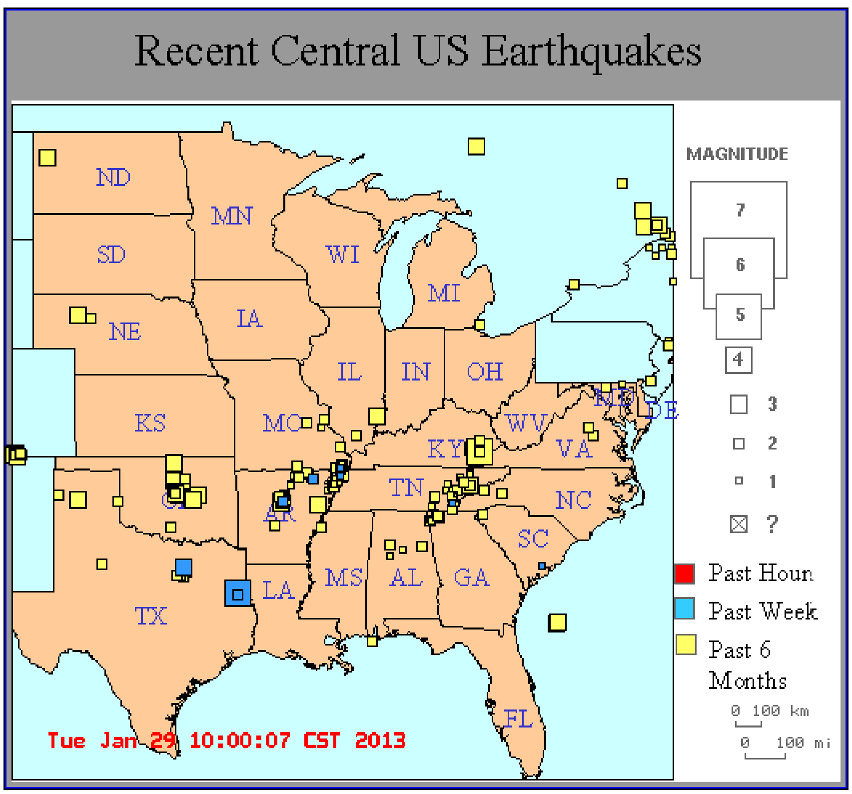
As previously discussed, the New Madrid Fault is a very active area of seismic events. Every month Arkansas can expect to have some type of seismic event, although usually low. **Figure 3.4.3.h** shows the Advanced National Seismic System (ANSS) monitoring stations near the NMSZ and the frequency of which data is collected. **Figure 3.4.3.i** shows earthquakes that have occurred in Central U.S in the last 6 months. This map was produced on January 29, 2013.

Figure 3.4.3.h ANSS Monitoring Stations



Source: Advanced National Seismic System

Figure 3.4.3.i Recent Central US Earthquakes



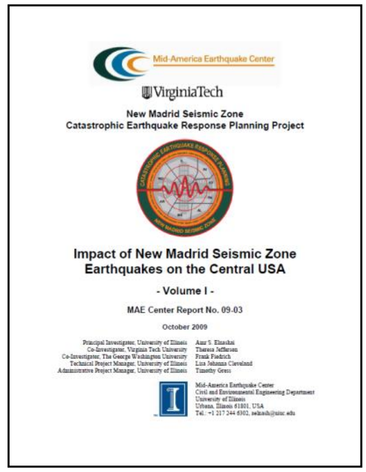
Source: Central U.S. Earthquake Consortium (CUSEC)

❖ *Probability of Future Hazard Events*

Like meteorologists, earth scientists present forecasts of earthquakes as the chance or "probability" of an earthquake occurring in a specific time interval. It is generally accepted that earthquakes can be expected in the future as frequently as they have occurred in the recent past. We determine how often earthquakes reoccur from historical and geological (pre-historical) studies. Sand blow deposits, found throughout northeastern Arkansas and surrounding states, are believed to be the byproduct of strong ground shaking associated with large earthquakes. Sand blow deposits in this area have been dated at about A.D. 900 and A.D. 1450 and suggest that major earthquakes (magnitude seven or greater) reoccur in the region approximately every 500 years, with the most recent sequence being in 1811-1812. Using this data, which was also used to produce the National Seismic Hazard Maps, the USGS and the Center for Earthquake Research and Information of the University of Memphis now estimate that the probability of a repeat of the 1811-1812 earthquake series (magnitude 7.5 to 8.0) in the NMSZ over the next 50 years is 7% to 10%. The probability that a magnitude 6.0 or larger earthquake will occur in the next 50 years is 25% to 40%. Earthquakes in the magnitude range of 7.5 to 8.0 are capable of causing widespread damage over a large region. Magnitude 6.0 earthquakes can cause serious damage in areas close to the earthquake's location.

The APDMAC determined that there is a high probability of future earthquakes in the State of Arkansas, along the New Madrid Fault, and throughout the surrounding area. However, the probability of a major event is much lower; therefore the probability of earthquakes was rated as "**Likely**". The APDMAC recognizes the difficulty in predicting seismic events and is committed to continually monitoring this situation as new data becomes available.

❖ *State Vulnerability Analysis*

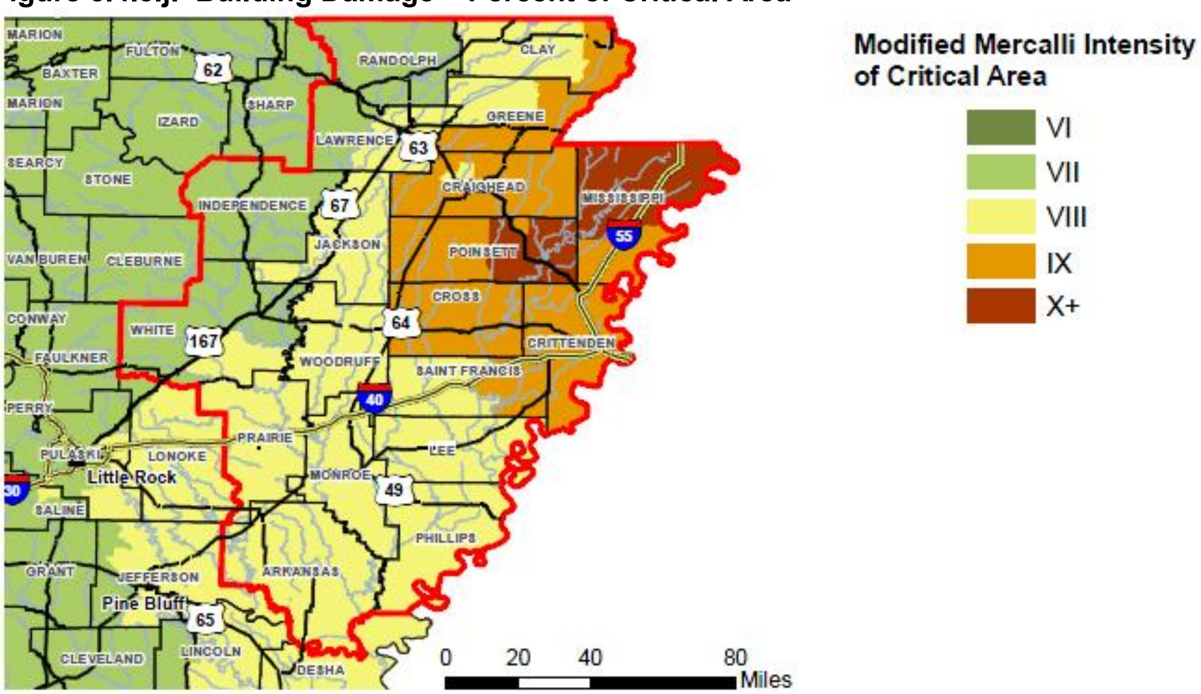


This earthquake impact assessment reflects the results of a study conducted in 2009, ***Impact of New Madrid Seismic Zone Earthquakes on the Central USA***, by the Mid-America Earthquake Center.

The NMSZ consists of three fault segments: the northeast segment, the reelfoot thrust or central segment, and the southwest segment. This study by the Mid-America Earthquake Center analyzes the 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 (Mw7.7) earthquake caused by a rupture over the entire length of the segment.

For Arkansas, the study identifies a critical area in the northeast corner of the State (see **Figure 3.4.3.j**). This area encompasses the 19 counties to be most severely impacted by the deterministic magnitude 7.7 (Mw7.7) earthquake. **Table 3.4.3.b** on the following page, presents the vulnerable building and populations for the 19 identified counties.

Figure 3.4.3.j. Building Damage – Percent of Critical Area



Source: Mid-America Earthquake Center

Table 3.4.3.b Building Damage by Occupancy Type for Arkansas

County Name	Population	Housing Density (units/sq.mi.)	Building Count	Building Exposure ($1,000)
Arkansas	19,019	9.5	11,545	$ 1,501,425
Clay	16,083	12.6	10,949	$ 1,181,580
Craighead	96,443	57.3	37,282	$ 5,603,268
Crittenden	50,902	35.2	21,306	$ 3,135,093
Cross	17,870	12.7	9,324	$ 1,074,314
Greene	42,090	31	18,308	$ 2,456,201
Independence	36,647	21.2	18,278	$ 2,386,851
Jackson	17,997	12	9,458	$ 1,162,927
Lawrence	17,415	13.6	10,260	$ 1,075,664
Lee	10,424	7.2	5,199	$ 491,271
Mississippi	46,480	22.7	24,713	$ 3,244,440
Monroe	8,149	7.3	6,452	$ 640,576
Phillips	21,757	14.6	12,235	$ 1,364,039
Poinsett	24,583	14.4	12,461	$ 1,612,527
Prairie	8,715	6.9	6,666	$ 629,613
Randolph	17,969	13.1	9,618	$ 1,035,165
Saint Francis	28,258	17.2	12,537	$ 1,551,990
White	77,076	31.4	31,878	$ 4,191,226
Woodruff	7,260	6.6	5,230	$ 515,107

❖ *State Estimates of Potential Losses*

The deterministic magnitude 7.7 (Mw7.7) earthquake was modeled using the following software packages: HAZUS MR3; FEMA, 2008; and MAEviz, Mid-America Earthquake Center, 2008. These software packages utilize building inventory counts are based on the 2000 census data adjusted to 2006 numbers using the Dun & Bradstreet Business Population Report.

Impact Assessment Results

There are approximately 1.3 million buildings in the State of Arkansas, with approximately 1.2 million residences for either a single family or multiple families (other residential). As a result of the NMSZ Mw7.7 scenario event, over 162,000 buildings are damaged in Arkansas. The largest portion of damage occurs in the northeast portion of the State. Nearly 145,000 at least moderately damaged buildings are residential construction, as is shown in **Table 3.4.3.c**. Residential construction also incurs substantial amounts of complete damage which renders many homes unusable.

Additionally, over 900,000 buildings within the State are wood frame structures, while another 180,000 are unreinforced masonry (URM) structures. Steel, precast, and cast-in-place concrete buildings comprise a much smaller portion of the State building inventory. **Table 3.4.3.d** shows that a significant portion of at least moderate damage occurs in woodframe construction, over 40%, and manufactured housing, over 30%. Approximately half of all complete damage is attributed to wood structures, though both URMs and manufactured housing each account for 20% of all complete damage in Arkansas.

Table 3.4.3.c Building Damage by Occupancy Type for All of Arkansas

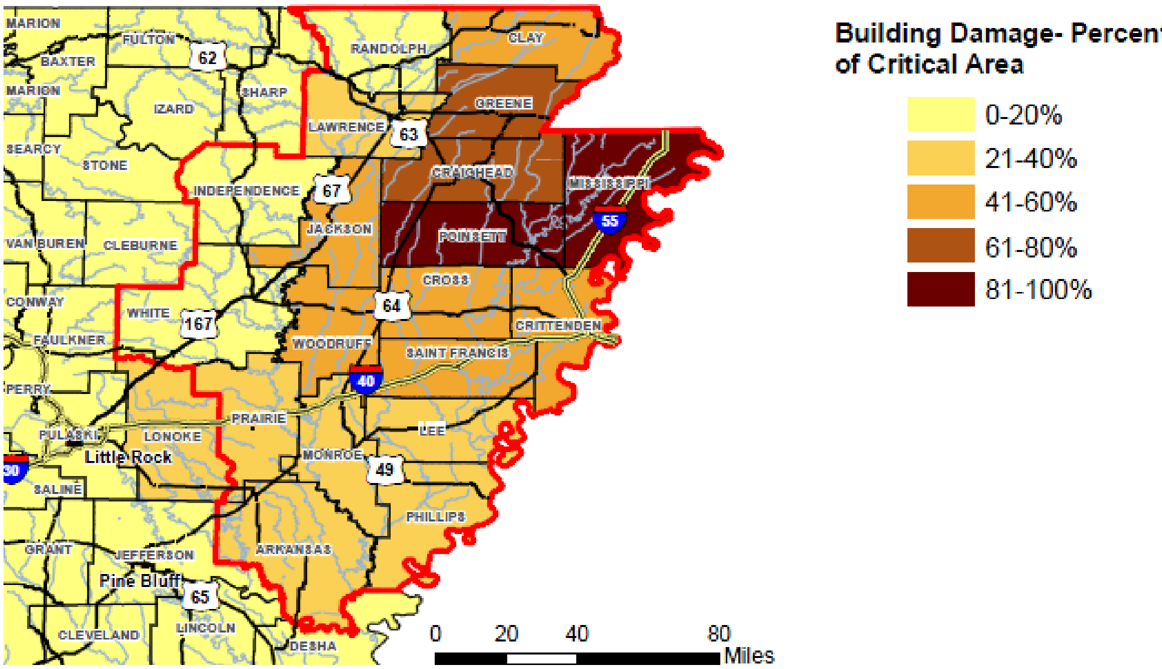
General Occupancy Type	Total Buildings	At Least Moderate Damage	Complete Damage
Single Family	833,500	69,700	35,800
Other Residential	408,500	75,000	27,400
Commercial	53,200	11,000	4,700
Industrial	14,600	2,800	1,100
Other	15,600	3,700	1,700
Total	**1,325,400**	**162,200**	**70,700**

Table 3.4.3.d General Building Damage by Building Type for All of Arkansas

General Building Type	Total Buildings	At Least Moderate Damage		Complete Damage	
Wood	902,100	68,800	42.4%	35,000	49.5%
Steel	25,300	7,300	4.5%	2,700	3.8%
Concrete	6,600	1,500	0.9%	700	1.0%
Precast	6,700	1,600	1.0%	700	1.0%
Reinforced Masonry	5,200	1,100	0.7%	500	0.7%
Unreinforced Masonry	181,900	29,100	17.9%	15,500	21.9%
Manufactured Housing	197,600	52,800	32.6%	15,600	22.1%
Total	**1,325,400**	**162,200**	**100.0%**	**70,700**	**100.0%**

Several counties experience more damage than the remainder of the State. Greene, Craighead, Poinsett, Crittenden, and Mississippi Counties are each estimated to incur at least 10,000 damaged buildings. **Figure 3.4.3.k**, on the following page, presents the building damage by county as a percent of the total critical area.

Figure 3.4.3.k. Building Damage – Percent of Critical Area



Source: Mid-America Earthquake Center

As a result of the NMSZ Mw7.7 scenario event, critical infrastructure is also severely damaged and operational capabilities are substantially reduced in northeastern Arkansas. Well over 200 schools, 100 police stations, nearly 180 fire stations and 25 hospitals are damaged by the scenario event and a large portion of that damage is complete, rendering many facilities useless after the event. **Table 3.4.3.e** details damage estimates for essential facilities in Arkansas. The impacted counties are catastrophically impacted, particularly Clay, Craighead, Crittenden, Cross, Greene, Jackson, Lee, Mississippi, Monroe, Phillips, Poinsett, Prairie, Saint Francis, and Woodruff Counties where most essential facilities, medical services, law enforcement and fire fighting services are nearly non-existent immediately after the event.

Significant damage to transportation lifelines is generally confined to the impacted counties. Craighead, Crittenden, Mississippi, and Poinsett Counties incur the largest numbers of damaged bridges. Furthermore, several major river bridges are damaged effectively separating major sections of Arkansas from neighboring states. The Harahan, Frisco, and Memphis/Arkansas bridges are damaged and impassible after the event. Nearly 40 airports and 15 railway facilities are damaged in the State, as shown in **Table 3.4.3.f.** Most damage to rail, air and water transport facilities is located in Clay, Crittenden, Craighead, Cross, Greene, Mississippi, and Poinsett Counties.

Table 3.4.3.e 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

Table 3.4.3.f Transportation Lifeline Damage for Arkansas

Transportation Lifelines	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**

As a result of the NMSZ Mw7.7 scenario event, impacts on utility infrastructure are most prominent in the impacted counties, though pipeline repairs are required throughout the entire State. **Table 3.4.3.g** details expected utility facility damage for Arkansas, and shows that hundreds of waste water and communication facilities are damaged. 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 waste water, communication, and other utility facilities.

Utility pipelines carry much-needed commodities to other parts of the country as well as individual homes in Arkansas. Both local distribution and major interstate pipeline repairs are quantified in **Table 3.4.3.h**. Local distribution networks for potable water, waste water, and natural gas require a combined 124,000 repairs. Restoring the networks to their pre-event status will take weeks or months depending on the availability of spare parts and accessibility of damaged pipelines. In addition, over 1,700 repairs are needed on interstate pipelines which transport vital commodities to the upper Midwest and east coast. Without timely restoration these portions of the country that are not directly impacted by the earthquake will experience significant indirect affects as natural gas and oil are unavailable, or in scarce supply. Damage to utility infrastructure also leaves hundreds of thousands without power or water immediately after the event. Approximately 330,000 households are without power and 190,000 households without water after the event. Over 80% of all households in Craighead, Poinsett, Mississippi, Cross, and Crittenden Counties are without power immediately after the event.

Table 3.4.3.g Utility Facilities Damage for Arkansas

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

Table 3.4.3.h 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

There are over 3,000 other critical facilities, as identified in HAZUS-MR3, in Arkansas and over 100 are damaged by the scenario earthquake. **Table 3.4.3.i** shows that nearly 60 dams are damaged, all of which are located in Poinsett County. The 20 damaged levees are located in Craighead, Greene, Mississippi, and Poinsett Counties. Very intense ground shaking is required to damage hazardous materials facilities and such levels of shaking occur in small portions of northeast Arkansas. All damaged hazardous materials facilities are located in Mississippi County.

Table 3.4.3.i Other Critical Facilities Damage for Arkansas

Facility Type	Total Facilities	Damaged
Dams	1,228	55
Levees	124	20
Hazardous Materials	1,834	69

Infrastructure damage generates 9.4 million tons of debris in Arkansas. Approximately 4.1 million tons are attributed to steel and concrete, while the remaining 5.3 million tons is comprised of wood, brick, and other building materials. Nearly two million tons of debris is created in Craighead County, with another 1.5 million tons in Mississippi County and one million tons in Crittenden County. Poinsett, Pulaski, and Greene Counties also have debris estimates between 650,000 and 750,000 tons. Over 375,000 truckloads13 are required to remove all the debris generated by the scenario event.

Damage from the scenario event causes 15,300 total casualties throughout the State. As illustrated in **Table 3.4.3.j,** nearly 75% of all casualties are minor injuries that do not require hospitalization. Nearly 650 deaths are expected as well and nearly all are estimated to occur in the impacted counties. Crittenden, Mississippi, and Craighead Counties are most severely impacted as each county is estimated to incur 2,000 to 3,000 total casualties for the 2:00 AM scenario earthquake.

Table 3.4.3.j Casualties at 2:00am for Arkansas

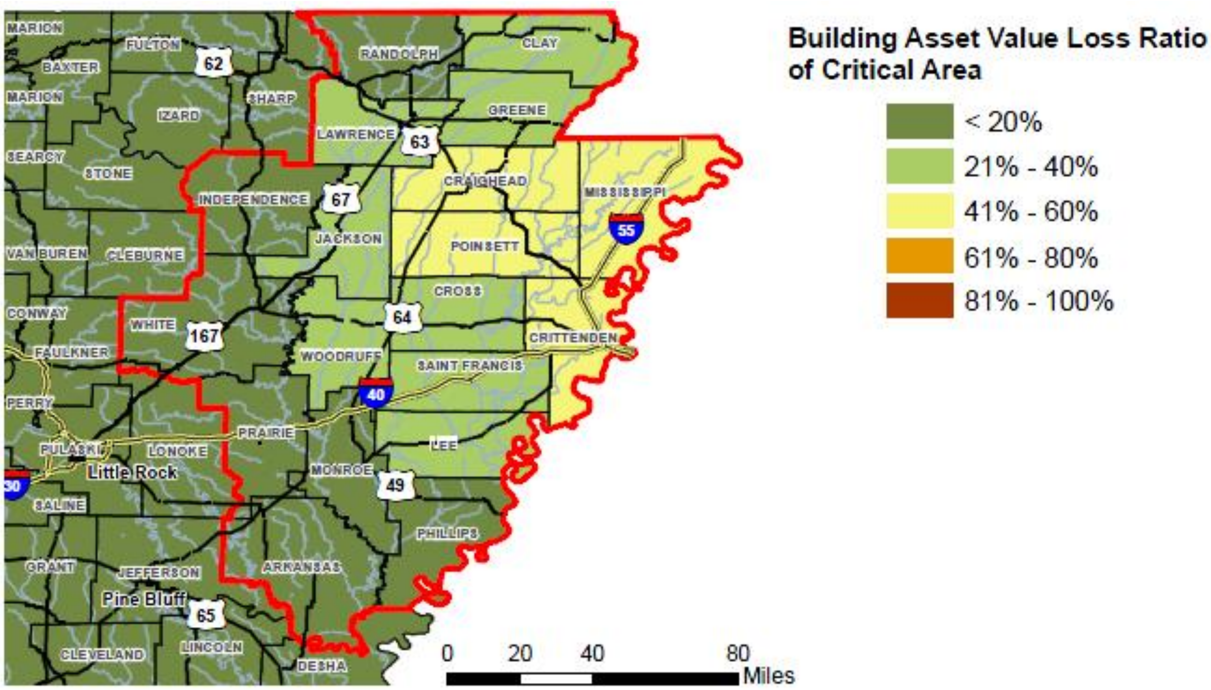
	Level 1	Level 2	Level 3	Level 4	Level 5
Casualties	11,245	3,075	344	641	15,305

Total assets in Arkansas include more than $180 billion in building value, nearly $75 billion in transportation infrastructure value, and approximately $210 billion in utility infrastructure value. This equates to more than $465 billion in total infrastructure value throughout the State. **Table 3.4.3.k** illustrates losses by infrastructure group which shows that buildings and utility lifelines experience nearly identical economic losses, about $18 billion. Transportation lifelines constitute a smaller portion of State economic loss at nearly $2.5 billion. With total economic losses reaching nearly $40 billion Arkansas will require substantial assistance to rebuild after the disaster. Building asset values are further displayed in **Figure 3.4.3.l** as a ratio of the critical area.

Table 3.4.3.k Direct Economic Loss for Arkansas ($ millions)

	Buildings	Transportation	Utilities	Total
Direct Economic Loss	$ 18,167	$ 2,347	$ 18,515	$ 39,029

Figure 3.4.3.l. Building Asset Value Loss Ratio



Source: Mid-America Earthquake Center

❖ Development in Hazard Prone Areas

The northeastern counties identified to be the most severely impacted by an earthquake event include the following: Arkansas, Clay, Craighead, Crittenden, Cross, Greene, Independence, Jackson, Lawrence, Lee, Mississippi, Monroe, Phillips, Poinsett, Prairie, Randolph, St. Francis, White, and Woodruff. Of these 19 counties, Craighead and White are also in the top 10 counties for population and housing gains from 2000 to 2010.

The 2010 and 2013 updates to the All-Hazards Mitigation Plan both utilized the 2009 study, ***Impact of New Madrid Seismic Zone Earthquakes on the Central USA***, by the Mid-America Earthquake Center for loss estimation purposes. Thus, a comparison between the 2010 and 2013 updates would not present any changes in loss estimation.

❖ Consequence Analysis

The information in **Table 3.4.3.l** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.3.l EMAP Consequence Analysis: Earthquake

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Health and Safety of Persons Responding to the Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require relocation of operations and lines of succession execution.
Property, Facilities, and Infrastructure	Damage to facilities and infrastructure in the area of the incident may be extensive for facilities, people, infrastructure, and HazMat.
Delivery of Services	Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
The Environment	May cause extensive damage, creating denial or delays in the use of some areas. Remediation needed.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time.
Regulatory and Contractual Obligations	Regulatory waivers may be needed. Fulfillment of contracts may be difficult. Demands may overload ability to deliver.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.4 Expansive Soils

This Expansive Soil profile was developed in the original 2004 plan, amended in the 2007 update, modified in 2010, and again modified in 2013. The committee has updated this section and added new information when relevant. This hazard profile and the subsequent vulnerability analysis are the primary tools for the determination of the State's mitigation strategy with respect to expansive soil. Due to no reported occurrences of expansive soils in the past three years, no updates were made to the vulnerability profile for this hazard.

❖ *Description/Location*

Expansive soil (or swelling soil) is soil or soft rock that increases in volume when the moisture content of the soil increases and decreases in volume when moisture content decreases. The clay mineral montmorillonite, as well as other minerals of the smectite clay mineral group within the soil, is nearly always the cause of the volume change. When water is added to these expansive clay minerals, the water molecules are pulled or adsorbed into gaps between the clay plates. As more water is absorbed, the plates are forced farther apart, leading to an expansion of the soil's volume or an increase in soil pressure. In pure form, montmorillonite clays may swell to over 15 times their dry volume. Most soils, however, contain only small amounts of montmorillonite so that expansion of more than 1.5 times the dry soil volume is rare. The force of expansion is capable of exerting pressures of 15,000 pounds per square foot or greater on foundations, slabs, and other confining structures. The amount of swelling (or potential volume of expansion) is linked to five main factors: the type of mineral content, the concentration of swelling clay, the density of the materials, moisture changes in the environment, and the restraining pressure exerted by materials on top of the swelling soil. Each of these factors impact how much swelling a particular area will experience, but may be modified, for better or worse, by development actions in the area.

Expansive soils are present throughout the world and are found in each American state. Every year they cause billions of dollars in damage. The American Society of Civil Engineers estimates that 1/4 of all homes in the United States have some damage caused by expansive soils. In a typical year in the United States they cause a greater financial loss to property owners than earthquakes, floods, hurricanes and tornadoes combined. Even though expansive soils cause enormous amounts of damage most people have never heard of them. This is because their damage is done slowly and cannot be attributed to a specific event. The damage done by expansive soils is then attributed to poor construction practices or a misconception that all buildings experience this type of damage as they age.

Various studies estimate that expansive soils result in somewhere between $2 and $11 billion in annual losses in the United States, significantly more than other natural hazards. Other studies have suggested that approximately 10% of the new homes constructed annually in the United States are subjected to significant damage during their useful lives by expansive soils and an additional 60% of homes sustain minor damage.

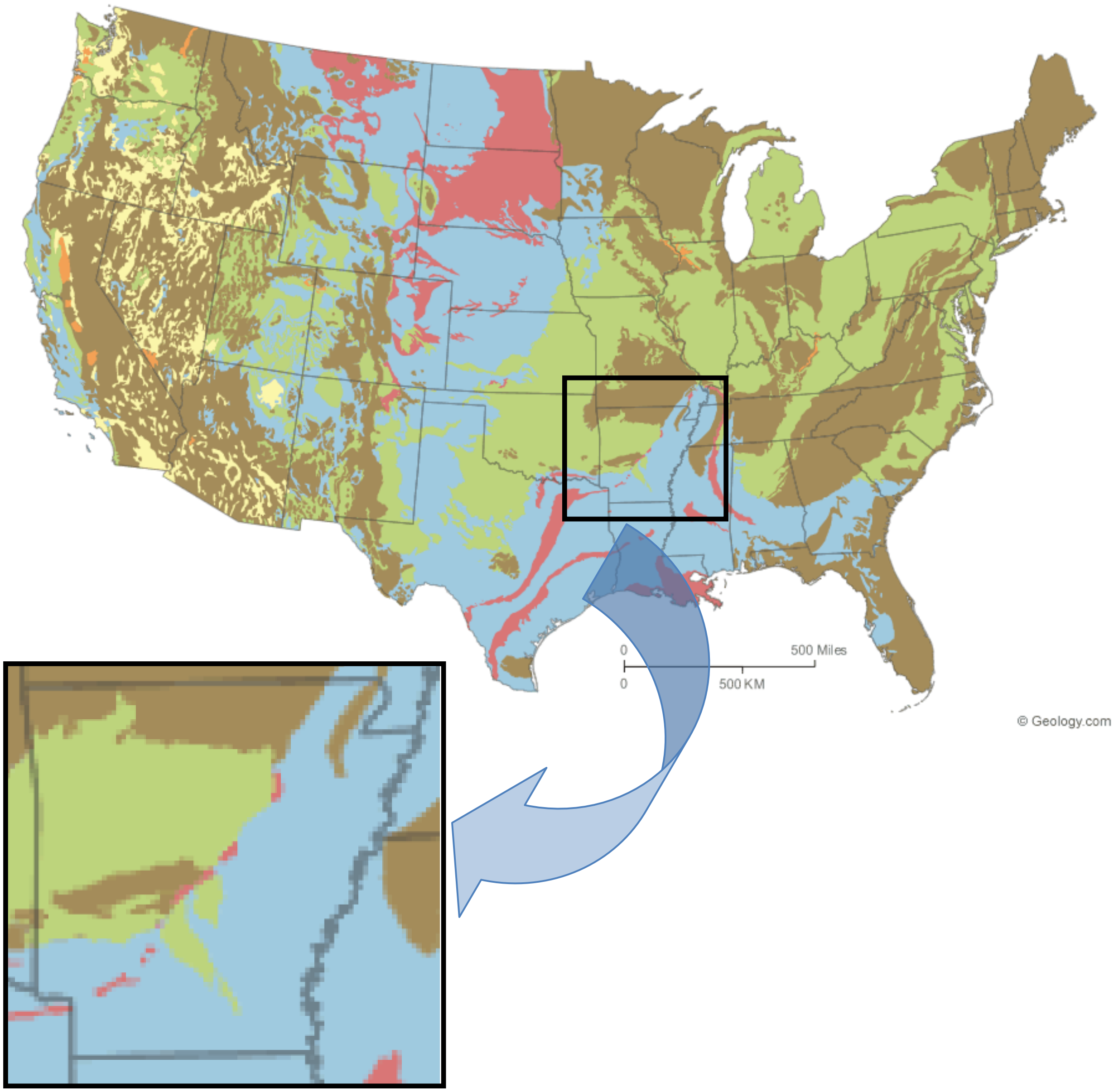
Expansive soils cause differential movement and horizontal pressure on structures resulting in cracked driveways, cracked sidewalks and basement floors, heaving of roads and highway structures and disruption of pipelines and sewer lines. Damage to homes can range from hairline plaster cracks and sticking doors to condemnation or complete destruction. Expansive soils occurring on slopes can also result in slow but damaging down-slope movement of material (creep) or even landslides.

Expansive clays in Arkansas are a source of concern because they shrink and swell according to their moisture content. If this uneven shrink and swell is not considered during construction, structures such as houses can literally break apart. Highways are also susceptible to damage from expansive clays resulting in higher maintenance costs. Many expansive soils problems can be accommodated through engineering techniques employed prior to construction.

In Arkansas, swelling soils expand and contract naturally during seasonal wetting (winter and spring) and drying (summer and fall) conditions and in their natural, undeveloped state they cause little damage. However, exposure to additional water sources, such as lawn and garden irrigation or precipitation drainage from houses, and reduced evaporation properties caused by the development of roads, sidewalks, buildings and parking lots, may cause the swelling soils to expand more than they would if they remained undeveloped. In addition, the grading of development areas may expose more swelling soil to moisture than the natural state, causing a more widespread swelling event.

Although all parts of Arkansas have the potential to be affected by expansive soils, they are most abundant in the southeastern part of the State within the Mississippi Alluvial Plain and Gulf Coastal Plain Physiographic Provinces (**Figure 3.4.4.a** and **inset**). The northern part of the State (northern Ozark Plateaus) and the central Ouachita Mountains are least affected by expansive soils.

Figure 3.4.4.a. Expansive Soil Map of the US



- Over 50 percent of these areas are underlain by soils with abundant clays of high swelling potential.
- Less than 50 percent of these areas are underlain by soils with clays of high swelling potential.
- Over 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.
- Less than 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.
- These areas are underlain by soils with little to no clays with swelling potential.
- Data insufficient to indicate the clay content or the swelling potential of soils.

In Arkansas, the clays of the Porters Creek Clay of the Midway Group are also highly expansive. 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 total thickness ranges from 3 to 40 meters, and the formation outcrops around the boundaries of the Mississippi Embayment, in the states of Mississippi, Tennessee, Kentucky, Illinois, Missouri and Arkansas. A general geologic description for the Midway Group (including the Porters Creek Clay):

> *The Midway Group is a sequence of "marginal marine" calcareous clay, claystones, clay shales, calcareous sandstones, and porous arenaceous limestones. Invertebrate fossils and fossilized reptile teeth are common. The Midway Group is locally divisible into two recognizable units: the Porters Creek Clay and the Clayton Limestone. The Porters Creek Clay is interval of dark bluish-gray to black calcareous clay sparsely fossiliferous with occasional fragments of limestone. The Porters Creek Clay contains highly expansive soils and is considered an aquitard, thus typically yields very little water to wells. Locally, outcrop thickness ranges from 0 to 130 feet and overlies the Clayton Limestone. The Clayton Limestone is comprised of thin to thick beds of white to light gray fossiliferous limestone, occasionally separated by thin clay beds and sandy intervals. The limestone is typically porous and fractured with varying thickness (up to 20 feet thick locally) and has a limited lateral extent. The Clayton Formation is considered a minor aquifer and typically yields sufficient water for household supplies. Locally, the units of the Midway Group will most likely occur as thin to thick lenticular bodies. This is due to either deposition on an irregular erosional surface, or by intermittent deposition interrupted by intervals of erosion. An unconformable surface separates the Midway Group from the underlying Paleozoic rocks at most localities.*

❖ Past Occurrences

Although expansive soils occur throughout much of Arkansas, the soils are rarely highly expansive; therefore, the average citizen does not notice their effects. Reports of severe damage to foundations are rare and not well documented. This data deficiency is addressed in Section 4.4.4 *2013 Updated Mitigation Actions*. Arkansas Geological Survey geologists have investigated but not formally documented moderate to severe expansive soil occurrences in southwest Little Rock (Pulaski County), Cabot (Lonoke County) and other locations in Lonoke County. Details of damage were not available. The Arkansas Highway and Transportation Department tests soils for expansivity (plasticity index) and engineers implement measures prior to road construction to mitigate damage. Roads built on highly expansive soils prior to the recognition of this hazard, such as parts of Interstate 30 between Little Rock (Pulaski County) and Arkadelphia (Clark County), have developed long wavelength "roller coaster" undulations.

❖ *Probability of Hazard Events*

Unlike other natural hazards discussed in this plan, expansive soil is a long-term condition that often causes incremental damage to a structure over a period of many years. It therefore cannot easily be attributed to an event or occurrence. When there is a significant natural or human induced excursion in expansive soil moisture content near a structure, accelerated damage may occur. Expansive soil events are potentially exacerbated during drought and wet cycles.

Although little noticed, soil expansion and contraction in the State is a high frequency/high probability event as it occurs daily and therefore causes damage to structures on a daily basis. This incremental damage, however, rarely leads to significant damage in Arkansas.

The probability of this event occurring in the southern and eastern portion of the State is higher than the central, northern or western region. Also, as the state experiences more issues with water levels along the Mississippi River and the Sparta Aquifer in the southeastern corner, this issue of expansive soil may begin to occur more frequently. Therefore, the APDMAC considers the probability for this hazard to be rising as more data is collected. Since there are no reported expansive soils events, the State's overall probability for this hazard is considered "**Unlikely**".

❖ *State Vulnerability Analysis*

The Assistant State Conservation Engineer and Senior Soil Scientist with the USDA Natural Resources Conservation Service provided GIS data for soils within Arkansas which have been interpreted to be very expansive down to a depth of 30 cm or greater. It was determined that by selecting soils depths 30cm or greater, soils that are only expansive at depths shallower than typical building foundations and/or sub-grades would be removed from consideration. This data along with census block data available in HAZUS MH 2.1 was used to determine the number and type of buildings within these identified expansive soil areas.

This methodology consisted of calculating the percentage of the census block areas inside the expansive soils areas. This percentage was then applied to the census block building data. This analysis provides a general picture of those counties that have more people and property within areas of expansive soils and therefore the potential for more damage if soil expansion were to occur.

Figure 3.4.4.b. depicts the 58 counties with soils interpreted to be very expansive down to a depth of 30cm or greater.

Figure 3.4.4.b. Arkansas Counties with Identified Expansive Soils

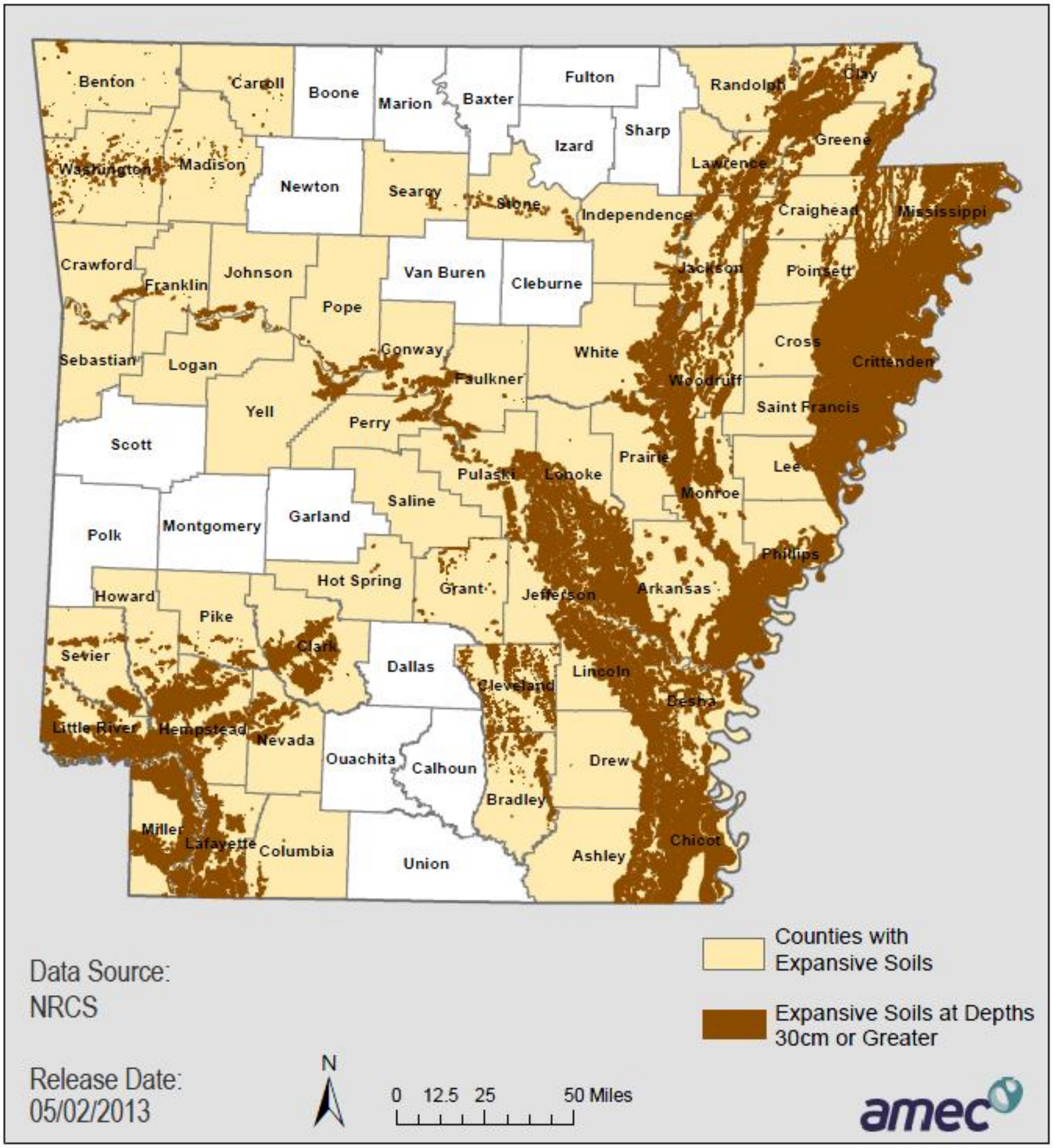


Table 3.4.4.a provides a breakdown by county of the percent of area with expansive soils and the estimated number of structures within the expansive soils areas. This data is to be used only for general determination of those areas that *could* suffer the greatest losses in the event of soil expansion events. Data limitations prevent a more accurate analysis including: lack of statewide parcel-type data which would provide more accurate results in determining structures within the soil expansion areas.

To complete the vulnerability analysis, a rating value of low, moderate, and high was assigned to each county based upon the percentage of expansive soils within the county. These rating values correspond to the following descriptive terms:

1) Low Vulnerability – Less than 10-percent expansive soils
2) Moderate Vulnerability – Between 10 and 35-percent expansive soils
3) High Vulnerability – Over 35-percent expansive soils within County

Table 3.4.4.a. Area and Building Counts within Identified Expansive Soil Areas in Arkansas Counties

County	% of Area within County with Expansive Soils	Residential Building Exposure in Expansive Soil Areas	Commercial Building Exposure in Expansive Soil Areas	Industrial Building Exposure in Expansive Soil Areas	Other Building Exposure in Expansive Soil Areas	Overall Vulnerability
Arkansas	21.89%	433	16	4	14	Moderate
Ashley	12.32%	142	6	2	5	Moderate
Benton	0.32%	207	7	1	3	Low
Bradley	4.24%	337	11	3	5	Low
Carroll	0.30%	640	32	6	7	Low
Chicot	53.59%	2074	88	21	45	High
Clark	12.72%	2294	86	27	32	Moderate
Clay	15.62%	397	8	1	10	Moderate
Cleveland	7.01%	326	7	3	6	Low
Columbia	0.88%	34	1	0	0	Low
Conway	6.09%	255	12	4	3	Low
Craighead	9.57%	282	12	3	8	Low
Crawford	1.54%	84	4	3	0	Low
Crittenden	69.69%	15267	713	151	197	High
Cross	30.54%	663	18	2	11	Moderate
Desha	27.58%	2158	86	13	40	Moderate
Drew	11.17%	231	6	2	4	Moderate

County	% of Area within County with Expansive Soils	Residential Building Exposure in Expansive Soil Areas	Commercial Building Exposure in Expansive Soil Areas	Industrial Building Exposure in Expansive Soil Areas	Other Building Exposure in Expansive Soil Areas	Overall Vulnerability
Faulkner	4.30%	466	21	8	5	Low
Franklin	0.82%	29	0	0	0	Low
Grant	0.82%	21	1	0	0	Low
Greene	24.19%	536	32	4	23	Moderate
Hempstead	29.10%	1771	52	25	26	Moderate
Hot Spring	0.08%	12	0	0	0	Low
Howard	7.69%	409	5	4	4	Low
Independence	2.63%	56	2	0	2	Low
Jackson	13.13%	271	8	2	7	Moderate
Jefferson	31.62%	1134	38	11	29	Moderate
Johnson	1.09%	99	2	0	1	Low
Lafayette	33.15%	1114	12	5	11	Moderate
Lawrence	12.26%	323	7	1	11	Moderate
Lee	25.14%	238	8	2	8	Moderate
Lincoln	30.70%	674	6	1	10	Moderate
Little River	31.67%	2418	100	24	46	Moderate
Logan	0.94%	35	1	0	1	Low
Lonoke	20.35%	723	31	5	29	Moderate
Madison	0.29%	22	0	0	0	Low
Miller	32.10%	474	15	5	4	Moderate
Mississippi	47.91%	4083	117	37	92	High
Monroe	27.83%	576	15	1	7	Moderate
Nevada	4.21%	279	8	5	4	Low
Perry	3.11%	147	3	1	3	Low
Phillips	30.97%	1018	28	3	35	Moderate
Pike	2.37%	166	0	0	0	Low
Poinsett	31.78%	2587	92	27	54	Moderate
Pope	1.62%	119	6	4	2	Low
Prairie	13.61%	339	0	0	1	Moderate
Pulaski	10.28%	1681	600	45	23	Moderate
Randolph	4.77%	98	1	0	3	Low

County	% of Area within County with Expansive Soils	Residential Building Exposure in Expansive Soil Areas	Commercial Building Exposure in Expansive Soil Areas	Industrial Building Exposure in Expansive Soil Areas	Other Building Exposure in Expansive Soil Areas	Overall Vulnerability
Saline	0.03%	0	1	1	0	Low
Searcy	0.30%	158	1	0	1	Low
Sebastian	1.06%	651	18	4	5	Low
Sevier	7.58%	1221	62	11	9	Low
St. Francis	35.75%	1462	43	5	24	High
Stone	1.55%	91	4	1	1	Low
Washington	2.00%	651	31	12	10	Low
White	10.06%	296	12	1	3	Moderate
Woodruff	23.29%	1021	25	3	10	Moderate
Yell	2.31%	114	1	0	0	Low

Source: NRCS and HAZUS MH 2.1

According to this analysis, Chicot, Crittenden, Mississippi, and St. Francis Counties have the largest area of expansive soils at over 35-percent of the total county area. For those counties with a moderate to high vulnerability rating, Chicot, Clark, Crittenden Desha, Little River, Mississippi, Poinsett, and Pulaski have over 2,000 structures currently located within an identified expansive soils area.

❖ *State Estimates of Potential Losses*

To estimate potential losses associated with expansive soils, the NRCS soils data along with census block data available in HAZUS MH 2.1 was used to determine the building values within the identified expansive soil areas of Counties with a moderate to high vulnerability rating (see **Table 3.4.4.b**). This methodology consisted of calculating the percentage of the census block areas inside the expansive soils areas. This percentage was then applied to the HAZUS MH 2.1 building data.

Table 3.4.4.b. Building Values within Identified Expansive Soil Areas

County	Structure Value Exposure in Expansive Soil Areas ($1,000)	Contents Value Exposure in Expansive Soil Areas ($1,000)	Total Building Exposure Value in Expansive Soil Areas ($1,000)
Arkansas	$ 52,741	$ 31,501	$ 84,241
Ashley	$ 14,757	$ 10,235	$ 24,992
Chicot	$ 252,529	$ 175,074	$ 427,603

County	Structure Value Exposure in Expansive Soil Areas ($1,000)	Contents Value Exposure in Expansive Soil Areas ($1,000)	Total Building Exposure Value in Expansive Soil Areas ($1,000)
Clark	$ 241,299	$ 149,237	$ 390,536
Clay	$ 40,604	$ 23,718	$ 64,322
Crittenden	$ 2,549,290	$ 1,600,950	$ 4,150,240
Cross	$ 62,002	$ 37,667	$ 99,668
Desha	$ 250,075	$ 156,170	$ 406,245
Drew	$ 22,494	$ 13,093	$ 35,586
Greene	$ 78,298	$ 47,741	$ 126,039
Hempstead	$ 197,548	$ 143,217	$ 340,765
Jackson	$ 31,498	$ 18,372	$ 49,869
Jefferson	$ 125,805	$ 77,402	$ 203,207
Lafayette	$ 78,537	$ 43,659	$ 122,196
Lawrence	$ 28,818	$ 16,682	$ 45,500
Lee	$ 31,295	$ 17,210	$ 48,505
Lincoln	$ 86,087	$ 46,445	$ 132,531
Little River	$ 304,194	$ 198,271	$ 502,465
Lonoke	$ 88,516	$ 52,634	$ 141,150
Miller	$ 52,485	$ 28,725	$ 81,210
Mississippi	$ 538,206	$ 348,351	$ 886,556
Monroe	$ 58,543	$ 33,229	$ 91,772
Phillips	$ 79,185	$ 49,898	$ 129,083
Poinsett	$ 346,839	$ 225,017	$ 571,856
Prairie	$ 33,224	$ 16,676	$ 49,900
Pulaski	$ 1,246,580	$ 1,154,077	$ 2,400,657
St. Francis	$ 138,711	$ 90,137	$ 228,849
White	$ 26,588	$ 15,239	$ 41,827
Woodruff	$ 102,836	$ 61,826	$ 164,662

Source: NRCS and HAZUS MH 2.1

❖ *Development in Hazard Prone Areas*

An analysis of development growth in counties with expansive soils, and moderate to high vulnerability, revealed the following counties had housing unit gains from 2000 to 2010: Clark, Crittenden, Drew, Greene, Hempstead, Little River, Lonoke, Miller, Pulaski, and White. Pulaski, Lonoke, and White Counties were among the top 10 counties with greatest housing gains. If additional development and population growth begins to occur in expansive soils areas, this will increase the vulnerability. The development and implementation of building codes which address expansive soils is a recommended mitigation action for each identified County. **Table 3.4.4.c** compares the loss estimations based on exposure from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these three counties with housing unit gains.

Table 3.4.4.c Comparison of Building Exposure within Identified Expansive Soil Areas[1]

County	Total Building Exposure Value 2010 Plan	Total Building Exposure Value 2013 Plan	Comparison
Lonoke	N/A	$141,150	Comparison is not available.
Pulaski	N/A	$ 2,400,657	Comparison is not available.
White	N/A	$41,827	Comparison is not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

❖ *Consequence Analysis*

The information in **Table 3.4.4.d** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.4.d EMAP Consequence Analysis: Expansive Soils

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be moderate to severe for incident areas.
Health and Safety of Persons Responding to the Incident	Limit impacts to personnel responding to the incident.
Continuity of Operations	Limited, unless facility is impacted.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads and/or utilities may postpone delivery of some services.
The Environment	Localized impact expected to be moderate for incident area.
Economic and Financial Condition	Limited. Local economy and finances may be adversely affected, depending on damage.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Localized impact expected to primarily adversely affect property owner(s) confidence in local entities development policies.

3.4.5 Flood

❖ *Description/Location*

During the twentieth century, floods were the leading natural disaster in the United States, representing 40 percent of all natural disasters in terms of number of lives lost and property damaged. The U.S. Geological Survey reports that nationwide, floods kill an average of 140 people each year and cause $6 Billion in property damage.

Flooding is defined as the accumulation of water within a water body and the overflow of excess water onto the adjacent floodplain, causing land that is normally dry to be inundated. Flooding is a natural process of over-bank flow. Floods may result from many causes. Most floods are caused by heavy rainfall from storms or thunderstorms that generate excessive runoff. A riverine flood is a flood caused by precipitation, runoff or snowmelt over a relatively large watershed causing flooding over wide areas and cresting in over eight hours. A flash flood is a flood caused by heavy precipitation or snowmelt over a limited watershed (typically fewer than 50 square miles), crests in eight hours or less time, and generally occurs in hilly terrain. Riverine floods have relatively low velocity, cover a large area of land, and take longer to recede, whereas flash floods have a higher velocity and may recede quickly. A flash flood can also occur when extreme amounts of precipitation fall on any terrain if the precipitation accumulates more rapidly than the terrain can allow runoff.

Figure 3.4.5.a Flood Waters Surround a Residence

Source: 2010 Arkansas State Hazard Mitigation Plan

Arkansas is vulnerable to both Flash Flooding and Riverine Flooding.

Flash Flooding

Flash floods pose more significant safety risks than other riverine floods because of the rapid onset, the high water velocity, the potential for channel scour and the debris load. Flash flooding results from intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil or impermeable surfaces. Debris carried by floods can damage or destroy structures in its path. In addition, more than one flood crest may result from a series of fast moving storms. Sudden destruction of structures and the washout of access routes may result in the loss of life.

Figure 3.4.5.b Flash Flooding

Source: 2010 Arkansas State Hazard Mitigation Plan

Flood damage is generally proportional to the volume and the velocity of the water. Floods are extremely dangerous because they cause damage through inundation and soaking as well as the incredible force of moving water. High volumes of water can move heavy objects and undermine roads and bridges. Although rural flooding is dangerous to fewer people and may be less costly than urban flooding, it can cause great damage to agricultural operations. Flooding can also facilitate other hazards such as landslides, or cause other hazards such as hazardous material events.

Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is an extremely dangerous form of flooding which can reach full peak in only a few minutes and allows little or no time for protective measures to be taken by those in its path. Flash flooding often results in higher loss of life, both human and animal, than slower developing river and stream flooding.

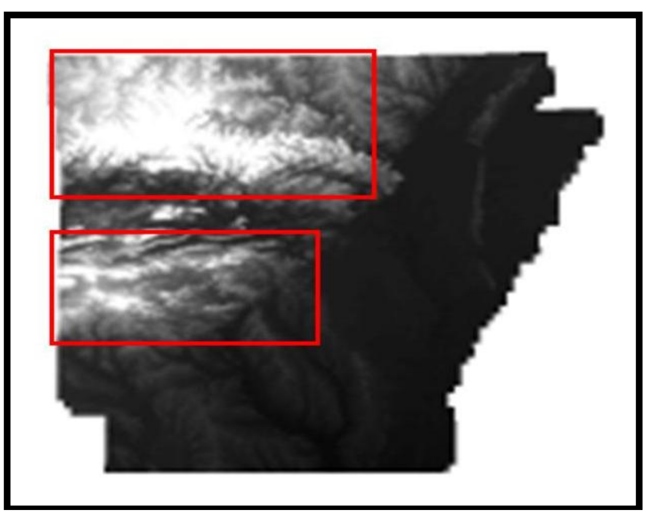
In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations–areas that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

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

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

Flash floods are most common in the western half of the State. The Ozark Plateaus, Ouachita Mountains and the Gulf Coastal Plain Physiographic Provinces that comprise much of this area exhibit high to moderate relief, steep to moderate slopes and bedrock with low permeability, all facilitating rapid runoff and the consequent potential for flash floods. Urban development in this part of the state exacerbates the flash flooding problem. The map shows topographic features of the State. The lighter areas on the maps show the more elevated areas of the State.

Figure 3.4.5.c   Topographic Features of Arkansas



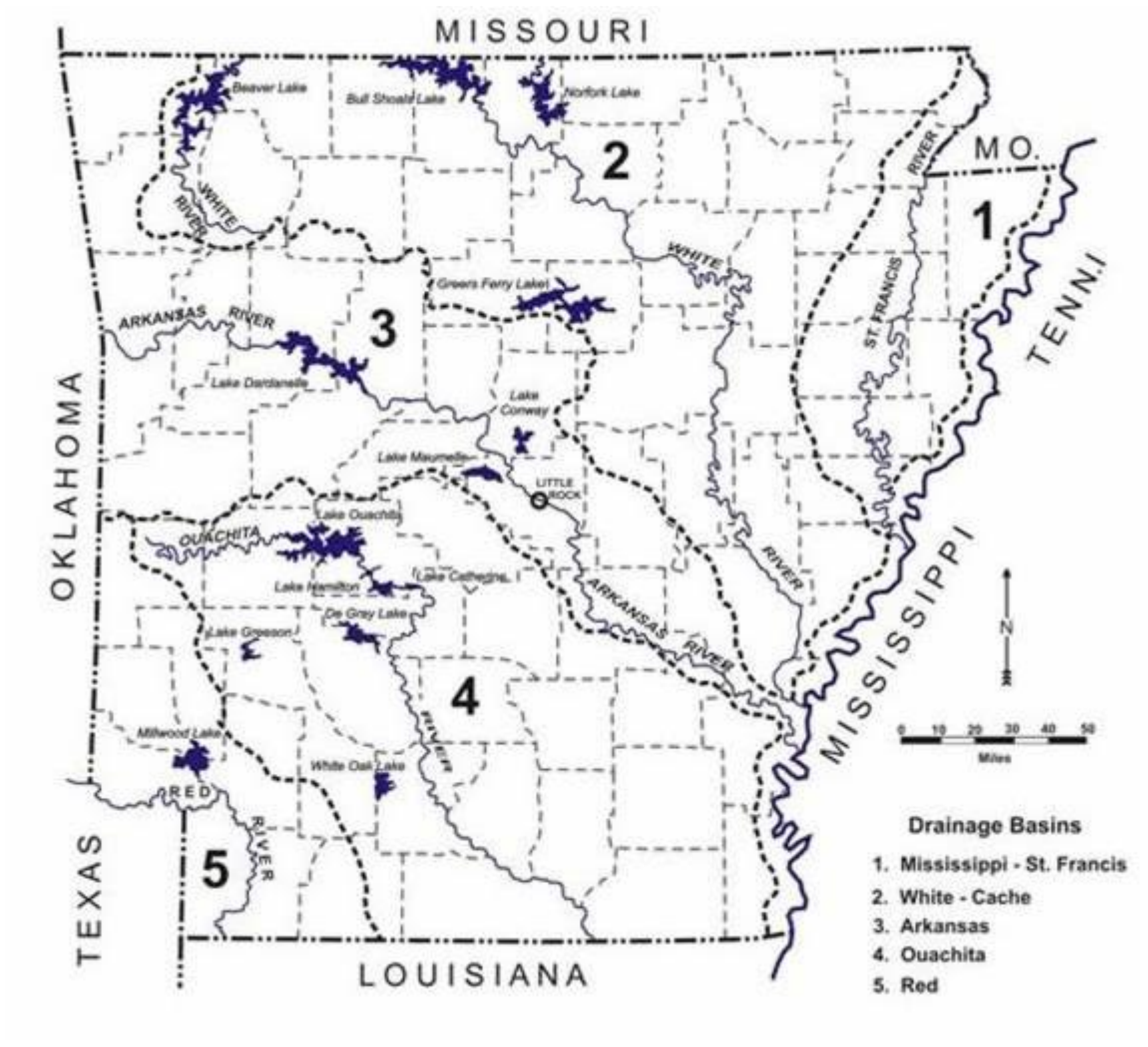
Source: 2010 State Hazard Mitigation Plan

Flood

Riverine Flooding

Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. Floodplains are a larger entity called a basin, which is defined as all the land drained by a river and its branches. The surface waters of Arkansas flow through 5 major drainage basins in the State as shown in **Figure 3.4.5.d**. They are: 1) the Mississippi-St. Francis, 2) the Arkansas, 3) the White-Cache, 4) the Ouachita, and 5) the Red.

Figure 3.4.5.d Five Major River Basins in Arkansas



Source: Arkansas Geological Survey, http://www.geology.ar.gov/water/surface_water.htm, Howard, J.M., Colton, G.W., and Prior, W.L., eds., 1997, Mineral, fossil-fuel, and water resources of Arkansas: Arkansas Geological Commission Bulletin 24

A floodplain is the normally dry, flat area of land adjoining the channel of a stream, watercourse or other water body, such as a lake or reservoir that is susceptible to inundation by floodwater and stream-borne sediments. Floodplains can be managed to mitigate against damage from floodwaters. Zoning regulations commonly prohibit development in floodplain areas. The terms "base flood" and "100-year flood" refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. The floodway is the channel of a watercourse and those portions of the adjoining floodplain providing the passage of the one percent annual chance flood volume. The floodway fringe is the portion of the floodplain where complete development will cause significant rise (typically one foot) in the floodplain. Damage from flooding depends on the amount of development.

Despite the hazards, floodplains have been developed with structures. Floodplains are attractive to developers because there are no topographic constraints on construction (no hills), they contain fertile alluvial soil and an abundant water supply, and they provide access to transportation, commerce, energy, and wastewater disposal.

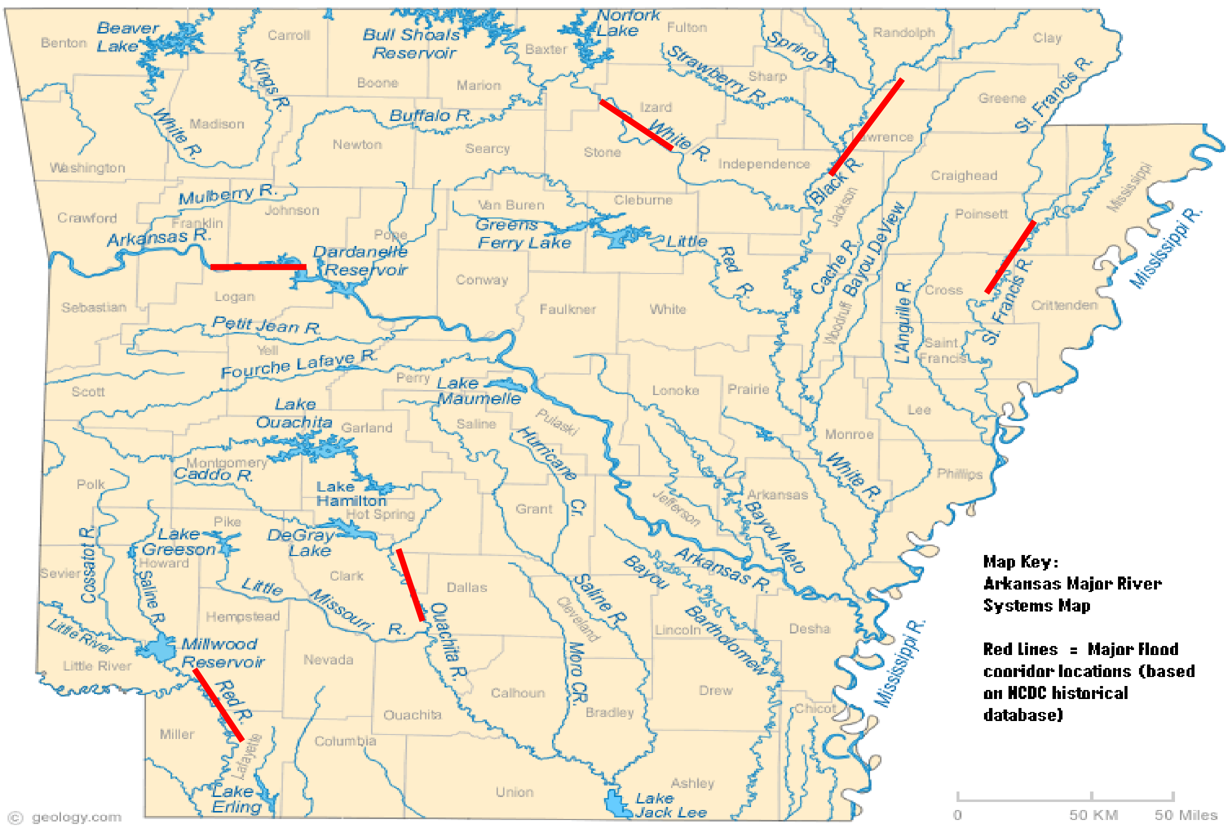
Undeveloped floodplains offer many benefits to communities. Floodplains act as natural flood-storage areas, decreasing the destructive force of floodwaters downstream. Biological activity, chemical processes and filtration of floodwaters on floodplains can reduce flood-generated pollution from agricultural and urban runoff and sewage overflow. Floodplain vegetation reduces soil erosion, reduces velocity of floodwaters, traps floodwater sediment increasing soil fertility and reduces sediment load downstream. High sediment load reduces biological activity and aesthetic and recreational value. Floodplain vegetation also shades streams, reducing water temperature and providing a habitat for organisms promoting biodiversity and productivity. Floodplains preserve and recharge groundwater supplies and provide opportunities for recreation, outdoor education and scientific study.

Figure 3.4.5.e Natural Floodplain

Source: 2010 State Hazard Mitigation Plan

Riverine floods are most common in the Mississippi Embayment of the eastern half of the state and along the Arkansas River in the Arkansas Valley Province in the western part of the State. These areas exhibit low relief and typically have flat, broad floodplains. Larger rivers including the Mississippi, Arkansas, St. Francis, White, Ouachita and Red Rivers, are most prone to riverine flooding. In total, there are about 87,617 miles of streams and rivers in and around the State of Arkansas.

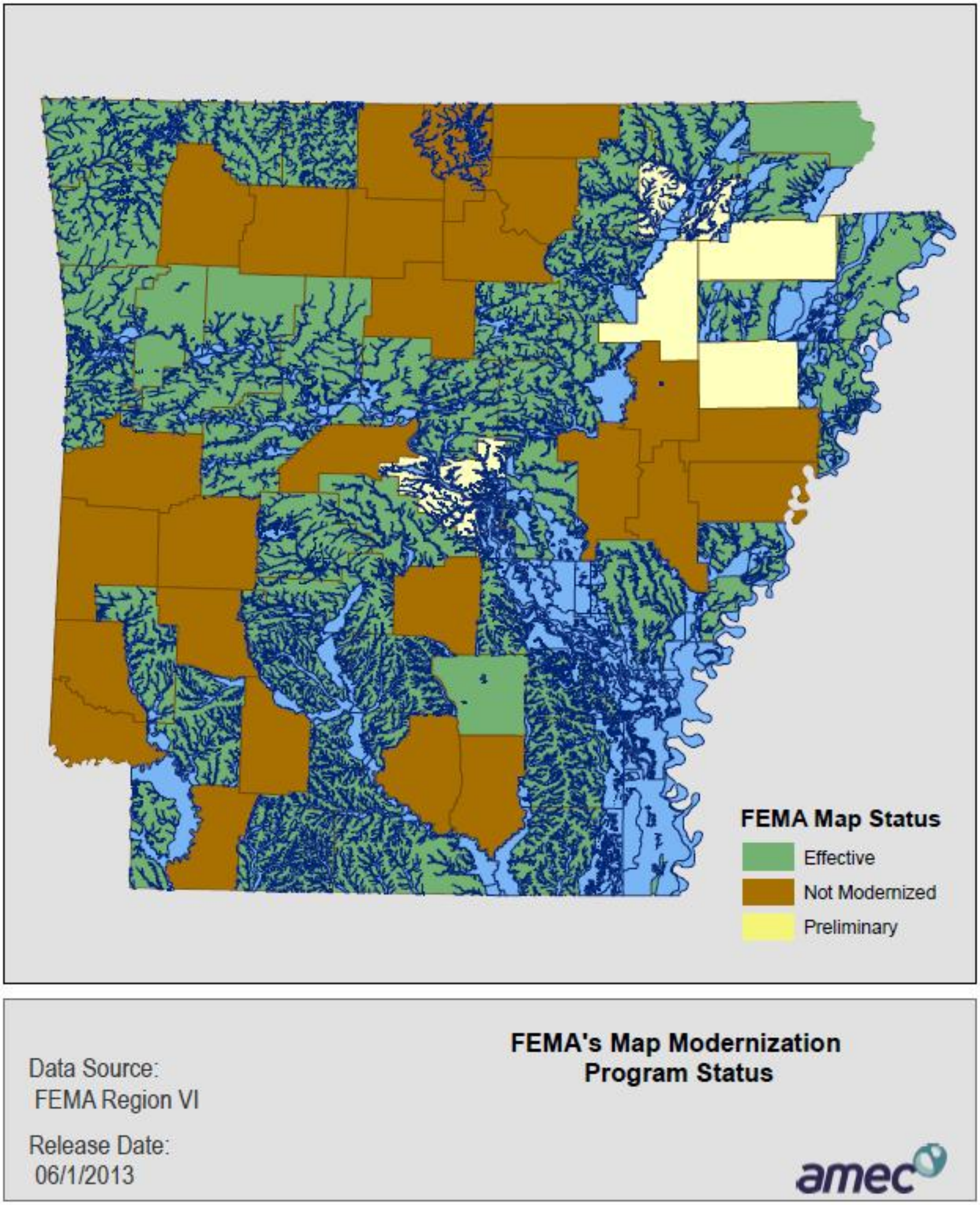
Figure 3.4.5.f Rivers in Arkansas



Source: 2010 State Hazard Mitigation Plan

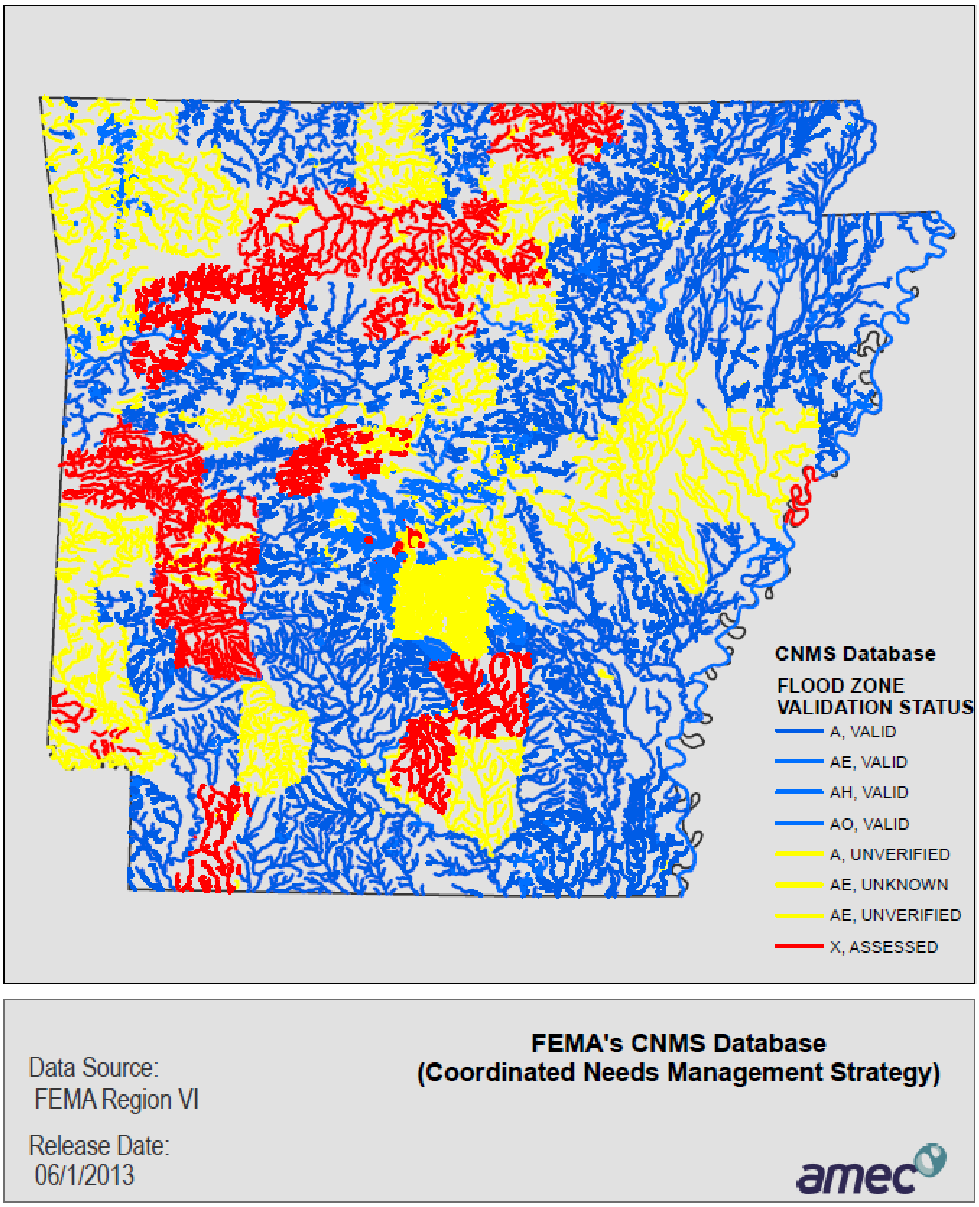
The 1-percent annual chance floodplain boundaries for the rivers in Arkansas are available digitally through FEMA’s Map Modernization Program for the majority of the State. In 2004, FEMA began a 5 year program to update flood maps nationwide. Initially, the Map Modernization Program planned to revise flood maps for all communities throughout the Nation, including Arkansas. However, funds were insufficient to accomplish this ambitious goal and modernization efforts are ongoing within the State. Figure 3.4.5.g presents the 1-percent annual chance floodplain boundaries for counties with currently effective digital flood insurance rate maps, as well as the status of Map Modernization within the State.

Figure 3.4.5.g Arkansas 1-Percent Annual Chance Floodplains and DFIRM Status



In continuation of the Map Modernization Program, FEMA uses modern geospatial technologies and current FEMA policies, requirements, and procedures to coordinate the management of mapping needs in a comprehensive approach. This is referred to as the Coordinated Needs Management Strategy (CNMS). CNMS uses existing digital map data to inventory and manage flood map update issues and support FIRM revision and production planning activities. Figure 3.4.5.h presents the current status of flood studies within the State of Arkansas as included in the CNMS inventory. The counties with current effective or preliminary maps show the flood zones as valid. For those counties that are not yet modernized, the unverified flood zones and unstudied or un-assessed areas are noted in yellow and red, respectively.

Figure 3.4.5.h Arkansas 1-Percent Annual Chance Floodplains and DFIRM Status



Groundwater Levels Contribute to Flooding

High groundwater levels may also cause flooding problems even where there is no surface flooding. Basements are susceptible to flooding from high groundwater levels. Seasonally, high groundwater is common in many areas of Arkansas, while in other areas groundwater is high only after long periods of above average precipitation. Data is collected on an ongoing basis about flooding and the natural conditions that cause these events. Ground water levels in the State effect a number of items.

- Flooding and flash flooding
- Drought
- Expansive soils

Arkansas is the fourth largest user of ground water in the United States. The Mississippi River Valley alluvial aquifer (alluvial aquifer) is a water-bearing assemblage of gravels and sands that underlies most of eastern Arkansas and several adjacent states. Ground-water withdrawals have caused cones of depressions to develop in the alluvial aquifer water-level surface, some as much as 100 feet deep. Long-term water-level measurements show an average annual decline of one foot per year in some areas.

The Sparta Aquifer is largely a confined aquifer of regional importance that comprises a sequence of unconsolidated sand, silt and clay units. Several large cones of depression have developed in the Sparta Aquifer, causing hydraulic heads to drop below the top of the formation in parts of central and southern Arkansas and several areas in north-central Louisiana.

Through analysis of existing Federal Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FISs), National Climatic Data Center (NCDC) data, National Inventory of Dams data, and locations of past federally declared flood disasters, the APDMAC determined that every county in the State can be affected by flooding. As a high-level example of the geographic dispersion of flooding throughout the State, the APDMAC reviewed the counties affected by the past federally declared events that involved flooding. Since 1957 when FEMA began this program, practically every county has been part of a declared flooding event.

❖ *Previous Occurrences*

The National Climactic Data Center (NCDC) severe storms database includes a database of flood events in Arkansas since 1993. Considering the categories of flash flood, urban/small stream flood, river flood, and flood in Arkansas there were 2,665 events between 1993 and 2012 (20 years). Total property damage for these events is estimated at $476,139,880. There were 55 deaths and 42 injuries in this time period. **Table 3.4.5.a** provides the number of events reported for each county in Arkansas during this 20-year period.

Table 3.4.5.b provides information on Presidential Disaster Declarations, including impacted counties, when available. Fifty-nine of the 75 Arkansas counties have been part of FEMA declared flooding-related events in only the past three years.

Table 3.4.5.a. Flood events in Arkansas by County, 1993-2012 as reported by the NCDC

County	# of Events	Reported Property Damages	County	# of Events	Reported Property Damages
Arkansas	33	$2,780,000	Lee	5	$11,000
Ashley	24	$1,459,000	Lincoln	23	$2,151,000
Baxter	33	$7,729,000	Little River	20	$610,000
Benton	44	$2,735,000	Logan	24	$15,711,000
Boone	29	$2,919,000	Lonoke	36	$4,915,000
Bradley	25	$3,441,000	Madison	47	$685,000
Calhoun	44	$3,779,000	Marion	22	$1,419,000
Carroll	33	$735,000	Miller	32	$2,114,000
Chicot	25	$3,059,000	Mississippi	20	$80,000
Clark	62	$4,608,500	Monroe	36	$4,307,000
Clay	20	$1,817,510	Montgomery	23	$9,439,500
Cleburne	29	$5,336,000	Nevada	20	$167,000
Cleveland	30	$2,101,000	Newton	28	$4,650,900
Columbia	34	$131,690,000	Ouachita	45	$5,806,000
Conway	33	$2,616,000	Perry	39	$1,638,000
Craighead	52	$1,287,000	Phillips	10	$1,103,500
Crawford	51	$1,275,000	Pike	24	$776,500
Crittenden	16	$68,000	Poinsett	22	$537,000
Cross	7	$279,000	Polk	35	$1,206,500
Dallas	28	$3,412,000	Pope	27	$3,370,100
Desha	21	$9,256,000	Prairie	35	$11,750,000
Drew	33	$1,242,000	Pulaski	114	$24,946,000
Faulkner	53	$4,407,000	Randolph	25	$7,814,000
Franklin	42	$820,000	Saline	58	$9,793,000
Fulton	29	$5,573,000	Scott	32	$1,524,000
Garland	48	$4,061,350	Searcy	24	$2,856,700
Grant	25	$2,751,000	Sebastian	57	$4,205,000
Greene	24	$481,520	Sevier	16	$135,000
Hempstead	31	$650,000	Sharp	46	$21,475,000
Hot Spring	41	$1,340,000	St. Francis	10	$55,000
Howard	26	$1,365,000	Stone	34	$9,258,000
Independence	58	$22,734,000	Union	39	$3,070,000
Izard	26	$15,440,000	Van Buren	23	$3,385,000
Jackson	44	$6,302,000	Washington	78	$8,485,000
Jefferson	38	$4,733,000	White	91	$15,302,200
Johnson	38	$2,510,500	Woodruff	90	$5,254,600
Lafayette	19	$305,000	Yell	49	$5,093,000
Lawrence	22	$11,426,000	Reported Multi-County	36	$2,517,000
			Total	**2665**	**$476,139,880**

Source: NCDC

Flood

Table 3.4.5.b. Arkansas Presidential Declarations Involving Flooding

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
7/8/2011	FEMA-4000-DR	Severe Storms, Tornadoes, and Flooding	3	Crawford, Franklin, Johnson	PA-$2,648,119 IA- $1,754,571
5/2/2011	FEMA-1975-DR	Severe Storms, Tornadoes and Associated Flooding	59	Arkansas, Baxter, Benton, Boone, Bradley, Calhoun, Carroll, Chicot, Clark, Clay, Cleburne, Cleveland, Conway, Craighead, Crawford, Crittenden, Dallas, Desha, Faulkner, Franklin, Fulton, Garland, Greene, Hot Spring, Howard, Independence, Izard, Jefferson Jackson, Johnson, Lawrence, Lee, Lincoln, Lonoke, Madison, Marion, Mississippi, Monroe, Montgomery, Nevada, Newton, Perry, Phillips, Pike, Poinsett, Polk, Prairie, Pulaski, Randolph, Saint Francis, Saline, Searcy, Sharp, Stone, Van Buren, Washington, White, Woodruff and Yell .	PA-$47,127,416 IA-$24,301,705
2/4/2010	FEMA-1872-DR	Severe Storms and Flooding	25	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.	PA-$9,933,649
12/3/2009	FEMA-1861-DR	Severe Storms, Tornadoes, and Flooding	38	Boone, Bradley, Calhoun, Carroll, Cleburne, Cleveland, Columbia, Conway, Cross, Dallas, Drew, 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.	PA-$15,550,793
6/16/2009	FEMA-1845-DR	Severe Storms, Tornadoes, and Flooding	38	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, Saint Francis, Saline, Searcy, Stone and Union.	PA-$9,594,421
10/22/2008	FEMA-1804-	Tropical Storm Ike	20	Carroll, Clark, Clay, Craighead, Greene, Hempstead,	PA-$2,616,028

Flood

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
	DR			Howard, Izard, Lafayette, Lawrence, Little River, Madison, Miller, Montgomery, Nevada, Newton, Pike, Randolph, Sharp and Van Buren	
9/18/2008	FEMA-1793-DR	Severe Storms and Flooding Associated With Hurricane Gustav	18	Ashley, Bradley, Calhoun, Chicot, Clark, Cleveland, Conway, Dallas, Drew, Garland, Grant, Hot Spring, Lincoln, Montgomery, Perry, Prairie, Saline and Van Buren.	PA-$3994,227
5/20/2008	FEMA-1758-DR	Severe Storms, Flooding, and Tornadoes	12	Arkansas, Benton, Cleburne, Conway, Crittenden, Grant, Lonoke, Mississippi, Phillips, Pulaski, Saline and Van Buren.	IA-$2474,245 PA-$2,752,278
3/26/2008	FEMA-1751-DR	Severe Storms, Flooding, and Tornadoes	50	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, Saint Francis, Saline, Scott, Searcy, Sebastian, Sharp, Stone, Van Buren, Washington, White, Woodruff and Yell	IA-11,675,465 PA-$41,116,383
2/7/2008	FEMA-1744-DR	Severe Storms, Tornadoes, and Flooding	10	Baxter, Conway, Izard, Marion, Newton, Pope, Randolph, Sharp, Stone, and Van Buren	IA-$4,360,723 PA-$5,020,006
6/30/2004	FEMA-1528-DR	Severe Storm, Flooding	14	Benton, Bradley, Calhoun, Clark, Columbia, Franklin, Hempstead, Howard, Lafayette, Little River, Nevada, Ouachita, Pike and Sevier.	PA-$3,348,751
5/7/2004	FEMA-1516-DR	Severe Storms, Flooding, and Landslides	14	Baxter, Boone, Carroll, Franklin, Independence, Jackson, Johnson, Madison, Marion, Newton, Searcy, Stone, Washington and Woodruff.	PA-$7,197,835
6/6/2003	FEMA-1472-DR	Severe Storms, Tornadoes and Flooding	21	Benton, Chicot, Cleburne, Columbia, Conway, Craighead, Crittenden, Cross, Faulkner, Fulton, Independence, Jackson, Lonoke, Madison, Nevada, Newton, Phillips, Saint Francis, Van Buren, White, and Woodruff	IA-$7,297,676 PA-$5,3305,934
1/24/2002	FEMA-1400-DR	Severe Storms and Flooding	20	Ashley, Clay, Cleburne, Columbia, Craighead, Crittenden, Franklin, Greene, Independence, Jackson, Lincoln, Little	PA-$2,225,171

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
				River, Logan, Monroe, Poinsett, Prairie, Scott, Stone, White and Woodruff.	
3/13/2001	FEMA-1363-DR	Storms and Flooding	22	Bradley, Clark, Cleveland, Columbia, Conway, Craighead, Dallas, Drew, Franklin, Hempstead, Hot Spring, Lafayette, Lincoln, Little River, Miller, Nevada, Newton, Ouachita, Polk, Prairie, Union and White.	PA-$3,019,659
1/23/1999	FEMA-1266-DR	Severe Storms, Tornadoes, High Winds and Flooding	16	Bradley, Chicot, Clay, Columbia, Drew, Faulkner, Grant, Hempstead, Jackson, Jefferson, Lafayette, Lonoke, Poinsett, Randolph, Saint Francis, and White	IA-$0 PA-$7,265,330
4/14/1997	FEMA-1176-DR	Flooding, Severe Storms	28	Bradley, Clay, Cleburne, Cleveland, Columbia, Craighead, Dallas, Drew, Faulkner, Grant, Greene, Izard, Jackson, Jefferson, Lafayette, Lincoln, Lonoke, Monroe, Montgomery, Ouachita, Poinsett, Saint Francis, Searcy, Sharp, Stone, Union, Van Buren and White.	IA & PA, Amounts Not Available
5/30/1991	FEMA-907-DR	Severe Storms and Flooding	21	Ashley, Bradley, Chicot, Cleveland, Columbia, Dallas, Desha, Fulton, Izard, Lafayette, Lee, Little River, Madison, Nevada, Ouachita, Polk, Scott, Sharp, Stone, Union and Van Buren.	PA Only, Amounts Not Available
5/15/1990	FEMA-865-DR	Severe Storms and Flooding	37	Benton, Boone, Calhoun, Carroll, Clark, Clay, Columbia, Conway, Crawford, Desha, Faulkner, Franklin, Garland, Hempstead, Hot Spring, Izard, Jefferson, Johnson, Lafayette, Little River, Logan, Madison, Marion, Miller, Monroe, Newton, Ouachita, Perry, Pike, Polk, Pope, Pulaski, Scott, Sebastian, Stone, Union and Yell.	IA & PA, Amounts Not Available
12/31/1987	FEMA-807-DR	Severe Storms and Flooding	11	Arkansas, Crittenden, Cross, Lee, Lonoke, Mississippi, Monroe, Ouachita, Poinsett, Pulaski and Woodruff.	Amounts Not Available
8/1/1983	FEMA-688-DR	Severe Storms and Flooding	5	Hempstead, Howard, Little River, Pike, and Sevier	PA Only-Amounts Not Available
12/13/1982	FEMA-673-DR	Severe Storms, Tornadoes and Flooding	38	Baxter, Clay, Cleburne, Conway, Craighead, Crawford, Desha, Faulkner, Fulton, Garland, Hempstead, Hot Spring,	PA & IA Amounts Not Available

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
				Independence, Izard, Jackson, Johnson, Lawrence, Little River, Marion, Miller, Monroe, Montgomery, Newton, Perry, Pike, Polk, Pope, Pulaski, Randolph, Saline, Scott, Searcy, Sevier, Sharp, Stone, Van Buren, Woodruff and Yell.	
9/15/1978	FEMA-564-DR	Severe Storms and Flooding	2	Pulaski and Saline	IA & PA, Amounts Not Available
6/7/1975	FEMA-471-DR	Heavy Rains and Flooding	7	Independence, Izard, Jefferson, Monroe, Randolph, Sharp, and White	IA & PA, Amounts Not Available
6/8/1974	FEMA-437-DR	Severe Storms and Flooding	8	Benton, Columbia, Garland, Jefferson, Johnson, Madison, Saint Francis, and Union	IA & PA, Amounts Not Available
5/31/1974	FEMA-435-DR	Heavy Rains and Flooding	1	Phillips	IA & PA, Amounts Not Available
5/29/1973	FEMA-389-DR	Severe Storms and Flooding	5	Craighead, Crawford, Crittenden, Jackson, and Poinsett	IA & PA, Amounts Not Available
4/27/1973	FEMA-375-DR	Severe Storms and Flooding	43	Arkansas, Ashley, Benton, Boone, Bradley, Calhoun, Chicot, Clark, Clay, Cleveland, Columbia, Craighead, Crittenden, Cross, Dallas, Desha, Drew, Fulton, Garland, Greene, Hempstead, Howard, Independence, Izard, Jackson, Jefferson, Lawrence, Lee, Lincoln, Madison, Mississippi, Monroe, Montgomery, Phillips, Pike, Poinsett, Pulaski, Randolph, Saint Francis, Saline, Union, Washington and Woodruff.	IA & PA, Amounts Not Available
1/27/1972	FEMA-321-DR	Severe Storms and Flooding	27	Baxter, Benton, Boone, Carroll, Conway, Crawford, Franklin, Fulton, Hempstead, Howard, Izard, Johnson, Little River, Logan, Madison, Marion, Miller, Montgomery, Newton, Perry, Polk, Scott, Sebastian, Sevier, Stone, Washington and Yell.	PA Only, Amounts Not Available

Source: FEMA, www.FEMA.gov: IA = Individual Assistance, PA = Public Assistance

- **Flood of 1927**: The Flood of 1927 was the most devastating in Arkansas' history. Almost one-fourth of Arkansas was under water. The Mississippi River was 60 miles wide in some places. Rising floodwaters drove about 143,000 people out of their homes, and hundreds died. The Flood of 1927 was caused by a combination of events. Early snowmelts in Canada caused the upper Mississippi River to swell, while huge rainfalls occurred in the upper mid-west. By April, heavy rain fell over the lower Mississippi Delta. On April 10, four inches of rain fell on some parts of Arkansas. On April 20, a record rainfall of almost nine inches fell on the Little Rock area, with more than seven inches falling in just four hours. The swollen Mississippi River began backing up the Arkansas, White and St. Francis Rivers. All levees on the Arkansas River between Fort Smith and Little Rock failed. Breaks in the levees were responsible for flooding towns and vast farming areas. More than 1,376,000 acres of tilled farmland were flooded. Some plantations suffered so much flood damage that they never recovered.

  Official reports suggested that between 91 and 120 people died in Arkansas as a result of the flood, but numbers were not exact due to widespread chaos and inadequate reports of losses. Without the efforts of the Red Cross, many more lives may have been lost due to disease or exposure. By the time floodwaters receded in July, more than 325,000 refugees had been cared for in Red Cross camps. The Red Cross helped provide safe drinking water, food and milk, gave hundreds of thousands of typhoid inoculations, controlled mosquitoes and malaria, disposed of dead animals and gave medical attention to the sick and wounded. They also organized a huge rescue force of boats that searched around the clock for victims huddled on high ground, perched on rooftops or clinging to trees.

- **The Floods of 1990**: One of the most costly years in State history in terms of flooding was 1990, as riverine and flash floods caused upwards of $60,000,000 damage and caused two fatalities. Flash flood events caused by heavy rains from March 3-5, 1990, affected 20 counties in the western half of the State. Schools were closed, businesses and government agencies were closed and/or flooded, automobiles washed off roads, school buses were stranded and hundreds of families were evacuated. Damage estimated by the NWS to washed-out roads and bridges in these counties was $754,000. Total damage estimates were unavailable from the NWS, but damage reported in the Arkansas Democrat Gazette was estimated to be over $10,000,000. In addition, the Ouachita River overflowed its banks from Arkadelphia to Camden in March, causing millions of dollars of damage to agricultural operations.

  Flash flooding events occurred in 20 counties in the western half of the State on May 3, 1990, caused by four to six inches of rain in a 24-hour period. This flash flood event resulted in an estimated $1,963,000 in damage to public facilities. Riverine flood events in May caused over $41,000,000 in damage to public facilities, private property and agricultural operations. The Red River was over flood stage from May 1 to May 22, 1990, causing $14,000,000 in short-term damage. Of this total, $2,700,000 in damage was caused by debris that was carried by the floodwaters. A total of $6,900,000 in agricultural damage was reported with $1,500,000 in damage to cattle operations alone. Long-term damage is extremely difficult to assess.

3.4.5.i Flood Waters of 1990 Overtake a Highway

For example, some fields were left with a three-foot thickness of silt and mud deposits, making it impossible for machinery to get into these fields. All tributaries of the Red River were subject to flood events at some point in this timeframe. The Arkansas River was also at flood stage for much of the month; the U. S. Army Corps of Engineers (USACOE) reported the highest crest on record for the McClellan-Kerr Navigation System. Damage to public facilities was estimated at over $10,000,000, with private property owners suffering over $7,000,000 of losses, and agricultural concerns ravaged by $11,000,000 of damage. Fort Smith suffered $2,000,000 of losses to city property. North Little Rock paid more than $1,500,000 for repair to the municipal sewer plant and the hydroelectric plant on the Arkansas River. More than $10,000,000 in losses was estimated for Jefferson County.

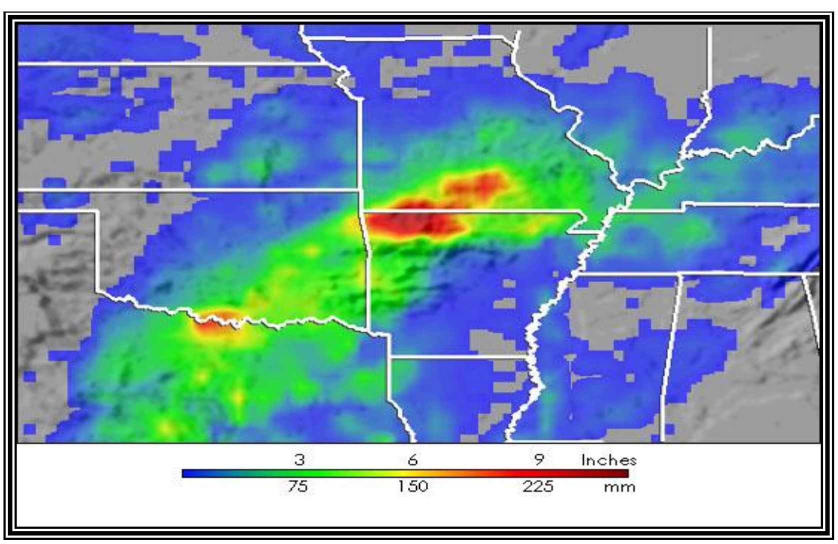
One of the most memorable flash floods in the history of the State also took place in May of 1990, as two separate four to six feet high walls of water moved down Central Avenue in Hot Springs, leaving businesses along Bathhouse Row inundated in up to six feet of floodwater. Cars and drivers floated down the street. Approximately 13 inches of rain fell in Garland County over a nine-hour period. Carpenter Dam Bridge over Lake Catherine was washed away. Water released from Lake Hamilton flooded homes on Lake Catherine. Over 300 homes outside the Hot Springs area had to be evacuated. The NWS reported damages totaling over $100,000,000 in Arkansas due to excessive rain in May. An additional 18 counties in central, northwest and southwest Arkansas suffered between $3,000,000 and $5,000,000 damage from flash floods in June and July of 1990.

- **April 1997 Flash Flooding**: On April 4, 1997, severe storms and heavy rains caused considerable flooding throughout the State which resulted in significant property damage and casualties in a wide area of Arkansas. Eleven inches of rain fell over a 24-hour period in Columbia County in the community of Magnolia. Floodwaters entered houses throughout the community. One foot of water accumulated in the local hospital and numerous bridges were washed out. Damage for this community alone was estimated at $11,000,000. Nearly 1/3 of the counties in Arkansas were declared federal disasters. Federally declared counties included Bradley, Cleburne, Cleveland, Columbia, Craighead, Dallas, Drew, Grant, Greene, Izard, Jackson, Jefferson, Lafayette, Lincoln, Lonoke, Monroe, Montgomery, Ouachita, Poinsett, Sharp, St. Francis, Stone, Union and Van Buren.

- **March 1997 Riverine Flooding**: Widespread riverine flooding in 1997 occurred March 1 through March 2 along the Mississippi River Floodplain in Mississippi, Poinsett and Crittenden Counties. At least 300 residential structures were inundated to a depth of six inches to three feet above the lowest floor. Jefferson and Lincoln Counties in the West Gulf Coastal Plain along the Arkansas River also suffered significant flooding during this time frame. All five of these counties are vulnerable to repetitive flood events. Minor to moderate flooding occurred in 25 federally declared counties during this event. Damage primarily affected roads and bridges.

- **April 2004 Flooding**: Extensive flooding occurred in north-central and northwestern Arkansas in the last two weeks of April 2004. Springtime showers and thunderstorms dumped heavy rains over parts of northwestern Arkansas and south central Missouri over the weekend. Hardest hit was northwestern Arkansas where two children were swept away by floodwaters west of Huntsville, Arkansas. Flooding was caused by heavy rainfall, as much as 15 inches over the two-week period. The Buffalo River was reported to be 25 feet over flood stage. Damage estimates for these floods from the Arkansas Department of Emergency Management were $25,000,000. **Figure 3.4.5.j** below shows radar recorded during the flooding event.

3.4.5.j Radar of April 28th, 2004 Rainfall in excess of 9 inches



Source: National Weather Service

- **FEMA-1861-DR Severe Storms, Tornadoes, and Flooding:** On November 18, 2009 Governor Mike Beebe requested a major disaster declaration due to severe storms, tornadoes, and flooding during the period of October 29 to November 8, 2009. The Governor requested a declaration for Public Assistance including direct Federal assistance for 37 counties and Hazard Mitigation statewide. During the period of November 9-13, 2009, joint Federal, State, and local Preliminary Damage Assessments (PDAs) were conducted in the requested counties and are summarized below. PDAs estimate damages immediately after an event and are considered, along with several other factors, in determining whether a disaster is of such severity and magnitude that effective response is beyond the capabilities of the State and the affected local governments, and that Federal assistance is necessary.

- **June 2010 Flooding**: Arkansas Gov. Mike Beebe said the Red Cross estimated as many as 300 people had been in the rugged Albert Pike campground area, a part of the U.S. Forest Service, but there was no way to determine the precise number. Emergency management officials had put the death toll Friday at 20 but revised the figure to 16. The 54-unit campground was quickly inundated with water, which was rising as quickly as 8 feet per hour. The water was so violent it overturned RVs and peeled asphalt off the roads.

- **FEMA-1975-DR-AR Severe Storms, Tornadoes, and Associated Flooding**, Declared May 2, 2011: Fifty-nine of the 75 counties in Arkansas were included in this declaration. Weeks of heavy rains and runoff from an unusually snowy winter caused tributaries of the Mississippi and, then the Mississippi itself to swell beginning in April. The flooding damaged thousands of homes and over 3 million acres of farmland in Mississippi, Tennessee, and Arkansas. In Arkansas, the town of Pocahontas was devastated as portions of the Black River levee failed. Reports indicate that the flood caused 14 fatalities in Arkansas. As of the preparation of this plan, total FEMA Public Assistance was $47,127,416 and FEMA Individual Assistance was $24,301,705.

3.4.5.k Flooding in Pocahontas, Arkansas, April 29, 2011

Source: Photo by Frank Bigger, Special to Arkansas Democrat Gazette, Front Page, April 30, 2011, Arkansas Online, http://www.arkansasonline.com/news/2011/apr/30/river-floods-100-homes-states-death-toll--20110430/?print

- **FEMA-4000-DR-AR Severe Storms, Tornadoes, and Flooding**, Declared July 8, 2011: some flooding accompanied severe storms and tornadoes in Crawford, Franklin, and Johnson Counties in northeast Arkansas. As of the preparation of this plan, total FEMA Public Assistance was $2,648,119 and FEMA Individual Assistance was $1,754,571. These damage amounts include all Stafford Act assistance as a result of the declaration, not just those attributable to the flooding.

Historical Crop Losses Due to Flooding

The State acquired data from the United States Department of Agriculture's Risk Management Agency to provide crop loss data based on crop insurance payments. Data was requested for the 10-year period from 2003 to 2012. During this period, $303,470,333 in crop insurance payments was made to Arkansas farmers as a result of flood and excess moisture/precipitation/rain. This translates to an average of over $30 Million annually. The most damaging year during this time-frame was 2011 which coincides with Presidential Declaration 1975. **Table 3.4.5.c** provides the crop insurance payments by year for this ten-year period. Please note that this data only applies to insured crops. According to the *2011 Arkansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 79 percent of Arkansas' row crops were insured in 2011.

Table 3.4.5.c. USDA Risk Management Agency Crop Insurance Payments Due to Flood and Excess Moisture/Precipitation/Rain, 2003-2012)

Crop Year	Indemnity Paid
2003 Total	$29,994,625
2004 Total	$17,796,676
2005 Total	$11,529,771
2006 Total	$3,687,737
2007 Total	$9,892,667
2008 Total	$18,238,316
2009 Total	$61,188,056
2010 Total	$30,313,401
2011 Total	$106,423,279
2012 Total	$14,405,805
Grand Total	**$303,470,333**

Source: USDA Risk Management Agency, 2013

2011 flooding resulted in over one-third of the total crop insurance payments over the last 10 years. Arkansas produces nearly half of the rice grown in the United States. The 2011 flooding impacted nearly 300,000 acres of rice in Arkansas which is about 10 percent of the total U.S. acreage. About 120,000 acres of winter wheat, which is about 22 percent of the Arkansas wheat crop, was impacted. Other crops such as cotton, corn, soybeans, and sorghum were impacted.

3.4.5.l Submerged Wheat Field in Holly Grove, Arkansas, 2011 Flooding

Source: Reuters/Eric Thayer, http://www.reuters.com/article/2011/05/10/us-usa-flooding-arkansas-idUSTRE7496XF20110510

❖ *Probability of Future Hazard Events*

The probability of a flood event is expressed as the percent chance that a specific magnitude flood will occur in a given year. **Table 3.4.5.d** summarizes the associated chance of occurrence for the type of floods the State experiences.

Table 3.4.5.d. Probability of Flood Occurrence

Flood Return Intervals	Chance of Occurrence in Any Given Year
10-Year	10%
50-Year	2%
100-Year	1%
500-Year	0.2%

According to the data from NCDC, Arkansas experiences an average of over 133 flood events, $23.8 Million in property losses, 2.75 flood-related deaths, and 2.1 flood-related injuries each year.

Extremely damaging flood events are indicated by declarations of Federal Disasters for flooding. Since 1957, the State of Arkansas has had 35 Presidential Disaster Declarations that involved flooding. This represents an average of less than one (0.6) declared flood disaster annually (or one federally declared flood disaster event every 1.6 years)

Every county in Arkansas has experienced a flash flood event. On average, 68 of the State's 75 counties are affected annually. Therefore, the probability of future flooding events is rated as **"Highly Likely".**

❖ *State Vulnerability Analysis*

To determine vulnerability to flooding and the jurisdictions most threatened by flooding and most vulnerable to damage and losses, the State analyzed data from several sources including:

- NCDC Storm Events Database
- USDA Risk Management Agency Crop Loss Statistics
- FEMA HAZUS Analysis-1-Percent Annual Chance Flood
- NFIP Flood Insurance Claims
- Repetitive Loss Properties/Severe Repetitive Loss Properties

NCDC Storm Events Database

The NCDC Storm Events Database was the primary source of data to complete the vulnerability analysis of flash flood in the State; while the HAZUS MH 2.1 analysis was utilized to describe vulnerability to riverine flooding.

Flash flooding is not considered to be a “geographic” hazard. Due to the large number of variables that occur in rainfall amounts and intensity, it is not possible to predict all specific locations that are vulnerable to flash flooding. However, it is known that certain low-lying areas with poor drainage are more vulnerable than areas higher in elevation with good drainage. Additionally, historical statistics of areas that have been prone to flash flooding in the past can be utilized to determine potential vulnerability to future flash flooding.

The NCDC Storm Events Database included four types of events for flood events: flash flood, flood, river flood, and urban/small stream flood. Therefore, to focus on the flash flood hazard, the two types of flooding considered from NCDC were flash flood and urban/small stream flood. For the period from 1993 to 2012, there were 2149 recorded events for these two event types. **Table 3.4.5.e** provides the number of events by county. The amount of associated property damages is also provided. However, upon examination, it appears that damages from riverine flood amounts are included with the events designated as flash flood. Therefore, these damages may not be an accurate reflection of damages attributed only to flash flooding. Additionally, this database captures only reported damages.

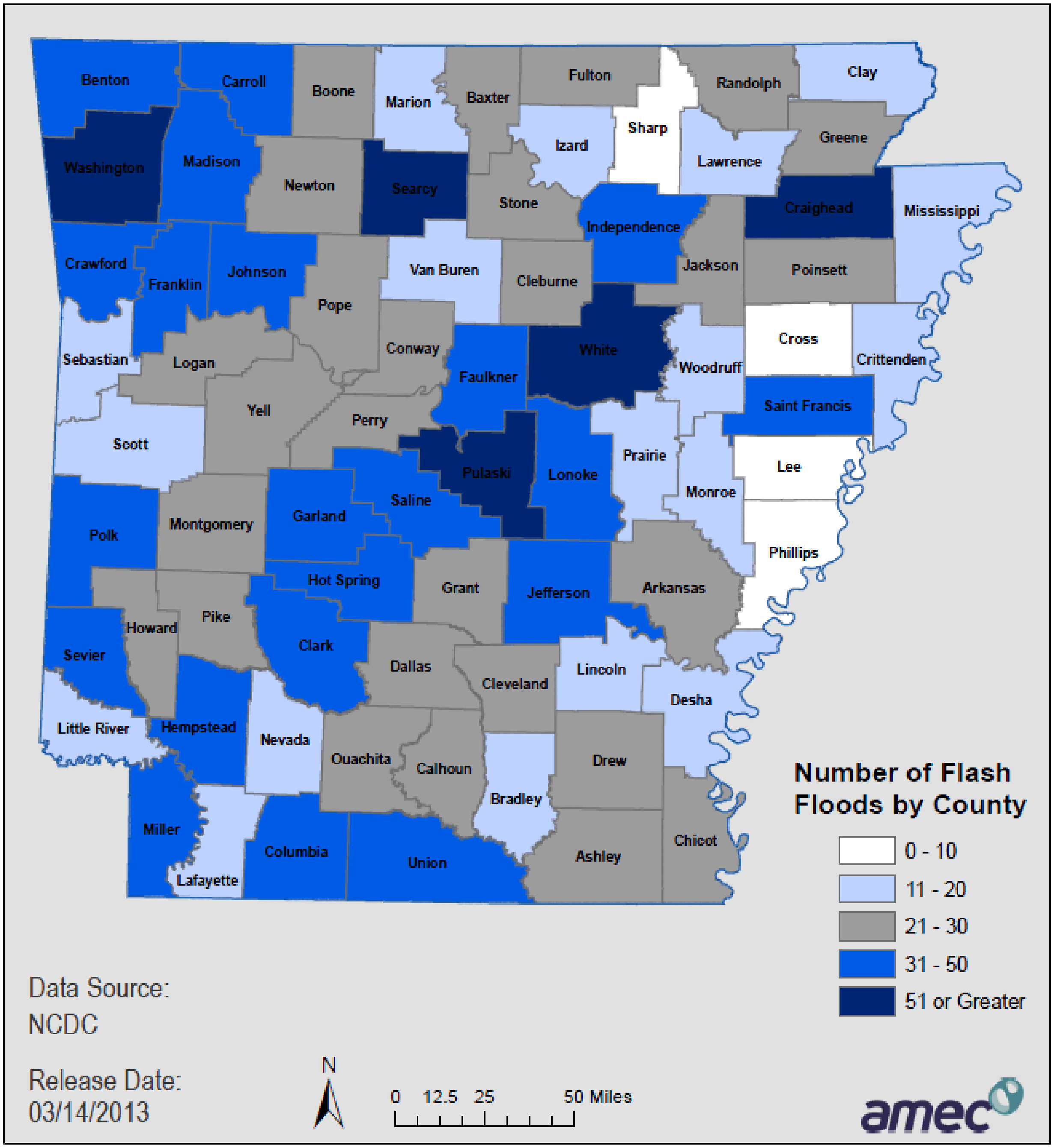
The map in **Figure 3.4.5.m** displays the number of flash flood events by county for the period from 1993 to 2012.

Table 3.4.5.e. NCDC Flash Flood Events 1993-2012

County	# of Flash Flood Events	Reported Property Damage	County	# of Flash Flood Events	Reported Property Damage
Arkansas	26	$175,000	Lee	5	$11,000
Ashley	22	$859,000	Lincoln	19	$1,151,000
Baxter	28	$3,179,000	Little River	20	$610,000
Benton	44	$2,735,000	Logan	23	$15,611,000
Boone	28	$2,419,000	Lonoke	33	$2,550,000
Bradley	19	$2,401,000	Madison	46	$685,000
Calhoun	25	$2,319,000	Marion	20	$1,119,000
Carroll	32	$735,000	Miller	32	$2,114,000
Chicot	22	$2,359,000	Mississippi	18	$70,000
Clark	44	$2,283,500	Monroe	13	$407,000
Clay	18	$467,510	Montgomery	22	$9,189,500
Cleburne	26	$4,086,000	Nevada	20	$167,000
Cleveland	22	$806,000	Newton	25	$2,873,900
Columbia	34	$131,690,000	Ouachita	25	$1,191,000
Conway	24	$1,965,000	Perry	21	$192,000
Craighead	51	$1,037,000	Phillips	10	$1,103,500
Crawford	46	$1,275,000	Pike	23	$426,500
Crittenden	16	$68,000	Poinsett	22	$537,000
Cross	7	$279,000	Polk	34	$1,056,500
Dallas	25	$1,662,000	Pope	23	$3,115,100
Desha	17	$5,251,000	Prairie	18	$463,000
Drew	29	$792,000	Pulaski	100	$15,866,000
Faulkner	41	$1,557,000	Randolph	22	$2,789,000
Franklin	41	$820,000	Saline	43	$4,202,000
Fulton	22	$2,613,000	Scott	32	$1,524,000
Garland	45	$1,761,350	Searcy	19	$1,406,700
Grant	21	$1,851,000	Sebastian	56	$4,205,000
Greene	23	$406,520	Sevier	15	$115,000
Hempstead	31	$650,000	Sharp	39	$2,625,000
Hot Spring	36	$835,000	St. Francis	10	$55,000
Howard	26	$1,365,000	Stone	27	$2,303,000
Independence	46	$589,000	Union	36	$1,070,000
Izard	20	$1,110,000	Van Buren	18	$2,560,000
Jackson	29	$732,000	Washington	78	$8,485,000
Jefferson	31	$2,528,000	White	53	$2,395,200
Johnson	36	$2,235,500	Woodruff	12	$417,600
Lafayette	18	$305,000	Yell	27	$1,937,000
Lawrence	19	$1,361,000			
			Total	**2149**	**$286,160,880**

Source: NCDC Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

3.4.5.m Flash Flood Events by County 1993-2012



FEMA HAZUS Analysis-1-Percent Annual Chance Flood

In addition to the AAL summary data which is presented in the next section on estimated losses, the results of the 1-percent annual chance flood event from the FEMA HAZUS AAL study are provided to demonstrate the vulnerability overview for this flood frequency scenario. The intent of this analysis was to enable the State to analyze the degree of severity using a consistent methodology for a specific frequency event. This is analysis is not intended to indicate that a 1-percent annual chance flood event would occur simultaneously in all jurisdictions, but rather demonstrate the impacts that the 1-percent annual chance event could have on each jurisdiction. The HAZUS model helps quantify risk along known flood-hazard corridors as well as lesser streams and rivers that have a drainage area of 10 square miles or more. **Table 3.4.5.f** provides the estimated losses for the 1-percent annual chance flood event by county. **Figure 3.4.5.n** that follows depicts the losses from the 1-percent annual chance flood event at the census block level.

Table 3.4.5.f. HAZUS Estimated Losses, 1-Percent Annual Chance Flood Event

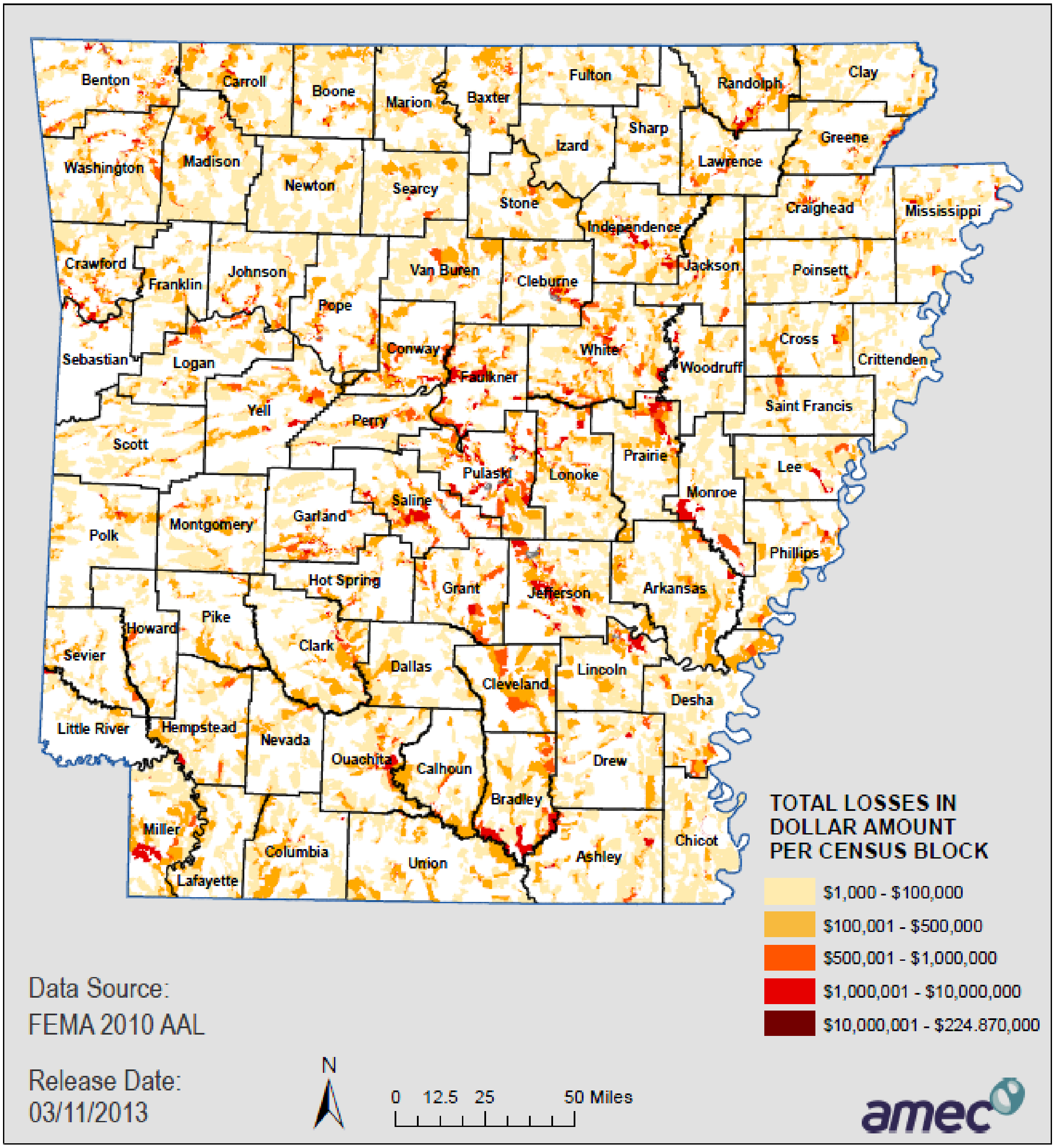
County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Contents Losses	Total Building Losses	Business Disruption Losses	Total Losses
Arkansas	$11,807,000	$7,631,000	$702,000	$1,096,000	$506,000	$4,128,000	$12,855,000	$13,015,000	$1,517,000	$27,387,000
Ashley	$12,557,000	$7,889,000	$432,000	$2,897,000	$544,000	$2,317,000	$13,103,000	$13,533,000	$977,000	$27,613,000
Baxter	$13,978,000	$9,564,000	$119,000	$2,476,000	$155,000	$1,156,000	$13,196,000	$14,252,000	$515,000	$27,963,000
Benton	$81,757,000	$53,351,000	$11,838,000	$33,688,000	$2,312,000	$25,710,000	$112,749,000	$95,907,000	$7,259,000	$215,915,000
Boone	$16,086,000	$11,027,000	$11,770,000	$22,033,000	$2,602,000	$8,968,000	$42,028,000	$30,458,000	$3,710,000	$76,196,000
Bradley	$16,610,000	$12,093,000	$29,000	$1,000,000	$11,000	$1,848,000	$14,941,000	$16,650,000	$576,000	$32,167,000
Calhoun	$6,309,000	$3,982,000	$30,000	$321,000	$0	$855,000	$5,158,000	$6,339,000	$114,000	$11,611,000
Carroll	$17,898,000	$11,713,000	$930,000	$4,564,000	$240,000	$1,955,000	$18,232,000	$19,068,000	$983,000	$38,283,000
Chicot	$4,891,000	$3,093,000	$438,000	$1,626,000	$946,000	$2,917,000	$7,636,000	$6,275,000	$668,000	$14,579,000
Clark	$26,646,000	$21,090,000	$919,000	$2,737,000	$602,000	$6,795,000	$30,622,000	$28,167,000	$2,726,000	$61,515,000
Clay	$8,051,000	$5,211,000	$66,000	$1,677,000	$146,000	$2,090,000	$8,978,000	$8,263,000	$991,000	$18,232,000
Cleburne	$36,992,000	$23,216,000	$4,432,000	$10,471,000	$1,161,000	$11,918,000	$45,605,000	$42,585,000	$3,337,000	$91,527,000
Cleveland	$7,348,000	$4,667,000	$64,000	$1,150,000	$5,000	$2,607,000	$8,424,000	$7,417,000	$627,000	$16,468,000
Colombia	$7,226,000	$4,571,000	$551,000	$2,666,000	$669,000	$2,941,000	$10,178,000	$8,446,000	$1,025,000	$19,649,000
Conway	$16,564,000	$10,792,000	$1,760,000	$3,593,000	$759,000	$8,474,000	$22,859,000	$19,083,000	$2,639,000	$44,581,000
Craighead	$25,690,000	$16,821,000	$1,084,000	$7,116,000	$1,008,000	$6,528,000	$30,465,000	$27,782,000	$1,803,000	$60,050,000
Crawford	$40,064,000	$27,431,000	$3,024,000	$28,046,000	$1,810,000	$22,895,000	$78,372,000	$44,898,000	$7,479,000	$130,749,000
Crittenden	$25,584,000	$17,967,000	$608,000	$4,281,000	$43,000	$4,228,000	$26,476,000	$26,235,000	$1,301,000	$54,012,000
Cross	$6,669,000	$4,177,000	$473,000	$1,714,000	$469,000	$1,546,000	$7,437,000	$7,611,000	$823,000	$15,871,000
Dallas	$3,986,000	$2,530,000	$32,000	$300,000	$36,000	$686,000	$3,516,000	$4,054,000	$216,000	$7,786,000
Desha	$22,477,000	$14,466,000	$1,060,000	$3,436,000	$1,667,000	$4,486,000	$22,388,000	$25,204,000	$1,845,000	$49,437,000
Drew	$4,089,000	$2,814,000	$147,000	$778,000	$301,000	$4,377,000	$7,969,000	$4,537,000	$1,388,000	$13,894,000
Faulkner	$40,983,000	$25,699,000	$3,427,000	$8,136,000	$1,323,000	$4,698,000	$38,533,000	$45,733,000	$1,418,000	$85,684,000
Franklin	$9,451,000	$7,779,000	$422,000	$892,000	$194,000	$786,000	$9,457,000	$10,067,000	$217,000	$19,741,000
Fulton	$10,864,000	$7,952,000	$461,000	$1,115,000	$237,000	$739,000	$9,806,000	$11,562,000	$276,000	$21,644,000
Garland	$108,420,000	$70,809,000	$1,389,000	$16,779,000	$1,042,000	$6,637,000	$94,225,000	$110,851,000	$2,756,000	$207,832,000
Grant	$13,197,000	$8,288,000	$307,000	$1,969,000	$73,000	$2,055,000	$12,312,000	$13,577,000	$627,000	$26,516,000

County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Contents Losses	Total Building Losses	Business Disruption Losses	Total Losses
Greene	$27,176,000	$19,100,000	$2,194,000	$7,981,000	$1,590,000	$17,421,000	$44,502,000	$30,960,000	$3,304,000	$78,766,000
Hempstead	$7,739,000	$4,839,000	$60,000	$580,000	$24,000	$1,974,000	$7,393,000	$7,823,000	$610,000	$15,826,000
Hot Spring	$15,971,000	$9,960,000	$984,000	$1,997,000	$1,275,000	$1,286,000	$13,243,000	$18,230,000	$497,000	$31,970,000
Howard	$6,751,000	$5,046,000	$1,041,000	$3,675,000	$489,000	$3,919,000	$12,640,000	$8,281,000	$1,746,000	$22,667,000
Independence	$36,472,000	$23,748,000	$6,035,000	$10,968,000	$1,574,000	$7,674,000	$42,390,000	$44,081,000	$2,542,000	$89,013,000
Izard	$9,977,000	$6,202,000	$304,000	$323,000	$150,000	$459,000	$6,984,000	$10,431,000	$137,000	$17,552,000
Jackson	$22,939,000	$15,357,000	$1,492,000	$8,246,000	$243,000	$4,225,000	$27,828,000	$24,674,000	$1,807,000	$54,309,000
Jefferson	$59,101,000	$39,267,000	$5,068,000	$23,037,000	$1,996,000	$36,040,000	$98,344,000	$66,165,000	$11,487,000	$175,996,000
Johnson	$30,124,000	$21,992,000	$8,287,000	$19,986,000	$3,995,000	$18,369,000	$60,347,000	$42,406,000	$6,223,000	$108,976,000
Lafayette	$4,760,000	$3,017,000	$9,000	$490,000	$2,000	$414,000	$3,921,000	$4,771,000	$166,000	$8,858,000
Lawrence	$12,752,000	$8,424,000	$1,159,000	$1,923,000	$351,000	$3,487,000	$13,834,000	$14,262,000	$1,141,000	$29,237,000
Lee	$5,970,000	$3,996,000	$356,000	$628,000	$317,000	$1,049,000	$5,673,000	$6,643,000	$477,000	$12,793,000
Lincoln	$35,317,000	$39,257,000	$754,000	$4,199,000	$697,000	$11,074,000	$54,530,000	$36,768,000	$3,988,000	$95,286,000
Little River	$3,553,000	$2,241,000	$58,000	$297,000	$40,000	$720,000	$3,258,000	$3,651,000	$164,000	$7,073,000
Logan	$15,920,000	$10,959,000	$779,000	$2,761,000	$1,600,000	$11,943,000	$25,663,000	$18,299,000	$3,007,000	$46,969,000
Lonoke	$25,314,000	$16,137,000	$1,587,000	$9,137,000	$1,040,000	$3,967,000	$29,241,000	$27,941,000	$1,796,000	$58,978,000
Madison	$12,846,000	$8,025,000	$488,000	$1,912,000	$489,000	$3,806,000	$13,743,000	$13,823,000	$978,000	$28,544,000
Marion	$10,088,000	$6,145,000	$679,000	$1,538,000	$455,000	$2,316,000	$9,999,000	$11,222,000	$558,000	$21,779,000
Miller	$12,833,000	$8,172,000	$599,000	$1,609,000	$340,000	$1,459,000	$11,240,000	$13,772,000	$386,000	$25,398,000
Mississippi	$8,886,000	$5,682,000	$522,000	$2,573,000	$455,000	$7,521,000	$15,776,000	$9,863,000	$2,003,000	$27,642,000
Monroe	$19,830,000	$12,463,000	$259,000	$1,843,000	$238,000	$1,168,000	$15,474,000	$20,327,000	$772,000	$36,573,000
Montgomery	$14,784,000	$9,268,000	$199,000	$2,116,000	$164,000	$1,883,000	$13,267,000	$15,147,000	$671,000	$29,085,000
Nevada	$3,640,000	$2,304,000	$0	$0	$0	$660,000	$2,964,000	$3,640,000	$156,000	$6,760,000
Newton	$8,187,000	$5,444,000	$2,591,000	$3,347,000	$259,000	$4,422,000	$13,213,000	$11,037,000	$1,586,000	$25,836,000
Ouachita	$17,627,000	$11,860,000	$1,412,000	$4,472,000	$689,000	$9,196,000	$25,528,000	$19,728,000	$3,427,000	$48,683,000
Perry	$13,743,000	$9,009,000	$39,000	$1,748,000	$63,000	$3,986,000	$14,743,000	$13,845,000	$930,000	$29,518,000
Phillips	$36,509,000	$24,250,000	$7,111,000	$80,366,000	$1,773,000	$19,736,000	$124,352,000	$45,393,000	$7,240,000	$176,985,000
Pike	$9,541,000	$5,995,000	$773,000	$4,680,000	$513,000	$2,492,000	$13,167,000	$10,827,000	$1,162,000	$25,156,000
Poinsett	$8,605,000	$5,488,000	$762,000	$3,310,000	$462,000	$3,182,000	$11,980,000	$9,829,000	$806,000	$22,615,000

County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Contents Losses	Total Building Losses	Business Disruption Losses	Total Losses
Polk	$11,210,000	$7,014,000	$310,000	$1,752,000	$302,000	$3,465,000	$12,231,000	$11,822,000	$960,000	$25,013,000
Pope	$25,361,000	$15,736,000	$3,164,000	$5,373,000	$987,000	$5,849,000	$26,958,000	$29,512,000	$1,547,000	$58,017,000
Prairie	$27,935,000	$17,481,000	$58,000	$768,000	$57,000	$393,000	$18,642,000	$28,050,000	$256,000	$46,948,000
Pulaski	$121,456,000	$78,503,000	$141,779,000	$357,379,000	$20,143,000	$59,923,000	$495,805,000	$283,378,000	$62,809,000	$841,992,008
Randolph	$19,810,000	$13,098,000	$3,444,000	$7,756,000	$3,412,000	$5,829,000	$26,683,000	$26,666,000	$2,779,000	$56,128,000
Saint Francis	$3,845,000	$2,389,000	$37,000	$271,000	$46,000	$308,000	$2,968,000	$3,928,000	$70,000	$6,966,000
Saline	$53,521,000	$34,815,000	$2,030,000	$12,246,000	$1,216,000	$9,955,000	$57,016,000	$56,767,000	$2,849,000	$116,632,000
Scott	$12,280,000	$7,866,000	$609,000	$4,007,000	$546,000	$2,916,000	$14,789,000	$13,435,000	$968,000	$29,192,000
Searcy	$5,272,000	$3,454,000	$1,791,000	$7,436,000	$975,000	$10,546,000	$21,436,000	$8,038,000	$2,491,000	$31,965,000
Sebastian	$15,530,000	$11,250,000	$2,550,000	$6,386,000	$1,023,000	$18,169,000	$35,805,000	$19,103,000	$3,487,000	$58,395,000
Sevier	$5,776,000	$3,880,000	$203,000	$1,906,000	$47,000	$330,000	$6,116,000	$6,026,000	$207,000	$12,349,000
Sharp	$16,315,000	$10,625,000	$139,000	$9,041,000	$111,000	$1,236,000	$20,902,000	$16,565,000	$1,018,000	$38,485,000
Stone	$7,229,000	$4,302,000	$185,000	$479,000	$197,000	$229,000	$5,010,000	$7,611,000	$98,000	$12,719,000
Union	$9,695,000	$6,784,000	$465,000	$2,881,000	$313,000	$2,781,000	$12,446,000	$10,473,000	$826,000	$23,745,000
Van Buren	$11,980,000	$8,029,000	$702,000	$4,308,000	$246,000	$1,469,000	$13,806,000	$12,928,000	$683,000	$27,417,000
Washington	$54,601,000	$35,596,000	$5,892,000	$25,691,000	$4,974,000	$25,032,000	$86,319,000	$65,467,000	$7,756,000	$159,542,000
White	$43,763,000	$27,208,000	$3,767,000	$9,577,000	$3,733,000	$10,028,000	$46,813,000	$51,263,000	$3,058,000	$101,134,000
Woodruff	$11,976,000	$7,745,000	$243,000	$2,660,000	$193,000	$1,577,000	$11,982,000	$12,412,000	$1,299,000	$25,693,000
Yell	$19,392,000	$13,880,000	$1,757,000	$4,227,000	$2,887,000	$7,169,000	$25,276,000	$24,036,000	$2,181,000	$51,493,000
Total	**$1,570,096,000**	**$1,049,925,000**	**$261,240,000**	**$836,443,000**	**$81,552,000**	**$497,392,000**	**$2,383,760,000**	**$1,912,888,000**	**$202,922,000**	**$4,499,570,008**

Source: FEMA AAL Study, 2010

Figure 3.4.5.n HAZUS Estimated Losses, 1-Percent Annual Chance Flood Event by Census Block



Flood

USDA Risk Management Agency Crop Insurance Payments

Table 3.4.5.g is the USDA Risk Management Agency's insured crop insurance payments for flood-related damages, as well as the annualized estimated crop damages for each county over the 10-year period from 2003 to 2012. The flood-related crop insurance payments have been extrapolated to estimate total damages to insurable crops. This is based on the percent of insurable crops that are covered by crop insurance. According to the *2011 Arkansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 79 percent of Arkansas' row crops were insured in 2011. Additionally, the USDA does not differentiate damages from riverine flooding and flash flooding so these losses are combined losses for both types of flooding. The crop exposure value from the 2007 Census of Agriculture is provided as the basis for a ratio of annualized losses to crop exposure.

Table 3.4.5.g. Flood-Related Crop Insurance Payments Analysis (2003-2012)

County Name	Crop Exposure Value (2007 Census of Agriculture)	Flood-Related Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio
Arkansas	$179,522,000	$987,101	$1,249,495	$124,949	0.0007
Ashley	$55,231,000	$6,252,764	$7,914,891	$791,489	0.0143
Baxter	$741,000	$0	$0	$0	0.0000
Benton	$6,942,000	$7,875	$9,968	$997	0.0001
Boone	$2,081,000	$0	$0	$0	0.0000
Bradley	$3,526,000	$3,862,820	$4,889,646	$488,965	0.1387
Calhoun	(D)	$0	$0	$0	Not Available
Carroll	$2,273,000	$0	$0	$0	0.0000
Chicot	$84,944,000	$11,782,568	$14,914,643	$1,491,464	0.0176
Clark	$2,258,000	$1,298,961	$1,644,254	$164,425	0.0728
Clay	$139,431,000	$11,720,006	$14,835,451	$1,483,545	0.0106
Cleburne	$1,618,000	$0	$0	$0	0.0000
Cleveland	$363,000	$0	$0	$0	0.0000
Columbia	$9,772,000	$0	$0	$0	0.0000
Conway	$10,926,000	$1,722,752	$2,180,699	$218,070	0.0200
Craighead	$153,368,000	$9,381,769	$11,875,657	$1,187,566	0.0077
Crawford	$10,801,000	$1,728,624	$2,188,132	$218,813	0.0203
Crittenden	$99,333,000	$21,882,487	$27,699,351	$2,769,935	0.0279

County Name	Crop Exposure Value (2007 Census of Agriculture)	Flood-Related Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio
Cross	$110,773,000	$23,245,433	$29,424,599	$2,942,460	0.0266
Dallas	(D)	$0	$0	$0	Not Available
Desha	$137,184,000	$8,120,161	$10,278,685	$1,027,868	0.0075
Drew	$35,925,000	$1,882,439	$2,382,834	$238,283	0.0066
Faulkner	$5,830,000	$2,089,755	$2,645,259	$264,526	0.0454
Franklin	$3,238,000	$432,613	$547,611	$54,761	0.0169
Fulton	$649,000	$0	$0	$0	0.0000
Garland	$2,379,000	$0	$0	$0	0.0000
Grant	$955,000	$0	$0	$0	0.0000
Greene	$105,774,000	$15,914,932	$20,145,484	$2,014,548	0.0190
Hempstead	$5,000,000	$0	$0	$0	0.0000
Hot Spring	$1,496,000	$0	$0	$0	0.0000
Howard	$1,809,000	$0	$0	$0	0.0000
Independence	$21,754,000	$6,312,957	$7,991,085	$799,108	0.0367
Izard	$1,165,000	$0	$0	$0	0.0000
Jackson	$102,272,000	$21,997,602	$27,845,066	$2,784,507	0.0272
Jefferson	$117,532,000	$5,568,131	$7,048,267	$704,827	0.0060
Johnson	$3,648,000	$682,325	$863,703	$86,370	0.0237
Lafayette	$16,175,000	$1,605,260	$2,031,975	$203,197	0.0126
Lawrence	$83,668,000	$9,815,849	$12,425,125	$1,242,513	0.0149
Lee	$126,190,000	$14,295,723	$18,095,852	$1,809,585	0.0143
Lincoln	$57,061,000	$1,470,263	$1,861,092	$186,109	0.0033
Little River	$8,744,000	$1,934,059	$2,448,176	$244,818	0.0280
Logan	$5,502,000	$280,186	$354,666	$35,467	0.0064
Lonoke	$118,946,000	$2,675,434	$3,386,625	$338,663	0.0028
Madison	$2,787,000	$0	$0	$0	0.0000
Marion	$755,000	$0	$0	$0	0.0000
Miller	$20,408,000	$4,236,981	$5,363,267	$536,327	0.0263
Mississippi	$194,984,000	$19,778,650	$25,036,266	$2,503,627	0.0128
Monroe	$90,551,000	$12,875,041	$16,297,520	$1,629,752	0.0180

County Name	Crop Exposure Value (2007 Census of Agriculture)	Flood-Related Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio
Montgomery	$1,127,000	$0	$0	$0	0.0000
Nevada	$1,266,000	$0	$0	$0	0.0000
Newton	$927,000	$0	$0	$0	0.0000
Ouachita	$1,514,000	$0	$0	$0	0.0000
Perry	$6,276,000	$0	$0	$0	0.0000
Phillips	$184,599,000	$25,878,368	$32,757,428	$3,275,743	0.0177
Pike	$750,000	$0	$0	$0	0.0000
Poinsett	$153,325,000	$24,508,456	$31,023,362	$3,102,336	0.0202
Polk	$1,687,000	$0	$0	$0	0.0000
Pope	$6,105,000	$93,652	$118,547	$11,855	0.0019
Prairie	$95,794,000	$2,778,722	$3,517,370	$351,737	0.0037
Pulaski	$18,618,000	$800,679	$1,013,518	$101,352	0.0054
Randolph	$43,265,000	$537,516	$680,400	$68,040	0.0016
Saint Francis	$89,406,000	$8,650,897	$10,950,503	$1,095,050	0.0122
Saline	$2,822,000	$0	$0	$0	0.0000
Scott	$1,430,000	$0	$0	$0	0.0000
Searcy	$719,000	$0	$0	$0	0.0000
Sebastian	$1,834,000	$174,976	$221,489	$22,149	0.0121
Sevier	$883,000	$0	$0	$0	0.0000
Sharp	$805,000	$0	$0	$0	0.0000
Stone	$1,012,000	$0	$0	$0	0.0000
Union	$921,000	$0	$0	$0	0.0000
Van Buren	$1,276,000	$0	$0	$0	0.0000
Washington	$7,904,000	$0	$0	$0	0.0000
White	$34,241,000	$5,083,158	$6,434,377	$643,438	0.0188
Woodruff	$89,377,000	$8,979,754	$11,366,777	$1,136,678	0.0127
Yell	$5,557,000	$142,634	$180,549	$18,055	0.0032
Total	$**2,899,724,000**	**$303,470,333**	**$384,139,662**	**$38,413,966**	**0.0132**

Source: USDA Risk Management Agency; 2007 USDA Census of Agriculture; (D) = Crop Exposure was not published to avoid disclosure of individual operations.

According to this analysis, the highest amount of annualized estimated crop damages due to flood has occurred in Phillips County and the highest estimated crop damage ratio due to flood has occurred in Bradley County.

NFIP Flood Insurance Claims Analysis

The State analyzed National Flood Insurance Program (NFIP) flood-loss data as another source to determine areas of Arkansas with the greatest flood risk. Arkansas NFIP participation and flood loss statistics were obtained from FEMA's Policy and Claim Statistics for Flood Insurance (which provides losses from 1978 to the present). As of February 14, 2013, 416 communities were National Flood Insurance Program (NFIP) participants, including 11 that do not have special flood hazard areas and 174 that are only minimally flood-prone. 92 mapped Arkansas communities that have flood hazard areas are not NFIP participants. This includes 13 suspended communities and 4 that have withdrawn. There are likely other communities in Arkansas that have flood hazard areas, but have not yet been mapped by FEMA to show where those hazard areas are.

Arkansas flood-loss information was culled from FEMA's "Policy and Loss Data by Community with County and State Data," which documents losses from 1978 through December31, 2012. 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, and
- 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.

Despite these limitations, the data depicts a pattern of historical flood losses in the State. The greatest losses have been in Pulaski, Crittenden, and Monroe Counties. **Table 3.4.5.h** shows the details of NFIP policy and loss statistics for each county in Arkansas.

Table 3.4.5.h. Arkansas NFIP Policy and Loss Statistics (As of December 31, 2012)

County Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Arkansas	359	$30,756,300	41	$866,121
Ashley	111	$10,859,000	34	$400,347
Baxter	215	$30,889,300	74	$2,558,885
Benton	922	$192,671,200	101	$2,039,440
Boone	83	$16,831,000	13	$175,043
Bradley	61	$5,512,000	47	$724,460
Calhoun	21	$3,443,300	3	$29,865
Carroll	0	$0	0	$0
Chicot	332	$65,638,900	109	$3,188,238
Clark	111	$15,149,000	18	$436,500
Clay	341	$25,107,100	84	$1,647,917
Cleburne	200	$39,547,700	9	$380,919
Cleveland	1	$20,000	0	$0
Columbia	16	$2,385,900	4	$21,810
Conway	64	$7,243,400	14	$165,419
Craighead	1870	$227,929,100	227	$3,606,404
Crawford	246	$42,907,500	24	$710,811
Crittenden	892	$161,803,400	641	$8,688,927
Cross	287	$26,604,100	46	$1,644,980
Dallas	8	$941,900	1	$7,084
Desha	364	$38,409,500	133	$1,625,202
Drew	72	$5,889,400	20	$220,614
Faulkner	765	$136,962,400	134	$2,396,324
Franklin	30	$4,391,700	32	$508,126
Fulton	46	$4,778,000	30	$713,244
Garland	1080	$208,463,100	142	$3,252,223
Grant	79	$10,654,800	9	$54,413
Greene	1,161	$92,326,700	139	$711,920
Hempstead	15	$1,390,200	0	$0
Hot Spring	88	$15,904,400	11	$28,744
Howard	34	$3,475,500	15	$88,801
Independence	243	$33,673,900	117	$1,686,174
Izard	141	$21,189,100	46	$1,734,883
Jackson	318	$30,029,800	119	$1,920,918
Jefferson	533	$76,331,900	314	$3,987,856
Johnson	147	$12,730,700	1	$18,909
Lafayette	5	$98,200	1	$1,412
Lawrence	260	$22,881,900	37	$515,389

County Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Lee	129	$10,454,300	25	$268,486
Lincoln	68	$7,200,100	13	$123,874
Little River	23	$1,631,000	3	$127,304
Logan	36	$2,023,400	5	$78,179
Lonoke	405	$64,473,700	47	$827,097
Madison	23	$1,851,500	4	$104,955
Marion	20	$3,101,700	2	$104,325
Miller	270	$35,666,200	71	$1,110,814
Mississippi	376	$55,459,300	44	$444,393
Monroe	295	$24,311,300	135	$4,115,804
Montgomery	76	$9,104,800	72	$1,977,552
Nevada	11	$835,100	1	$5,209
Newton	2	$830,100	5	$101,361
Ouachita	132	$14,987,900	62	$1,101,104
Perry	52	$6,969,500	4	$13,628
Phillips	397	$42,384,200	391	$3,096,488
Pike	17	$3,489,900	9	$230,064
Poinsett	318	$33,333,600	27	$544,533
Polk	42	$4,416,300	4	$43,825
Pope	266	$40,805,100	39	$757,128
Prairie	154	$11,716,800	58	$2,531,711
Pulaski	3384	$615,580,300	1008	$17,077,501
Randolph	182	$21,365,100	95	$2,506,045
Saline	492	$104,915,100	164	$3,451,726
Scott	9	$1,248,700	5	$231,244
Searcy	0	$0	0	$0
Sebastian	655	$121,174,900	188	$3,629,632
Sevier	42	$3,771,400	7	$370,355
Sharp	110	$18,859,300	72	$1,832,494
St. Francis	106	$12,497,400	9	$309,351
Stone	6	$1,023,000	2	$51,684
Union	172	$22,296,400	99	$1,308,487
Van Buren	48	$8,935,900	12	$412,456
Washington	910	$175,709,900	141	$3,850,770
White	455	$67,030,000	88	$2,183,128
Woodruff	90	$7,728,900	40	$923,537
Yell	51	$6,006,400	7	$60,007
Total	21345	$3,189,009,800	5748	$102,664,573

Source: FEMA, “Policy and Loss Data by Community with County and State Data

Repetitive Loss Analysis

A high priority in Arkansas and nationwide is the reduction of losses to repetitive loss structures. These structures strain the National Flood Insurance Fund. They increase the NFIP's annual losses and the need for borrowing and, more importantly, they drain resources needed to prepare for catastrophic events. The NFIP defines a repetitive loss property as "any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. At least two of the claims must be more than 10 days apart."

History of Repetitive Loss

Table 3.4.5.i illustrates the number and location (by county) of Arkansas' repetitive loss properties.

Table 3.4.5.i. Arkansas Repetitive Loss Properties (In Order by Number of Properties)

County	# of Repetitive Loss Properties	# Mitigated	# Insured	# of Losses	Total Paid
Arkansas	6	1	3	15	$370,033
Ashley	6	0	3	14	$214,989
Baxter	16	3	13	35	$1,536,753
Benton	12	0	5	29	$744,497
Boone	1	0	0	3	$13,475
Bradley	12	1	5	30	$449,467
Chicot	15	1	4	42	$874,980
Clark	4	0	4	8	$144,997
Clay	13	0	10	28	$735,415
Cleburne	1	0	1	2	$69,835
Conway	2	0	0	8	$80,492
Craighead	37	5	11	99	$2,092,091
Crawford	4	4	2	9	$525,626
Crittenden	94	37	39	297	$5,284,159
Cross	7	0	3	16	$298,401
Desha	19	3	5	41	$396,145
Drew	1	0	0	6	$190,221
Faulkner	19	0	12	48	$1,175,575
Franklin	4	0	3	19	$439,660
Fulton	7	1	5	18	$415,519
Garland	20	2	9	50	$1,346,253
Grant	3	0	2	6	$48,625
Greene	5	0	3	10	$120,556
Howard	2	1	0	5	$41,926

County	# of Repetitive Loss Properties	# Mitigated	# Insured	# of Losses	Total Paid
Independence	25	0	8	60	$917,943
Izard	11	0	4	24	$463,789
Jackson	13	1	3	39	$706,264
Jefferson	40	5	10	156	$2,159,720
Lawrence	4	0	2	10	$201,976
Lee	5	2	1	12	$118,778
Lincoln	4	0	2	10	$87,376
Little River	1	0	0	2	$81,504
Lonoke	10	0	4	25	$489,225
Miller	7	2	3	25	$108,453
Mississippi	3	1	1	8	$84,868
Monroe	22	4	13	46	$1,434,332
Montgomery	12	0	4	26	$830,082
Newton	2	0	0	5	$101,361
Ouachita	7	0	4	15	$213,262
Phillips	52	9	9	191	$2,080,571
Poinsett	4	0	3	8	$118,258
Polk	1	0	1	3	$35,423
Pope	5	1	2	16	$433,636
Prairie	8	0	2	16	$425,510
Pulaski	137	17	72	378	$10,385,190
Randolph	17	0	10	38	$1,150,845
Saline	26	0	7	84	$2,548,081
Scott	1	0	0	2	$201,533
Sebastian	27	1	16	81	$2,152,964
Sevier	1	0	0	2	$21,163
Sharp	14	0	9	34	$971,079
Union	8	0	4	19	$390,867
Van Buren	1	0	1	2	$19,826
Washington	20	0	14	50	$1,292,397
White	10	0	3	22	$815,339
Woodruff	5	0	4	10	$219,845
Yell	1	0	0	2	$7,999
Total	**814**	**102**	**358**	**2,259**	**$48,879,148**

Source: Flood Insurance Administration (Current as of November 30, 2012)

Mitigation of Repetitive Loss Properties

The State of Arkansas has made mitigation of repetitive loss properties a priority use of mitigation funds. Of the 814 properties that meet the definition of repetitive loss, 102 have been mitigated, leaving 712 unmitigated repetitive loss properties. The mitigated properties have been mitigated by several methods. Some of the types of mitigation efforts utilized may have included:

- Elevation of the structure,
- Protection by flood control/stormwater management projects, and
- Structures completely removed, including buildings simply demolished not part of a mitigation program, those buildings acquired and demolished as part of a mitigation program, and, buildings relocated out of the floodplain.

Severe Repetitive Loss Analysis

The Flood Insurance Reform Act of 2004 identified another category of repetitive loss, categorized as Severe Repetitive Loss (SRL). SRL properties are defined it as "a single family property (consisting of one-to-four residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000 and with cumulative amounts of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. As of November 30, 2012, there are 30 validated insured residential properties in Arkansas that meet the qualifications of SRL and the requirements to be considered for possible mitigation activities under FEMA's SRL criteria. In total, these properties have sustained 152 losses and have received flood insurance payments in excess of $3 Million. These properties are considered a priority for use of mitigation funds by the State of Arkansas. **Table 3.4.5.j** provides additional information on these 30 properties.

History of Severe Repetitive Loss

In addition to the verified residential, insured properties detailed above, the NFIP tracks other categories of properties, including unverified properties, commercial properties, previously mitigated properties, and currently uninsured properties that meet the loss criteria.

As of November 30, 2012, Including the 30 verified, residential, insured properties on the official SRL list, there are 75 validated properties of all types (residential, uninsured, mitigated, non-residential) that have incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000 and with cumulative amounts of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. An additional 18 properties are pending validation. With 494 combined losses, total flood insurance payments to these 93 properties total over $13 Million. Additional details are provided in **Table 3.4.5.k**. Note, properties marked with an "*" next to the SRL status are the 30 properties on the official SRL list.

Table 3.4.5.j. Verified Residential Insured Severe Repetitive Loss Properties

County Name	Community Name	Losses	Total Paid
Baxter	Norfork, City Of	4	$148,098
Chicot	Chicot County *	5	$89,131
Chicot	Chicot County *	5	$85,987
Conway	Morrilton, City Of	6	$76,440
Craighead	Bono, City Of	4	$60,355
Craighead	Jonesboro, City Of	7	$62,568
Craighead	Jonesboro, City Of	6	$77,397
Crittenden	West Memphis, City Of	4	$314,702
Crittenden	West Memphis, City Of	8	$75,189
Crittenden	West Memphis, City Of	4	$82,155
Crittenden	West Memphis, City Of	8	$129,668
Fulton	Fulton County*	5	$149,158
Independence	Batesville, City Of	4	$74,809
Independence	Batesville, City Of	6	$84,202
Independence	Independence County*	3	$92,029
Jackson	Jackson County *	4	$135,603
Jefferson	Jefferson County *	11	$101,087
Jefferson	Pine Bluff, City Of	4	$72,941
Jefferson	Pine Bluff, City Of	5	$116,443
Newton	Jasper, City Of	3	$55,821
Pulaski	Little Rock, City Of	4	$116,715
Pulaski	Little Rock, City Of	4	$94,683
Pulaski	Little Rock, City Of	6	$111,049
Pulaski	Little Rock, City Of	4	$99,988
Randolph	Randolph County*	3	$145,552
Saline	Benton, City Of	7	$130,809
Saline	Benton, City Of	4	$120,587
Saline	Benton, City Of	4	$128,875
Saline	Saline County *	6	$314,698
Washington	Fayetteville, City Of	4	$43,587
Total		**152**	**$3,390,326**

Flood

Table 3.4.5.k. Arkansas Severe Repetitive Loss Properties

County Name	Community Name	Losses	Total Paid	SRL Indicator
Crawford	Crawford County *	3	$152,080	MVU
Crittenden	West Memphis, City Of	4	$67,223	MVU
Crittenden	West Memphis, City Of	6	$103,424	MVU
Crittenden	West Memphis, City Of	5	$64,849	MVU
Crittenden	West Memphis, City Of	6	$70,282	MVU
Crittenden	West Memphis, City Of	5	$57,744	MVU
Jefferson	Jefferson County *	7	$48,251	MVU
Jefferson	Jefferson County *	5	$100,425	MVU
Jefferson	Jefferson County *	9	$97,977	MVU
Jefferson	Pine Bluff, City Of	8	$151,515	MVU
Chicot	Chicot County *	5	$256,703	P
Craighead	Jonesboro, City Of	5	$64,643	P
Drew	Drew County*	6	$190,221	P
Monroe	Monroe County*	2	$138,051	P
Arkansas	Arkansas County*	3	$190,000	PN
Phillips	West Helena, City Of	6	$126,596	PN
Pulaski	Little Rock, City Of	5	$434,706	PN
Crittenden	West Memphis, City Of	5	$63,109	PNU
Franklin	Ozark, City Of	11	$335,001	PNU
Garland	Hot Springs, City Of	4	$462,508	PNU
Izard	Calico Rock, City Of	3	$42,973	PNU
Phillips	Helena-West Helena, City Of	5	$84,143	PNU
Bradley	Bradley County*	2	$21,664	PU
Jefferson	Pine Bluff, City Of	6	$128,364	PU
Phillips	Helena-West Helena, City Of	2	$37,542	PU
Phillips	West Helena, City Of	8	$144,766	PU
Pulaski	Little Rock, City Of	6	$27,938	PU
Union	Calion, City Of	3	$35,332	PU
Baxter	Norfork, City Of	4	$148,098	V*
Chicot	Chicot County *	5	$89,131	V*
Chicot	Chicot County *	5	$85,987	V*
Conway	Morrilton, City Of	6	$76,440	V*
Craighead	Bono, City Of	4	$60,355	V*
Craighead	Jonesboro, City Of	7	$62,568	V*
Craighead	Jonesboro, City Of	6	$77,397	V*
Crittenden	West Memphis, City Of	4	$314,702	V*
Crittenden	West Memphis, City Of	8	$75,189	V*

County Name	Community Name	Losses	Total Paid	SRL Indicator
Crittenden	West Memphis, City Of	4	$82,155	V*
Crittenden	West Memphis, City Of	8	$129,668	V*
Fulton	Fulton County*	5	$149,158	V*
Independence	Batesville, City Of	4	$74,809	V*
Independence	Batesville, City Of	6	$84,202	V*
Independence	Independence County*	3	$92,029	V*
Jackson	Jackson County *	4	$135,603	V*
Jefferson	Jefferson County *	11	$101,087	V*
Jefferson	Pine Bluff, City Of	4	$72,941	V*
Jefferson	Pine Bluff, City Of	5	$116,443	V*
Newton	Jasper, City Of	3	$55,821	V*
Pulaski	Little Rock, City Of	4	$116,715	V*
Pulaski	Little Rock, City Of	4	$94,683	V*
Pulaski	Little Rock, City Of	6	$111,049	V*
Pulaski	Little Rock, City Of	4	$99,988	V*
Randolph	Randolph County*	3	$145,552	V*
Saline	Benton, City Of	7	$130,809	V*
Saline	Benton, City Of	4	$120,587	V*
Saline	Benton, City Of	4	$128,875	V*
Saline	Saline County *	6	$314,698	V*
Washington	Fayetteville, City Of	4	$43,587	V*
Craighead	Jonesboro, City Of	4	$1,156,549	VN
Faulkner	Conway, City Of	7	$81,013	VN
Miller	Texarkana, City Of	7	$52,868	VN
Pope	Russellville, City Of	6	$210,828	VN
Pope	Russellville, City Of	4	$112,895	VN
Pulaski	Little Rock, City Of	5	$409,609	VN
Pulaski	Little Rock, City Of	5	$91,374	VN
Pulaski	Little Rock, City Of	6	$285,617	VN
Sebastian	Fort Smith, City Of	7	$501,569	VN
Arkansas	Arkansas County*	4	$49,654	VNU
Benton	Decatur, City Of	4	$280,134	VNU
Crittenden	West Memphis, City Of	7	$53,160	VNU
Garland	Hot Springs, City Of	4	$85,353	VNU
Garland	Hot Springs, City Of	4	$59,818	VNU
Phillips	Helena-West Helena, City Of	8	$196,097	VNU
Sebastian	Fort Smith, City Of	7	$176,114	VNU
Sebastian	Fort Smith, City Of	8	$221,541	VNU
Crittenden	West Memphis, City Of	4	$251,731	VU

County Name	Community Name	Losses	Total Paid	SRL Indicator
Jackson	Jackson County *	5	$101,831	VU
Jackson	Jackson County *	5	$61,912	VU
Jefferson	Jefferson County *	9	$64,636	VU
Jefferson	Pine Bluff, City Of	4	$40,601	VU
Lawrence	Lawrence County*	3	$72,018	VU
Lonoke	Lonoke County*	2	$52,205	VU
Phillips	Helena-West Helena, City Of	7	$58,648	VU
Phillips	Helena-West Helena, City Of	6	$84,500	VU
Phillips	Phillips County*	10	$259,548	VU
Phillips	West Helena, City Of	11	$103,608	VU
Prairie	Prairie County *	2	$104,400	VU
Pulaski	Little Rock, City Of	5	$39,416	VU
Pulaski	Sherwood, City Of	5	$71,643	VU
Saline	Benton, City Of	6	$216,467	VU
Saline	Shannon Hills, City Of	4	$137,812	VU
Sharp	Hardy, City Of	6	$164,877	VU
Washington	Fayetteville, City Of	6	$191,201	VU
Total		**494**	**$13,189,603**	

Source: Flood Insurance Administration (current as of October 2, 2012): **MV**-Mitigated Validated, **MVU**-Mitigated Validated Uninsured, **V**- Validated, **VU**-Validated Uninsured, **VN**-Validated Non Residential, **VNU**-Validated Nonresidential Uninsured, **P**-Pending, **PU**-Pending Uninsured, **PN**-Pending Non Residential **PNU**- Pending Nonresidential Uninsured

Mitigation of Severe Repetitive Loss

Of the 75 properties with an SRL status, 10 have been mitigated (MVU); bringing the number of un-mitigated structures with an SRL status down to 484.

❖ *State Estimates of Potential Losses*

Flash Flooding

Based on statistical analysis of historical losses reported to NCDC for flash flooding events in Arkansas since 1993, average annual property losses are estimated to be $14,308,044 as a result of flash flooding events.

Crop Losses

Based on the 10-years of crop insurance payments, extrapolated to estimate losses to all row crops (insured and uninsured), average annual losses to row crops are estimated to be $38,413,966.

Riverine Flooding

HAZUS Flood Average Annualized Loss Study

In 2009-2010 FEMA conducted a HAZUS Flood Average Annualized Loss (AAL) study which was performed for the entire continental United States using the MR4 release of HAZUS-MH. The inputs for the AAL included 30 meter Digital Elevation Model (DEM) and the default census block data in HAZUS MR4, which utilized the 2000 Decennial Census data.

The analysis was performed at the county level using Level 1 methodology with national datasets. The purpose of the AAL study was to identify flood-prone areas and communicate relative flood risk in terms of people and property vulnerable to damage. The AAL study data provides potential dollar losses for four flood frequencies as follows: 10-percent (10-year), 2-percent (50-year), 1-percent (100-year), and 0.2 percent (500-year). The average annualized loss estimates are then calculated based on the aggregated dollar losses from the various flood frequencies (averaged and annualized).

AAL total losses for the State of Arkansas are estimated to be $ 353,336,000 based on this study. **Table 3.4.5.l** provides the detailed estimated AAL results for each county in Arkansas for the following loss types: Residential Building and Contents Losses, Commercial Building and Contents Losses, Other Building and Contents Losses, Total Building and Contents Losses, Business Disruption Losses, and Total Losses**. Figure 3.4.5.o** that follows provides a statewide map depicting the AAL results by census block.

Table 3.4.5.I. Arkansas AAL Losses by County and Loss Type

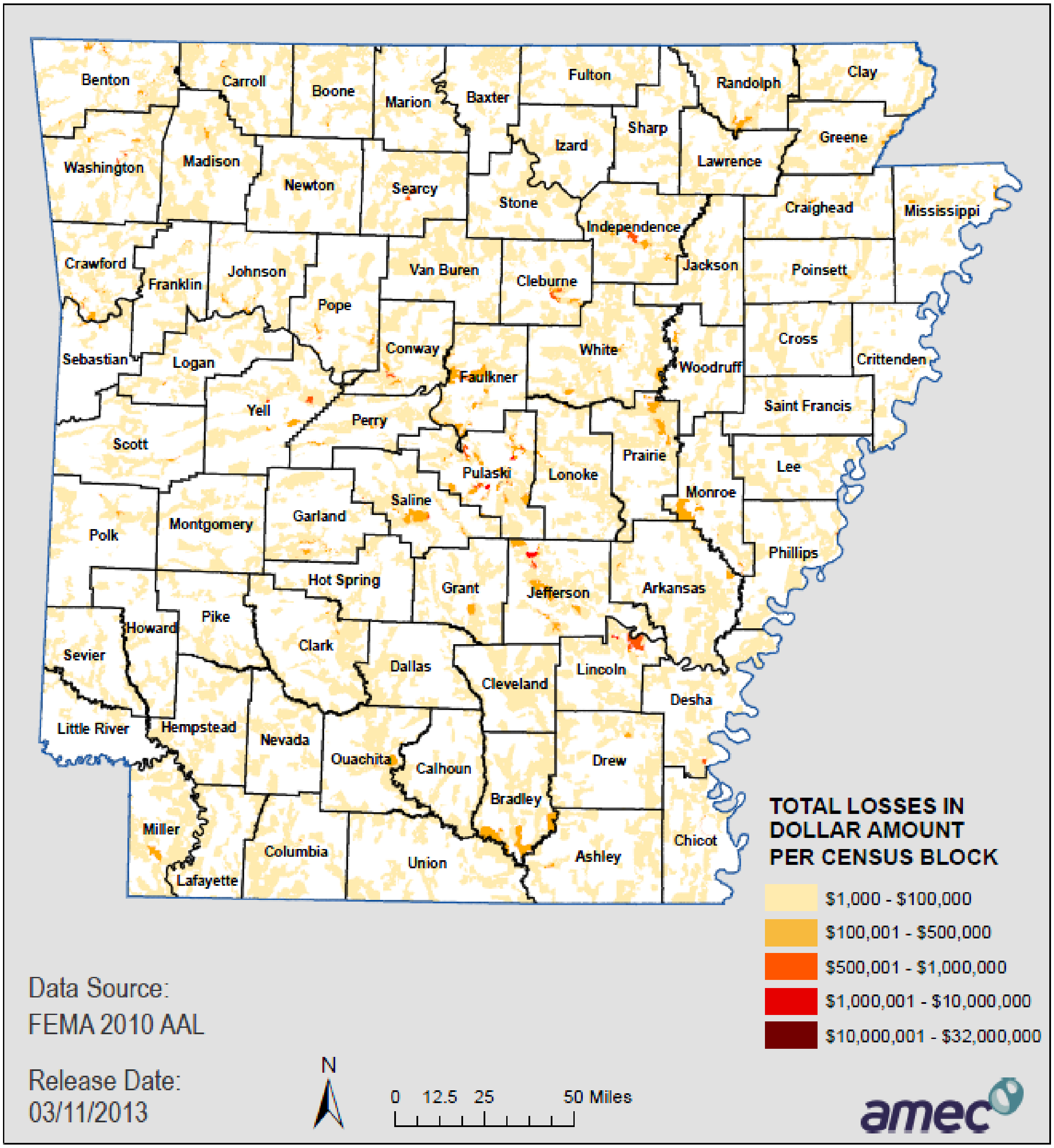
County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Building Losses	Total Contents Losses	Business Disruption Losses	Total Losses
Arkansas County	$859,000	$549,000	$51,000	$68,000	$39,000	$307,000	$949,000	$924,000	$95,000	$1,968,000
Ashley County	$861,000	$530,000	$29,000	$171,000	$42,000	$143,000	$932,000	$844,000	$51,000	$1,827,000
Baxter County	$959,000	$646,000	$8,000	$172,000	$11,000	$68,000	$978,000	$886,000	$22,000	$1,886,000
Benton County	$6,678,000	$4,397,000	$963,000	$2,827,000	$186,000	$2,178,000	$7,827,000	$9,402,000	$537,000	$17,766,000
Boone County	$1,287,000	$863,000	$917,000	$1,769,000	$206,000	$739,000	$2,410,000	$3,371,000	$257,000	$6,038,000
Bradley County	$1,318,000	$963,000	$2,000	$83,000	$0	$154,000	$1,320,000	$1,200,000	$37,000	$2,557,000
Calhoun County	$492,000	$302,000	$2,000	$24,000	$0	$71,000	$494,000	$397,000	$6,000	$897,000
Carroll County	$1,493,000	$963,000	$79,000	$417,000	$19,000	$171,000	$1,591,000	$1,551,000	$63,000	$3,205,000
Chicot County	$357,000	$213,000	$38,000	$130,000	$57,000	$171,000	$452,000	$514,000	$34,000	$1,000,000
Clark County	$2,260,000	$1,921,000	$67,000	$199,000	$45,000	$449,000	$2,372,000	$2,569,000	$170,000	$5,111,000
Clay County	$568,000	$357,000	$5,000	$143,000	$11,000	$167,000	$584,000	$667,000	$69,000	$1,320,000
Cleburne County	$3,105,000	$1,942,000	$372,000	$906,000	$83,000	$1,029,000	$3,560,000	$3,877,000	$272,000	$7,709,000
Cleveland County	$584,000	$367,000	$4,000	$95,000	$0	$187,000	$588,000	$649,000	$41,000	$1,278,000
Colombia County	$531,000	$332,000	$26,000	$186,000	$38,000	$239,000	$595,000	$757,000	$65,000	$1,417,000
Conway County	$1,378,000	$887,000	$92,000	$309,000	$36,000	$759,000	$1,506,000	$1,955,000	$226,000	$3,687,000
Craighead County	$1,964,000	$1,242,000	$91,000	$569,000	$89,000	$485,000	$2,144,000	$2,296,000	$101,000	$4,541,000
Crawford County	$3,256,000	$2,201,000	$231,000	$2,125,000	$135,000	$1,716,000	$3,622,000	$6,042,000	$500,000	$10,164,000
Crittenden County	$2,255,000	$1,568,000	$53,000	$384,000	$4,000	$374,000	$2,312,000	$2,326,000	$77,000	$4,715,000
Cross County	$484,000	$298,000	$32,000	$126,000	$41,000	$116,000	$557,000	$540,000	$45,000	$1,142,000
Dallas County	$296,000	$180,000	$1,000	$24,000	$3,000	$45,000	$300,000	$249,000	$11,000	$560,000
Desha County	$1,852,000	$1,169,000	$90,000	$290,000	$143,000	$406,000	$2,085,000	$1,865,000	$145,000	$4,095,000
Drew County	$314,000	$205,000	$11,000	$64,000	$26,000	$394,000	$351,000	$663,000	$117,000	$1,131,000

County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Building Losses	Total Contents Losses	Business Disruption Losses	Total Losses
Faulkner County	$3,264,000	$2,033,000	$270,000	$634,000	$103,000	$382,000	$3,637,000	$3,049,000	$71,000	$6,757,000
Franklin County	$738,000	$624,000	$26,000	$67,000	$12,000	$60,000	$776,000	$751,000	$12,000	$1,539,000
Fulton County	$925,000	$669,000	$37,000	$99,000	$16,000	$63,000	$978,000	$831,000	$18,000	$1,827,000
Garland County	$7,974,000	$5,164,000	$91,000	$1,367,000	$137,000	$532,000	$8,202,000	$7,063,000	$164,000	$15,429,000
Grant County	$1,021,000	$635,000	$25,000	$156,000	$4,000	$172,000	$1,050,000	$963,000	$44,000	$2,057,000
Greene County	$2,104,000	$1,484,000	$147,000	$582,000	$100,000	$1,434,000	$2,351,000	$3,500,000	$225,000	$6,076,000
Hempstead County	$582,000	$343,000	$3,000	$36,000	$1,000	$178,000	$586,000	$557,000	$41,000	$1,184,000
Hot Spring County	$1,258,000	$772,000	$51,000	$147,000	$77,000	$104,000	$1,386,000	$1,023,000	$28,000	$2,437,000
Howard County	$488,000	$361,000	$82,000	$301,000	$39,000	$299,000	$609,000	$961,000	$120,000	$1,690,000
Independence County	$2,836,000	$1,837,000	$494,000	$914,000	$129,000	$623,000	$3,459,000	$3,374,000	$174,000	$7,007,000
Izard County	$759,000	$468,000	$21,000	$27,000	$11,000	$38,000	$791,000	$533,000	$5,000	$1,329,000
Jackson County	$1,376,000	$888,000	$104,000	$503,000	$21,000	$250,000	$1,501,000	$1,641,000	$72,000	$3,214,000
Jefferson County	$4,764,000	$3,133,000	$302,000	$1,208,000	$160,000	$2,107,000	$5,226,000	$6,448,000	$603,000	$12,277,000
Johnson County	$2,450,000	$1,756,000	$653,000	$1,656,000	$347,000	$1,560,000	$3,450,000	$4,972,000	$486,000	$8,908,000
Lafayette County	$312,000	$190,000	$0	$42,000	$0	$27,000	$312,000	$259,000	$6,000	$577,000
Lawrence County	$928,000	$598,000	$85,000	$166,000	$29,000	$304,000	$1,042,000	$1,068,000	$76,000	$2,186,000
Lee County	$401,000	$264,000	$28,000	$54,000	$22,000	$86,000	$451,000	$404,000	$24,000	$879,000
Lincoln County	$2,913,000	$3,484,000	$58,000	$353,000	$55,000	$999,000	$3,026,000	$4,836,000	$335,000	$8,197,000
Little River County	$165,000	$97,000	$5,000	$17,000	$3,000	$36,000	$173,000	$150,000	$7,000	$330,000
Logan County	$1,226,000	$846,000	$62,000	$213,000	$116,000	$923,000	$1,404,000	$1,982,000	$216,000	$3,602,000
Lonoke County	$1,973,000	$1,242,000	$134,000	$759,000	$85,000	$325,000	$2,192,000	$2,326,000	$102,000	$4,620,000
Madison County	$1,129,000	$691,000	$40,000	$165,000	$40,000	$344,000	$1,209,000	$1,200,000	$79,000	$2,488,000
Marion County	$749,000	$452,000	$59,000	$130,000	$38,000	$180,000	$846,000	$762,000	$34,000	$1,642,000
Miller County	$978,000	$602,000	$44,000	$120,000	$27,000	$117,000	$1,049,000	$839,000	$22,000	$1,910,000

County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Building Losses	Total Contents Losses	Business Disruption Losses	Total Losses
Mississippi County	$732,000	$462,000	$38,000	$217,000	$35,000	$669,000	$805,000	$1,348,000	$135,000	$2,288,000
Monroe County	$1,271,000	$795,000	$11,000	$67,000	$11,000	$67,000	$1,293,000	$929,000	$13,000	$2,235,000
Montgomery County	$1,223,000	$752,000	$17,000	$172,000	$13,000	$162,000	$1,253,000	$1,086,000	$40,000	$2,379,000
Nevada County	$276,000	$166,000	$0	$0	$0	$47,000	$276,000	$213,000	$12,000	$501,000
Newton County	$683,000	$452,000	$129,000	$301,000	$20,000	$400,000	$832,000	$1,153,000	$131,000	$2,116,000
Ouachita County	$1,318,000	$884,000	$101,000	$358,000	$45,000	$735,000	$1,464,000	$1,977,000	$249,000	$3,690,000
Perry County	$1,055,000	$681,000	$1,000	$146,000	$2,000	$340,000	$1,058,000	$1,167,000	$72,000	$2,297,000
Phillips County	$2,991,000	$1,969,000	$570,000	$7,649,000	$149,000	$1,782,000	$3,710,000	$11,400,000	$599,000	$15,709,000
Pike County	$735,000	$458,000	$59,000	$350,000	$45,000	$192,000	$839,000	$1,000,000	$76,000	$1,915,000
Poinsett County	$685,000	$430,000	$67,000	$268,000	$39,000	$252,000	$791,000	$950,000	$46,000	$1,787,000
Polk County	$888,000	$549,000	$19,000	$135,000	$20,000	$282,000	$927,000	$966,000	$61,000	$1,954,000
Pope County	$2,117,000	$1,322,000	$257,000	$449,000	$82,000	$444,000	$2,456,000	$2,215,000	$91,000	$4,762,000
Prairie County	$1,906,000	$1,192,000	$4,000	$70,000	$4,000	$38,000	$1,914,000	$1,300,000	$12,000	$3,226,000
Pulaski County	$9,954,000	$6,384,000	$10,859,000	$27,814,000	$1,555,000	$4,729,000	$22,368,000	$38,927,000	$4,578,000	$65,873,000
Randolph County	$1,548,000	$992,000	$185,000	$390,000	$95,000	$380,000	$1,828,000	$1,762,000	$143,000	$3,733,000
Saint Francis County	$317,000	$188,000	$4,000	$18,000	$3,000	$26,000	$324,000	$232,000	$1,000	$557,000
Saline County	$4,495,000	$2,913,000	$162,000	$1,046,000	$103,000	$821,000	$4,760,000	$4,780,000	$195,000	$9,735,000
Scott County	$998,000	$614,000	$48,000	$343,000	$44,000	$242,000	$1,090,000	$1,199,000	$69,000	$2,358,000
Searcy County	$416,000	$274,000	$148,000	$659,000	$79,000	$913,000	$643,000	$1,846,000	$211,000	$2,700,000
Sebastian County	$1,205,000	$877,000	$212,000	$501,000	$82,000	$1,455,000	$1,499,000	$2,833,000	$251,000	$4,583,000
Sevier County	$466,000	$296,000	$14,000	$161,000	$2,000	$26,000	$482,000	$483,000	$5,000	$970,000
Sharp County	$1,429,000	$915,000	$10,000	$697,000	$7,000	$137,000	$1,446,000	$1,749,000	$68,000	$3,263,000
Stone County	$591,000	$337,000	$14,000	$41,000	$16,000	$16,000	$621,000	$394,000	$5,000	$1,020,000
Union County	$725,000	$437,000	$33,000	$170,000	$25,000	$230,000	$783,000	$837,000	$34,000	$1,654,000

County	Residential Building Losses	Residential Contents Losses	Commercial Building Losses	Commercial Contents Losses	Other Building Losses	Other Contents Losses	Total Building Losses	Total Contents Losses	Business Disruption Losses	Total Losses
Van Buren County	$1,008,000	$671,000	$50,000	$352,000	$19,000	$131,000	$1,077,000	$1,154,000	$46,000	$2,277,000
Washington County	$4,604,000	$2,965,000	$481,000	$2,186,000	$390,000	$2,092,000	$5,475,000	$7,243,000	$597,000	$13,315,000
White County	$3,489,000	$2,136,000	$296,000	$808,000	$288,000	$833,000	$4,073,000	$3,777,000	$200,000	$8,050,000
Woodruff County	$996,000	$624,000	$21,000	$271,000	$18,000	$149,000	$1,035,000	$1,044,000	$102,000	$2,181,000
Yell County	$1,493,000	$1,061,000	$124,000	$343,000	$231,000	$613,000	$1,848,000	$2,017,000	$167,000	$4,032,000
Total	**$124,078,000**	**$82,524,000**	**$19,919,000**	**$66,779,000**	**$6,208,000**	**$39,714,000**	**$150,205,000**	**$189,017,000**	**$14,114,000**	**$353,336,000**

3.4.5.o Arkansas AAL Results by Census Block



❖ *Development in Hazard Prone Areas*

According to FEMA's HAZUS Flood Average Annualized Loss (AAL) study, the following counties have the top ten annualized losses: Pulaski, Benton, Phillips, Garland, Washington, Jefferson, Crawford, Saline, Johnson, and Lincoln. Of these, Benton, Crawford, Saline, and Washington Counties are also in the top 10 counties for population (percentage) and housing gains from 2000 to 2010. **Table 3.4.5.m** compares the annualized loss estimates from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these four counties.

Table 3.4.5.m Comparison of Annualized Loss[1]

County	Annualized Loss 2010 Plan	Annualized Loss 2013 Plan	Comparison
Benton	N/A	$17,766,000	Comparison not available.
Crawford	$67,000	$10,164,000	Comparison reveals data computations were not performed in similar manner, comparison is not applicable.
Saline	N/A	$9,735,000	Comparison not available.
Washington	N/A	$13,315,000	Comparison not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

The National Flood Insurance Program (NFIP) addresses land development in flood hazard areas of communities that are participants in the NFIP. It is not known how much development is occurring in flood hazard areas, but for communities in these counties that participate in the NFIP, any development in the floodplain should be built 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. Additionally, the communities listed in **Table 3.4.5.n** are part of the NFIPs Community Rating System (CRS) and are taking steps above and beyond the minimum requirements to qualify for reductions in flood insurance premiums. The floodplain management practices for CRS communities are reviewed on a periodic cycle, typically every five years.

Table 3.4.5.n. Arkansas CRS Eligible Communities and Their Discounts

Community Number	Community Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA	% Discount for Non-SFHA	Status
50029	Arkadelphia, City of	10/1/1991	10/1/2005	8	10	5	Current
50192	Benton, City of	10/1/1993	10/1/1993	9	5	5	Current
50419	Benton County	5/1/2005	5/1/2005	8	10	5	Current
50012	Bentonville, City of	10/1/1992	10/1/2002	8	10	5	Current
50140	Blytheville, City of	10/1/1995	10/1/1995	9	5	5	Current
50046	Bono, City of	10/1/1992	10/1/2012	9	5	5	Current
50308	Bryant, City of	10/1/1992	10/1/1992	9	5	5	Current

Flood

Community Number	Community Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA	% Discount for Non-SFHA	Status
50433	Garland County	10/1/1993	10/1/1993	9	5	5	Current
50168	Helena, City of	10/1/1993	10/1/1999	10	0	0	Rescinded
50084	Hot Springs City of	10/1/1993	10/1/2006	8	10	5	Current
50180	Jacksonville, City of	10/1/1994	10/1/2004	8	10	5	Current
50048	Jonesboro, City of	10/1/1992	10/1/1992	9	5	5	Current
50181	Little Rock, City of	10/1/1991	10/1/2011	7	15	5	Current
50088	Malvern, City of	10/1/1991	10/1/1996	10	0	0	Rescinded
50109	Pine Bluff, City of	10/1/1994	10/1/1995	10	0	0	Rescinded
50053	Van Buren, City of	5/1/2009	5/1/2009	9	5	5	Current
50055	West Memphis, City of	10/1/1992	5/1/2012	7	15	5	Current

Source: FEMA, NFIP Flood Insurance Agent's Manual, October 1, 2012

❖ *Consequence Analysis*

Floods and flash flooding will negatively affect the State of Arkansas with a variety of impacts:

- People, facilities and infrastructure located within the floodplains in Arkansas are susceptible to flood impacts.
- Areas with poor drainage (e.g., fast growing municipalities that lack adequate storm drainage management) are more susceptible to the short-term effects of flash flooding.
- Injuries and deaths have resulted in the past from flooding events. Most cases involved automobile accidents during dangerous conditions.
- The flooding situation created by Hurricane Katrina showed the worst case scenario resulting in long-term, significant flooding. The impacts included severe property damage, severe damage to cars and other equipment, water system contamination, wastewater treatment disruptions, civil unrest and evacuation issues. Arkansas does not expect to face a flooding event of this magnitude.
- Flooding, and particularly flash flooding, has caused traffic accidents and congestion that has resulted in short-term impacts on the transportation infrastructure.
- Property damaged by a flooding event often results in a mold infestation that can require cleaning and repairs. The mold can also create health issues for people in contact with it. Additional public health concerns that may result from flooding include the need for disease and injury surveillance, community sanitation, evaluation of flood-affected food supplies, private water and sewage sanitation, and vector control (for mosquitoes and other pests that thrive in water or moist areas)
- Responders are often put at risk during flood events as they respond to calls for assistance. Their risks can range from sickness due to exposure to inclement weather, to performing

dangerous rescue missions for stranded citizens. Most responders, however, are not at a great health and safety risk from flooding events.

- Flooding, as a localized event, does not pose a significant effect on the State's ability to maintain normal operations. During major flooding events, state resources directed by ADEM would be mobilized to assist in the response and recovery and this can cause a re-prioritization of the short and medium-term government agenda. However, this hazard should not cause any major disruptions to essential government services.
- Flooding is usually the result of fast moving, severe storm systems and often includes other hazards including tornadoes, lightning, straight-line winds and hail. The impact from these related hazards will compound the response and recovery issues related directly to flooding.

The eastern boundary of the State of Arkansas is established by the Mississippi River. A significant flood of this river will severely impact the State. The Mississippi River is constantly monitored and an intricate series of flood-related levees helps to regulate its water levels. There would be some advanced notice of any major flooding and this would reduce the impact especially to human and animal life. In the event of a 500-year flood on the river, there would be significant impact to all of the localized areas including homes, business facilities, water transportation locations, boating equipment, and agricultural areas.

The information in **Table 3.4.5.o provides** the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.5.o EMAP Consequence Analysis: Flood

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Health and Safety of Persons Responding to the Incident	Localized impact expected to limit damage to personnel in the flood areas at the time of the incident.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services.
The Environment	Localized impact expected to be severe for incident areas and moderate to light for other areas affected by the flood or HazMat spills.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.6 Landslides

This Landslide profile was developed in the original plan, amended in the previous updates, and modified again in 2013. The committee has updated this section and added new information when relevant. This hazard profile and the subsequent vulnerability analysis are the primary tools for the determination of the State's mitigation strategy with respect to landslides.

❖ *Description/Location*

"Landslide" is a term that encompasses many phenomena involving lateral and down slope movement of earth materials such as rock, soil and/or artificial fill. The term covers a broad category of events, including mudflows, mudslides and debris flows, rock falls, rockslides, debris slides, earth flows and soil creep. Landslides can occur as sudden, short-lived events, or as a slow moving slide mass (such as the Portuguese Bend Landslide of southern California, which has moved at a rate of three feet per year since 1956) or as soil creep.

All landslides are triggered by natural causes or man-made activities. The principal factors that contribute to landslide susceptibility are:

Topography: Influences stream erosion that, in turn, influences slope angle and gradient. The steeper the slope the more susceptible it is to sliding. Human activities (cut-and-fill construction for highways, construction of buildings and mining) reshape the contours of the land, altering the natural slope and thus making it more susceptible to landslides.

Geology: The strength of rocks, that is, their resistance to erosion, is an important geologic factor in the landslide process. Certain bedrock formations or soil types appear to be more susceptible to movement. Examples in Arkansas include areas of highly weathered Pennsylvanian Age shale, the Fayetteville Shale Formation in the northwest part of the State and many of the clay layers in the eastern part of the State.

Seismic activity: Landslides and lateral spreads often result from seismic activity as experienced in Arkansas during the 1811-1812 New Madrid earthquakes. Lateral spreading can occur in very gently sloping terrain where shallow, sandy and saturated soils exist, typically adjacent to rivers. Earthquakes can cause liquefaction of the loosely compacted sandy soils which can settle and crack lead to lateral spreading.

Rainfall/snowmelt: Rainfall has a pronounced effect on landscape (slope) development. It has the capacity to erode and undermine slope surfaces. Water that is absorbed increases pore water pressure and weight and lubricates inherently weak zones of rock and soil. Generally, it is assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced landslides in the past.

Landslides are classified by the type of movement that occurs and the type of material involved. The types of movement are slides, flows, lateral spreads, falls and topples. The types of material include bedrock and soil (including artificial fill). Soils are described as material that is either predominantly coarse (debris) or predominantly fine (earth).

- Slides: Involve downward displacement of rock or soil along one or more failure surfaces. The material may be broken into a number of pieces or remain as a single, intact block. Slides are commonly initiated when the bottom of the slope is removed (by running water or human activity), thereby steepening the overall slope to the point a landslide occurs. Slides are common throughout Arkansas, especially along streams and highways.
- Flows: Consist of slurries of loose rocks, soil, organic matter, air and water moving down slope in a manner similar to a viscous fluid. They are distinguished from slides by having high water content. Although flows are not as severe a problem in Arkansas as in some of the western states, they are common in all areas of the State, especially along the slopes of Crowley's Ridge (Cronin, 1992; see McFarland, 1992). A type of flow known as soil creep is an extremely slow and steady process that may persist over long periods of time. It is commonly observed in weathered bedrock and soil on steep slopes throughout Arkansas.
- Lateral Spreads: Slow-to-rapid lateral extensional movements of rock or soil masses on almost level ground. Loose, granular soils commonly produce lateral spreads through liquefaction which is the transformation of a granular material from a solid state into a liquefied state. Liquefaction is caused by vibration of the earth produced by a strong earthquake. While the documentation of lateral spreading in Arkansas is extremely poor, there is detailed mapping of liquefaction in the vicinity of the New Madrid Seismic Zone in the northeastern part of the State.
- Falls and Topples: Occur when masses of rock or other material detach from a steep slope or cliff and descend by free falling, rolling or bouncing. In Arkansas, falls and topples are infrequent in occurrence and are restricted to the rock outcrops of the Ouachita and Ozark Mountains and the bluff faces of the Arkansas River Valley.

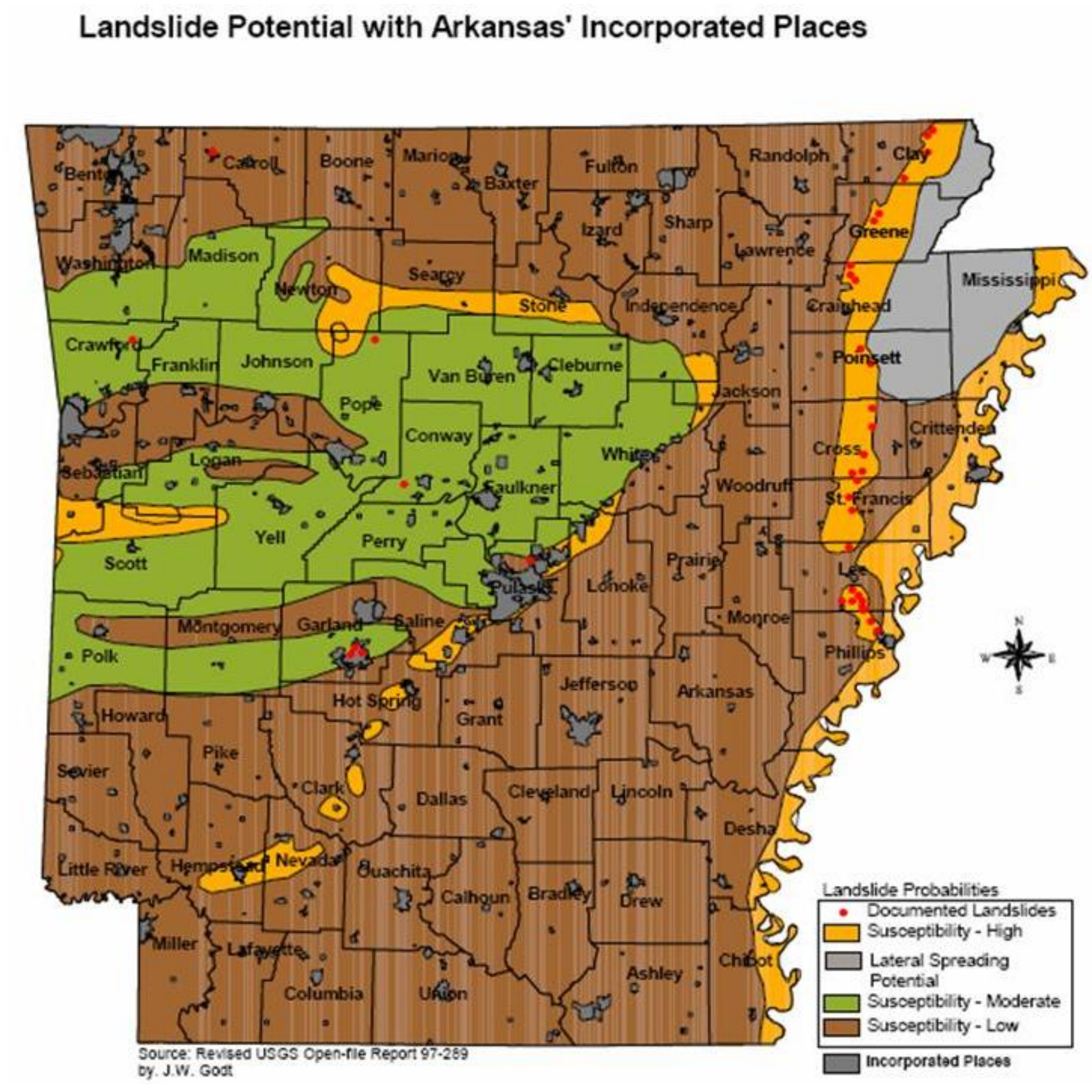
Studies by FEMA and others have found that landslides occur in every state and cause over $2 billion in building and highway losses and approximately 25 to 50 deaths annually in the United States. It has been estimated that about 40 percent of the United States population has been exposed to the direct and indirect effects of landslides. Although landslides may not be preventable, their devastating effects on humans and their property is avoidable and can be mitigated.

❖ *Previous Occurrences*

Landslides have occurred in nearly every county in Arkansas. They have destroyed or damaged roads, railroads, bridges, mining facilities, parks and recreational areas, residential and commercial buildings, sewers, dams, reservoirs, forests, fisheries and farms. Damage caused directly by landslides is largely undocumented or often reported incorrectly. The devastating effects of landslides often are attributed to the triggering event such as a flood, earthquake or storm.

The University of Arkansas-Little Rock used USGS data to produce map, **Figure 3.4.6.a,** that shows the landslide potential within the State of Arkansas.

Figure 3.4.6.a Landslide Potential with Arkansas' Incorporated Places



The USGS and the State of Arkansas have identified the area in the Ozark-Ouachita mountainous region to be particularly susceptible to landslides especially during periods of heavy rains. The soil conditions in many of these areas are susceptible to numerous, fast-moving landslides during heavy rains.

Broader landslide studies that have included Arkansas include the generalized work of Godt (1997) and Radbruch-Hall et al. (1982), a landslide survey of Crowley's Ridge by McFarland (1992), and the numerous site visits by the geologists of the Arkansas Geological Commission (AGC). These site visits were generally made at the invitation of the Arkansas Highway and Transportation Department (AHTD) or the property owner of the landslide, were reconnaissance in nature, and generally no public report was generated.

Except for Crowley's Ridge, the New Madrid Seismic Zone (NMSZ) and Hot Springs, no detailed study of specific landslides or areas of landslide susceptibility has been conducted in Arkansas. The study of Crowley's Ridge by McFarland (1992) inventoried the ridge's present landslides and concluded that more work is needed to "broaden our insight into the landslide hazard of Crowley's Ridge" and that the area is prone to an earthquake large enough to cause landslides is in the future. Studies within NMSZ have shown the extent of liquefaction in Arkansas; the next large earthquake could produce liquefaction within these areas. Following the Hot Springs landslide of November 11, 1995, a rockfall hazard evaluation report was prepared by Woodward-Clyde (1997) for the City of Hot Springs. The report concluded it would cost approximately $3,000,000 to construct the needed mitigation measures in the downtown area. No other landslide investigations or risk assessments have been performed in Arkansas.

- ***June 11, 2010 Montgomery County:*** Early on the morning of 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 Boone and Conway Counties:*** A strong but slow-moving storm began on December 23, 2009 and continued through the 24th. Many places received 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 early on the morning of the December 24, 2009. Mud flowed down onto Arkansas Highway 154. Approximately 200 truckloads of mud, topsoil and fallen trees had to be removed.

- ***May 19, 2005 Greers Ferry Lake:*** Early on the morning of March 28, 2005, after two days of rain, a significant landslide occurred on the north side of Stevens Point on the south shore of Greers Ferry Lake. The slide collided, in part, with a house; crushing the garage on the south side of the house and tearing a small room off the west side. The slide ultimately involved an area extending from a sandstone ledge over 100 feet in elevation above the house down to and into the lake over 100 feet in elevation below the house and extending to either side of the house.

Figure 3.4.6.b Examples of Landslide Damage to Residential Structure

Source: http://www.geology.ar.gov/pdf/Greers%20Ferry%20Landslide.pdf

- ***March 28, 2005 Ozark-Ouachita Highlands:*** After two days of rain on March 28, 2005 resulting from the landfall of Hurricane Rita, several landslides (rock falls, mud/debris flows and slumps) were started, including one very large landslide that destroyed a house.

- ***January 29, 2005 "Duck-Crusher" Landslide, Hot Springs*****:** A rock fall landslide occurred in Hot Springs along Central Avenue. This fall was caused by the separation of gunnite (sprayed-on concrete) from the high wall of the parking lot cut. Little of the material that fell was original hillside rock. Most of it was the concrete, with a much smaller amount of rock material falling last and covering the collapsed concrete slabs. More of this wall of sprayed-on concrete is likely to fail again for the same reasons.

Figure 3.4.6.c Examples of Landslide Damage

May 17, 2004 February 1, 2005

Source: http://www.geology.ar.gov/pdf/The%20Duck%20Crusher%20Landslide%20Site.pdf

- ***April 2004 Newton and Madison County Landslides:*** Heavy rainfall between six and 10 inches fell over a large part of northern Arkansas over a three day period through the morning of April 24th, 2004, resulting in widespread flash flooding over the northern part of the state. Numerous county roads and bridges were flooded by several feet of water and were impassable for a period of time. Some county roads also sustained damages due to washouts. This heavy rainfall triggered five landslides along state highways in Newton and Madison Counties, partially or completely shutting down two state highways. On May 7, Newton and Madison Counties, along with 12 other Arkansas Counties, were declared Federal Disaster areas (FEMA-1516-DR). An initial estimate to repair these five landslide areas was $1.4 million.

- ***November 11, 1995 West Mountain, Hot Springs:*** A rock slide occurred along an exposed northeast scarp of West Mountain in downtown Hot Springs. In a matter of seconds, several hundred tons of rock and slide debris crashed through the back wall and second floor of the Hot Springy Dingy Novelty store and portions of two other buildings along Central Avenue. The slide crushed one person and injured two others in the novelty store. Although the size of the landslide was small (i.e., approximately 43 feet long and 30 feet high), its damage to life and property was most severe (McFarland and Stone, 1995; Engineering and Geological Services, Inc., 1995; Woodward-Clyde Consultants, 1997).

- ***March 23, 1984 North Mountain, Hot Springs:*** The southwest end of North Mountain in downtown Hot Springs slid into an open parking lot between the Arlington Hotel and its parking deck. This portion of North Mountain had been modified and oversteepened by excavating into the hillside to accommodate a larger parking lot. A small retaining wall and fence had been placed at the toe of the hill to intercept rocks and boulders that fell from the cut wall, in hopes of protecting any cars in the parking lot. The hotel's engineer had noticed rocks falling from the cut slope several hours before the landslide occurred. He was standing by the hillside when the landslide began and barely escaped. The landslide failure was along joints and fractures that had been weakened and lubricated by spring rains. Although none of the slide debris and boulders spilled out onto Central Avenue, most of the parking lot was destroyed. At the suggestion of the Arkansas Geological Commission, part of the slide mass was left in place at the toe of the slope to act as a buttress and help stabilize the hillside from future slides.

❖ *Probability of Future Hazard Events*

According to the Arkansas Highway and Transportation Department, the annual frequency of significant landslide events is three to four per year. However, this number varies considerably (between zero and over 20) depending primarily on precipitation characteristics that year. With this information, the APDMAC has determined that landslides will continue to occur in the State and cause damage. The probability of landslides is very difficult to calculate because most landslides are related to other hazards including:

- Severe storms with heavy rains;
- Flooding; and
- Earthquakes.

Based on the historical records, there is a high probability that landslides will occur in the high risk areas along the eastern border and along the Ozark-Ouachita mountainous region in the central western area of the State. Generally, there is a low probability of landslides for the rest of the State; however isolated areas especially with human development may be susceptible to this hazard. Based on the available reported data, only a limited number of landslides have been reported in the State of Arkansas, however many landslides occur without being reported due to little or no damage. Therefore, the State's overall probability rating was determined to be **"Possible"**. This lack of data is considered a data limitation and a corresponding mitigation item has been included in the Mitigation Strategy chapter of this plan.

❖ *State Vulnerability Analysis*

Landslides have occurred in nearly every county in Arkansas, causing serious damage and loss of life. Landslides are triggered by causes such as weaknesses in the rock and soil, earthquake activity, the occurrence of heavy rainfall or snowmelt or construction activity that changes some critical aspect of the geological environment. A combination of these causes makes it difficult to predict exactly when and where landslides will occur. Landslides are not always reported or documented, especially in remote areas.

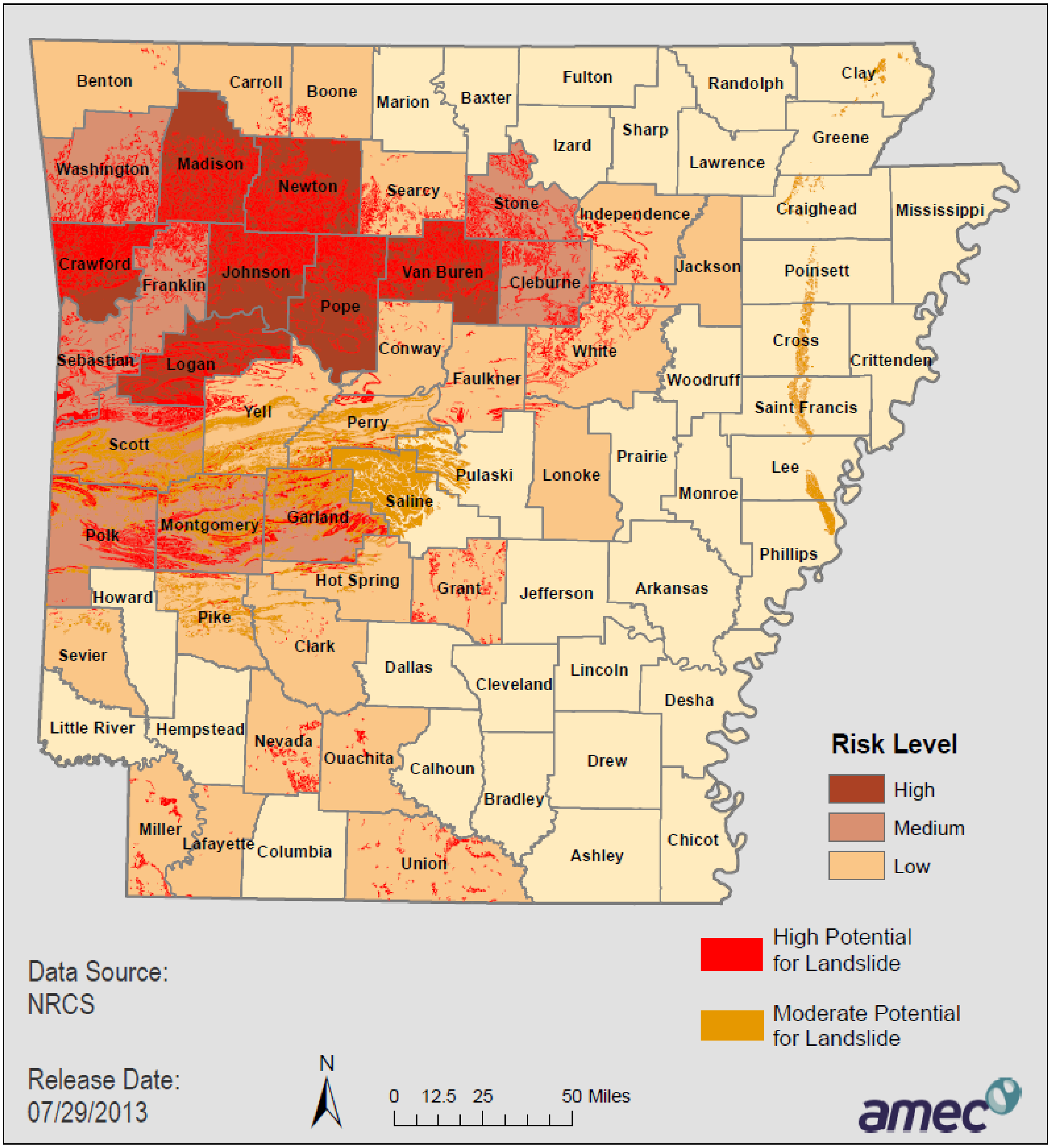
Similar to the expansive soils analysis, the Assistant State Conservation Engineer and Senior Soil Scientist with the USDA Natural Resources Conservation Service provided GIS data for soils within Arkansas which have been interpreted to be landslide-prone soils. This data along with census block data available in HAZUS MH 2.1 was used to determine the number of people and number of buildings within these identified landslide-prone soils areas.

This methodology consisted of calculating the percentage of the census block areas inside the landslide-prone soils areas. This percentage was then applied to the census block population and building data. This analysis provides a general picture of those counties that have more people and property within areas of landslide-prone soils and therefore the potential for more damage if a landslide were to occur.

Figure 3.4.6.d. depicts the 38 counties with soils interpreted to be very landslide-prone.

Table 3.4.6.a provides a breakdown by county of the percent of area with landslide-prone soils and the estimated number of structures within the landslide-prone soils areas. This data is to be used only for general determination of those areas that *could* suffer the greatest losses in the event of soil expansion events. Data limitations prevent a more accurate analysis including: lack of statewide parcel-type data which would provide more accurate results in determining structures within the landslide-prone soil areas.

Figure 3.4.6.d. Arkansas Counties with Soils Susceptible to Landslides



To complete the vulnerability analysis, a rating value of low, moderate, and high was assigned to each county based upon the percentage of landslide-prone soils within the county. These rating values correspond to the following descriptive terms:

1) Low Vulnerability – Less than 10-percent landslide-prone soils
2) Moderate Vulnerability – Between 10 and 20-percent landslide-prone soils
3) High Vulnerability – Over 20-percent landslide-prone soils within County

Table 3.4.6.a. Area and Building Counts within Identified Landslide-Prone Soil Areas in Arkansas Counties

County	% of Area within County with High Potential for Landslide	Residential Building Exposure in Areas with High Potential for Landslide	Commercial Building Exposure in Expansive Soil Areas	Industrial Building Exposure in Areas with High Potential for Landslide	Other Building Exposure in Areas with High Potential for Landslide	Overall Vulnerability
BENTON	0.3%	73	2	1	0	Low
BOONE	1.7%	103	1	0	1	Low
CARROLL	1.7%	52	1	0	1	Low
CLARK	0.3%	53	2	0	1	Low
CLEBURNE	13.5%	973	30	7	10	Moderate
CONWAY	3.2%	107	5	1	1	Low
CRAWFORD	44.3%	4045	106	43	29	High
FAULKNER	3.7%	938	14	7	6	Low
FRANKLIN	15.9%	394	4	0	4	Moderate
GARLAND	14.2%	1751	71	30	18	Moderate
GRANT	5.4%	295	5	2	4	Low
HOT SPRING	2.0%	64	0	0	0	Low
INDEPENDENCE	5.9%	677	23	4	8	Low
JACKSON	0.7%	47	1	0	0	Low
JOHNSON	29.8%	549	11	6	5	High
LAFAYETTE	0.4%	4	0	0	0	Low
LOGAN	24.0%	997	13	4	11	High
LONOKE	0.8%	445	17	3	2	Low
MADISON	21.6%	1095	16	8	10	High
MILLER	3.8%	256	3	0	3	Low
MONTGOMERY	15.7%	247	2	3	2	Moderate
NEVADA	4.7%	110	0	0	0	Low
NEWTON	27.9%	844	3	2	4	High
OUACHITA	1.1%	168	4	6	3	Low
PERRY	4.9%	97	1	0	2	Low
PIKE	2.6%	63	3	2	1	Low
POLK	17.3%	293	3	2	1	Moderate
POPE	23.5%	694	14	4	10	High
SCOTT	13.4%	193	9	4	7	Moderate
SEARCY	9.4%	245	3	1	3	Low
SEBASTIAN	16.8%	4449	172	49	36	Moderate
SEVIER	0.3%	2	0	0	0	Low
STONE	17.8%	749	10	3	7	Moderate
UNION	3.0%	162	1	0	2	Low
VAN BUREN	25.9%	1983	44	9	11	High
WASHINGTON	17.2%	3066	78	30	31	Moderate

County	% of Area within County with High Potential for Landslide	Residential Building Exposure in Areas with High Potential for Landslide	Commercial Building Exposure in Expansive Soil Areas	Industrial Building Exposure in Areas with High Potential for Landslide	Other Building Exposure in Areas with High Potential for Landslide	Overall Vulnerability
WHITE	8.7%	1447	24	5	16	Low
YELL	6.2%	297	3	0	1	Low

Source: NRCS and HAZUS MH 2.1

According to this analysis, Crawford, Johnson, Logan, Madison, Newton, Pope and Van Buren Counties have the largest area of landslide-prone soils at over 20-percent of the total county area. For those counties with high vulnerability rating, Crawford, Logan, Madison, and Van Buren have over 1,000 structures currently located within an identified landslide-prone soils area.

❖ State Estimates of Potential Losses

To estimate potential losses associated with expansive soils, the NRCS soils data along with census block data available in HAZUS MH 2.1 was used to determine the building values within the identified landslide-prone soil areas of Counties with a moderate to high vulnerability rating. This methodology consisted of calculating the percentage of the census block areas inside the expansive soils areas. This percentage was then applied to the HAZUS MH 2.1 building data.

Table 3.4.6.b. Building Values within Identified Landslide-Prone Soil Areas in Arkansas Counties

County	Structure Value Exposure in Landslide Areas ($1,000)	Contents Value Exposure in Landslide Areas ($1,000)	Total Building Exposure Value in Landslide Areas ($1,000)
BENTON	$9,454	$5,377	$14,831
BOONE	$11,846	$6,812	$18,658
CARROLL	$5,941	$3,283	$9,224
CLARK	$6,096	$3,524	$9,619
CLEBURNE	$128,485	$80,715	$209,200
CONWAY	$17,955	$11,792	$29,747
CRAWFORD	$512,993	$301,474	$814,467
FAULKNER	$111,258	$60,823	$172,081
FRANKLIN	$47,428	$25,286	$72,714
GARLAND	$291,750	$188,567	$480,317
GRANT	$37,339	$20,892	$58,231
HOT SPRING	$6,063	$3,121	$9,183
INDEPENDENCE	$98,751	$55,766	$154,517
JACKSON	$5,433	$2,884	$8,317
JOHNSON	$55,727	$33,496	$89,223

County	Structure Value Exposure in Landslide Areas ($1,000)	Contents Value Exposure in Landslide Areas ($1,000)	Total Building Exposure Value in Landslide Areas ($1,000)
LAFAYETTE	$402	$202	$604
LOGAN	$111,408	$60,504	$171,912
LONOKE	$87,985	$47,889	$135,874
MADISON	$109,647	$61,837	$171,484
MILLER	$30,476	$16,736	$47,212
MONTGOMERY	$24,228	$13,322	$37,551
NEVADA	$8,790	$4,405	$13,194
NEWTON	$73,323	$39,008	$112,330
OUACHITA	$25,817	$20,687	$46,504
PERRY	$8,831	$4,936	$13,767
PIKE	$6,408	$3,814	$10,221
POLK	$24,348	$13,092	$37,440
POPE	$98,020	$55,135	$153,154
SCOTT	$24,907	$16,650	$41,557
SEARCY	$22,835	$13,080	$35,915
SEBASTIAN	$894,569	$526,066	$1,420,635
SEVIER	$259	$188	$447
STONE	$68,361	$38,590	$106,950
UNION	$23,152	$13,136	$36,288
VAN BUREN	$208,767	$119,431	$328,198
WASHINGTON	$457,255	$265,283	$722,538
WHITE	$185,788	$105,196	$290,985
YELL	$33,457	$19,286	$52,743

Source: NRCS and HAZUS MH 2.1

❖ *Development in Hazard Prone Areas*

An analysis of development growth in counties with landslide-prone soils revealed all counties with noted moderate to high vulnerability had housing unit gains from 2000 to 2010. Garland, Sebastian, and Washington Counties were among the top 10 counties with greatest housing gains. If additional development and population growth begins to occur in landslide-prone soils areas, this will increase the vulnerability. The development and implementation of building codes which address landslide-prone soils is a recommended mitigation action for each identified County. **Table 3.4.6.c** compares the total exposure from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these three counties.

Table 3.4.6.c Comparison of Building Exposure within Identified Landslide-Prone Soil Areas [1]

County	Total Building Exposure 2010 Plan	Total Building Exposure 2013 Plan	Comparison
Garland	$10,436,947	$480,317	2010 exposure values are countywide and may over estimate the potential loss estimate; 2013 exposure values are clipped to the high potential landside areas from NRCS. Comparison is not available.
Sebastian	$13,727,680	$1,420,635	2010 exposure values are countywide and may over estimate the potential loss estimate; 2013 exposure values are clipped to the high potential landside areas from NRCS. Comparison is not available.
Washington	$17,331,257	$722,538	2010 exposure values are countywide and may over estimate the potential loss estimate; 2013 exposure values are clipped to the high potential landside areas from NRCS. Comparison is not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

❖ *Consequence Analysis*

The information in **Table 3.4.6.d** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.6.d EMAP Consequence Analysis: Landslide-Prone Areas

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be moderate to severe for incident areas.
Health and Safety of Persons Responding to the Incident	Limit impacts to personnel responding to the incident.
Continuity of Operations	Limited, unless facility is impacted.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads and/or utilities may postpone delivery of some services.
The Environment	Localized impact expected to be moderate for incident area.
Economic and Financial Condition	Limited. Local economy and finances may be adversely affected, depending on damage.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Localized impact expected to primarily adversely affect property owner(s) confidence in local entities development policies.

3.4.7 Severe Thunderstorms

❖ *Description/Location*

Thunderstorms, sometimes referred to as "thunder events" are recorded and observed as soon as a peal of thunder is heard by an observer at a NWS first-order weather station. A thunder event is composed of lightning and rainfall, and can intensify into a severe thunderstorm with damaging or deadly hail, high winds, tornadoes, and flash flooding.

The National Weather Service defines a thunderstorm as severe if it contains hail that is one inch or the wind gusts are at 58 mph or higher. At any given moment across the world, there are about 1,800 thunderstorms occurring. Arkansas experiences a high number of thunderstorms each year, the majority of which occur in the warm months. The entire State of Arkansas is at risk to the damaging effects of severe thunderstorms. Other hazards associated with thunderstorms include: heavy rains causing flash flooding (discussed separately in Section 3.4.5), tornadoes (discussed separately in Section 3.4.9), damaging winds, hail, and lightning. This section of the risk assessment will focus on the damaging winds, hail, and lightning aspects of severe thunderstorms.

Straight-Line Wind

Straight-line wind is any wind that is not associated with rotation. This term is used mainly to differentiate a severe storm from tornadic winds. Straight-line winds originate as a downdraft of rain-cooled air, which reaches the ground and spreads out rapidly, producing a potentially damaging gust of wind up to 100 mph. In recent years, there have been several occasions in Arkansas in which winds greater than 100 mph have been measured. Winds of 58 mph (50 knots) or more are considered severe. The horizontal component of near-surface wind phenomena is the most significant aspect of the hazard.

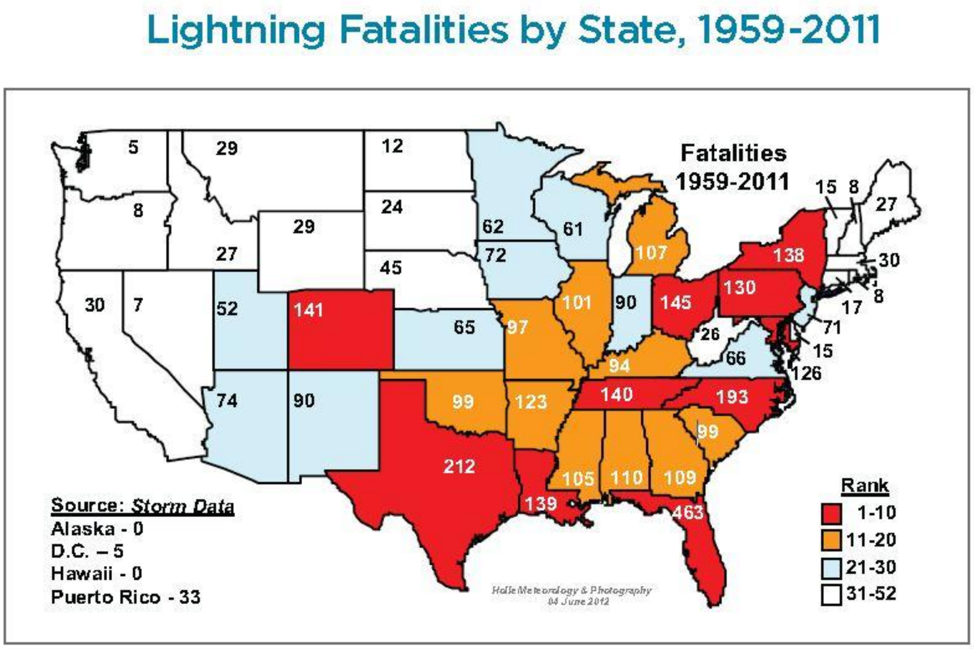
Lightning

Lightning is a discharge of atmospheric electricity, accompanied by a vivid flash of light, from a thunderstorm, frequently from one cloud to another, sometimes from a cloud to the earth. The sound produced by the electricity passing rapidly through the atmosphere causes thunder.

During the past decade, more than 15,000 lightning-induced fires resulted in widespread property damage and the loss of two million acres of forest. Each year lightning causes an average of 93 deaths and 300 injuries in the United States (see **Figure 3.4.7.a**). Lightning also causes several million dollars in damage to homes, businesses, churches and barns each year. Lightning is a problem for all communities in Arkansas. Electrical fires, electricity loss and damage to equipment are a few of the main hazards associated with lightning strikes.

In Arkansas, there were 116 deaths and 275 injuries due to lightning from 1959 to 1999. Statistics show that the deaths and injuries occurred mostly in the summer months when people are most likely to be outdoors. More recently, lightning was responsible for one fatality and four injuries in 2011. There were no fatalities and no injuries due to lightning in 2012.

Figure 3.4.7.a. U.S. Lightning Fatalities by State (1959-2011)



Source: VAISALA (http://www.lightningsafety.noaa.gov/stats/59-11_fatalities_rates.pdf)

Hail

Hail is frozen water droplets formed inside a thunderstorm cloud. They are formed during the strong updrafts of warm air and downdrafts of cold air, when the water droplets are carried well above the freezing level to temperatures below 32 degrees Fahrenheit. Then the frozen droplet begins to fall, carried by cold downdrafts, and may begin to thaw as it moves into warmer air toward the bottom of the thunderstorm. Figure **3.4.7.b** presents an example of quarter-size hail in North Little Rock.

Hail usually lasts an average of 10 to 20 minutes but may last much longer in some storms. Hail causes $1 billion in damage to crops and property each year in the U.S. Anyone out of doors during a thunderstorm is exposed and at risk of injury from lightning. More people are killed by lightning strikes while participating in some form of recreation than any other activity. The peak periods for hailstorms, late spring and early summer, coincide with the most critical agricultural seasons for wheat, corn, rice, soy beans and tobacco. Arkansas also has significant exposure to hailstorms, and virtually all buildings and crops in the State are at risk.

Figure 3.4.7.b. Quarter size hail covered the ground at the National Weather Service in North Little Rock (Pulaski County) during the afternoon of 06/30/2009; Severe Lightning

Source: NWS; Northwest Arkansas Preparedness Fair

❖ *Previous Occurrences*

Arkansas experiences a high number of thunderstorms each year, the majority of which occur in the warm months. Noted thunderstorm events include the following:

- ***May 6, 2009 Storms:*** Trees were down on houses, vehicles, and power lines. Approximately 30 homes were damaged and three people were injured by the falling trees. Much of the roof was removed from an exhibition building at the Drew County Fairgrounds. Unstable air, fronts meandering in the State, and areas of low pressure aloft contributed to severe weather, including a few tornadoes. At Arkansas Post (Arkansas County), the rain contributed to making it the wettest May ever recorded.

- ***The Texarkana Microburst:*** On May 22, 2008, two severe thunderstorms came together over the south side of the city. One severe storm was moving northeastward from southern Bowie County while the other was moving northwestward through Miller County. Both storms collided in an area just south of downtown Texarkana. As a result of the collision, the storm cores collapsed in an area just east of State Line Avenue over a several block area between 16th and 20th Streets. Numerous large trees were snapped or uprooted onto homes and cars in the Glendale Subdivision. As the survey expanded outward to the north near 24th Street and the Woodlawn Cemetery, trees were noted to have fallen in a north or northeastward direction typical of a microburst. Damage was found as far northeast as the Calvary Cemetery area with trees downed in a north to northeast direction. Trees were also uprooted and snapped on the Texas side of State Line Avenue with a heavier concentration along Magnolia Street between 24th Street and 30th Streets. It was noted that the trees fell in a northwesterly direction which would be expected if a microburst had occurred to the south and east of those locations. Numerous homes were damaged on the Texas side of State Line Avenue as a result. Powerlines were also downed throughout the area as a result of either poles snapping or trees falling on the lines. The area impacted by the microburst is approximately 3.5 miles long to the northeast of the origin and four miles in width from one end of the damage swath to the other. City and County officials estimate that 44 homes sustained major damage with an unknown number of vehicles damaged. At least 100 damage reports have been collected thus far. Only one minor injury occurred when a tree fell on a home injuring an elderly woman inside. All of Miller County was considered a disaster area after the damage that resulted from the microburst across the northern portion of the county.

- ***June 1, 2008 Storms, Logan County*:** Six houses suffered major damage, 20 had moderate damage, and 27 had minor damage. Four businesses had major damage, including a car dealership, two shop buildings, and a lumber company. At the car dealership, 37 cars were damaged, primarily due to flying debris and the collapse of three concrete block walls of an adjacent building. Three other businesses suffered moderate damage, and six had minor damage. Many trees were blown down, some of which fell on houses. Arkansas' second-oldest cherry tree was toppled. Many power lines were blown down and about 40 utility poles had to be replaced.

- ***The Ashley County Storm:*** On March 9, 2006, a potent squall line of thunderstorms moved across Ashley County and caused widespread damage, especially across southern and eastern sections of the county. As the squall line moved through, a small segment of the line pushed out ahead of the line. This "bow segment" caused extensive damage along a swath from just south of Crossett to near Portland. The most significant damage occurred just south and southeast of Crossett. Along the damage swath, numerous trees and power lines were blown down. Several structures sustained damage along with a few outbuildings which were blown away. A total of $500,000 in property damage was recorded.

- ***The Bentonville Storm:*** On May 16, 2003, this severe storm, estimated at 80 miles an hour, did significant damage in Bentonville. The brick walls of part of a business were reduced to rubble as the winds were let in as its garage door was blown open. Nine homes in the southeast part of the town's Walnut Ridge subdivision were damaged. Large tree limbs were blown down throughout the city with many of them knocking down power lines and causing power outages. Over $700,000.00 in property damage was recorded.

- ***The Brinkley Storm:*** On July 2, 1994, this severe storm downed numerous trees, some of which fell on parked cars in the town on Brinkley. A number of homes and businesses were damaged by fallen trees. Some power lines were also pulled down by falling trees. One mobile home was destroyed and several others were damaged. An airplane was flipped over at the municipal airport. Over $500,000.00 was reported in property damage.

Straight-Line Wind

From January 2000 to December 2012, Arkansas experienced 821 severe thunderstorms with damaging winds in excess of 67 miles per hour (58 knots). **Table 3.4.7.a** provides annual statistics for these events. During this period, there were four deaths, 45 injuries, and over $59 million reported property damages.

Table 3.4.7.a. Thunderstorm Wind Events with Wind Speeds above 69 Miles per Hour from 2000 to 2012

Year	# of Events with Winds over 69 mph	Deaths	Injuries	Property Damage	Crop Damage
2000	35	1	1	3.166M	0.00K
2001	46	0	3	1.143M	0.00K
2002	39	0	5	1.030M	0.00K
2003	67	0	2	1.916M	0.00K
2004	60	0	7	1.384M	0.00K
2005	44	0	1	980.00K	0.00K
2006	79	0	2	2.487M	0.00K
2007	25	0	3	1.212M	0.00K
2008	81	1	6	9.515M	0.00K
2009	105	0	8	17.486M	0.00K
2010	27	0	0	3.590M	0.00K
2011	114	2	3	7.339M	0.00K
2012	99	0	4	7.831M	0.20K
TOTAL	**821**	**4**	**45**	**59.079M**	**0.20K**

Source: National Climatic Data Center (Storm Events Database)

Noted wind events include:

- ***September 14, 2008 Wind Storms:*** Hurricane Ike made landfall near Galveston, Texas around 2 am CDT on 9/13 and moved northward across northern Texas to near Tyler and then northeastward into Arkansas near Ozark during the early morning hours of the 14th. The combination of a cold front passing into the region and the proximity of the tropical storm to the area resulted in high winds across much of northwest Arkansas. Trees, large tree limbs, and power lines were blown down. Some trees fell onto and blocked roads while some others fell on homes and businesses.

- ***January 29, 2008 Wind Storms:*** A strong cold front approached from the plains during the morning of January 29th. The front arrived during the early afternoon hours, and winds shifted to the northwest. Wind speeds of 30 to 40 mph were common, with gusts over 50 mph. Approximately 80,000 power outages occurred. Damages from this event estimated at $250 thousand.

- ***July 2003 Memphis Wind Storms:*** On the morning of July 22, 2003, downtown Memphis, Tennessee was hit hard by a downburst wind event that produced winds over 100 mph. Numerous trees, power lines, power poles and radio towers were blown down. Some of the trees fell on houses producing major damage. At least 20 buildings collapsed. Numerous homes and buildings were damaged and a few were destroyed. Among the damaged buildings was the Gibson Guitar factory in downtown Memphis. The city's main entertainment district, Beale Street, was shut down for a week. One person was killed when a tree fell on his house, crushing him. Over 300,000 homes in the county were without electricity. Most were without power for anywhere from two days to two weeks. Several people were killed due to post-storm related issues such as carbon monoxide poisoning from their improper use of generators. Property damage in Memphis from this straight-line wind event was estimated to be over $40 million dollars.

  Across the Mississippi River in West Memphis (Crittenden County), Arkansas, wind damage occurred but was less severe than in Memphis because of lower wind speeds (75 mph) and less infrastructure. About 20 mobile homes were damaged. Several boathouses and a grain elevator were damaged in Horseshoe Lake and five tractor-trailers were blown over. Numerous trees were blown down with some of the trees falling on houses. Damage estimates for Crittenden County were $100,000. Numerous other communities in eastern Arkansas suffered damages from this wind event.

- ***115 mph Winds, Waldenburg:*** The strongest straight-line winds recorded in Arkansas, 115 mph (100 Knots), occurred in May of 2003 near Waldenburg (Poinsett County). This wind speed is equivalent to a low-end F2 tornado. A grain silo was damaged near Waldenburg and a house trailer was destroyed. Numerous trees were blown down with some of the trees falling on houses. The National Weather Service estimated property damage at $25,000.

- ***Nashville Severe Storm, 2000:*** In May of 2000, 98 mph winds near Nashville (Howard County) caused pine, oak and pecan trees over a 15-mile wide area to be flattened. Two homes were destroyed, five homes suffered major damage, 30 homes suffered minor damage, three mobile homes were totally destroyed and one new motor home was crushed by a fallen tree. No injuries or deaths occurred. The National Weather Service estimated property damage from this straight-line wind event at $1.1 million.

- ***El Dorado Severe Storm, 1998:*** This severe storm with winds of over 80 mph toppled trees throughout the El Dorado (Union County) area and caused damage to many homes, businesses and power lines. A large broadcasting tower was blown down and a tree fell across a home totally demolishing it. Residents were evacuated after a nitric acid tank was blown down near an El Dorado chemical plant. The spill residue was contained and neutralized on-site. There was one injury reported when a man was trapped inside his car after a tree fell on it. The National Weather Service estimated property damage at $1 million.

Lightning

From January 2000 to December 2012, Arkansas experienced 235 damaging lightning events. **Table 3.4.7.b** provides annual statistics for these events. During this period, there were seven deaths, 36 injuries, and over $18 million reported property damages.

Table 3.4.7.b. Lightning Events from 2000 to 2012

Year	# of Events	Deaths	Injuries	Property Damage	Crop Damage
2000	5	0	2	10.00K	0.00K
2001	11	0	4	227.00K	0.00K
2002	13	1	2	181.00K	0.00K
2003	6	0	2	90.00K	0.00K
2004	5	1	2	0.00K	0.00K
2005	8	0	1	240.00K	0.00K
2006	21	3	6	125.01K	0.00K
2007	27	0	1	7.044M	0.00K
2008	31	1	3	2.672M	0.00K
2009	33	0	5	1.768M	0.00K
2010	37	0	4	2.847M	0.00K
2011	23	1	4	1.345M	0.00K
2012	15	0	0	2.445M	0.00K
TOTAL	**235**	**7**	**36**	**18.994M**	**0.00K**

Source: National Climatic Data Center (Storm Events Database)

Noted lightning events include:

- ***July 12, 2009*:** A lightning strike started a fire at the Martin Sprocket & Gear Incorporated Plant in Paragould. The fire destroyed all the warehouses and ten percent of the plant received heavy smoke damage from the fire.

- ***The Apartment Complex Lightning Event:*** On June 30, 1999, lightning caused a fire that heavily damaged a duplex in Johnson. Major flash flooding resulted across northwest Arkansas when a line of thunderstorms, containing torrential rainfall and associated with a nocturnal MCS, moved slowly southeastward across northwest Arkansas on the morning of June 30. Major flash flooding was reported in several locations, most notably in the Fort Smith area and western Benton County. The following are rainfall amounts measured at major airports across the region: NW Arkansas Regional Airport (Highfill)...3.20", Fort Smith Regional Airport...2.62", and Drake Field (Fayetteville)...2.39". This came on top of an already-wet spring and measurable rainfall in the two days preceding this event.

- ***The Heber Springs Lightning Event:*** On June 28, 1997, a group of people were attending a picnic on the shore of Greers Ferry Lake at the Old Highway 25 Park. Lightning struck nearby and injured 12 people. One other person was killed as a result of being struck. The extent of injuries to the others struck consisted of burns. Most of the injured were treated and released from the hospital the same day and several others were kept for observation. No property or crop damage was reported for this event.

- ***The 911 Operations Lightning Event:*** On October 26, 1995, lightning struck a transmission tower at the 911 Operations Center in Little Rock. The lightning travelled into the building and knocked out a portion of the 911 computer system. The equipment was repaired a few days later. Damage was estimated at around $150,000.

Hail

From January 2000 to December 2012, Arkansas experienced 2,441 hail events with hail size 1.0 inch in diameter or larger. **Table 3.4.7.c** provides annual statistics for these events. During this period, there were no deaths or injuries, but over $215 million reported property damages.

Table 3.4.7.c. Hail Events (greater than 1.0 inch in diameter) from 2000 to 2012

Year	# of Events with Hail 1.0 inch in Diameter and Larger	Deaths	Injuries	Property Damage	Crop Damage
2000	114	0	0	586.25K	25.00K
2001	144	0	0	595.15K	8.00K
2002	96	0	0	3.106M	0.00K
2003	245	0	3	50.131M	0.00K
2004	123	0	0	18.05K	0.00K
2005	133	0	0	10.74K	0.00K
2006	219	0	0	3.205M	0.00K
2007	95	0	0	171.50K	100.00K
2008	232	0	0	88.663M	100.00K
2009	167	0	0	66.090M	8.00M
2010	213	0	0	592.00K	0.00K
2011	488	0	0	2.524M	0.00K
2012	172	0	0	145.00K	0.00K
TOTAL	**2441**	**0**	**0**	**215.838M**	**241.00K**

Source: National Climatic Data Center (Storm Events Database)

Noted hail events include:

- ***The Alma Hail Event:*** On March 5, 1999, a large hail event was recorded around Alma Arkansas. There were several reports of extremely large hail around Alma. The largest report was of giant softball-sized hail, while there were also reports of quarter and golfball-sized hail just north of Alma. Such enormous hail caused widespread damage in Alma. Many cars sustained windshield and body damage. Just one auto body shop reported that it had written estimates from hail damage totaling $140,000. Many roofs also sustained major damage. At the Eagle Crest Golf Course, the hail left small craters on the greens, closing the course for several days while the crater marks were filled. A photo in the Alma Journal newspaper showed a softball-sized pock mark on the golf greens. A child was treated for injuries at a local hospital after being struck by the hail. Summary of events for March 5, 1999 follow: An approaching cold front and an upper level disturbance kicked off several severe thunderstorms in northwest Arkansas on March 5. The largest severe thunderstorm developed in Sequoyah County Oklahoma and then strengthened as it moved across Crawford and Franklin Counties along Interstate 40. Along the way, this storm produced giant hail as large as baseballs and softballs. This storm demonstrated strong rotation, producing a brief tornado touchdown just west of Alma and considerable damage from softball-sized hail in Alma. A second weaker, though severe, thunderstorm formed over southern Crawford County and followed the same path as the first storm. Finally, a severe thunderstorm moved out of northeast Oklahoma and clipped northwest Benton County, producing marginally severe hail.

- ***The Urbanette Hail Event:*** On March 1, 2007 a broad swath of hail up to golfball size occurred across the northeastern portion of Carroll County. The largest hail reportedly damaged homes and automobiles. A moist, unstable air mass had developed across northwestern Arkansas ahead of a strong upper level disturbance that moved across the Southern Plains during the early morning hours of the 1st. Thunderstorms erupted along and ahead of a cold front as it moved across the area. A total of $100,000 in damages was recorded in the town of Urbanette.

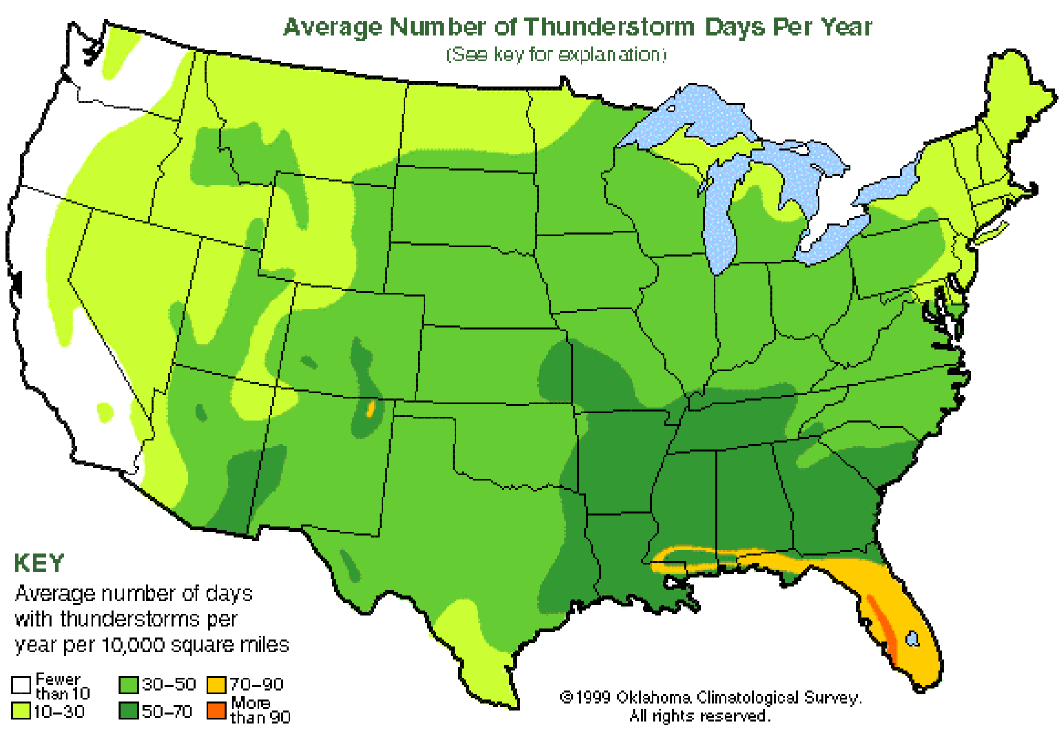
- ***March 31, 2008 Texarkana:*** Very large hail fell across the entire city of Texarkana, Arkansas resulting in widespread damage to automobiles, home roofs and windows. The estimated monetary damage amount at the time of this publication was nearly 65 million dollars and according to local emergency management officials, this amount would likely be adjusted upward. The hail damage was particularly bad in downtown Texarkana, Arkansas. The city hall's Spanish tile roof, some of the hardest material known as far as roofing material is concerned, was damaged and destroyed. Many car dealerships inventory was deemed a total loss from the hail. Hail stones not only broke out car windows but went completely through the roofs of some dealerships and then busted out car windows inside the facilities. Damage estimates from this event: $85 million

- ***June 30, 2009 Oakgrove:*** A devastating hailstorm, several miles wide, affected northern portions of North Little Rock and continued eastward through Sherwood and on into the area between Jacksonville and Galloway. In North Little Rock, hail up to 1 inch in diameter pelted the National Weather Service office at the North Little Rock airport for 6 minutes, from 5:11 to 5:17 PM CDT. The hail became larger as it progressed farther to the east. The Indian Hills and Windsor Valley subdivisions in North Little Rock were particularly hard-hit, as some of the hail increased to golf ball size (1.75 inches). Roofs were ruined and cars were dented. In Sherwood, much of the hail was golf ball size, and some of it was even larger. The hailstones poked holes in vinyl siding, ruined roofs, dented cars, and smashed car windshields. City officials indicated that thousands of roofs would have to be replaced. Automobile dealerships along U.S. Highway 67/167 were very hard-hit. One dealer said it was the first time in the 40 year history of the dealership that they were going to have to hold a hail sale. The largest hail was baseball size (2.75 inches) and was reported in the southern part of Sherwood. The hailstorm then continued eastward into Lonoke County. For the sake of completeness, all hail reports received by the National Weather Service are listed individually. Damage estimate for this storm: $60 million.

❖ *Probability and Magnitude of Future Hazard Events*

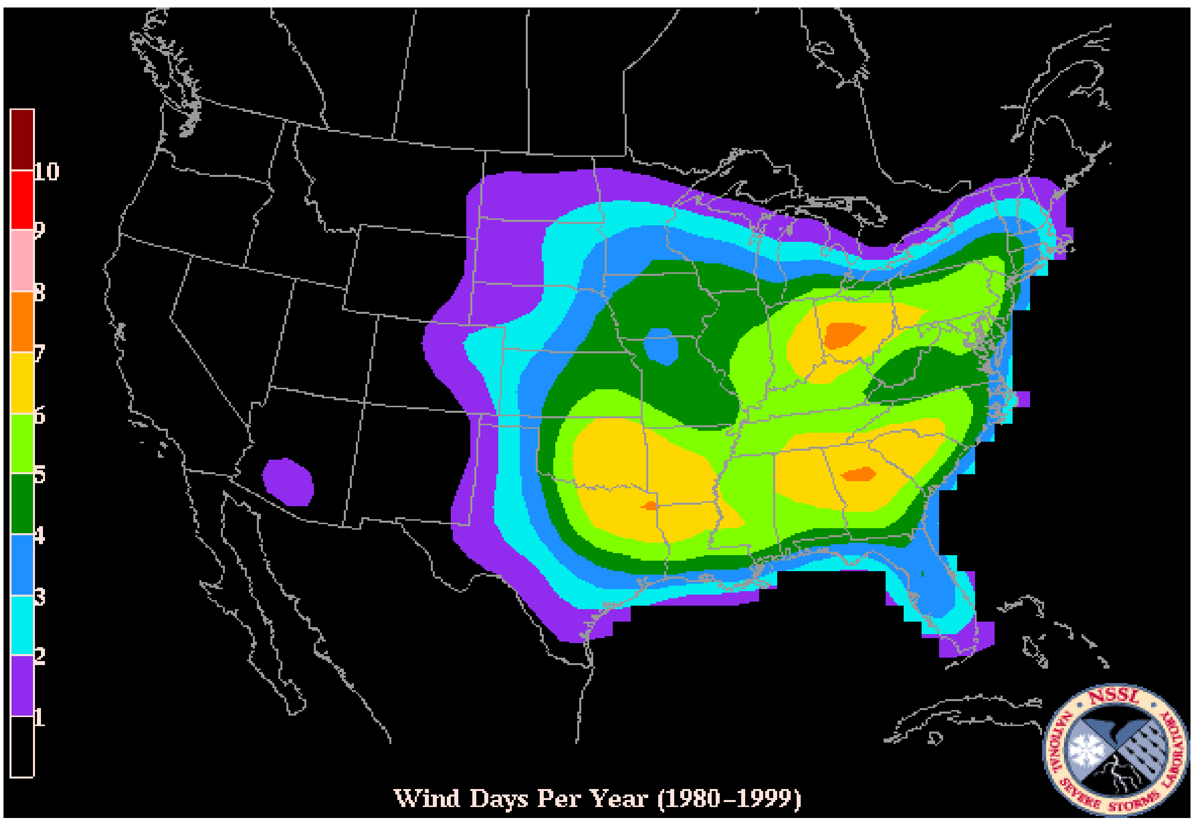
Thunderstorms are underrated killer events experienced in every region of Arkansas where people and property are exposed to damage, injury and loss of life. Everywhere they occur, thunderstorms are responsible for significant structural damage to buildings, forest and wildfires, downed power lines and trees and flash flooding. Based on data from the National Climatic Data Center's Severe Storms Database from 2000 through 2013, all counties in Arkansas have experienced severe straight-line winds, hail, and lightning events. **Figure 3.4.7.c** , as presented below, reveals that Arkansas averages 50 to 70 thunderstorm days per year. Therefore, the probability has been determined to be **"Highly Likely".**

Figure 3.4.7.c. Average Number of Thunderstorm Days Per Year



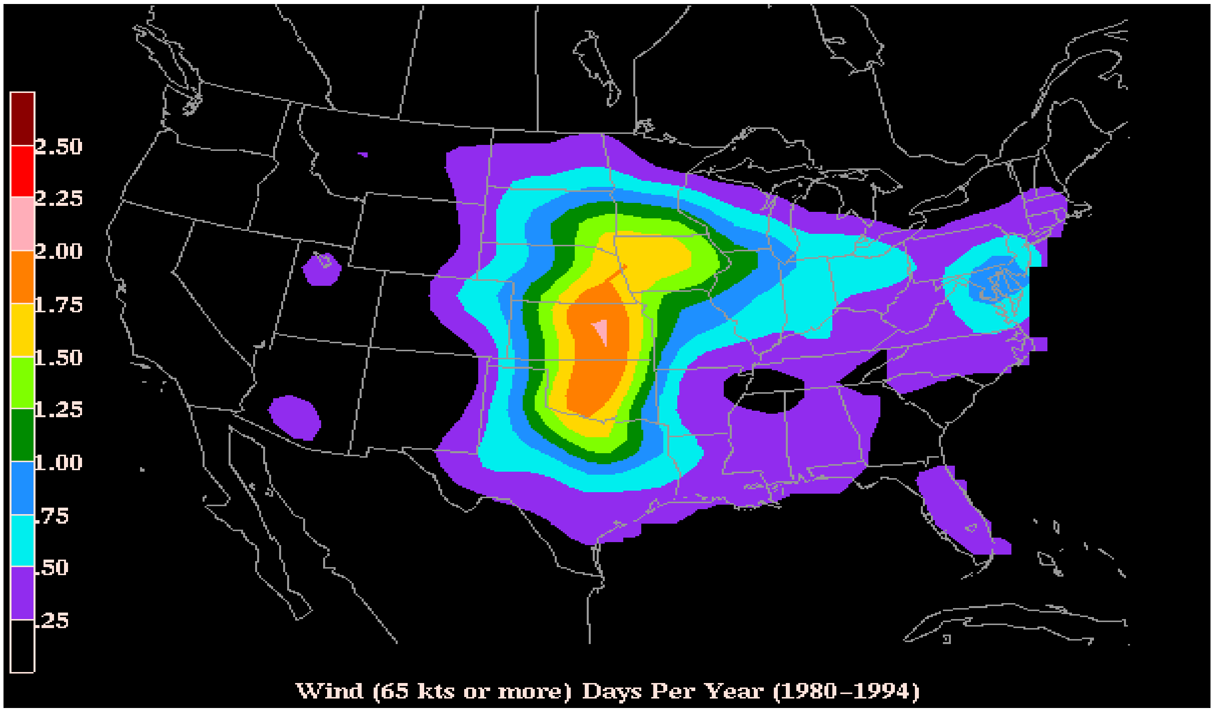
In addition, the National Oceanographic and Atmospheric Association's (NOAA) National Severe Storms Laboratory (NSSL) initiated a project to estimate the likelihood of severe weather hazards in the United States. One aspect addressed is the total annual threat of severe storms in the United States. The mean number of days per year with one or more >50 knot (>58 mph) events within 25 miles of a point is shown in **Figure 3.4.7.d**. Note that most of Arkansas lies within the six to seven wind days per year interval, with the northeast part of the State in the four to six wind days per year interval. The pattern changes when winds of >65 knots (79 mph) are considered (**Figure 3.4.7.e**).

Figure 3.4.7.d. The Total Annual Threat of a Severe Storm in the U.S. Based on NOAA. (NSSL data between 1980 and 1999): The mean number of days per year with one or more >50 knot (>58 mph) wind events within 25 miles of a point is shown.



Source: NOAA

Figure 3.4.7.e. The Total Annual Threat of a Severe Storm in the US based on NOAA NSSL data between 1980 and 1994: The mean number of days per year with one or more >65 knot (>79 mph) events within 25 miles of a point is shown.



Source: NOAA

When these higher wind speeds are considered, western Arkansas shows the highest annual threat (0.5 to 1 >65 knot wind day per year) whereas the eastern part of the State exhibits a lower threat (0 to 0.5 >65 knot wind days per year) (**Figure 3.4.7.e**).

According to NCDC, during the 12-year period from 2000-2012, high wind (over 67 mph), hail, and lightning caused an annual average of 0.9 deaths, 6.75 injuries, $25 million in property damages and nearly $20,000 in crop damages. The property and crop damage figures reported in NCDC are early estimates and are likely very low. According to this data, severe thunderstorms have a moderate to critical impact both in terms of human safety as well as economic losses. Therefore, the severity has been determined to be **moderate.**

❖ State Vulnerability Analysis

Severe thunderstorms are a common occurrence in Arkansas. Since wind, hail, and lightning are all contributing elements of severe thunderstorms, the planning team focused on damaging winds in excess of 67 miles per hour (58 knots), hail in excess of 1.0 inches or larger and damaging lightning strikes to analyze vulnerability, risk, and estimated losses to this hazard across the State.

The method used to determine vulnerability to severe thunderstorms was a statistical analysis of data from several sources: National Climatic Data Center (NCDC) storm events data (2000 to 2012), Crop Insurance Claims data from USDA‘s Risk Management Agency (2003-2012), U.S. Census Data (2010), USDA‘s Census of Agriculture (2007), and the calculated Social Vulnerability Index for Arkansas Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina.

Table 3.4.7.d provides the housing density, building exposure, crop exposure, and social vulnerability data. These are the common data elements for the analysis of wind, hail, and lightning with one exception; the lightning analysis did not consider crop exposure as crop loss is an unlikely result of lightning events.

Table 3.4.7.d Additional Statistical Data Compiled for Vulnerability Analysis

County	Housing Density (units/sq.mi.)	Total Building Exposure ($ 1,000)	Crop Exposure ($ 1,000)	Social Vulnerability Index
Arkansas	9.5	$ 1,501,425	$ 179,522	1
Ashley	11.0	$ 1,506,103	$ 55,231	2
Baxter	40.7	$ 2,607,031	$ 741	5
Benton	109.9	$ 11,163,666	$ 6,942	1
Boone	28.5	$ 2,220,914	$ 2,081	2
Bradley	9.0	$ 760,621	$ 3,526	3
Calhoun	4.6	$ 309,312	N/A	1
Carroll	21.5	$ 1,644,687	$ 2,273	4
Chicot	8.4	$ 714,986	$ 84,944	5
Clark	12.0	$ 1,462,834	$ 2,258	4
Clay	12.6	$ 1,181,580	$ 139,431	4
Cleburne	28.6	$ 1,950,886	$ 1,618	3
Cleveland	6.8	$ 474,659	$ 363	2
Columbia	15.1	$ 1,506,893	$ 9,772	3
Conway	17.6	$ 1,304,591	$ 10,926	2

County	Housing Density (units/sq.mi.)	Total Building Exposure ($ 1,000)	Crop Exposure ($ 1,000)	Social Vulnerability Index
Craighead	57.3	$ 5,603,268	$ 153,368	1
Crawford	44.0	$ 3,139,394	$ 10,801	1
Crittenden	35.2	$ 3,135,093	$ 99,333	1
Cross	12.7	$ 1,074,314	$ 110,773	4
Dallas	6.5	$ 575,374	N/A	3
Desha	8.2	$ 893,119	$ 137,184	3
Drew	10.2	$ 1,216,184	$ 35,925	3
Faulkner	71.9	$ 5,802,656	$ 5,830	1
Franklin	13.2	$ 1,015,281	$ 3,238	4
Fulton	11.0	$ 677,500	$ 649	4
Garland	74.6	$ 6,585,659	$ 2,379	4
Grant	12.3	$ 958,177	$ 955	1
Greene	31.0	$ 2,456,201	$ 105,774	2
Hempstead	14.3	$ 1,281,291	$ 5,000	2
Hot Spring	23.3	$ 1,793,857	$ 1,496	2
Howard	10.6	$ 867,279	$ 1,809	2
Independence	21.2	$ 2,386,851	$ 21,754	2
Izard	12.5	$ 733,725	$ 1,165	5
Jackson	12.0	$ 1,162,927	$ 102,272	5
Jefferson	37.9	$ 5,452,407	$ 117,532	3
Johnson	17.1	$ 1,259,682	$ 3,648	2
Lafayette	8.2	$ 477,045	$ 16,175	4
Lawrence	13.6	$ 1,075,664	$ 83,668	5
Lee	7.2	$ 491,271	$ 126,190	5
Lincoln	8.7	$ 664,689	$ 57,061	5
Little River	12.1	$ 861,887	$ 8,744	4
Logan	14.3	$ 1,342,035	$ 5,502	3
Lonoke	35.3	$ 3,442,239	$ 118,946	1
Madison	9.0	$ 750,378	$ 2,787	2
Marion	15.7	$ 1,007,075	$ 755	5
Miller	30.8	$ 2,312,723	$ 20,408	2
Mississippi	22.7	$ 3,244,440	$ 194,984	3
Monroe	7.3	$ 640,576	$ 90,551	5
Montgomery	7.4	$ 549,377	$ 1,127	4

County	Housing Density (units/sq.mi.)	Total Building Exposure ($ 1,000)	Crop Exposure ($ 1,000)	Social Vulnerability Index
Nevada	7.4	$ 500,017	$ 1,266	3
Newton	5.7	$ 553,806	$ 927	4
Ouachita	17.9	$ 1,640,912	$ 1,514	3
Perry	8.9	$ 596,184	$ 6,276	2
Phillips	14.6	$ 1,364,039	$ 184,599	5
Pike	9.3	$ 628,313	$ 750	3
Poinsett	14.4	$ 1,612,527	$ 153,325	4
Polk	11.7	$ 1,129,619	$ 1,687	3
Pope	31.4	$ 3,667,579	$ 6,105	1
Prairie	6.9	$ 629,613	$ 95,794	4
Pulaski	231.1	$ 32,156,611	$ 18,618	1
Randolph	13.1	$ 1,035,165	$ 43,265	3
Saline	17.2	$ 1,551,990	$ 89,406	5
Scott	61.9	$ 5,296,383	$ 2,822	1
Searcy	5.8	$ 552,388	$ 1,430	4
Sebastian	7.4	$ 486,443	$ 719	5
Sevier	102.7	$ 8,983,942	$ 1,834	1
Sharp	12.2	$ 785,579	$ 883	2
St. Francis	16.2	$ 1,125,138	$ 805	4
Stone	11.1	$ 647,786	$ 1,012	5
Union	18.9	$ 3,146,335	$ 921	2
Van Buren	14.6	$ 1,059,575	$ 1,276	5
Washington	93.2	$ 10,449,177	$ 7,904	1
White	31.4	$ 4,191,226	$ 34,241	1
Woodruff	6.6	$ 515,107	$ 89,377	5
Yell	10.5	$ 1,142,082	$ 5,557	3

Table 3.4.7.e provides the additional data obtained to complete the overall vulnerability analysis.

Table 3.4.7.e Additional Statistical Data Compiled for Vulnerability Analysis

County	Total No. Hail Incidents	Total Hail Property Loss ($)	Total Crop Insurance Paid for Hail Damage ($)	Total Wind Incidents	Total Wind Property Loss ($)	Total Crop Insurance Paid for Wind Damage ($)	Total Lightning Incidents	Total Lightning Property Losses ($)
Arkansas	67	49.0K	100.0K	6	335.00K	na	1	50.00K
Ashley	58	1.719K	na	2	160.00K	na	na	na
Baxter	92	na	na	6	307.00K	na	5	65.00K
Benton	122	3.01K	na	3	405.00K	na	9	257.00K
Boone	75	na	na	5	382.00K	na	3	257.00K
Bradley	40	na	na	5	335.00K	na	3	20.00K
Calhoun	30	na	na	5	320.00K	na	1	20.00K
Carroll	62	235.0K	na	2	300.00K	na	2	90.00K
Chicot	62	957.0K	100.0K	3	90.00K	na	na	na
Clark	74	na	na	5	385.00K	na	8	281.5K
Clay	48	524.150K	25.0K	3	39.00K	na	1	na
Cleburne	48	na	na	5	307.00K	na	3	270.00K
Cleveland	38	na	na	6	335.00K	na	1	15.00K
Columbia	43	100.0K	na	1	50.00K	na	6	267.00K
Conway	92	10.0K	na	5	315.00K	na	10	452.00K
Craighead	76	145.87K	na	7	95.00K	na	5	71.00K
Crawford	122	570.0K	na	5	39.00K	na	na	na
Crittenden	52	161.98K	na	1	5.00K	na	na	na
Cross	26	29.8K	5.0K	5	335.00K	na	1	5.00K
Dallas	33	na	na	5	320.00K	na	2	5.00K
Desha	24	250.0K	na	5	320.00K	na	2	40.00K
Drew	33	na	na	5	335.00K	na	5	49.00K
Faulkner	99	na	na	5	340.00K	na	6	125.00K
Franklin	110	510.0K	na	2	40.00K	na	5	63.00K
Fulton	34	na	na	5	307.00K	na	2	2.10K
Garland	118	na	na	7	480.00K	na	18	431.00K
Grant	40	na	na	6	320.00K	na	1	1.00K
Greene	47	28.540K	na	2	60.00K	na	1	1.0M
Hempstead	60	na	na	2	60.00K	na	1	20.00K
Hot Spring	92	na	na	6	340.00K	na	5	40.00K
Howard	91	na	na	na	na	na	na	na
Independence	89	na	na	5	307.00K	na	9	815.00K
Izard	78	na	na	6	307.00K	na	5	189.00K

County	Total No. Hail Incidents	Total Hail Property Loss ($)	Total Crop Insurance Paid for Hail Damage ($)	Total Wind Incidents	Total Wind Property Loss ($)	Total Crop Insurance Paid for Wind Damage ($)	Total Lightning Incidents	Total Lightning Property Losses ($)
Jackson	50	na	na	5	307.00K	na	2	200.00K
Jefferson	60	na	na	8	157.00K	na	3	38.00K
Johnson	81	na	na	6	307.00K	na	2	125.00K
Lafayette	37	60.0K	na	na	na	na	na	na
Lawrence	44	106.590K	na	2	80.00K	na	na	na
Lee	11	8.110K	na	1	0.00K	na	na	na
Lincoln	31	na	na	6	320.00K	na	na	na
Little River	61	na	na	2	30.00K	na	2	101.00K
Logan	37	na	na	5	315.00K	na	2	5.00K
Lonoke	115	5.0M	7.002M	6	335.00K	na	4	1.8M
Madison	90	345.0K	na	2	95.00K	na	1	100.00K
Marion	45	25.0K	na	5	307.00K	na	1	100.00K
Miller	46	85.0K	na	2	25.00K	na	5	175.00K
Mississippi	71	78.960K	5.0K	5	110.00K	na	5	58.01K
Monroe	35	na	na	6	320.00K	na	2	1.00K
Montgomery	67	0.05K	na	5	315.00K	na	3	na
Nevada	31	na	na	1	0.30K	na	1	5.00K
Newton	57	na	na	5	315.00K	na	1	na
Ouachita	50	na	na	5	320.00K	na	2	na
Perry	39	252.0K	na	5	315.00K	na	na	na
Phillips	12	14.050K	na	1	10.00K	na	na	na
Pike	60	na	na	5	320.00K	na	2	33.00K
Poinsett	51	3.046M	na	2	45.00K	na	2	55.00K
Polk	94	na	na	5	315.00K	na	5	80.00K
Pope	62	na	na	5	307.00K	na	4	45.00K
Prairie	37	na	na	6	320.00K	na	2	302.00K
Pulaski	246	61.3M	1.0M	10	329.00K	na	26	8.265M
Randolph	55	84.32K	na	2	130.00K	na	1	20.00K
Saline	115	na	na	7	455.00K	na	5	1.75M
Scott	50	10.0K	na	5	315.00K	na	na	na
Searcy	48	na	na	5	307.00K	na	1	na
Sebastian	155	1.165M	na	2	20.00K	na	7	300.00K
Sevier	58	50.1K	na	1	20.00K	na	4	415.00K
Sharp	47	na	na	5	307.00K	na	2	11.5K
St. Francis	43	34.74K	na	1	40.00K	na	1	90.00K

County	Total No. Hail Incidents	Total Hail Property Loss ($)	Total Crop Insurance Paid for Hail Damage ($)	Total Wind Incidents	Total Wind Property Loss ($)	Total Crop Insurance Paid for Wind Damage ($)	Total Lightning Incidents	Total Lightning Property Losses ($)
Stone	37	na	na	5	310.00K	na	1	15.00K
Union	46	10.0K	na	2	10.00K	na	na	na
Van Buren	58	na	na	5	307.00K	na	5	22.00K
Washington	132	51.06M	na	4	125.00K	na	3	300.00K
White	116	na	na	5	340.00K	na	7	52.5K
Woodruff	19	na	3.0K	6	315.00K	na	na	na
Yell	72	na	na	5	315.00K	na	2	1.00K

From the statistical data collected, six factors were considered in determining overall vulnerability:

- housing density;
- building exposure;
- crop exposure;
- social vulnerability;
- likelihood of occurrence; and
- average annual property loss ratio.

For hail and wind, the additional factor of average annual crop insurance claims as a result of these hazards was considered. To complete the vulnerability analysis utilizing these factors, a rating value of 1-5 was assigned to the data obtained for each factor. These rating values correspond to the following descriptive terms:

- Low
- Medium-low
- Medium
- Medium-high
- High

The rating values of all factors were then combined to determine the overall vulnerability rating. **Table 3.4.7.f** below provides the factors considered and the ranges for the rating values assigned.

Table 3.4.7.f. Ranges for Severe Thunderstorm Vulnerability Factor Ratings

Factors Considered	Low (1)	Medium-Low (2)	Medium (3)	Medium- High (4)	High (5)
Common Factors					
Housing Density (# per sq. mile)	4.60-13.20	13.21-23.30	23.31-61.90	61.91-109.90	109.91-231.10
Building Exposure ($)	309,312-1,200,000	1,200,001-2,600,000	2,600,001-6,500,000	6,500,001-11,150,000	11,150,000-32,156,611
Crop Exposure ($ in millions)	0 - 8,500	8,501-20,000	20,001-55,000	55,001-125,000	125,000-194984
Social Vulnerability	1	2	3	4	5
Wind					
Likelihood of Occurrence (# of events/yrs. of data)	1.33-3.67	3.68-5.33	5.34-7.75	7.76-11.83	11.84-16.5
Average Annual Property Loss Ratio (annual property loss/exposure)	0.002133-0.032973	0.032974-0.068337	0.068338-0.101141	0.101142-0.188381	0.188282-0.344998
Wind Crop Loss Ratio (annual crop claims/exposure)	0-0.046749	0.046750-0.165983	0.165984-0.362365	0.362366-0.537879	0.537880-2.854201
Hail					
Likelihood of Occurrence (# of events/yrs. Of data)	1.00-2.92	2.93-4.58	4.59-6.75	6.76-12.92	12.93-20.50
Average Annual Property Loss Ratio (annual property loss/exposure)	0-0.001261	0.001262-0.003488	0.003489-0.013238	0.013239-0.033934	0.0339535-0.255231
Hail Crop Loss Ratio (annual crop claims/exposure)	0-0.080904	0.080905-0.287961	0.287962-0.875937	0.875938-6.800817	6.800818-16.887947
Lightning					
Likelihood of Occurrence (# of events/yrs. Of data)	0-0.08	0.09-025	0.26-0.50	0.51-0.83	0.84-2.17
Average Annual Property Loss Ratio (annual property loss/exposure)	0-0.003732	0.003733-0.011533	0.011534-0.021466	0.021467-0.044023	0.044024-0.134708

Figures 3.4.7.f, g, and h provide the likelihood of occurrence for wind, hail, and lightning events in Arkansas counties based on the historical events reported in the NCDC database for the period from 2000-2012.

Figure 3.4.7.f Likelihood of Occurrence of High Wind Events

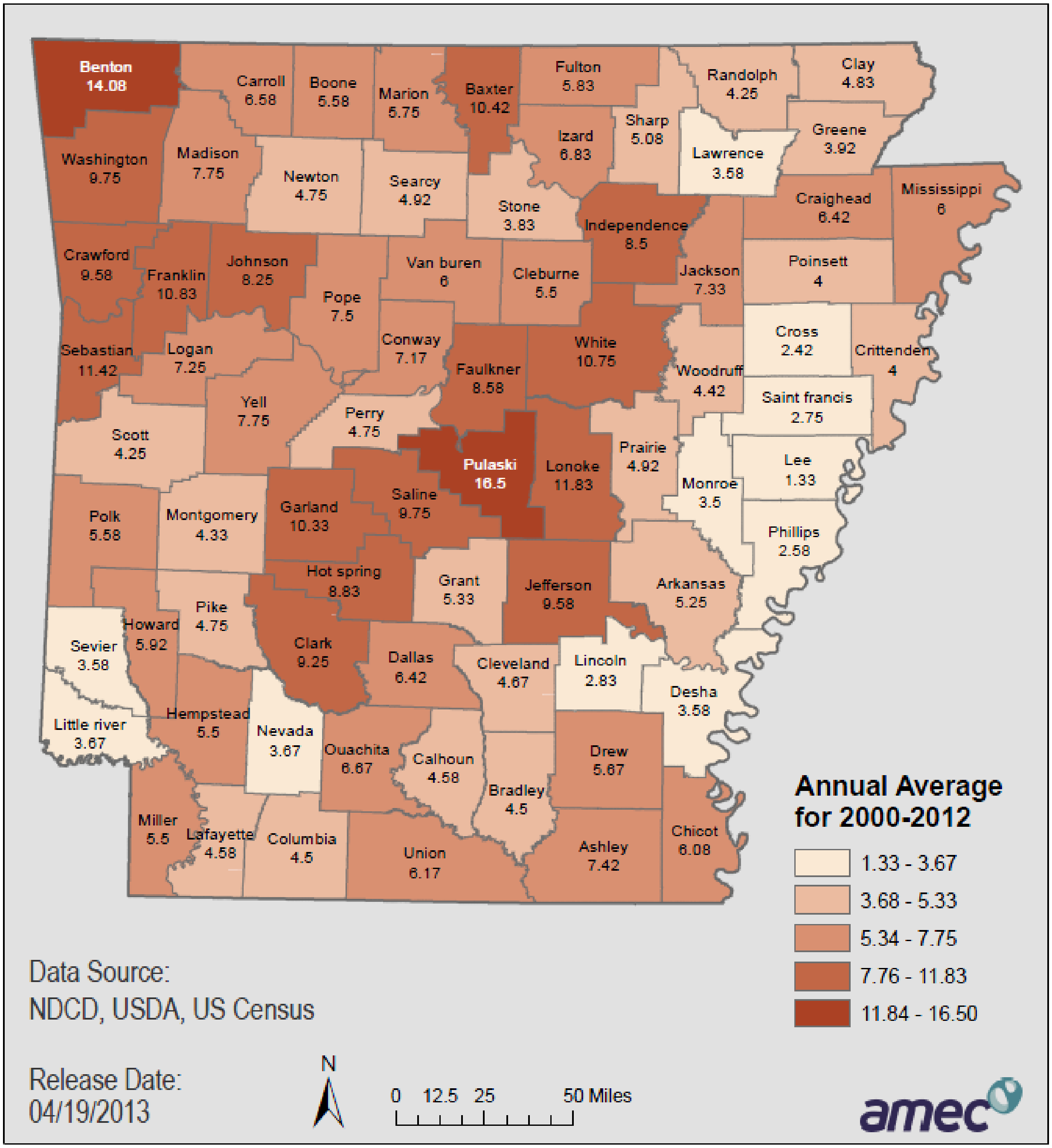


Figure 3.4.7.g Likelihood of Occurrence of Hail Events

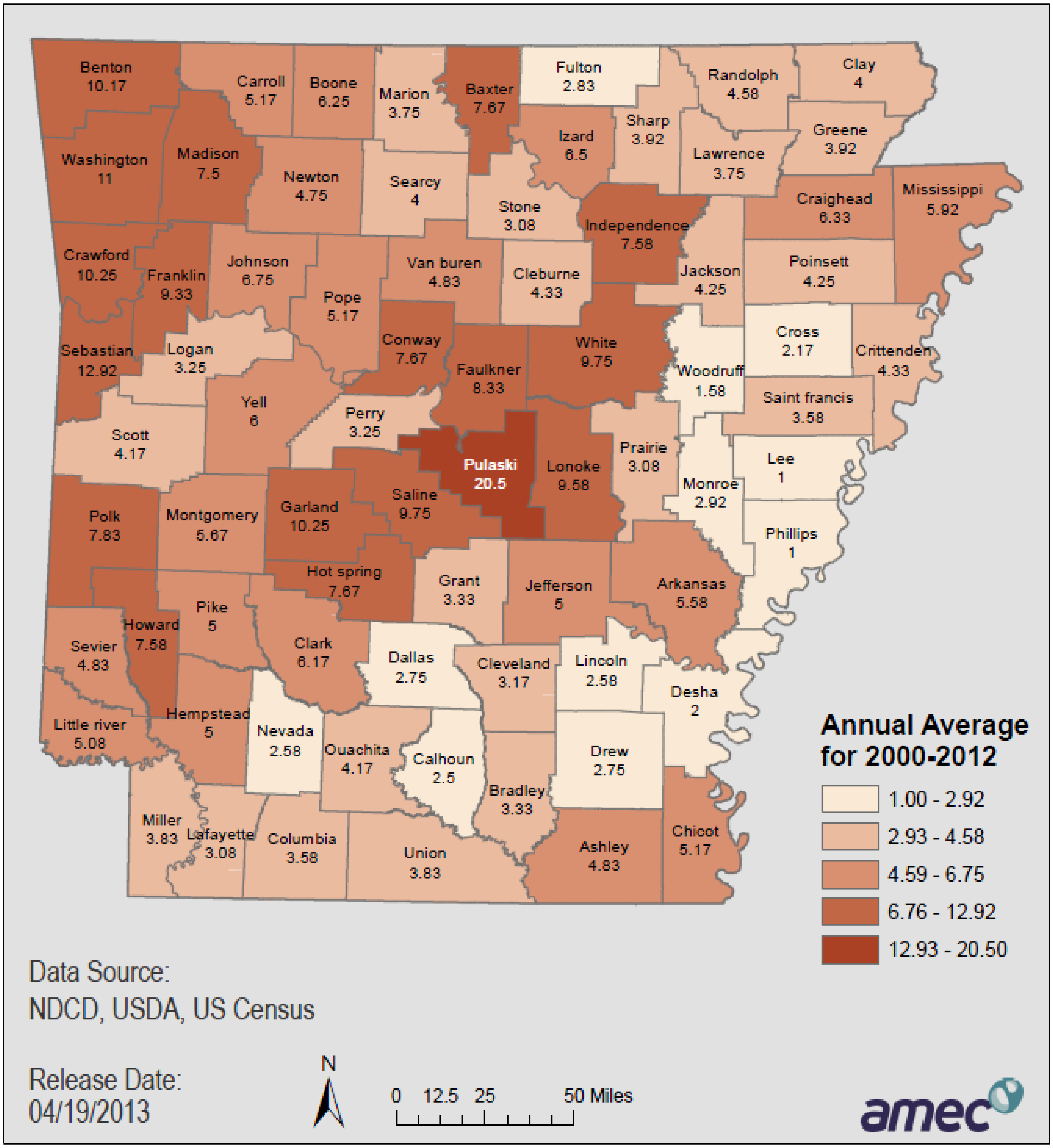
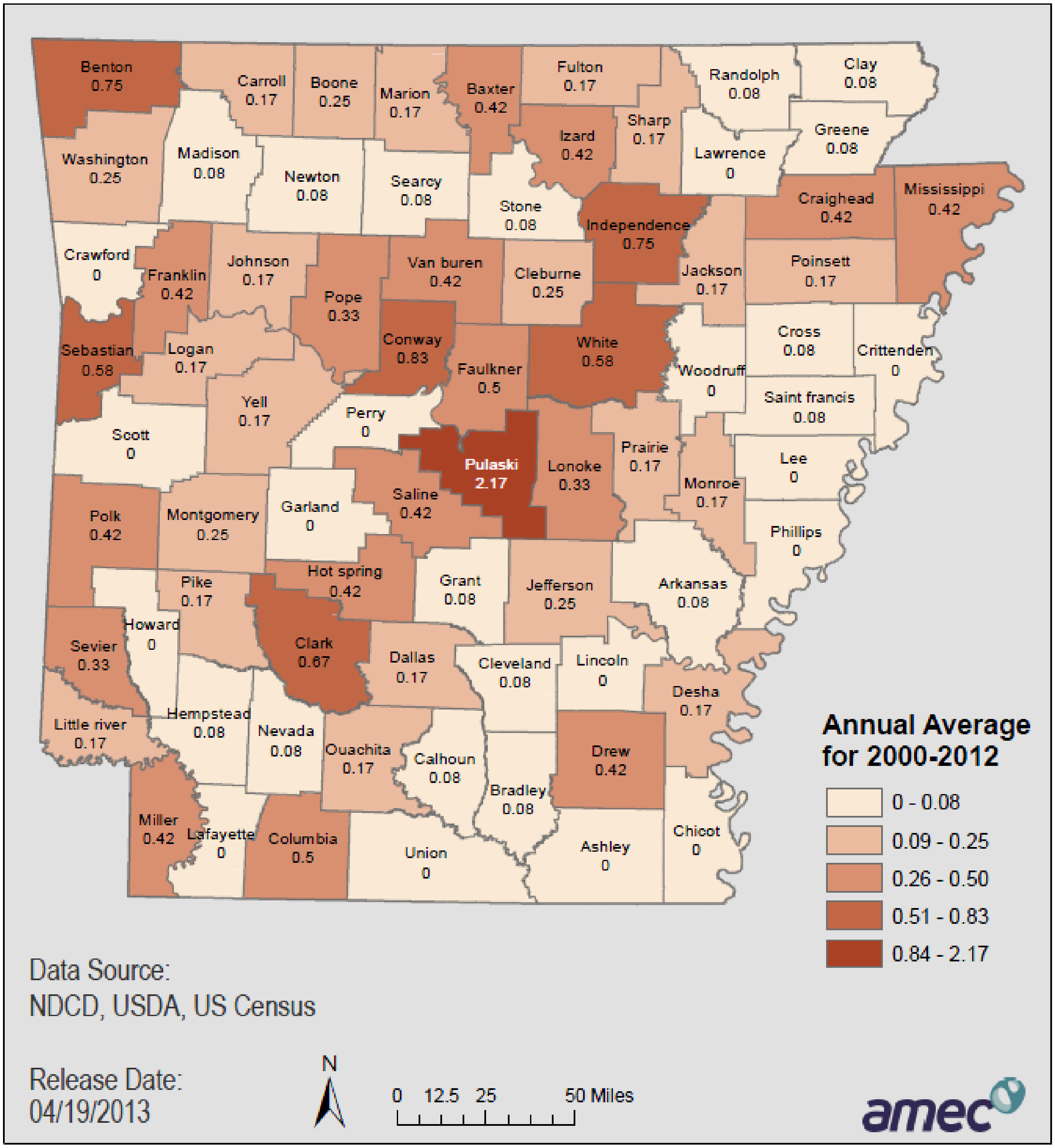


Figure 3.4.7.h Likelihood of Occurrence of Lightning Events



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

With the overall vulnerability rating determined for the three event types, a combined vulnerability rating was computed for severe thunderstorms. This rating combined the scoring of the county factors of housing density, building exposure, crop exposure, and social vulnerability; with the event factors of likelihood, average annual property loss ratio, and average annual crop loss ratio.

Table 3.4.7.g provides the calculated ranges applied to determine overall vulnerability of Arkansas counties to severe thunderstorms and **Table 3.4.7.h** provides the calculated vulnerability ratings for wind, hail, and lightning as well as the calculated combined vulnerability rating for the severe thunderstorm hazard. **Figure 3.4.7.i** that follows provides the mapped results of this analysis by county.

Table 3.4.7.g Ranges for Severe Thunderstorm Combined Vulnerability Rating

	Low (1)	Medium-Low (2)	Medium (3)	Medium- High (4)	High (5)
Severe Thunderstorm Combined Vulnerability	15-20	20-24	24-27	27-31	31-38

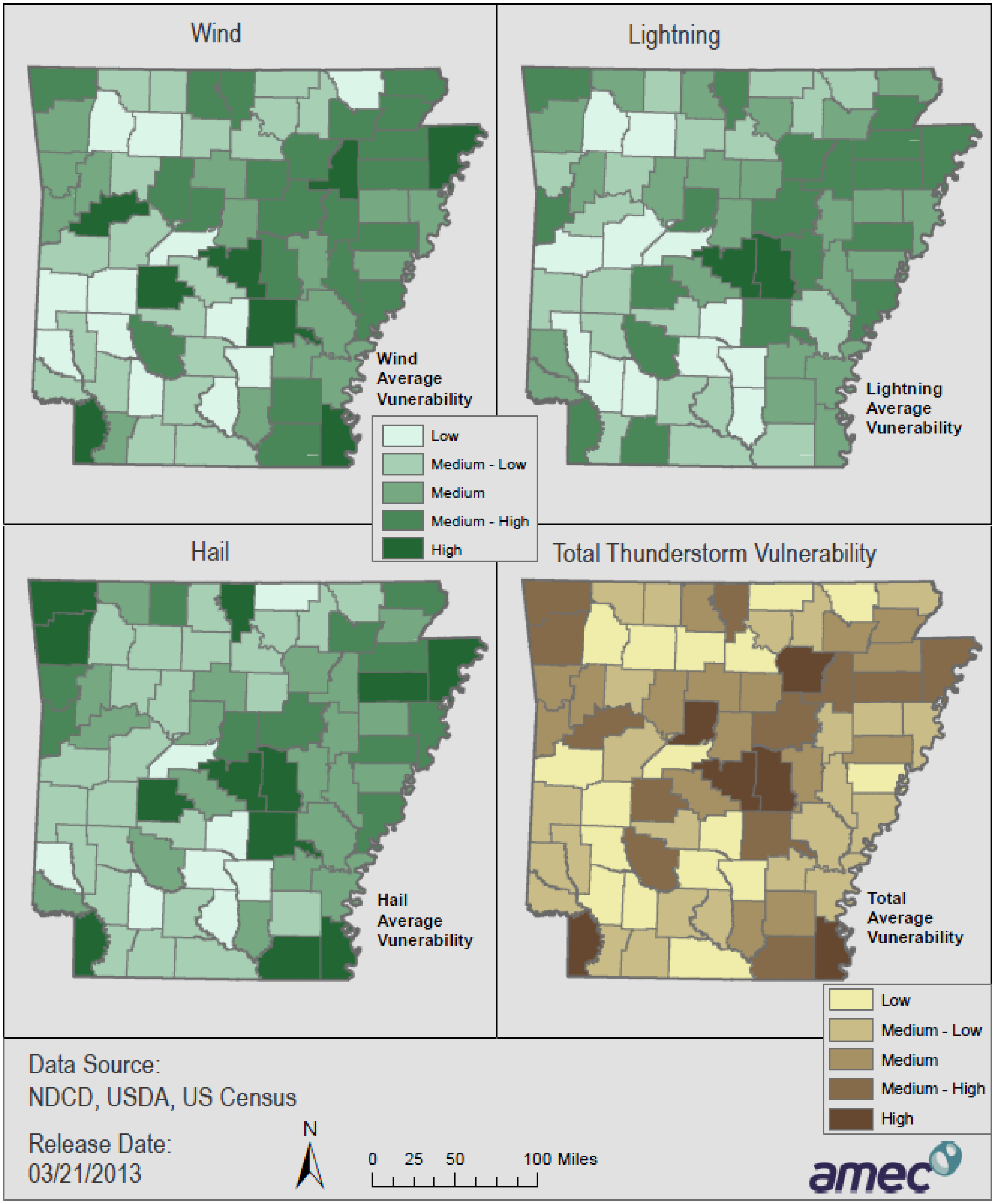
Table 3.4.7.h Severe Thunderstorm Combined Vulnerability Rating

County	Overall Wind Vulnerability Rating	Overall Hail Vulnerability Rating	Overall Lightning Vulnerability Rating	Severe Thunderstorm Combined Vulnerability Rating	Severe Thunderstorm Combined Vulnerability
Arkansas	16	14	11	23.00	Medium-Low
Ashley	18	18	11	29.00	Medium-High
Baxter	18	18	16	28.00	Medium-High
Benton	18	18	16	30.00	Medium-High
Boone	13	16	11	24.00	Medium-Low
Bradley	15	14	8	25.00	Medium
Calhoun	12	7	10	21.00	Medium-Low
Carroll	14	14	13	23.00	Medium-Low
Chicot	22	20	13	33.00	High
Clark	17	15	15	31.00	Medium-High
Clay	17	16	13	24.00	Medium-Low
Cleburne	17	13	13	25.00	Medium
Cleveland	12	9	7	18.00	Low

County	Overall Wind Vulnerability Rating	Overall Hail Vulnerability Rating	Overall Lightning Vulnerability Rating	Severe Thunderstorm Combined Vulnerability Rating	Severe Thunderstorm Combined Vulnerability
Columbia	13	13	15	23.00	Medium-Low
Conway	18	14	16	32.00	High
Craighead	18	17	16	27.00	Medium
Crawford	15	17	11	25.00	Medium
Crittenden	15	16	13	22.00	Medium-Low
Cross	15	14	12	21.00	Medium-Low
Dallas	13	9	9	19.00	Low
Desha	16	14	13	23.00	Medium-Low
Drew	18	13	13	26.00	Medium
Faulkner	15	16	13	26.00	Medium
Franklin	15	14	12	27.00	Medium
Fulton	14	10	10	20.00	Low
Garland	20	19	15	28.00	Medium-High
Grant	9	8	6	15.00	Low
Greene	18	15	16	27.00	Medium
Hempstead	13	12	9	20.00	Low
Hot Spring	13	13	11	23.00	Medium-Low
Howard	13	11	7	21.00	Medium-Low
Independence	19	15	17	33.00	High
Izard	13	13	14	24.00	Medium-Low
Jackson	20	15	16	29.00	Medium-High
Jefferson	20	18	16	28.00	Medium-High
Johnson	14	12	11	23.00	Medium-Low
Lafayette	16	12	10	22.00	Medium-Low
Lawrence	19	17	14	26.00	Medium
Lee	15	15	14	20.00	Low
Lincoln	15	15	13	21.00	Medium-Low
Little River	13	14	12	23.00	Medium-Low
Logan	21	14	11	30.00	Medium-High
Lonoke	19	19	18	34.00	High
Madison	10	12	8	20.00	Low
Marion	18	13	12	25.00	Medium
Miller	21	18	15	34.00	High
Mississippi	21	18	17	30.00	Medium-High
Monroe	18	14	14	24.00	Medium-Low
Montgomery	11	12	10	19.00	Low
Nevada	12	9	8	17.00	Low

County	Overall Wind Vulnerability Rating	Overall Hail Vulnerability Rating	Overall Lightning Vulnerability Rating	Severe Thunderstorm Combined Vulnerability Rating	Severe Thunderstorm Combined Vulnerability
Newton	12	12	9	19.00	Low
Ouachita	14	12	11	21.00	Medium-Low
Perry	11	10	7	18.00	Low
Phillips	18	17	16	23.00	Medium-Low
Pike	11	11	10	20.00	Low
Poinsett	19	19	16	28.00	Medium-High
Polk	11	12	11	22.00	Medium-Low
Pope	18	13	12	27.00	Medium
Prairie	16	14	16	26.00	Medium
Pulaski	21	22	21	38.00	High
Randolph	12	12	10	18.00	Low
Saline	18	17	16	25.00	Medium
Scott	14	14	14	26.00	Medium
Searcy	14	11	9	20.00	Low
Sebastian	13	12	10	19.00	Low
Sevier	16	16	15	27.00	Medium
Sharp	12	10	12	24.00	Medium-Low
St. Francis	14	12	11	21.00	Medium-Low
Stone	13	12	10	19.00	Low
Union	13	12	10	19.00	Low
Van Buren	16	14	13	25.00	Medium
Washington	16	19	13	28.00	Medium-High
White	17	16	15	28.00	Medium-High
Woodruff	18	14	13	23.00	Medium-Low
Yell	14	12	9	23.00	Medium-Low

Figure 3.4.7.i Vulnerability Summary for Severe Thunderstorms



❖ State Estimates of Potential Losses

To determine potential financial loss estimates to severe thunderstorms in Arkansas, the available historical loss data was annualized. In the case of frequently occurring weather-related hazards such as severe thunderstorms, annualized historical loss data is considered to be the best resource for determining future potential losses. As discussed above in the vulnerability overview for this hazard, historical loss data was obtained from the National Climatic Database for wind, hail, and lightning for the period from 2000-2012. In addition, since agriculture plays such an important role in the Arkansas economy, the team also obtained data from USDA's Risk Management Agency for paid crop insurance claims as a result of wind and hail for the period from 2003 to 2012. According to this data, the combined annualized property loss to the State of Arkansas as a result of severe thunderstorms (wind, hail, and lightning) is $28,618,679. **Table 3.4.7.i** provides the annualized total loss estimates (property and crop) for all counties.

Based on this data, **Figures 3.4.7.j, k, and l** provide the potential annualized loss estimates for wind, lightning, and hail based on historical damages. **Figure 3.4.7.m** at the conclusion of this section provides the combined total annualized losses to provide a total potential loss estimate for the severe thunderstorm hazard. There are no distinct patterns of loss that can be inferred from the maps other than higher losses in areas with greater exposure. Thus, this analysis demonstrates the random distribution of this hazard and its impacts around the State of Arkansas.

Table 3.4.7.i Annualized Severe Thunderstorm Damages

County	WIND Annualized Property Loss and Crop Claims ($)	HAIL Annualized Property Loss and Crop Claims ($)	LIGHTNING Annualized Property Loss and Crop Claims ($)	COMBINED Annualized Property Loss and Crop Claims ($)
Arkansas	$213,376	$ 6,419	$ 4,167	$ 223,961
Ashley	$184,102	$ 176,275	$ -	$ 360,377
Baxter	$ 65,833	$ -	$ 5,417	$ 71,250
Benton	$352,917	$ 250,964	$ 21,417	$ 625,298
Boone	$ 53,833	$ 14,153	$ 1,667	$ 69,653
Bradley	$ 54,217	$ 59,547	$ 1,667	$ 115,431
Calhoun	$ 79,417	$ -	$ 41,667	$ 121,083
Carroll	$ 15,875	$ 19,583	$ 7,500	$ 42,958
Chicot	$243,364	$ 120,794	$ -	$ 364,158
Clark	$108,733	$ 1,709	$ 21,958	$ 132,400
Clay	$108,352	$ 52,013	$ -	$ 160,365
Cleburne	$287,583	$ -	$ 22,500	$ 310,083
Cleveland	$ 89,417	$ -	$ 1,250	$ 90,667
Columbia	$ 28,333	$ 8,333	$ 22,250	$ 58,917

County	WIND Annualized Property Loss and Crop Claims ($)	HAIL Annualized Property Loss and Crop Claims ($)	LIGHTNING Annualized Property Loss and Crop Claims ($)	COMBINED Annualized Property Loss and Crop Claims ($)
Conway	$340,001	$ 1,125	$ 37,667	$ 378,792
Craighead	$ 92,178	$ 17,909	$ 5,917	$ 116,003
Crawford	$ 34,333	$ 56,961	$ -	$ 91,294
Crittenden	$ 43,315	$ 28,010	$ -	$ 71,324
Cross	$ 85,637	$ 18,459	$ 417	$ 104,512
Dallas	$ 41,083	$ -	$ 417	$ 41,500
Desha	$ 88,186	$ 21,729	$ 3,333	$ 113,248
Drew	$267,636	$ 6,814	$ 4,083	$ 278,534
Faulkner	$191,333	$ 558	$ 12,500	$ 204,392
Franklin	$ 30,930	$ 42,500	$ 5,250	$ 78,680
Fulton	$ 61,417	$ -	$ 175	$ 61,592
Garland	$333,083	$ -	$ -	$ 333,083
Grant	$ 47,500	$ -	$ 83	$ 47,583
Greene	$105,954	$ 10,656	$ 83,333	$ 199,943
Hempstead	$ 57,083	$ -	$ 1,667	$ 58,750
Hot Spring	$ 58,083	$ -	$ 3,333	$ 61,417
Howard	$156,833	$ -	$ -	$ 156,833
Independence	$298,844	$ 1,108	$ 67,917	$ 367,868
Izard	$ 19,083	$ -	$ 15,750	$ 34,833
Jackson	$136,766	$ 4,323	$ 16,667	$ 157,755
Jefferson	$ 92,220	$ 4,095	$ 3,167	$ 99,481
Johnson	$ 86,083	$ -	$ 10,417	$ 96,500
Lafayette	$ 68,205	$ 5,000	$ -	$ 73,205
Lawrence	$117,837	$ 20,077	$ -	$ 137,914
Lee	$ 6,641	$ 9,730	$ -	$ 16,371
Lincoln	$ 40,167	$ 12,336	$ -	$ 52,503
Little River	$ 70,000	$ 1,284	$ 8,417	$ 79,700
Logan	$477,159	$ 3,793	$ 417	$ 481,368
Lonoke	$266,396	$ 418,023	$150,000	$ 834,420
Madison	$ 14,408	$ 28,750	$ 8,333	$ 51,492
Marion	$261,917	$ 2,083	$ 2,250	$ 266,250
Miller	$267,385	$7,083,346	$ 14,583	$7,365,315
Mississippi	$133,931	$ 22,355	$ 4,834	$ 161,120
Monroe	$ 88,224	$ 3,312	$ 83	$ 91,619

County	WIND Annualized Property Loss and Crop Claims ($)	HAIL Annualized Property Loss and Crop Claims ($)	LIGHTNING Annualized Property Loss and Crop Claims ($)	COMBINED Annualized Property Loss and Crop Claims ($)
Montgomery	$ 7,104	$ 42	$ -	$ 7,146
Nevada	$ 61,167	$ -	$ 417	$ 61,583
Newton	$ 24,583	$ -	$ -	$ 24,583
Ouachita	$ 95,250	$ -	$ -	$ 95,250
Perry	$ 54,250	$ 21,000	$ -	$ 75,250
Phillips	$ 88,465	$ 12,917	$ -	$ 101,382
Pike	$ 30,083	$ -	$ 2,750	$ 32,833
Poinsett	$ 88,449	$ 263,068	$ 4,583	$ 356,101
Polk	$ 36,500	$ -	$ 6,667	$ 43,167
Pope	$221,175	$ -	$ 3,750	$ 224,925
Prairie	$ 66,690	$ 141	$ 25,167	$ 91,998
Pulaski	$374,213	$5,108,428	$688,750	$6,171,391
Randolph	$ 22,250	$ 7,027	$ 1,667	$ 30,943
Saline	$ 53,138	$ 8,803	$ 7,500	$ 69,441
Scott	$ 78,667	$ -	$112,500	$ 191,167
Searcy	$ 95,083	$ 833	$ -	$ 95,917
Sebastian	$ 26,583	$ -	$ -	$ 26,583
Sevier	$ 81,992	$ 97,083	$ 25,000	$ 204,075
Sharp	$174,083	$ 4,175	$ 34,583	$ 212,842
St. Francis	$102,833	$ -	$ 958	$ 103,792
Stone	$ 39,000	$ -	$ 1,250	$ 40,250
Union	$ 55,500	$ 833	$ -	$ 56,333
Van Buren	$107,167	$ -	$ 1,833	$ 109,000
Washington	$ 22,283	$4,255,000	$ 25,000	$4,302,283
White	$173,333	$ -	$ 4,375	$ 177,708
Woodruff	$ 46,009	$ -	$ -	$ 46,009
Yell	$153,250	$ 1,600	$ 83	$ 154,934

Figure 3.4.7.j Annualized Wind Damages (67 MPH or Greater)

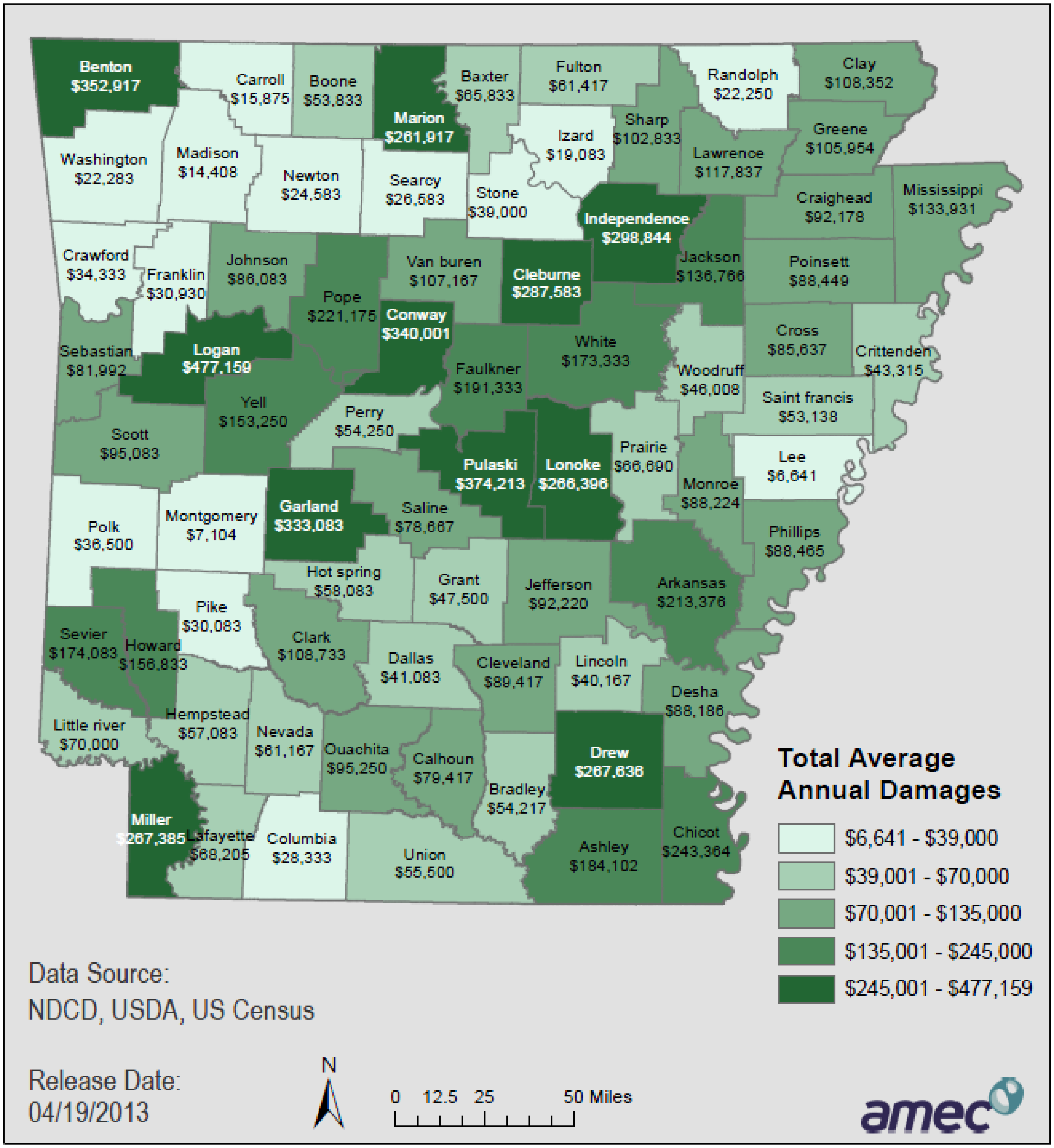


Figure 3.4.7.k Annualized Hail Damages

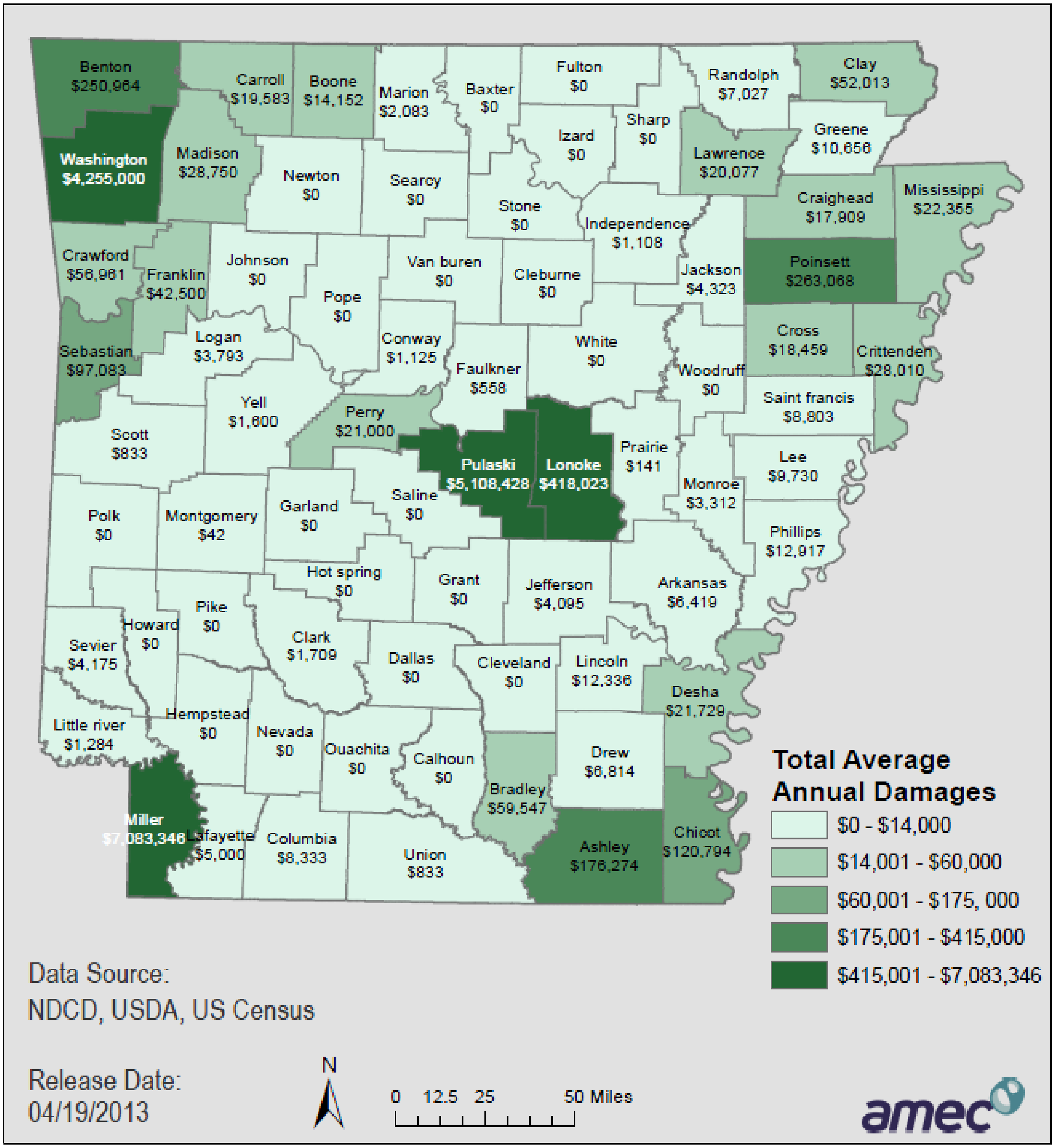


Figure 3.4.7.I Annualized Lightning Damages

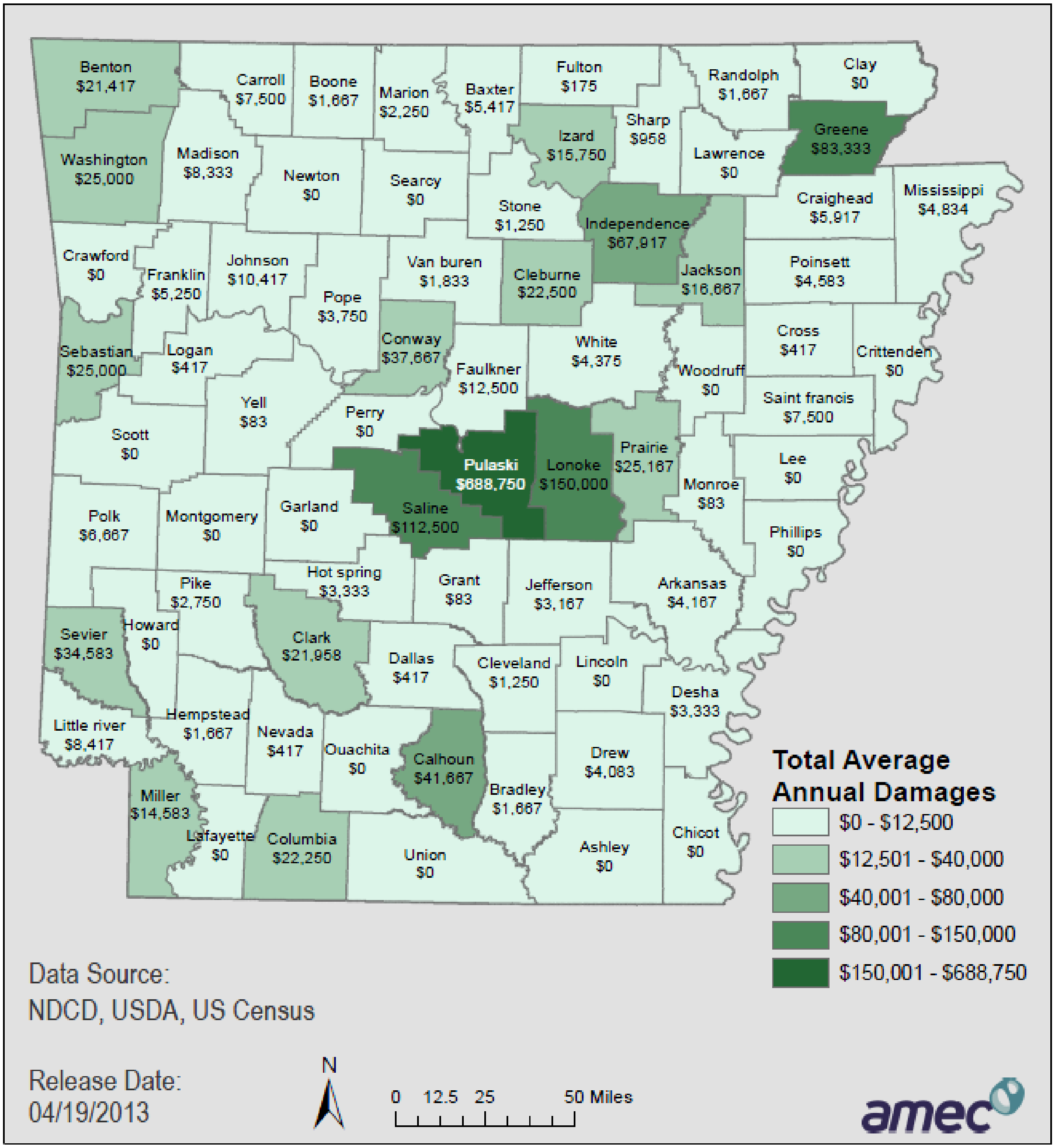
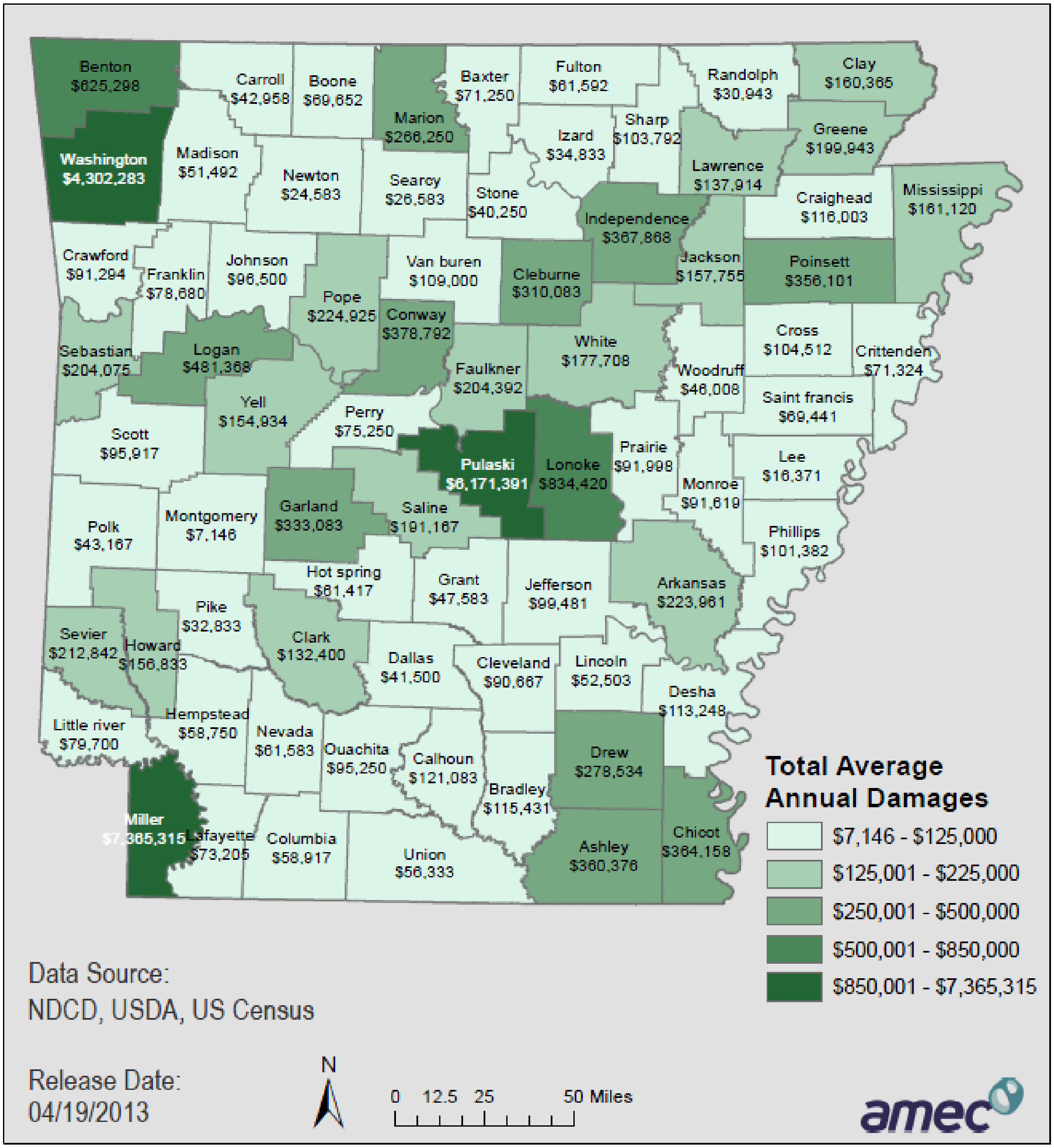


Figure 3.4.7.m Annualized Severe Thunderstorm Damages (Wind, Hail, & Lightning)



❖ *Development in Hazard Prone Areas*

According to the overall vulnerability summary for severe thunderstorms, the following counties have high vulnerability ratings: Chicot, Conway, Independence, Lonoke, Miller, and Pulaski. Of these, Lonoke and Pulaski Counties are also in the top 10 counties for population and housing gains from 2000 to 2010. **Table 3.4.7.j** compares the annualized loss from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these two counties.

Table 3.4.7.j Comparison of Annualized Loss Estimates[1]

County	Annualized Loss 2010 Plan	Annualized Loss 2013 Plan	Comparison
Lonoke	N/A	$ 834,420	Comparison not available.
Pulaski	N/A	$6,171,391	Comparison not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

❖ *Consequence Analysis*

Severe thunderstorms losses are usually attributed to associated hazards of hail, downburst winds, lightning and heavy rains. Losses to hail and high wind are typically insured losses that are localized and do not result in presidential disaster declarations. However, in some cases, impacts are severe and widespread and assistance outside the State capabilities is necessary. Hail and wind also can have devastating impacts on crops. Severe thunderstorms/heavy rains that lead to flooding are accounted for in the flood profile.

The information in **Table 3.4.7.k** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.7.k. EMAP Consequence Analysis: Severe Thunderstorm

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Health and Safety of Persons Responding to the Incident	Localized impact expected to limit damage to personnel in the areas at the time of the incident.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services.
The Environment	Localized impact expected to be severe for incident areas and moderate to light for other areas affected by the storm or HazMat spills.
Economic and Financial Condition	Losses to private structures covered, for the most part, by private insurance.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.8 Severe Winter Weather

❖ *Description/Location*

Severe winter weather, including extreme cold, heavy snowfall, ice storms, winter storms, blizzards, and/or strong winds, affects every state in the continental United States. Areas where such weather is uncommon, such as Arkansas, are typically disrupted more severely by severe winter weather than regions that experience this weather more frequently. The occurrence of severe winter weather has a substantial impact on communities, utilities, transportation systems and agriculture, and often results in loss of life due to accidents or hypothermia. In addition, severe winter weather may spawn other hazards such as flooding, severe thunderstorms, tornadoes, and extreme winds that may delay recovery efforts.

Snowfall: The National Weather Service (NWS) defines snowfall as a steady fall of snow for several hours or more. Heavy snow is defined as either a snowfall accumulating to four inches in depth in twelve hours or less, or snowfall accumulation to six inches or more in depth in 24 hours or less. In states such as Arkansas, where lesser accumulations can cause significant impacts, lower thresholds may be used. Heavy snow can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days and unprotected livestock may be lost. The cost of snow removal, repairing damages and loss of business can have large economic impacts on cities and towns.

Sleet: Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Heavy sleet is a relatively rare event defined as the accumulation of ice pellets covering the ground to a depth of 0.5 inch or more.

Ice: Freezing rain or freezing drizzle can create a layer of ice on surfaces such as the ground, trees, power lines, vehicles, streets, highways, etc. Small accumulations of ice can make driving and walking difficult while heavy accumulations produce extremely dangerous and damaging conditions. An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice, 0.25 inches or greater, can pull down trees and utility lines resulting in loss of power and communication.

The images below show the affects from heavy accumulations of ice from ice storms or heavy snow. These accumulations can bring down trees, electrical wires, telephone poles and lines and communication towers. Power and communications disruptions are common consequences of ice storms and heavy snow in Arkansas.

Figure 3.4.8.a A Frozen Limb Falls on a Live Electric Line

Source: Arkansas 2010 All-Hazards Mitigation Plan

Figure 3.4.8.b Road Closures due to the Effects of an Ice Storm

Source: Arkansas 2010 All-Hazards Mitigation Plan

Heavy accumulations of ice or snow may also result in building collapses or structural damage to buildings. The damage may be caused directly by the excessive weight of the ice/snow accumulation, or by ice-laden trees or branches falling on structures. Homes, businesses, as well as weaker nonresidential structures, commonly sustain structural damage. Poultry houses in Arkansas are particularly at risk.

Due to the infrequency of severe winter weather events, the State of Arkansas lacks sufficient snow removal equipment and road treatments (sand, salt). This creates extremely hazardous conditions for motorists on the ice and snow covered roads.

Winter Storms: A combination of severe winter weather types occurring over a wide area is called a winter storm. Winter storms are formed by below freezing temperatures, moisture and lift. Lift, which is commonly provided by warm air colliding with cold air along a weather front, raises the moist air to form clouds and cause precipitation. Strong winds with these intense storms and cold fronts can knock down trees, utility poles and power lines. However, these conditions are rare in Arkansas. Winter storms in the mid-west and plains states typically develop over southeast Colorado on the lee side of the Rockies. These storms move easterly or northeasterly and use both the southward plunge of cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce ice, snow and sometimes blizzard conditions. These fronts may push deep into the interior regions, sometimes as far south as Florida. Winter storms are sometimes accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, severe drifting and dangerous wind chill.

Blizzards: A winter storm is categorized as a blizzard when the following conditions prevail for a period of three hours or longer: 1) Sustained wind or frequent gusts to 35 miles per hour or greater; and 2) Considerable falling and/or blowing snow that reduces visibility to less than 1/4 mile.

Extreme Cold: Extreme cold often accompanies or succeeds severe winter weather. Prolonged exposure to the cold can cause frostbite or hypothermia and become life threatening. Infants and elderly people are most at risk. What constitutes extreme cold and its effects varies across different areas of the United States. In areas unaccustomed to winter weather, near freezing temperatures are considered extreme cold. Pipes may freeze and rupture in homes that are poorly insulated or without heat.

❖ *Previous Occurrences*

From 2000 through December of 2012, there were 622 recorded events with significant snow and ice. Since the previous plan update, there have been 331 winter weather events and 176 winter storm events recorded. Most of these events were evenly distributed across the State with practically every county having been affected by at least one recorded event.

- **January 1979 Ice Storm:** One of the worst ice storms to affect Arkansas occurred in January of 1979. Several counties in south central and southeast Arkansas experienced ice accumulations up to three inches. Several cities, including Monticello, McGee and Warren, were completely paralyzed. Several deaths resulted from auto accidents. Up to 80,000 customers were without power, many for up to two weeks. Utility damage estimates at the time were $5 million. The Arkansas Forestry Commission estimated that 3.5 million acres of timber suffered ice damage inflicting a loss in excess of $6.5 million on forest landowners. Total unadjusted damages were in excess of $15 million.
- **January 1988 Snowstorm:** The largest snowstorm to affect Arkansas occurred in January of 1988, when the entire State was blanketed by heavy snow. Up to 16 inches of snow accumulated in Heber Springs and El Dorado, and 13 inches fell in Little Rock. Sleet and freezing rain also fell in the south. Poultry growers were particularly hard hit by this storm. At least 215 poultry houses collapsed from the weight of accumulated snow

($14.5 million damage to buildings) killing 3.5 million birds ($8.5 million loss). Many other structures, such as awnings, sheds, metal buildings, hangers, marinas and greenhouses collapsed, damaging or destroying their contents. Cattle growers had problems because feed supplies could not be delivered to the animals. Many calves were lost due to stress from the heavy snow and harsh conditions. Significant damage also occurred to power lines and exposed cabling.

- **February 1994 Ice Storm:** An extremely damaging ice storm struck Arkansas and much of the southeastern United States in February 1994. It was unusual in its great aerial extent (10 states affected) and large precipitation amounts. Ice accumulations ranged from one inch to as much as six inches in parts of northern Mississippi - unprecedented ice accumulations in this area for a freezing rain event. Overall, the storm produced over $3 billion in damages and cleanup costs, and at least nine deaths were attributed to the storm. Well over two million customers were without electricity at some time, and 1/2 million were still without power three days after the storm. Falling trees and limbs damaged many homes, businesses and vehicles. In Arkansas, the southeast part of the State was most severely affected with some areas having almost every power pole downed by the ice. A number of homes and businesses sustained structural damage caused by falling trees. Approximately 120,000 customers were without power at some time during the storm, many for up to two weeks. Some power companies called this the worst ice storm in their history. Severe damage to the forestry industry and specific orchard crops occurred. Damage and cleanup costs in Arkansas were estimated at over $50 million.

- **January 2000 Winter Storms:** Severe winter weather was particularly damaging to Arkansas in 2000. On January 27th and 28th, a major winter storm brought mostly heavy snow to Arkansas. Two to eight inches of snow accumulated in the northern half of the State and along the southern border. In much of the southern half of the State, eight to 14 inches of snow was common. Clark County recorded the highest average snowfall total in the State at 15 inches, with isolated reports of 20 inches. It was the most widespread, heavy snow to affect Arkansas since 1988. More than 600 chicken houses, each housing up to 20,000 chickens, were damaged or destroyed. Collapsed houses and hypothermia killed the vast majority of the chickens. Due to the loss of poultry, approximately two-dozen counties were declared federal agricultural disaster areas. During the height of the storm, Interstate 30 became impassible from Malvern to south of Arkadelphia, and was closed for a number of hours. The National Guard was called out to rescue stranded motorists, and a number of shelters

Figure 3.4.8.c January 2000 Winter Storm Event

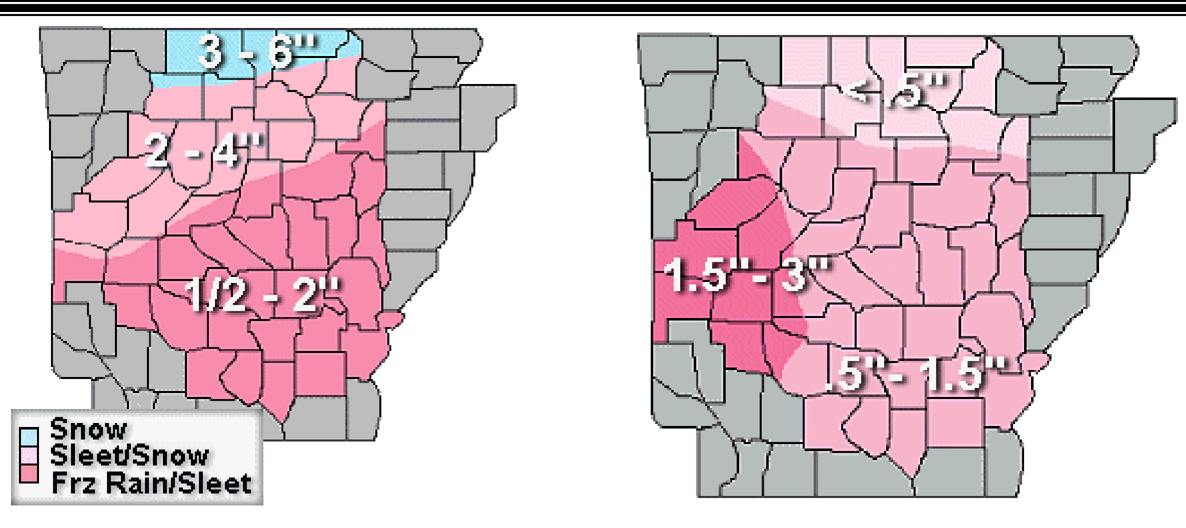
Source: National Weather Service

Severe Winter Weather

opened for motorists and for the homeless. On January 29th, a State of Emergency was declared, with only necessary travel advised. There was only one known fatality related to the storm reported, the death was due to hypothermia

- **December 2000 Winter Storms:** Two major ice storms severely affected Arkansas within a two-week period in December of 2000. A major winter/ice storm developed in Arkansas late on December 12 and lasted through December 13. Three to six inches of snow fell across the northern part of the State before mixing with two to four inches of snow and sleet across much of northern and western Arkansas. In central and southern Arkansas, one-half to one inch of freezing rain accumulated with sleet mixed in at times. Where icing occurred, there were massive power outages with branches and entire trees falling in some areas due to the weight of the ice. Falling trees and limbs resulted in property damage (mainly to roofs and vehicles), personal injury (many head lacerations and other injuries were reported) and blocked roads. Many power poles also fell, and some with transformers started fires. About 300,000 customers lost power during this mid-December event, believed to be the largest power outage in Arkansas history to date. Many people were without power and heat for several days during which time most businesses, schools and government offices were closed. Entergy, the largest electric supplier in Arkansas (645,000 customers), brought in approximately 6,000 linemen and tree trimmers from 10 states (more than ever called upon in company history) to help restore power and remove tree debris from lines.

Figure 3.4.8.d Accumulations of the December 2000 Winter Storms



Source: National Weather Service

Some additional reported consequences of the power losses included service stations unable to dispense fuel, community water systems unable to treat and distribute water, senior citizens unable to receive medical attention (such as dialysis and oxygen), retirement and nursing homes without electricity, Red Cross shelters without electricity, airport closings because beacons were inoperable, loss of perishables in grocery stores and restaurant, and loss of phone service (including some cellular) and cable service in many areas of the State. There was also concern about accidental fires and/or carbon monoxide incidents by the many persons trying to heat homes using alternative methods. The freezing rain, sleet and cold weather from this event resulted in nine deaths in the State. These included traffic accidents and a house fire that killed a mother and two children.

Following the major winter/ice storm on December 12th and 13th, a second ice storm developed during the morning of December 25th and continued through December 27th. Mostly freezing rain and sleet were noted, with one and a half to three inches of ice in western sections of the State and one-half to two inches of ice elsewhere. Roads were much icier during this second storm due to lower temperatures. Most major state highways were covered with two inches of ice and many roads were nearly impassible from the ice and trees that had fallen due to the weight of the ice. Numerous traffic accidents were attributed to the ice, including several pile-ups on I-55. The National Guard was contacted to help stranded motorists.

The loss of power during the second storm was even greater than the first, as about 320,000 customers lost power statewide, many for several days. The ice damaged or destroyed several main transmission lines connecting power grids to cities. Entergy mobilized more than 5,200 linemen and servicemen and nearly 4,000 tree trimmers from 24 states to restore service.

The lack of electricity affected the ability of some communities to treat and deliver water. Over 120,000 people in 35 communities, including Hot Springs, were without water for some period of time. The National Guard hauled 500-gallon water tanks to cities in need and also delivered generators and other emergency equipment. There were also gasoline shortages as stations were unable to operate pumps. Arkadelphia was one of a few stops between Texarkana and Little Rock with open restaurants and operating gas stations until the stations ran out of gas on the 27th. Little Rock National Airport was closed from the evening of the 25th until midday on the 27th due to ice on the runways stalling some 170 flights. This was the first time since 1975 that the airport had been closed for more than 24 hours. Other consequences of the ice storm included the loss of communication towers in many communities (including Garland County), loss of phone service for 25,000 customers, loss of power at some hospitals and a shortage of supplies, such as oxygen cylinders at nursing homes. Impassible roads kept some fire crews and emergency workers from responding to emergency calls.

The State’s livestock and forests were also hard hit by the ice storms. An estimated 31,533 beef cattle, 4,653 dairy cattle, 12,065 swine, 30,000 turkeys and over five million chickens (including chicks) died as a result of the storms. The Arkansas Forestry Commission estimates that private, non-industrial landowners bore $50 million in damage and replacement costs. Large paper companies, such as International Paper and Weyerhauser Co., suffered losses in the millions of dollars as well. Trees and branches felled by the ice in residential areas were also damaged resulting in a massive and costly debris-removal effort. Federal and State government funded most of the cost of this cleanup. Debris removal in Arkadelphia was not completed until the end of April. Other effects of the storm were not felt immediately. The millions of downed trees and branches left by the ice storms may serve as fuel for wildfires, which could be much hotter, denser and more widespread.

Combined, the two December 2000 ice storms took the lives of at least 20 people in Arkansas. The National Weather Service has stated that these two storms are likely the most widespread and damaging ice storms in recorded state history, which dates back to 1819.

- **October 18, 2004 – Severe Winter Weather:** The counties of Prairie, Pulaski and Saline were impacted by a severe winter weather event. The State declared this a disaster event and initiated the processes for Public Assistance (PA) and Individual Assistance (IA). Thirty-one people were approved for temporary housing and the estimated damages were approximately $200,000.
- **January 13, 2007 – Ice, Rains and Flooding:** This event impacted a number of counties across the State. The State initiated the process for Public and Individual Assistance and estimated the combined damages at $625,000. Seventy-seven people were approved for temporary housing.
- **January 2009 Ice, Rains and Flooding:** A five-day storm resulted in repair costs nearly twice of those after the dual ice storms in late December 2000. This time, more than 40,000 electrical poles snapped or were damaged under the burden of the ice-laden wires or trees. The Electric Cooperatives of Arkansas replaced over 1,500 miles of electrical wire. The financial toll from the January ice storm in north Arkansas is estimated at $500 million, with most of the cost for restoring electric utilities. The three major utilities that sustained damage from the storm say they will spend close to $460 million for repairs. Much of the cost is from the widespread collapse of power lines and utility poles. Only the nonprofit Electric Cooperatives of Arkansas, which estimated damages at $250 million, stands to receive any state or federal assistance.
- **February 8, 2010 Winter Storms:** As an area of low pressure aloft approached from the west, snow began spreading into western Arkansas very early in the morning. Precipitation spread rapidly eastward as the morning progressed. In northern Arkansas, snow fell. Through the middle of the State, snow fell, mixed with sleet at times. By afternoon, however, much of the precipitation in the middle of the State changed over to rain and sleet. In some areas, the wintry mix changed back to snow in the evening. Farther south, rain predominated, mixed with a little sleet or snow at times. All precipitation diminished in the evening and into the early morning hours of the 9th. Most places in the northern half of Arkansas received at least 3 to 6 inches of snow. In a band about 75 miles wide, centered along a line from Clarksville and Russellville across Greenbrier to between Augusta and Brinkley, snowfall amounts of 6 to 10 inches were common.
- **March 20, 2010 Winter Storm:** A strong upper level storm system moved from the Southern Rockies into the Southern Plains on the 20th and 21st while a cold front moved across the are on the 19th and 20th. Precipitation formed over the region late on the 19th and changed over to snow from north to south on the 20th. Periods of snow, some heavy at times, continued into the afternoon and evening hours of the 21st as the storm exited the region to the east. Widespread four to six inch snows occurred over northwestern and west central Arkansas. Portions of Benton and Madison Counties received up to a foot of snow, 13 inches of snow fell across portions of Carroll County, and up to sixteen inches

fell across portions of Washington County. Roads were snow packed and very treacherous during and after the storm, resulting in numerous automobile accidents.

January 9, 2011 Winter Storm: A significant winter storm affected all of Southwest and South Central Arkansas on Sunday, January 9th. This storm system moved out of the Texas Hill Country late on January 8th and moved into the Southern Plains and Lower Mississippi Valley during the day Sunday January 9th. An area of low pressure at the surface and in the lower levels of the atmosphere developed offshore the Southeast Texas Gulf Coast and remained offshore the Louisiana Gulf Coast during the day of the event. This low pressure system helped to feed moisture into the region from the south. Initially, the lower levels of the atmosphere were very dry, but lift provided by the storm system helped to moisten and cool the lower levels of the atmosphere such a combination of freezing rain, sleet and snow were the result across all of South and Southwest Arkansas. The transition from freezing rain and sleet to all snow was quick during the morning of January 9th across the region. The storm system exited the region late on January 9th but not before dumping some impressive freezing rain, sleet and snowfall totals across the southern half of the State. Generally, one quarter to one half inch of freezing rain and sleet was reported initially across portions of Southwest and South Central Arkansas with the snow being the predominant precipitation type during the afternoon and evening of January 9th. Following are some snowfall totals for January 9th across South and Southwest Arkansas: 8 inches in Ashdown, 7 inches in Dierks and Nashville, 6 inches in Hope, 6 miles north of Lewisville, and Texarkana, 5 inches in Dequeen and Tolette, 4 inches in Lewisville, 2 inches in Magnolia and 1 inch in El Dorado. There were numerous reports of traffic accidents across the southern half of the State including isolated power outages as well.

- **January 20, 2011 Winter Storm:** An upper level disturbance approached the region from the northwest late on the 19th. Light freezing rain and sleet developed ahead of this system over northwestern Arkansas late in the evening of the 19th. The precipitation changed over to snow around midnight on the 20th and continued to spread southward over time. Snow continued into the morning hours of the 20th before the system moved to the east of the region. Four to six inches of snow fell across a large portion of northwestern Arkansas.

- **February 1, 2012 Winter Storm:** A very strong storm system moved across the Southern Rockies into the Southern Plains on the 31st of January and 1st of February. Cold air had surged into the region ahead of this system on the 30th and 31st. Precipitation developed into northwestern Arkansas during the early morning hours of the 1st, beginning as freezing rain and sleet. Most places transitioned to snow fairly quickly although some locations in northwestern Arkansas received between one quarter and one half inch of sleet before the transition. Other locations received about one quarter of an inch of ice before changing over to snow. Heavy snow fell during most of the day resulting in more than four inch accumulations west of a Berryville to Van Buren line. Much of Benton County and portions of Carroll County received nearly a foot of snow. Strong winds frequently gusting to more than 30 mph resulted in very low visibilities and drifting snow. The storm had a crippling impact on the region with interstate highways impassable and closed and many businesses shut down for a couple days during and following the storm. The storm's effects on the area lasted days. Hundreds of traffic accidents occurred during this storm and numerous vehicles were stranded in the snow.

- **February 3, 2011 Winter Storm:** A cold arctic airmass was in place across the four state region the night of February 3rd as a strong upper level storm system moved quickly out of the southern Great Basin and into the West Texas Hill Country. A large area of precipitation, mostly in the form of snow, developed across Central Texas during the late night hours of February 3rd and moved quickly northeast into Northeast Texas, Southeast Oklahoma and Southwest Arkansas during the early morning hours of February 4th. Accumulating snow was the result across much of the area with a mixture of sleet and freezing rain across portions of East Central Texas and Central Louisiana. The system exited the region late in the afternoon of February 4th. The following are snow reports across Southwest Arkansas: Little River County: 4 inches, Sevier County: 4.5 inches, Howard County: 4.5 inches, Miller County: 6.5 inches, Hempstead County: 4 inches, Lafayette County: 5 inches, Nevada County: 3 inches, Columbia County: 3 inches, Union County: 2.5 inches.

- **February 4, 2011 Winter Storm:** A strong upper level disturbance moved from southwest Texas to northern Texas into northern Arkansas on the 4th. Snow developed into the area during the morning hours and continued into the evening hours. Some of this snow was moderate to heavy and resulted in bands of locally heavy accumulations of up to five inches across northwestern Arkansas.

- **February 7, 2011 Winter Storm:** A low pressure system tracked northeast from Northwest Louisiana into Northeast Mississippi during the early morning hours into the early afternoon of February 7, 2011. Rain changed to snow across much of Eastern Arkansas as cold arctic air filtered into the area behind the low pressure system. Snow accumulations generally ranged from 1 to 3 inches across Eastern Arkansas with isolated 4 to 5 inches occurring across Mississippi County. The snow caused hazardous weather conditions as a result numerous accidents were reported.

- **February 8th and 9th 2011 Winter Storm:** A strong upper level disturbance moved from the northwestern United States southeastward into the Southern Plains on the 8th and 9th. Snow developed across the region during the evening hours of the 8th and continued through the 9th. Widespread light to moderate snow fell across northwestern and west-central Arkansas and bands of very heavy snow developed. Much of northwestern Arkansas received more than a foot of snow while portions of Benton, Washington, and Madison Counties picked up about two feet of snow. Many roads were impassable as blowing and drifting snow resulted in two to four foot snow drifts. Two elderly people died from heart attacks while shoveling snow.

- **February 13, 2012 Winter Storm:** A cold air mass was gradually retreating from Arkansas on the 13th, but precipitation moved in from the west before the cold air could exit. In most parts of Arkansas, precipitation began as snow. Then, as warmer air moved in during the day, the snow changed to a mixture of sleet and freezing rain. This occurred during the morning in southern and central sections, and during the afternoon in the north. Finally, the wintry mix changed over to rain as warmer air continued to invade the State. This changeover occurred during the morning in the south, around midday in central sections, and during the afternoon or early evening in the north. Snowfall totals over the southern half of the State were well less than an inch. Over the northern half, most snow accumulations were in the 1 to 3 inch range. However, totals to 4 inches were reported in the higher elevations of Newton County south of Jasper, and in northern Baxter County. Freezing rain amounts ranged from a trace to around 0.10 inch.

❖ *Probability of Future Hazard Events*

Since 2000, Arkansas has experienced 696 severe winter weather events including 218 heavy snow/snowstorm events, 185 ice storm events and 622 winter storms. These numbers indicate that Arkansas can expect an average of almost 15 severe winter weather events each year, including 2.4 heavy snows, 2.3 ice storms each year, and 3.7 winter storm event in an average year. Therefore, the probability of the State experiencing future events is "**Highly Likely**".

It is quite difficult to make an objective and quantitative measure of the severity of snowstorms, ice storms, and extreme cold. Therefore, any analysis should be considered subjective and qualitative.

For northern counties, the probability of a snowstorm, ice storm, or extreme cold should be considered high due to historically higher average snowfall and lower average temperatures. The severity is rated moderate to critical due to the overall level of preparedness in this area. For example, homes and businesses may be better insulated due to the higher probability of severe cold relative to other areas. Also, people living in this area may be more likely to use snow tires or purchase four-wheel-drive vehicles. People living in this area may be more likely to maintain adequate supplies of home heating fuels and consider other preparedness measures. Local and State governments may have access to more snow clearing equipment and maintain adequate supplies of materials needed for snow or ice removal. School districts and businesses may be more likely to develop and use snow routes or establish closing procedures.

Southern counties have a low probability of a snowstorm, ice storm, or extreme cold due to their lower average snowfalls and temperatures. Events in these areas also have a critical potential severity. This may be due to a lower level of preparedness. People living in this area may have homes with inadequate insulation or fail to maintain an adequate supply of home heating fuels. People may be less likely to equip their vehicles with snow tires or purchase four-wheel-drive vehicles. Local and State governments may not maintain sufficient amounts of equipment and materials. Schools and businesses may not have formal snow routes or closing procedures.

❖ *State Vulnerability Analysis*

Severe Winter Weather including snow, ice, and severe cold has caused recent damage for the citizens of Arkansas with a Presidential Declaration in January 2013. The method used to determine vulnerability to severe winter weather across Arkansas was statistical analysis of data from several sources: National Climatic Data Center (NCDC) storm events data (2000 to 2012), Crop Insurance Claims data from USDA's Risk Management Agency (2003-2012), U.S. Census Data (2010), USDA's Census of Agriculture (2007), and the calculated Social Vulnerability Index for Arkansas Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina.

Table 3.4.8.a provides the housing density, building exposure, crop exposure, and social vulnerability data, total incidents, total property loss, and the total crop insurance paid. These are the common data elements for the analysis of severe winter weather.

Table 3.4.8.a Additional Statistical Data Compiled for Vulnerability Analysis

County	Housing Density (units/sq.mi.)	Total Building Exposure ($ 1,000)	Crop Exposure ($ 1,000)	Social Vulnerability Index	Total Incidents	Total $ Property Loss ($)	Total Crop Insurance Paid (S)
Arkansas	9.5	$ 1,501,425	$ 179,522	1	22	$ 70,000	$ 123,452
Ashley	11.0	$ 1,506,103	$ 55,231	2	12	$ 1,357,500	$ 229,727
Baxter	40.7	$ 2,607,031	$ 741	5	42	$ 50,210,000	-
Benton	109.9	$ 11,163,666	$ 6,942	1	25	$ 30,250,000	$ 216,580
Boone	28.5	$ 2,220,914	$ 2,081	2	51	$ 50,050,000	$ 147,349
Bradley	9.0	$ 760,621	$ 3,526	3	19	$ 50,000	$ 957,213
Calhoun	4.6	$ 309,312	N/A	1	21	$ 50,000	-
Carroll	21.5	$ 1,644,687	$ 2,273	4	25	$ 17,500,000	-
Chicot	8.4	$ 714,986	$ 84,944	5	11	$ 1,047,500	$ 119,963
Clark	12.0	$ 1,462,834	$ 2,258	4	24	$ 1,005,000	$ 37,130
Clay	12.6	$ 1,181,580	$ 139,431	4	29	$ 3,554,010	$ 150,348
Cleburne	28.6	$ 1,950,886	$ 1,618	3	31	$ 26,920,000	-
Cleveland	6.8	$ 474,659	$ 363	2	22	$ 115,000	-
Columbia	15.1	$ 1,506,893	$ 9,772	3	12	$ 4,544,444	-
Conway	17.6	$ 1,304,591	$ 10,926	2	31	$ 12,000,000	$ 109,798
Craighead	57.3	$ 5,603,268	$ 153,368	1	33	$ 4,030,010	$ 428,491
Crawford	44.0	$ 3,139,394	$ 10,801	1	15	$ 425,000	$ 221,427
Crittenden	35.2	$ 3,135,093	$ 99,333	1	23	$ 104,000	$ 676,552
Cross	12.7	$ 1,074,314	$ 110,773	4	25	$ 1,032,000	$ 945,065
Dallas	6.5	$ 575,374	N/A	3	23	$ 100,000	-
Desha	8.2	$ 893,119	$ 137,184	3	19	$ 50,000	$ 246,983
Drew	10.2	$ 1,216,184	$ 35,925	3	23	$ 55,000	$ 98,907
Faulkner	71.9	$ 5,802,656	$ 5,830	1	32	$ 17,000,000	-
Franklin	13.2	$ 1,015,281	$ 3,238	4	14	-	$ 128,406
Fulton	11.0	$ 677,500	$ 649	4	39	$ 50,336,000	-
Garland	74.6	$ 6,585,659	$ 2,379	4	33	$ 12,030,000	-

County	Housing Density (units/sq.mi.)	Total Building Exposure ($ 1,000)	Crop Exposure ($ 1,000)	Social Vulnerability Index	Total Incidents	Total $ Property Loss ($)	Total Crop Insurance Paid (S)
Grant	12.3	$ 958,177	$ 955	1	29	$ 530,000	-
Greene	31.0	$ 2,456,201	$ 105,774	2	32	$ 8,817,010	$ 935,804
Hempstead	14.3	$ 1,281,291	$ 5,000	2	13	$ 4,554,444	-
Hot Spring	23.3	$ 1,793,857	$ 1,496	2	29	$ 5,030,000	-
Howard	10.6	$ 867,279	$ 1,809	2	15	$ 4,694,444	-
Independence	21.2	$ 2,386,851	$ 21,754	2	34	$ 51,220,000	$ 206,119
Izard	12.5	$ 733,725	$ 1,165	5	38	$ 51,130,000	-
Jackson	12.0	$ 1,162,927	$ 102,272	5	32	$ 36,430,000	$ 538,598
Jefferson	37.9	$ 5,452,407	$ 117,532	3	30	$ 175,000	$ 57,176
Johnson	17.1	$ 1,259,682	$ 3,648	2	33	$ 25,100,000	$ 113,076
Lafayette	8.2	$ 477,045	$ 16,175	4	10	$ 4,544,444	$ 25,133
Lawrence	13.6	$ 1,075,664	$ 83,668	5	30	$ 1,426,010	$ 77,130
Lee	7.2	$ 491,271	$ 126,190	5	21	$ 104,000	$ 281,235
Lincoln	8.7	$ 664,689	$ 57,061	5	21	$ 60,000	$ 2,883
Little River	12.1	$ 861,887	$ 8,744	4	12	$ 4,544,444	$ 59,824
Logan	14.3	$ 1,342,035	$ 5,502	3	37	$ 11,000,000	$ 70,357
Lonoke	35.3	$ 3,442,239	$ 118,946	1	30	$ 3,095,000	$ 49,202
Madison	9.0	$ 750,378	$ 2,787	2	24	$ 16,200,000	-
Marion	15.7	$ 1,007,075	$ 755	5	41	$ 50,100,000	-
Miller	30.8	$ 2,312,723	$ 20,408	2	13	$ 4,644,444	$ 84,680
Mississippi	22.7	$ 3,244,440	$ 194,984	3	33	$ 125,010	$ 676,659
Monroe	7.3	$ 640,576	$ 90,551	5	28	$ 120,000	$ 471,774
Montgomery	7.4	$ 549,377	$ 1,127	4	34	$ 3,000,000	-
Nevada	7.4	$ 500,017	$ 1,266	3	11	$ 4,544,444	-
Newton	5.7	$ 553,806	$ 927	4	47	$ 840,000	-
Ouachita	17.9	$ 1,640,912	$ 1,514	3	20	$ 50,000	-
Perry	8.9	$ 596,184	$ 6,276	2	31	$ 12,000,000	-
Phillips	14.6	$ 1,364,039	$ 184,599	5	15	$ 107,000	$ 1,676,439
Pike	9.3	$ 628,313	$ 750	3	25	$ 1,000,000	-
Poinsett	14.4	$ 1,612,527	$ 153,325	4	28	$ 868,000	$ 840,508
Polk	11.7	$ 1,129,619	$ 1,687	3	37	$ 6,000,000	-
Pope	31.4	$ 3,667,579	$ 6,105	1	35	$ 27,000,000	$ 5,320
Prairie	6.9	$ 629,613	$ 95,794	4	27	$ 1,020,000	$ 10,454
Pulaski	231.1	$ 32,156,611	$ 18,618	1	31	$ 48,125,000	$ 29,386
Randolph	13.1	$ 1,035,165	$ 43,265	3	29	$ 2,029,010	-
Saline	17.2	$ 1,551,990	$ 89,406	5	23	$ 108,000	$ 869,922
Scott	61.9	$ 5,296,383	$ 2,822	1	33	$ 10,025,000	-
Searcy	5.8	$ 552,388	$ 1,430	4	37	$ 10,500,000	-
Sebastian	7.4	$ 486,443	$ 719	5	43	$ 50,745,000	-

County	Housing Density (units/sq.mi.)	Total Building Exposure ($ 1,000)	Crop Exposure ($ 1,000)	Social Vulnerability Index	Total Incidents	Total $ Property Loss ($)	Total Crop Insurance Paid (S)
Sevier	102.7	$ 8,983,942	$ 1,834	1	16	-	$ 10,296
Sharp	12.2	$ 785,579	$ 883	2	12	$ 169,569,444	-
St. Francis	16.2	$ 1,125,138	$ 805	4	41	$ 50,690,000	-
Stone	11.1	$ 647,786	$ 1,012	5	34	$ 51,360,000	-
Union	18.9	$ 3,146,335	$ 921	2	12	$ 150,000	-
Van Buren	14.6	$ 1,059,575	$ 1,276	5	35	$ 26,380,000	-
Washington	93.2	$ 10,449,177	$ 7,904	1	22	$ 46,000,000	-
White	31.4	$ 4,191,226	$ 34,241	1	31	$ 18,470,000	$ 69,312
Woodruff	6.6	$ 515,107	$ 89,377	5	30	$ 11,000,000	$ 471,592
Yell	10.5	$ 1,142,082	$ 5,557	3	33	$ 13,000,000	$ 8,672

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

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

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

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

Table 3.4.8.b Ranges for Severe Winter Weather Vulnerability Factor Ratings

Factors Considered	Low (1)	Medium-Low (2)	Medium (3)	Medium- High (4)	High (5)
Common Factors					
Housing Density (# per sq. mile)	4.60-13.20	13.21-23.30	23.31-61.90	61.91-109.90	109.91-231.10
Building Exposure ($)	309,312-1,200,000	1,200,001-2,600,000	2,600,001-6,500,000	6,500,001-11,150,000	11,150,000-32,156,611
Crop Exposure ($ in millions)	0 - 8,500	8,501-20,000	20,001-55,000	55,001-125,000	125,000-194984
Social Vulnerability	1	2	3	4	5
Severe Winter Weather					
Likelihood of Occurrence (# of events/yrs. of data)	0.83 - 1.33	1.40 - 2.08	2.09-2.67	2.68 - 3.25	3.26 - 4.25
Average Annual Property Loss Ratio (annual property loss/exposure)	0 - 3.36	0.36 - 1.15	1.15 - 4.15	4.15 - 8.7	8.7 – 18.0
Crop Loss Ratio (annual crop claims/exposure)	0-0.22	0.22 - 0.68	0.68 - 2.05	2.05 - 7.08	7.08 - 27.15

Figure 3.4.8.e provides the likelihood of occurrence for severe winter weather events in Arkansas counties based on the historical events reported in the NCDC database for the period from 2000 to 2012. As seen, Baxter, Boone, Marion, Newton, Searcy, and Sharp are all rated high in the likelihood of occurrence and all are located in northern portion of the State.

Once the ranges were determined and applied to all factors considered in the analysis for severe winter weather they were weighted equally and factored together to determine an overall vulnerability rating.

Table 3.4.8.c provides the calculated vulnerability rating for each factor considered in the vulnerability analysis for the severe winter weather hazard. **Figure 3.4.8.f** that follows provides the mapped results of this analysis by county. As seen, Baxter, Boone, Marion, and Searcy are again all rated high in the vulnerability rating. In addition, counties in the northeast corner of the State are rated high in the vulnerability rating, this is due to high exposure ratings with high likelihood ratings.

Figure 3.4.8.e Likelihood of Occurrence of Severe Winter Weather

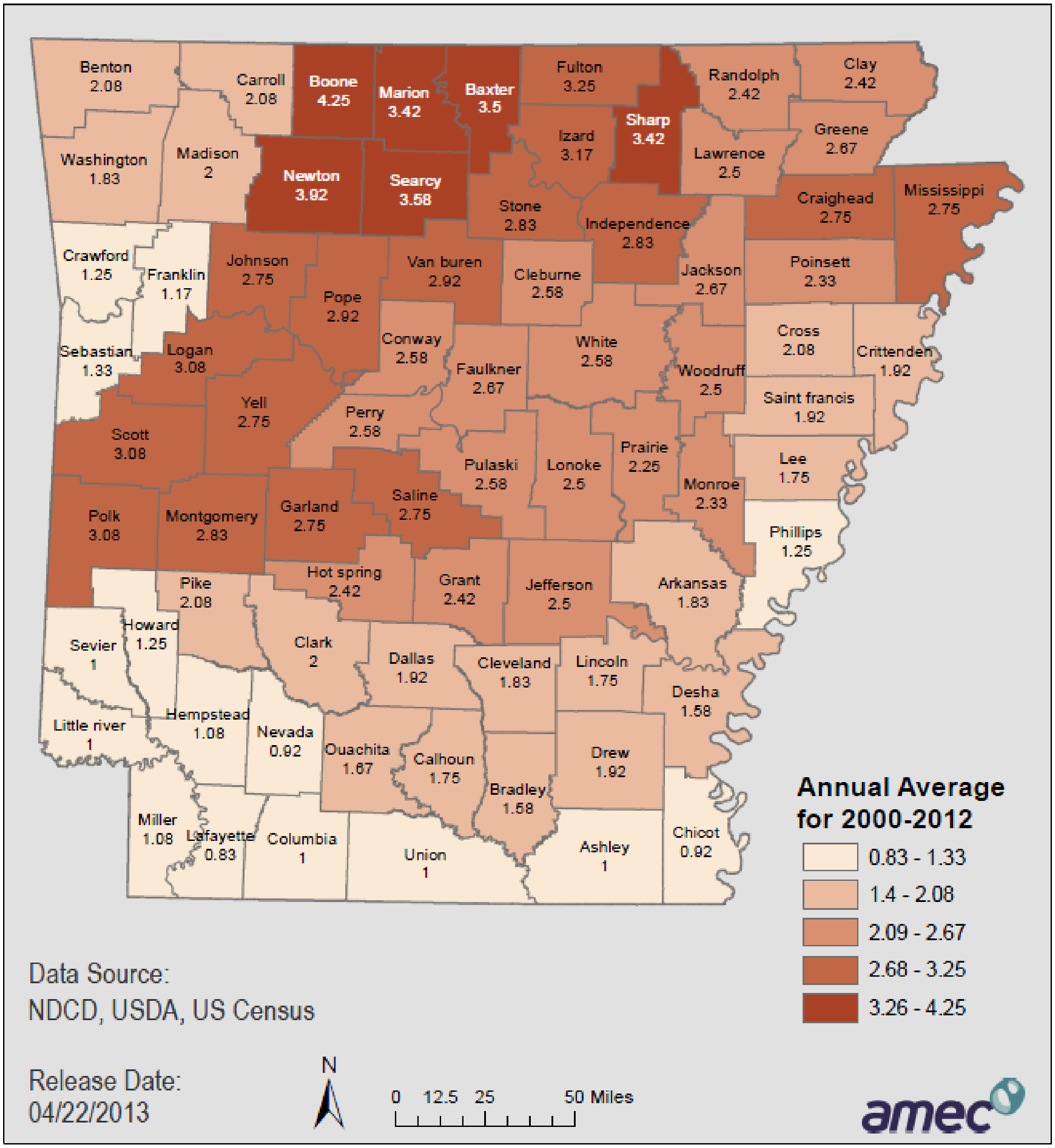
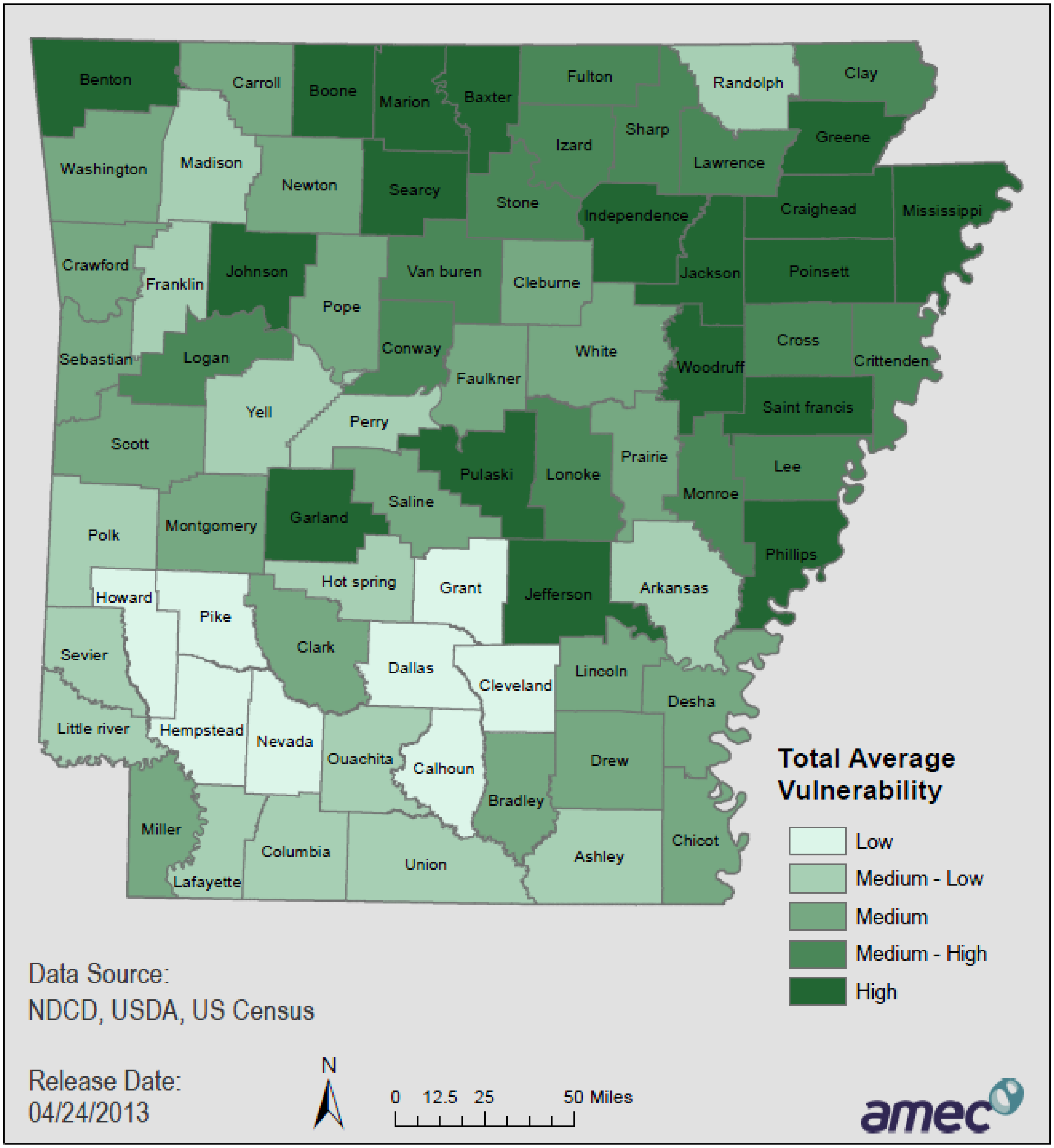


Table 3.4.8.c Additional Statistical Data Compiled for Vulnerability Analysis

County	Housing Density Rating	Likelihood Rating	Exposure Rating	Property Loss Ratio Rating	Crop Exposure Rating	Crop Loss Ratio Rating	Social Vulnerability Index	Vulnerability Rating	Annualized Property and Crop Loss ($)
Arkansas	1	2	2	1	5	1	1	Medium-Low	$ 18,179
Ashley	1	1	2	1	4	2	2	Medium-Low	$ 136,098
Baxter	3	5	3	3	1	1	5	High	$ 4,184,167
Benton	4	2	5	1	1	4	1	High	$ 2,542,491
Boone	3	5	2	3	1	4	2	High	$ 4,185,568
Bradley	1	2	1	1	1	5	3	Medium	$ 99,888
Calhoun	1	2	1	1	1	1	1	Low	$ 4,167
Carroll	2	2	2	2	1	1	4	Medium	$ 1,458,333
Chicot	1	1	1	1	4	1	5	Medium	$ 99,288
Clark	1	2	2	1	1	3	4	Medium	$ 87,463
Clay	1	3	1	1	5	1	4	Medium-High	$ 311,202
Cleburne	3	3	2	2	1	1	3	Medium	$ 2,243,333
Cleveland	1	2	1	1	1	1	2	Low	$ 9,583
Columbia	2	1	2	1	2	1	3	Medium-Low	$ 378,704
Conway	2	3	2	2	2	3	2	Medium-High	$ 1,010,980
Craighead	3	4	3	1	5	2	1	High	$ 378,683
Crawford	3	1	3	1	2	3	1	Medium	$ 57,559
Crittenden	3	2	3	1	4	2	1	Medium-High	$ 76,322
Cross	1	2	1	1	4	3	4	Medium-High	$ 180,507
Dallas	1	2	1	1	1	1	3	Low	$ 8,333
Desha	1	2	1	1	5	1	3	Medium	$ 28,865
Drew	1	2	2	1	3	2	3	Medium	$ 14,474
Faulkner	4	3	3	1	1	1	1	Medium	$ 1,416,667
Franklin	1	1	1	1	1	4	4	Medium-Low	$ 12,841
Fulton	1	4	1	4	1	1	4	Medium-High	$ 4,194,667
Garland	4	4	4	1	1	1	4	High	$ 1,002,500
Grant	1	3	1	1	1	1	1	Low	$ 44,167
Greene	3	3	2	1	4	3	2	High	$ 828,331
Hempstead	2	1	2	1	1	1	2	Low	$ 379,537
Hot Spring	2	3	2	1	1	1	2	Medium-Low	$ 419,167
Howard	1	1	1	2	1	1	2	Low	$ 391,204
Independence	2	4	2	3	3	3	2	High	$ 4,288,945
Izard	1	4	1	4	1	1	5	Medium-High	$ 4,260,833
Jackson	1	3	1	3	4	2	5	High	$ 3,089,693
Jefferson	3	3	3	1	4	1	3	High	$ 20,301
Johnson	2	4	2	3	1	4	2	High	$ 2,102,974
Lafayette	1	1	1	2	2	1	4	Medium-Low	$ 381,217

County	Housing Density Rating	Likelihood Rating	Exposure Rating	Property Loss Ratio Rating	Crop Exposure Rating	Crop Loss Ratio Rating	Social Vulnerability Index	Vulnerability Rating	Annualized Property and Crop Loss ($)
Lawrence	2	3	1	1	4	1	5	Medium-High	$ 126,547
Lee	1	2	1	1	5	1	5	Medium-High	$ 36,790
Lincoln	1	2	1	1	4	1	5	Medium	$ 5,288
Little River	1	1	1	2	2	2	4	Medium-Low	$ 384,686
Logan	2	4	2	2	1	3	3	Medium-High	$ 923,702
Lonoke	3	3	3	1	4	1	1	Medium-High	$ 262,837
Madison	1	2	1	3	1	1	2	Medium-Low	$ 1,350,000
Marion	2	5	1	3	1	1	5	High	$ 4,175,000
Miller	3	1	2	1	3	2	2	Medium	$ 395,505
Mississippi	2	4	3	1	5	2	3	High	$ 78,083
Monroe	1	3	1	1	4	2	5	Medium-High	$ 57,177
Montgomery	1	4	1	2	1	1	4	Medium	$ 250,000
Nevada	1	1	1	2	1	1	3	Low	$ 378,704
Newton	1	5	1	1	1	1	4	Medium	$ 70,000
Ouachita	2	2	2	1	1	1	3	Medium-Low	$ 4,167
Perry	1	3	1	3	1	1	2	Medium-Low	$ 1,000,000
Phillips	2	1	2	1	5	3	5	High	$ 176,561
Pike	1	2	1	1	1	1	3	Low	$ 83,333
Poinsett	2	3	2	1	5	2	4	High	$ 156,384
Polk	1	4	1	2	1	1	3	Medium-Low	$ 500,000
Pope	3	4	3	2	1	1	1	Medium	$ 2,250,532
Prairie	1	3	1	1	4	1	4	Medium	$ 86,045
Pulaski	5	3	5	1	2	1	1	High	$ 4,013,355
Randolph	1	3	1	1	3	1	3	Medium-Low	$ 169,084
Saline	2	2	2	1	4	3	5	High	$ 95,992
Scott	3	4	3	1	1	1	1	Medium	$ 835,417
Searcy	1	4	1	3	1	1	4	Medium	$ 875,000
Sebastian	1	5	1	4	1	1	5	High	$ 4,228,750
Sevier	4	1	4	1	1	2	1	Medium	$ 1,030
Sharp	1	1	1	5	1	1	2	Medium-Low	$ 14,130,787
St. Francis	2	5	1	3	1	1	4	Medium-High	$ 4,224,167
Stone	1	4	1	4	1	1	5	Medium-High	$ 4,280,000
Union	2	1	3	1	1	1	2	Medium-Low	$ 12,500
Van Buren	2	4	1	3	1	1	5	Medium-High	$ 2,198,333
Washington	4	2	4	1	1	1	1	Medium	$ 3,833,333
White	3	3	3	1	3	1	1	Medium	$ 1,546,098
Woodruff	1	3	1	3	4	2	5	High	$ 963,826
Yell	1	4	1	2	1	1	3	Medium-Low	$ 1,084,201

Figure 3.4.8.f Vulnerabitiy to Severe Winter Weather

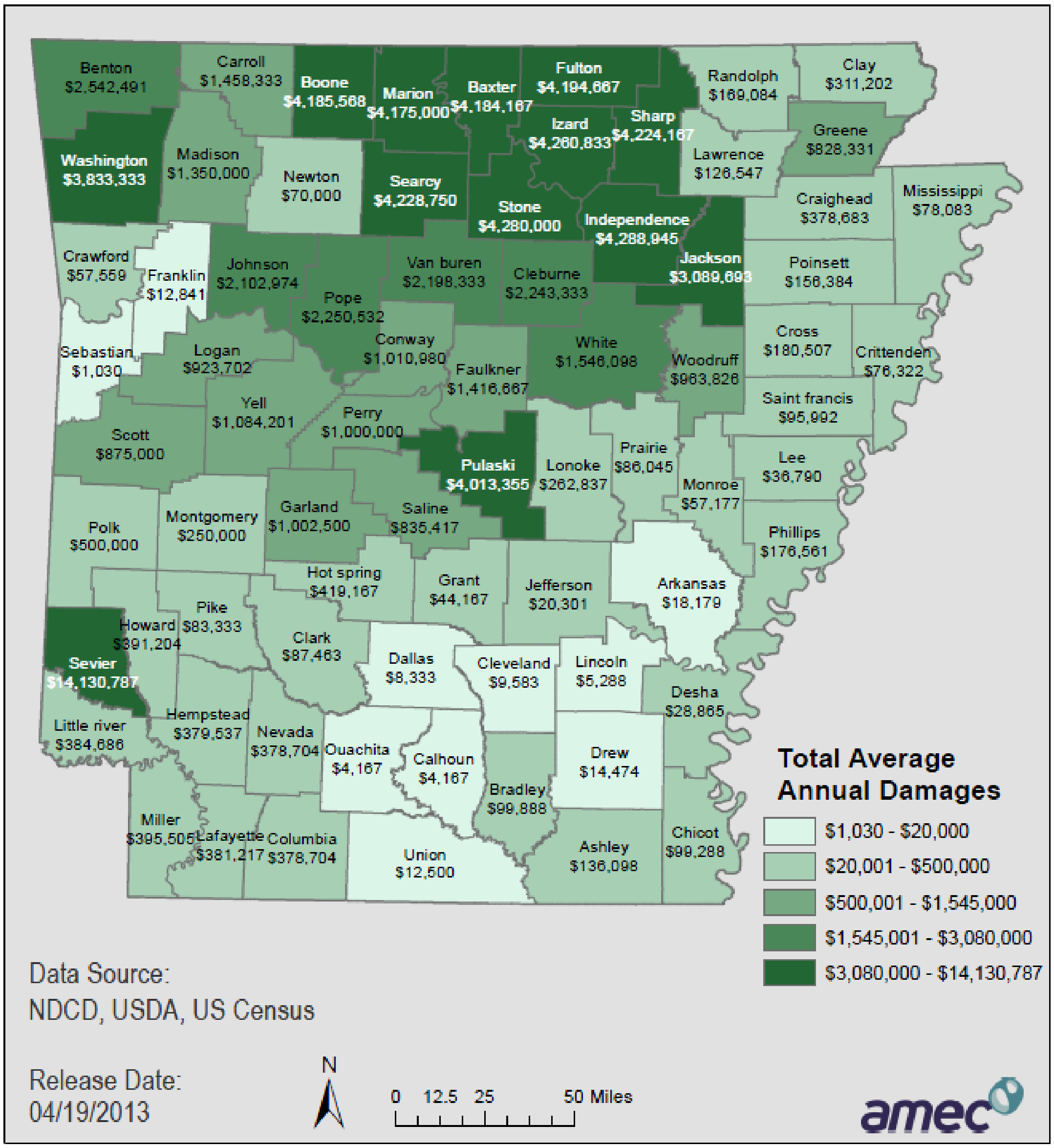


❖ *State Estimates of Potential Losses*

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

Figure 3.4.8.g shows the annualized severe winter weather damages across Arkansas. As seen, counties located in northern portion of the State have the highest annualized damages.

Figure 3.4.8.g Annualized Severe Winter Weather Damages



❖ *Development in Hazard Prone Areas*

According to the overall vulnerability summary for winter storms, the following counties have high vulnerability ratings: Baxter, Benton, Boone, Craighead, Garland, Greene, Independence, Jackson, Jefferson, Johnson, Marion, Mississippi, Phillips, Poinsett, Pulaski, Saint Francis, Searcy, and Woodruff. Of these, Benton, Craighead, and Pulaski Counties are also in the top 10 counties for population and housing gains from 2000 to 2010. **Table 3.4.8.d** compares the annualized loss from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these three counties.

Table 3.4.8.d Comparison of Annualized Loss Estimates[1]

County	Annualized Loss 2010 Plan[1]	Annualized Loss 2013 Plan	Comparison
Benton	$2,955,217	$2,542,491	Annualized loss estimates have slightly decreased since previous plan estimates.
Craighead	$2,394,800	$378,683	Comparison reveals data computations were not performed in similar manner, comparison is not applicable.
Pulaski	N/A	$4,013,355	Comparison is not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

❖ *Consequence Analysis*

People are adversely affected by winter storms, ice storms, and extreme cold, some more than others. Observations by the National Oceanic and Atmospheric Administration (NOAA) indicate that of winter deaths related to exposure to cold, 50 percent were over 60 years old, over 75 percent were male, and about 20 percent occurred in the home. Of winter deaths related to ice and snow, about 70 percent occur in automobiles, and 25 percent are people caught in storms. As noted earlier, ice storms can result in significant economic costs to homeowners, business owners, and utility companies.

Snowstorms, ice storms, and extreme cold can also interact to cause many hazards. Only a few degrees may be the difference between rain, ice, or snow. Duration and intensity of any of these events will determine the overall impact of a particular event. Wind speed may be the difference between a minor snow and a blizzard. These events cannot be prevented. Preparedness for these events may be the greatest single factor to reduce loss of life, injury, and property damage. NOAA weather broadcasts via radio and television provide important information for people to prepare and thus reduce risks to their lives and property.

The information in **Table 3.4.8.e** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.8.e. EMAP Consequence Analysis: Severe Winter Weather

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for affected areas and moderate to light for other less affected areas.
Health and Safety of Persons Responding to the Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained, equipped, and protected personnel.
Continuity of Operations	Unlikely to necessitate execution of the Continuity of Operations Plan.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the areas of the incident. Power lines and roads most adversely affected.
Delivery of Services	Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
The Environment	Environmental damage to trees, bushes, etc.
Economic and Financial Condition	Local economy and finances may be adversely affected, depending on damage.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.9 Tornado

❖ *Description/Location*

A tornado is a rapidly rotating vortex or funnel of air extending from a cumulonimbus cloud to the ground. It is usually spawned by a thunderstorm and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Often, vortices remain suspended in the atmosphere as funnel clouds. When the lower tip of a vortex touches the ground, it becomes a tornado and a force of destruction.

Tornadoes can cause several kinds of damage to buildings. Tornadoes have been known to lift and move objects weighing more than 300 tons a distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. However, the less spectacular damage is much more common.

Houses and other obstructions in the path of the wind cause the wind to change direction. This change in wind direction increases pressure on parts of the building. The combination of increased pressures and fluctuating wind speeds creates stress on the building that frequently causes connections between building components (e.g., roof, siding, windows, etc.) to fail. Tornadoes also generate a tremendous amount of flying debris or "missiles," which often become airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls.

Tornadoes are classified according to the EF- Scale (the original F – Scale was developed by Dr. Theodore Fujita, a renowned severe storm researcher). The Enhanced F- Scale (see **Table 3.4.9.a**) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F scale was implemented in the U.S. on February 1, 2007.

Table 3.4.9.a Enhanced Fujita Scale for Tornado Damage

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

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

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.4.9.b**. The damage descriptions are summaries. For the actual EF scale it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator. Information on the Enhanced Fujita Scale's damage indicators and degrees are available at www.spc.noaa.gov/efscale/ef-scale.html.

Table 3.4.9.b Enhanced Fujita Scale with Potential Damage

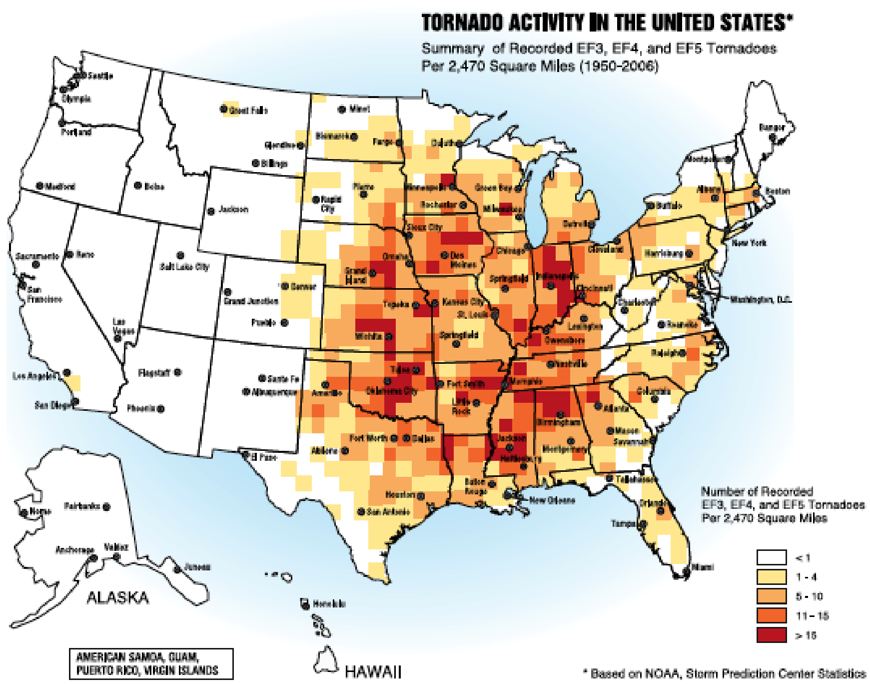
Enhanced Fujita Scale			
Scale	Wind Speed (mph)	Relative Frequency	Potential Damage
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in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

Source: NOAA Storm Prediction Center

The best lead time for a tornado is about 30 minutes. Tornadoes have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground due to low light in evening hours, blowing dust or driving rain and hail. Therefore, there is very little, or no, warning of when a specific tornado may be on the ground.

Figure 3.4.9.a illustrates the number of F3, F4, and F5 tornadoes recorded in the United States per 3,700 square miles between 1950 and 2006. **0** illustrates the wind zones in the United States. By noting the Arkansas data from these two maps and matching them up in **Table 3.4.9.c**, it appears that all of Arkansas is highly susceptible to tornadoes.

3.4.9.a Tornado Activity in the United States



Source: FEMA 320, Taking Shelter from the Storm, 3rd edition

3.4.9.b Wind Zones in the United States

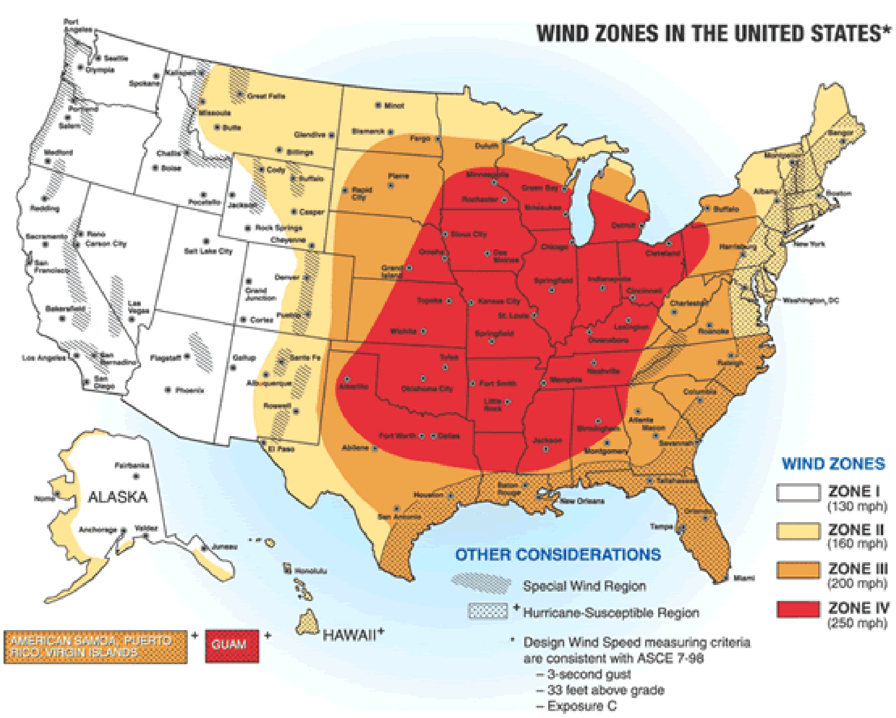


Table 3.4.9.c. Number of Events Compared with Wind Zones (gray shading indicates number of events and zones in Arkansas)

Number of Tornadoes Per 3,700 square miles (See 0)	Wind Zone (See 0)			
	I	II	III	IV
<1	Low Risk	Low Risk	Low Risk	Moderate Risk
1-5	Low Risk	Moderate Risk	High Risk	High Risk
6-10	Low Risk	Moderate Risk	High Risk	High Risk
11-15	High Risk	High Risk	High Risk	High Risk
>15	High Risk	High Risk	High Risk	High Risk

Source: Taking Shelter from the Storm, FEMA, 2004

The path width of a single tornado is generally less than 0.6 mile, although some damage path widths are in excess of one mile. The path length of a single tornado can range from a few hundred yards to over 200 miles. The average tornado in North America moves from southwest to northeast, but tornadoes have been known to move in any direction. The average forward speed of a tornado is 30 mph, but may vary from nearly stationary to greater than 70 mph. The lifespan of a tornado is rarely longer than 30 minutes.

❖ *Previous Occurrences*

Tornadoes have caused substantial property damage, injury, loss of life and economic disruption in Arkansas. According to The Tornado History Project as of March 2013, Arkansas ranks 7th in the nation for the number of deaths per 10,000 square miles, 3rd in the number of killer tornadoes and 3rd in killer tornadoes as a percent of all tornadoes.

The State of Arkansas has had 18 presidential declarations that involved tornadoes since 1970 (see **Table 3.4.9.d** for the details).

According to the National Climatic Data Center Storm Events database, there were 1,978 tornadoes in Arkansas from the 30 year period from 1983 through 2012. Tornadoes reported in the database are in segments. One tornado can have multiple segments. Also, the database counts a new segment when county boundaries are crossed. So, the number of past occurrences is really a reflection of the number of past tornado segments. Total property damage for these events is estimated at $1.6 billion. There were 374 deaths and 5,085 injuries in this time period. This suggests that Arkansas experiences 66 tornadoes, $55 million in tornado property losses, 12 deaths and 170 injuries each year.

Table 3.4.9.d. Arkansas Presidential Declarations Involving Tornadoes

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
4/1/1975	FEMA-463-DR	Severe Storms and Tornadoes	1	Bradley.	N/A
4/1/1976	FEMA-498-DR	Tornadoes	4	Cleburne, Lonoke, Pulaski and Yell.	N/A
4/11/1979	FEMA-574-DR	Tornado	8	Ashley, Bradley, Calhoun, Howard, Jackson, Nevada, Ouachita and Polk.	N/A
4/16/1980	FEMA-617-DR	Severe Storms and Tornadoes	5	Crittenden, Faulkner, Johnson, Lonoke and Pulaski.	N/A
12/13/1982	FEMA-673-DR	Severe Storms, Tornadoes and Flooding	31	Baxter, Clay, Cleburne, Conway, Craighead, Crawford, Desha, Faulkner, Fulton, Garland, Hempstead, Hot Spring, Independence, Izard, Jackson, Lawrence, Little River, Miller, Monroe, Montgomery, Perry, Pike, Pope, Pulaski, Randolph, Saline, Sharp, Stone, Van Buren, Woodruff and Yell.	N/A
12/17/1987	FEMA-806-DR	Tornadoes	1	Crittenden.	N/A
12/23/1988	FEMA-817-DR	Severe Storms and Tornadoes	24	Chicot, Clark, Columbia, Craighead, Faulkner, Garland, Greene, Hot Spring, Independence, Izard, Johnson, Logan, Lonoke, Nevada, Ouachita, Phillips, Poinsett, Prairie, Pulaski, Saline, Stone, Van Buren, White and Woodruff.	N/A
4/23/1996	FEMA-1111-DR	Severe Storms and Tornadoes	6	Crawford, Franklin, Madison, Marion, Sebastian, and Washington.	N/A
3/2/1997	FEMA-1162-DR	Severe Storms and Tornadoes	18	Baxter, Clark, Clay, Cross, Greene, Hempstead, Hot Spring, Jackson, Lee, Lincoln, Lonoke, Mississippi, Nevada, Newton, Poinsett, Pulaski, Saline and White.	N/A
1/23/1999	FEMA-1266-DR	Severe Storms, Tornadoes, High Winds and Flooding	16	Bradley, Chicot, Clay, Columbia, Drew, Faulkner, Grant, Hempstead, Jackson, Jefferson, Lafayette, Lonoke, Poinsett, Randolph, Saint Francis, and White.	PA-$7,265,330 IA-$0

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
6/6/2003	FEMA-1472-DR	Severe Storms, Tornadoes and Flooding	21	Benton, Chicot, Cleburne, Columbia, Conway, Craighead, Crittenden, Cross, Faulkner, Fulton, Independence, Jackson, Lonoke, Madison, Nevada, Newton, Phillips, Saint Francis, Van Buren, White, and Woodruff.	PA-$5,3305,934 IA-$7,297,676
2/7/2008	FEMA-1744-DR	Severe Storms, Tornadoes, and Flooding	10	Baxter, Conway, Izard, Marion, Newton, Pope, Randolph, Sharp, Stone, and Van Buren.	PA-$5,020,006 IA-$4,360,723
3/26/2008	FEMA-1751-DR	Severe Storms, Flooding, and Tornadoes	50	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, Saint Francis, Saline, Scott, Searcy, Sebastian, Sharp, Stone, Van Buren, Washington, White, Woodruff and Yell.	PA-$41,116,383 IA-11,675,465
5/20/2008	FEMA-1758-DR	Severe Storms, Flooding, and Tornadoes	12	Arkansas, Benton, Cleburne, Conway, Crittenden, Grant, Lonoke, Mississippi, Phillips, Pulaski, Saline and Van Buren.	PA-$2,752,278 IA-$2474,245
6/16/2009	FEMA-1845-DR	Severe Storms, Tornadoes, and Flooding	38	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, Saint Francis, Saline, Searcy, Stone and Union.	PA-$9,594,421
12/3/2009	FEMA-1861-DR	Severe Storms, Tornadoes, and Flooding	38	Boone, Bradley, Calhoun, Carroll, Cleburne, Cleveland, Columbia, Conway, Cross, Dallas, Drew, 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.	PA-$15,550,793

Date Declared	Federal Declaration #	Incident Type	# of Counties	Counties	Stafford Act Assistance Amounts
5/2/2011	FEMA-1975-DR	Severe Storms, Tornadoes and Associated Flooding	59	Arkansas, Baxter, Benton, Boone, Bradley, Calhoun, Carroll, Chicot, Clark, Clay, Cleburne, Cleveland, Conway, Craighead, Crawford, Crittenden, Dallas, Desha, Faulkner, Franklin, Fulton, Garland, Greene, Hot Spring, Howard, Independence, Izard, Jefferson Jackson, Johnson, Lawrence, Lee, Lincoln, Lonoke, Madison, Marion, Mississippi, Monroe, Montgomery, Nevada, Newton, Perry, Phillips, Pike, Poinsett, Polk, Prairie, Pulaski, Randolph, Saint Francis, Saline, Searcy, Sharp, Stone, Van Buren, Washington, White, Woodruff and Yell.	PA-$47,127,416 IA-$24,301,705
7/8/2011	FEMA-4000-DR	Severe Storms, Tornadoes, and Flooding	3	Crawford, Franklin and Johnson.	PA-$2,648,119 IA- $1,754,571

Source: Arkansas All Hazard Mitigation Plan 2010, FEMA Disaster Declarations, http://www.fema.gov/disasters/
Note: N/A is not available information; IA = Individual Assistance, PA = Public Assistance.

Table 3.4.9.e shows the top 10 counties with the number of tornadoes and **Table 3.4.9.f** shows the number of Arkansas Tornadoes by county from 1983 to 2012.

Table 3.4.9.e. Arkansas Tornadoes by County: Top 10, 1983-2012

County	Prior Tornado Events 1983-2012	County	Prior Tornado Events 1983-2012
Pulaski	84	Saline	48
Lonoke	76	Mississippi	44
White	73	Benton	42
Faulkner	54	Arkansas	41
Jackson	48	Independence	39

Source: National Climatic Center Data

Table 3.4.9.f. Top Arkansas Tornado Fatalities by County, 1983-2012

County	Fatalities
White	59
Craighead	37
Woodruff	32
Lonoke	18
Pulaski	16
Sebastian	16
Faulkner	15
Saline	12
Howard	10
Conway	8
Independence	8
Poinsett	8
Van Buren	8

Source: National Climatic Center Data

Figure 3.4.9.c shows the top counties by the number of fatalities and **Figure 3.4.9.d** shows the number of Arkansas Tornadoes fatalities by county from 1983 to 2012.

Figure 3.4.9.c. Arkansas Tornadoes by County, 1983–2012

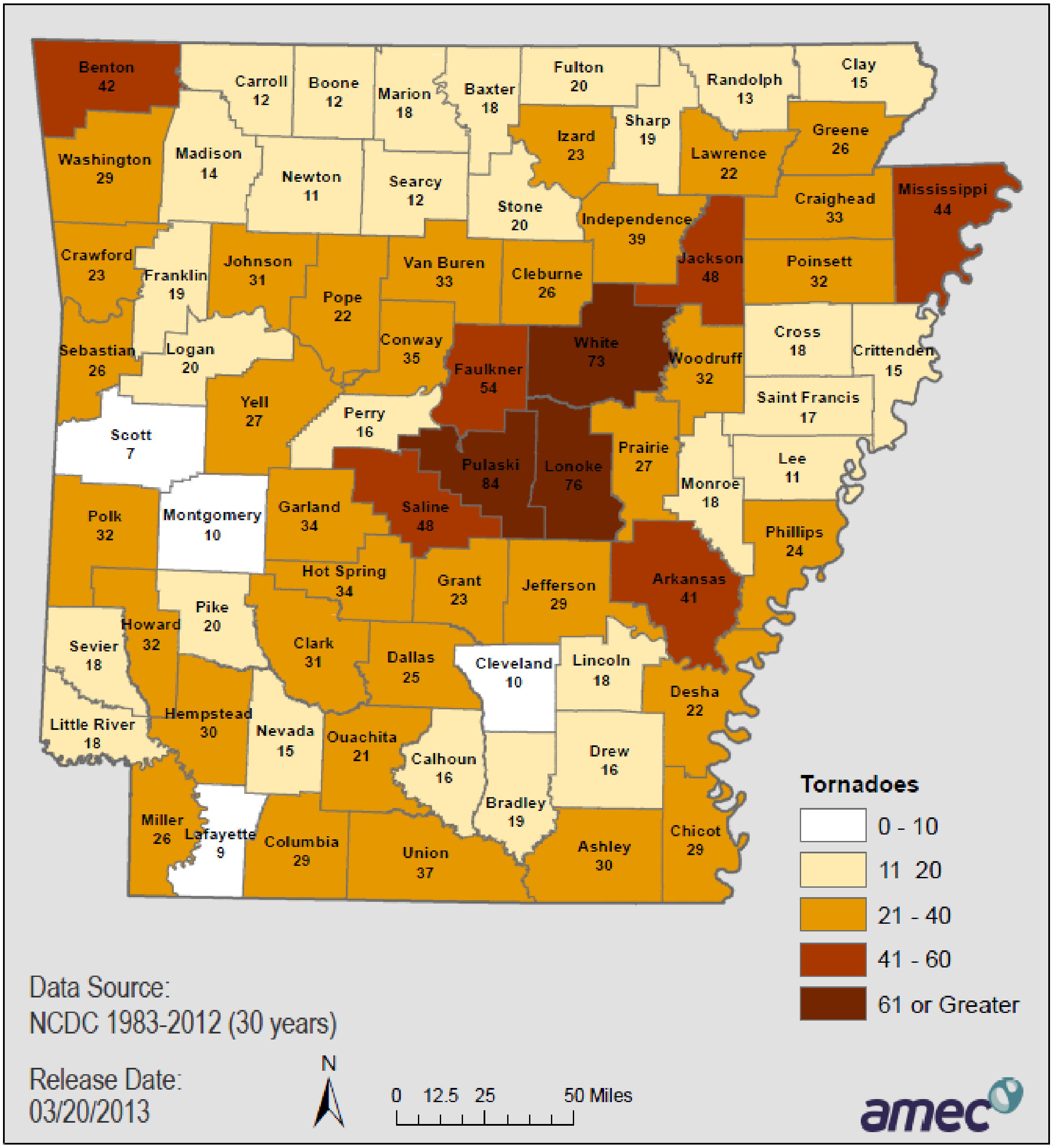
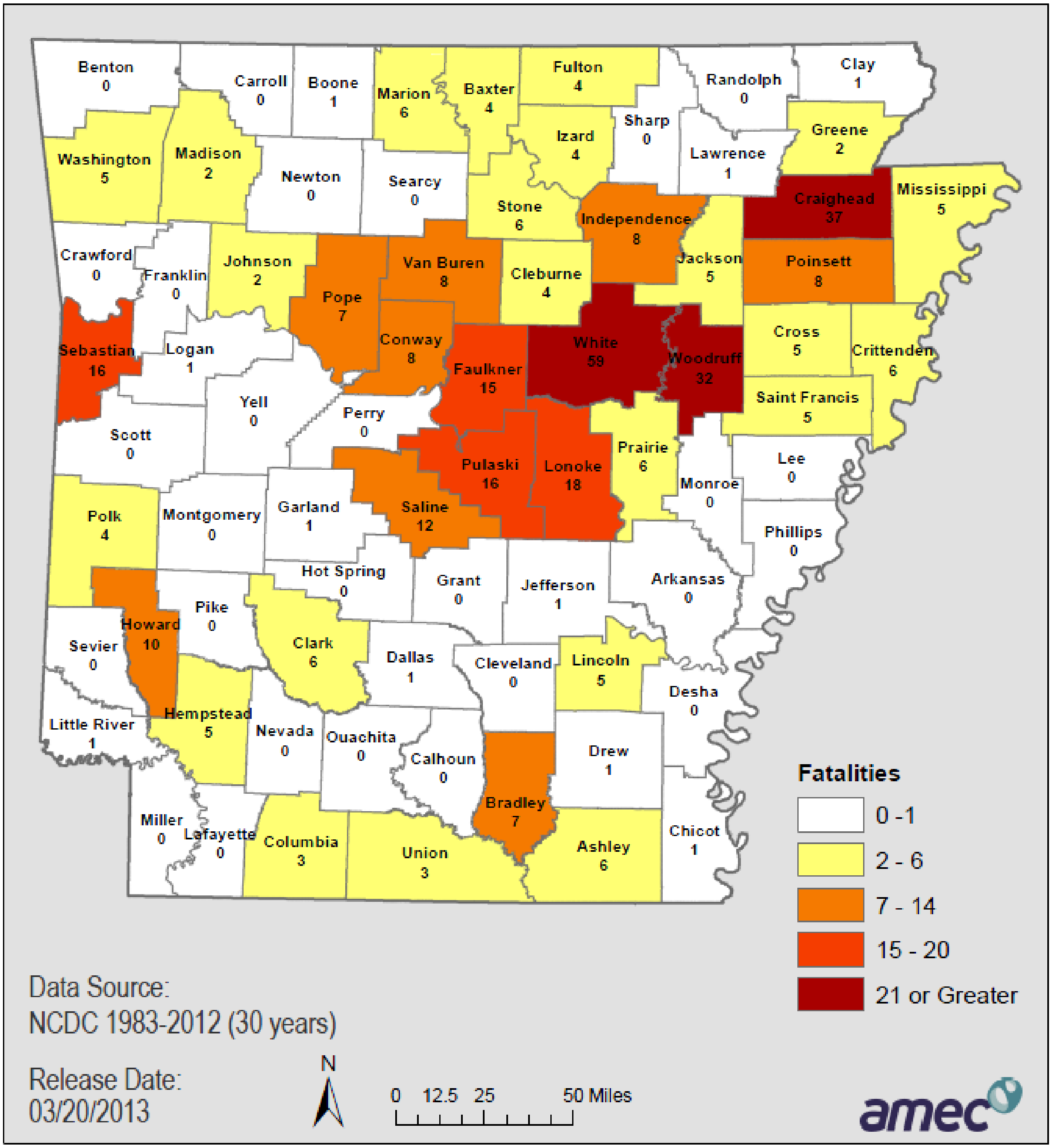


Figure 3.4.9.d. Arkansas Tornado Fatalities by County, 1983-2012



- **April 21, 1996 Fort Smith Tornado:** On the night of April 21, 1996, downtown Fort Smith was devastated by a strong tornado. The tornado touched down in Moffett, Oklahoma and quickly strengthened as it crossed the Arkansas River into Fort Smith (Sebastian County) at an intensity of F2. The tornado moved northeastward through Fort Smith devastating the downtown area and an industrial section of town before entering Crawford and Van Buren Counties. Here, its intensity increased locally to F3 while killing four people and injuring 89. The destruction in Sebastian County included 35 homes destroyed, 120 severely damaged, and 1,133 with minor damage. In the commercial district, 88 businesses were damaged or destroyed. Damage totals in Crawford County included 463 homes destroyed, 50 had major damage, 142 had minor damage, 246 apartments were damaged, and 10 businesses were damaged or destroyed. Damage totals from this tornado are estimated in excess of $300 million.

Figure 3.4.9.e. Tornado Damage of Homes from April 21, 1996

Source: Arkansas All Hazard Mitigation Plan 2010

- Four other tornadoes occurred in Arkansas that night killing two additional people, and large hail caused approximately $9 million in damages in Fayetteville. An F2 tornado is generally not thought of as a particularly damaging tornado. The Fort Smith tornado, however, is an example of a moderate tornado being at the "wrong place," thus causing massive damage. Although the tornado occurred at the wrong place, it struck at the "right time" (near 11:00 PM). Casualties were substantially lower than they would have likely been had the tornado struck in the afternoon.
- **March 1, 1997 Arkadelphia Tornado:** A severe weather situation with tornadoes and very heavy rainfall erupted along a nearly stationary front from Texas to West Virginia. At mid-afternoon, an outbreak of 24 strong to violent tornadoes in Arkansas and adjacent states resulted in 29 deaths, including 25 in Arkansas. Of the 17 tornadoes that affected Arkansas, five of these were F4 intensity. The most deadly F4 tornado began in southwest Clarke County with major damage and loss of six lives in Arkadelphia. Damage path width in this area ranged from 1/4 to over 1/2 mile. This tornado continued along Interstate 30 through Hot Spring County and much of Saline County, and reached F4 intensity as it moved to the Shannon Hills area and finally into Pulaski County. Total path length of this tornado was 80 miles. Sixteen people were killed by this tornado. The National Weather Service, using NEXRAD radar, issued tornado warnings from 10 to 32

minutes before the tornadoes struck, greatly reducing the loss of lives. Damage estimates in the 25 counties that became eligible for federal assistance included 275 homes and 129 mobile homes which were destroyed, and 582 homes and 30 mobile homes which were damaged.

Figure 3.4.9.f. March 1, 1997 Tornado Damage in South Little Rock

Source: Arkansas All Hazard Mitigation Plan 2010

- **January 21, 1999 Little Rock Tornado:** A record 56 tornadoes occurred statewide in Arkansas. One tornado in this system directly affected the capitol city of Little Rock. This F3 tornado moved from eastern Saline County into southwest Pulaski County at approximately 6:33 PM. Trees were downed as the tornado entered Pulaski County, with some roof damage to a business along Interstate 30 about five miles southwest of Little Rock. The tornado continued northeast into eastern sections of the downtown Little Rock area crossing near the intersection of Interstates 30 and 630. In this area, many homes and businesses (at least 235 structures) were heavily damaged or destroyed. It was estimated that about 750 structures sustained at least some damage. This included homes in a historic district built at the turn of the century. Trees were also downed throughout the area. One tree fell onto a car, taking the life of a woman inside. The Governor's Mansion was not spared, with numerous trees down and one tree damaging a fence around the property. A grocery store was also destroyed at the corner of 17th and Main. One man lost his life at this location. Further northeast, the tornado weakened as it crossed Interstate 40 just east of Highway 67/167. However, the tornado blew a tree down onto a mobile home about two miles southeast of Sherwood. A man lost his life as a result. The tornado finally dissipated in Sherwood, after showing a damage path 15 miles long and 700 yards wide. Disaster costs for this tornado outbreak totaled $4.7 million.

- **February 24, 2007 Dumas, Arkansas:** A tornado shredded several businesses and homes in a small Arkansas town, injuring about a dozen people, some of them seriously, however there were no reports of fatalities. The storm slammed into one of the town's main thoroughfares, destroying most of the businesses along U.S. 65, including a Fred's department store. The National Weather Service reported that parts of cars were hanging in trees in the storm zone. Wind speeds were estimated between 90 and 100 mph. Damage from a possible tornado was also reported in Tichnor, in southern Arkansas County, just northwest of Dumas.
- The severe storm system affected three other counties besides Desha, including Bradley, Drew and Union. More than two dozen people were injured in the storms and about 150 homes were damaged or destroyed. The State declared this event an official disaster and approved 56 people for temporary housing. The estimated damages are set at over $720,000.
- **October 29, 2009 East Camden:** The tornado began in a wooded area of the Highland Industrial Park and then tore through the Arkansas Fire Training Academy. At the academy, the Apparatus Building was heavily damaged; walls were blown out of the Smoke Building. A large part of the roof was torn off the Administration and Classroom Building, and vehicles belonging to the students were tossed around and overturned. There were no injuries. Trees, power lines, and power poles were blown down. The tornado then continued into the Ouachita County portion of the Highland Industrial Park. NCDC lists a total of 21 tornadoes (segments) for this day. Total damages from the East Camden listing alone estimated at $1.8 million.
- **March 10, 2010 outbreaks in Hempstead, Saline, White, and Cleburne Counties:** Tornadoes were on the ground starting at 4:17 pm and the last was recorded at 9:30pm. The most damaging event was an EF2 tornado near the city of Pearson in Cleburne County with one fatality and three injuries. Cumulative damages from these reports are listed at over $3 million (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm).
- **April 30, 2010 Conway and Van Buren Counties:** An EF3 tornado had a 20 mile length path that passed through Scotland. One fatality and 15 people injured. There were multiple tornadoes throughout Arkansas this day. No other fatalities reported (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm) .
- **December 31, 2010 Adair, Washington, and Benton Counties:** An EF3 had a 21 mile length path that caused four fatalities and 10 injuries (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm).
- **April 15, 2011 outbreaks in Saline, Pulaski, and Lonoke Counties:** These tornadoes started in the early morning hours about 1:13am until 2:17am. As EF1 tornado west of the city of Little Rock caused two fatalities when a large tree fell into a house killing a

woman and her son (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm).

Figure 3.4.9.g. EF1 Tornado Uprooted A Tree Onto A House On April 15, 2011.

Source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=slides2011.htm

- **April 25, 2011 outbreak in Hempstead, Little River, Sevier, Polk, Montgomery, Garland, Saline, Pike, Clark, Hot Spring, Perry, Pulaski, Faulkner, and White counties:** An EF3 tracked through the city of Vilonia, Faulkner County where four people were killed and 16 injuries. Multiple other injuries were reported throughout the counties mentioned (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm).

Figure 3.4.9.h. A Church Took a Direct Hit from an EF3 Tornado at Fountain Lake, Garland County in April 25, 2011.

Tornado

Source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=slides2011.htm

- **May 24, 2011outbreak in Franklin, Logan, Franklin, and Johnson Counties:** At 11:53pm, an EF4 tornado with a path of 45 miles long killed four people and injured 27 people. All the fatalities occurred in mobile homes (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm).
- **Year of 2012:** Only 18 tornadoes statewide occurred with no fatalities and three injuries. The last time Arkansas had fewer tornadoes than in 2012 was in 2007, when only 16 tornadoes occurred (source: National Weather Service, Little Rock, AR, http://www.srh.noaa.gov/lzk/?n=2012.htm).
- **Deadliest Tornadoes in Arkansas History:** Tornadoes that caused 50 or more fatalities in Arkansas include the Fort Smith tornado of January 12, 1898 (55), the Brinkley tornado of March 8, 1909 (58+), the Hopewell-Warren tornado of January 3, 1949 (55 in AR), and a tornado that traveled from Dierks to Bald Knob on March 21, 1952 (57+), with 50 fatalities in Judsonia alone. **Table 3.4.9.g** lists and provides information on the ten deadliest tornadoes in Arkansas. The deadliest year for tornadoes in Arkansas was 1952, when 112 deaths occurred. All of these deaths occurred during the March 21, 1952 outbreak when 17 tornadoes moved from southwestern, across central, and into northeastern Arkansas.

Table 3.4.9.g. The Ten Most Deadly Tornadoes in Arkansas

Date	Counties	Deaths	Injuries	Comments
March 8, 1909	Grant, Jefferson, Pulaski, Lonoke, Prairie, Monroe	58+	633	Sheridan to 10 miles NE of Brinkley; 85-mile path length and up to 880 yards width; 49 deaths and 15 injuries at Brinkley.
March 21, 1952	Howard, Saline, Faulkner, White, Jackson, Craighead	57+	346	Dierks to Judsonia to Bald Knob damaged; 250-mile length, 900 yards width; part of 9th most deadly tornado event in U.S.; 28 tornadoes in four states killed 204 (112 in AR) and caused $15 million in damage.
Jan. 3, 1949	Columbia, Union, Ouachita, Calhoun, Bradley, Lincoln, Drew	55 in AR	402 in AR	Originated in Louisiana; in Arkansas 145 miles in length, up to 500 yard wide damage path; damaged Hopewell and Warren.
Jan. 12, 1898	Sebastian	55	44	Fort Smith damaged; several miles long, 200 yard width damage path.
April 10, 1944	Columbia, Cross	42	304	Areas near Magnolia and Parkin damaged; 200-mile length, up to 200 yards wide.
March 21, 1952	Lonoke, Prairie, Woodruff, Cross, Poinsett	40	274	Same tornado event as 3/21/52 tornado above; New England, Hazen, Cotton Plant, Hilleman, and Marked Tree damaged; 105 miles long, 880 yards wide.

Date	Counties	Deaths	Injuries	Comments
April 15, 1921	Miller, Hempstead, Pike	35 in AR	238 in AR	Originated in Texas; from Mineola, TX to Mt. Pisgah Settlement, AR damaged; 26 deaths in TX; 70 miles long in AR, 667 yard wide damage path.
June 1, 1947	Jefferson	35	300	Pine Bluff damaged; 19 miles long, up to 1.5 mile wide damage path.
May 15, 1968	Craighead	34	350	Jonesboro damaged; eight mile path length, up to 200 yard wide damage path.
April 10,1929	Independence, Jackson, Lawrence, Greene	31	62	From Almond to Lorado damaged; 65 miles long, 1200 yards wide; immense tornado destroyed Swifton where 23 died.

Insured Crop Loss Data

According to the USDA Risk Management Agency, insured crop losses to the State of Arkansas as a result of tornado damage for the ten year period of 2003-2012 totaled $91,630 as shown in **0**. It shows three years with crop losses resulting from tornadoes during this ten-year period. In Arkansas, 79 percent of the row crops were insured in 2011 according to the *2011 Arkansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency.

This information is also reported and annualized by county in **Table 3.4.9.h.** in the **Error! Reference source not found.** section.

Table 3.4.9.h Crop Insurance Paid for Tornado Damages by Year, 2003-2012

Year	Crop Insurance Paid
2012	$26,905
2010	$58,705
2010	0
2008	$6,020
2007	0
2006	0
2005	0
2004	0
2003	0
Total	**$91,630**

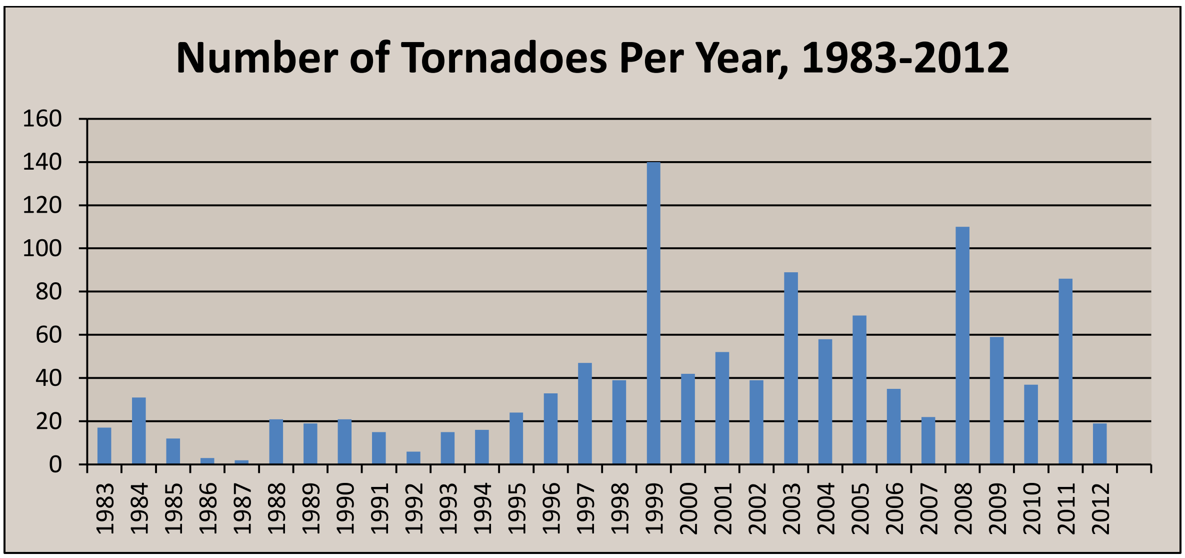
Source: USDA Risk Management Agency

❖ *Probability of Future Hazard Events*

According to the National Climatic Data Center Storm Events database, there were 1,978 tornadoes in Arkansas during the 30 year period from 1983 through 2012. Total property damage for these events is estimated at $1.6 billion. There were 374 deaths and 5,085 injuries in this time period. This suggests that Arkansas experiences 66 tornadoes, $55 million in tornado property losses, 12 deaths and 170 injuries each year. Therefore, the probability that Arkansas will experience a tornado event is "**Highly Likely**".

Figure 3.4.9.i shows the number of tornadoes in Arkansas each year from 1983 through 2012. The largest number of tornadoes in a single year in Arkansas was 140 in 1999. The smallest number of reported tornadoes in a single year was two in 1987.

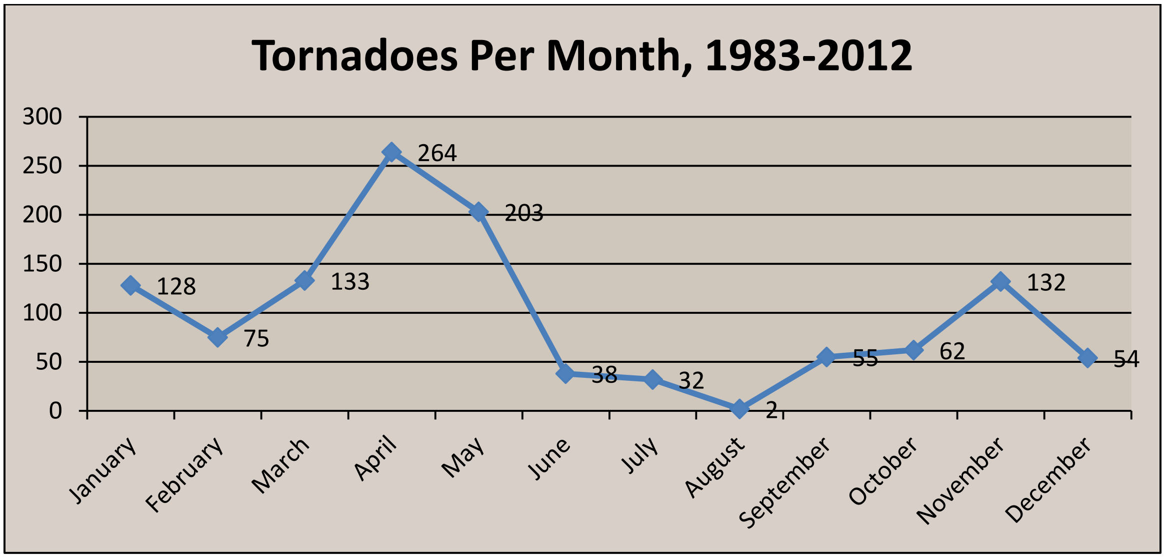
Figure 3.4.9.i Arkansas Tornadoes by Year , 1983-2012



Source: National Climatic Data Center

Tornadoes in Arkansas occur most often between March and May, which has come to be known as "tornado season" in Arkansas and other areas. The chart below in **Figure 3.4.9.j** is a breakdown of tornadoes in Arkansas by month from the 30 year period from 1983 through 2012. Historically, the month of April experiences the most tornados and May is a close second. Over 50 percent of all tornadoes occurred during the March through May timeframe. This is somewhat earlier than the May-June peak tornado occurrence nationally. A secondary tornado maximum occurs in November, December, and January with the least common month being in August.

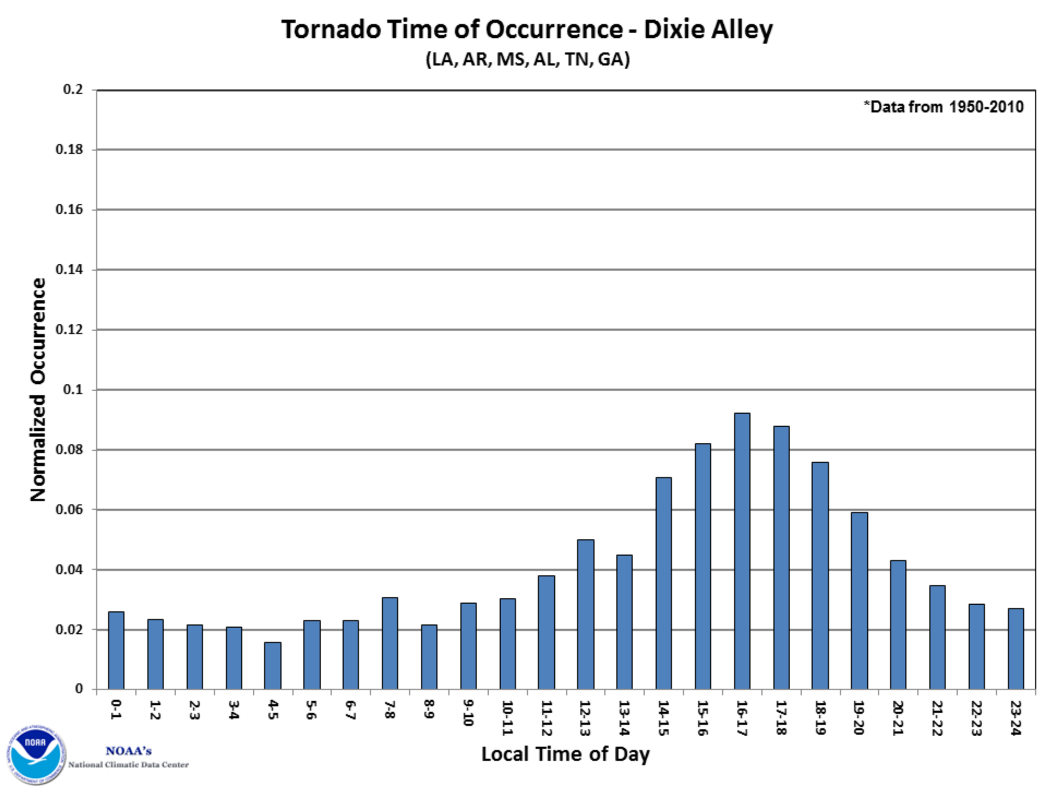
Figure 3.4.9.j Arkansas Tornado Occurrence by Month, 1983-2012



Source: National Climatic Data Center

Figure 3.4.9.k shows the number of tornadoes by time of occurrence in the Dixie Alley which consists of Louisiana, Arkansas, Mississippi, Alabama, Tennessee and Georgia. The most occur between 6pm and 7pm local time.

Figure 3.4.9.k Tornado Time of Occurrence, Dixie Alley, 1950-2010



Source: NOAA, National Climatic Data Center, http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html

❖ *State Vulnerability Analysis*

All 75 counties in Arkansas are vulnerable and highly susceptible to tornados. Over the 30 year period from 1983 to 2012, all counties have experienced tornadoes. Scott County had the fewest recorded tornadoes with seven and Pulaski County had the most recorded tornadoes with 84. Tornadoes are the most common along an elongated zone extending from Clark County northeastward to Mississippi County (see **Figure 3.4.9.c** for Arkansas map of tornadoes per county).

National Weather Service data suggests that there may be an area through Arkadelphia (Clark County), Malvern (Hot Spring County), Little Rock (Pulaski County), Cabot (Lonoke County), White County, Oil Trough (Independence County), and Jonesboro (Craighead County) (approximately along I-30 and U.S. 67) that is slightly more at risk to tornadoes than other parts of Arkansas, especially in a major outbreak. The mountainous terrains of the Ouachita Mountains, Arkansas Valley, and Ozark Highlands, to the northwest, force warm moist air from the low lying Gulf Coastal Plain and Mississippi Alluvial Plain upwards, and then, guide the storms northeastward along their base. A secondary parallel alley may extend from north of Morrilton (Conway County) through Wooster (Faulkner County), Greenbrier (Faulkner County), Guy Faulkner County), Quitman (Cleburne County), to Heber Springs (Cleburne County).

To refine and access the relative vulnerability of each of Aransas' counties to tornadoes, the State assigned ratings to pertinent factors that were examined at the county level. These factors are: population density, total building exposure valuation, prior events, property damage, annualized property damage, crop exposure, crop insurance paid, total estimated crop damages and annualized crop insurance paid. Then a rating value of 1-5 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the most vulnerable counties.

Tornados that touch-down can create a unique path of destruction unlike a wide-spread winter storm event that can affect entire regions of the State. So using the prior events as a factor can give the perception that a county has a higher overall vulnerability to tornadoes, but in fact the entire State is vulnerable.

The following are the data sources for the rating factors: National Climatic Data Center (NCDC) storm events (1983 – 2012), U.S. Census Bureau (2010), USDA's Census of Agriculture (2007) and USDA Risk Management Agency (2003 – 2012). **Table 3.4.9.i** below provides the data for each factor that is considered for tornado vulnerability by county.

Table 3.4.9.i Tornado Vulnerability: Data for Factors Considered by County

County	Population Density	Total Building Exposure	Prior Events 1983-2012	Property Damages	Annualized Property Damages	Crop Exposure	Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages
Arkansas	19.2	$2,477,077,000	41	$82,550,000	$2,751,667	$179,522,000	$0	$0	$0
Ashley	23.6	$2,473,909,000	30	$5,976,300	$199,210	$55,231,000	$0	$0	$0
Baxter	74.9	$4,197,064,000	18	$40,775,000	$1,359,167	$741,000	$0	$0	$0
Benton	261.2	$18,124,650,000	42	$15,660,400	$522,013	$6,942,000	$0	$0	$0
Boone	62.5	$3,661,130,000	12	$2,500,000	$83,333	$2,081,000	$0	$0	$0
Bradley	17.7	$1,219,055,000	19	$27,200	$907	$3,526,000	$0	$0	$0
Calhoun	8.5	$487,400,000	16	$2,085,200	$69,507	(D)	$0	$0	$0
Carroll	43.6	$2,695,269,000	12	$100,000	$3,333	$2,273,000	$0	$0	$0
Chicot	18.3	$1,182,084,000	29	$3,089,350	$102,978	$84,944,000	$0	$0	$0
Clark	26.6	$2,454,246,000	31	$126,967,500	$4,232,250	$2,258,000	$0	$0	$0
Clay	25.2	$1,913,761,000	15	$9,222,000	$307,400	$139,431,000	$26,905	$34,057	$3,406
Cleburne	46.9	$3,158,527,000	26	$63,025,000	$2,100,833	$1,618,000	$0	$0	$0
Cleveland	14.5	$745,014,000	10	$1,000,100	$33,337	$363,000	$0	$0	$0
Columbia	32.1	$2,487,799,000	29	$5,800,550	$193,352	$9,772,000	$0	$0	$0
Conway	38.5	$2,109,979,000	35	$26,400,300	$880,010	$10,926,000	$0	$0	$0
Craighead	136.4	$9,363,774,000	33	$26,197,850	$873,262	$153,368,000	$0	$0	$0
Crawford	104.4	$5,094,553,000	23	$5,700,150	$190,005	$10,801,000	$0	$0	$0
Crittenden	83.5	$5,071,309,000	15	$33,176,000	$1,105,867	$99,333,000	$0	$0	$0

County	Population Density	Total Building Exposure	Prior Events 1983-2012	Property Damages	Annualized Property Damages	Crop Exposure	Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages
Cross	29	$1,735,924,000	18	$6,956,200	$231,873	$110,773,000	$0	$0	$0
Dallas	12.2	$931,131,000	25	$4,605,230	$153,508	(D)	$0	$0	$0
Desha	16.9	$1,473,786,000	22	$45,055,000	$1,501,833	$137,184,000	$0	$0	$0
Drew	22.3	$2,043,409,000	16	$50,100	$1,670	$35,925,000	$0	$0	$0
Faulkner	174.8	$9,493,160,000	54	$57,515,200	$1,917,173	$5,830,000	$0	$0	$0
Franklin	29.8	$1,615,236,000	19	$2,695,825	$89,861	$3,238,000	$0	$0	$0
Fulton	19.8	$1,080,353,000	20	$502,500	$16,750	$649,000	$0	$0	$0
Garland	141.7	$10,737,081,000	34	$32,615,300	$1,087,177	$2,379,000	$0	$0	$0
Grant	28.3	$1,536,069,000	23	$5,120,150	$170,672	$955,000	$0	$0	$0
Greene	72.9	$4,021,652,000	26	$26,099,000	$869,967	$105,774,000	$0	$0	$0
Hempstead	31.1	$2,106,061,000	30	$23,985,000	$799,500	$5,000,000	$0	$0	$0
Hot Spring	53.5	$2,884,905,000	34	$7,222,600	$240,753	$1,496,000	$0	$0	$0
Howard	23.4	$1,467,341,000	32	$4,706,000	$156,867	$1,809,000	$0	$0	$0
Independence	48	$4,037,294,000	39	$56,230,500	$1,874,350	$21,754,000	$0	$0	$0
Izard	23.6	$1,179,051,000	23	$17,800,180	$593,339	$1,165,000	$0	$0	$0
Jackson	28.4	$1,919,576,000	48	$66,261,250	$2,208,708	$102,272,000	$58,705	$74,310	$7,431
Jefferson	88.9	$8,851,582,000	29	$5,740,175	$191,339	$117,532,000	$0	$0	$0
Johnson	38.7	$2,059,439,000	31	$5,350,000	$178,333	$3,648,000	$0	$0	$0
Lafayette	14.5	$751,599,000	9	$1,250,000	$41,667	$16,175,000	$0	$0	$0
Lawrence	29.6	$1,745,322,000	22	$942,200	$31,407	$83,668,000	$0	$0	$0
Lee	17.3	$783,925,000	11	$311,000	$10,367	$126,190,000	$0	$0	$0

County	Population Density	Total Building Exposure	Prior Events 1983-2012	Property Damages	Annualized Property Damages	Crop Exposure	Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages
Lincoln	25.2	$1,059,440,000	18	$31,300	$1,043	$57,061,000	$0	$0	$0
Little River	24.7	$1,395,954,000	18	$46,000	$1,533	$8,744,000	$0	$0	$0
Logan	31.6	$2,163,500,000	20	$325,000	$10,833	$5,502,000	$0	$0	$0
Lonoke	88.7	$5,471,879,000	76	$82,501,250	$2,750,042	$118,946,000	$0	$0	$0
Madison	18.8	$1,174,747,000	14	$1,095,350	$36,512	$2,787,000	$0	$0	$0
Marion	27.9	$1,627,364,000	18	$28,040,000	$934,667	$755,000	$0	$0	$0
Miller	69.5	$3,739,010,000	26	$1,100,325	$36,678	$20,408,000	$0	$0	$0
Mississippi	51.6	$5,367,159,000	44	$26,676,100	$889,203	$194,984,000	$0	$0	$0
Monroe	13.4	$1,045,076,000	18	$5,593,000	$186,433	$90,551,000	$0	$0	$0
Montgomery	12.2	$867,509,000	10	$75,100	$2,503	$1,127,000	$0	$0	$0
Nevada	14.6	$786,848,000	15	$2,405,000	$80,167	$1,266,000	$0	$0	$0
Newton	10.1	$908,572,000	11	$590,000	$19,667	$927,000	$0	$0	$0
Ouachita	35.6	$2,650,489,000	21	$677,350	$22,578	$1,514,000	$0	$0	$0
Perry	18.9	$933,980,000	16	$4,990,000	$166,333	$6,276,000	$0	$0	$0
Phillips	31.3	$2,246,385,000	24	$1,957,000	$65,233	$184,599,000	$6,020	$7,620	$760
Pike	18.8	$1,007,404,000	20	$352,900	$11,763	$750,000	$0	$0	$0
Poinsett	32.4	$2,694,317,000	32	$51,499,600	$1,716,653	$153,325,000	$0	$0	$0
Polk	24.1	$1,882,852,000	32	$50,685,930	$1,689,531	$1,687,000	$0	$0	$0
Pope	76	$5,994,915,000	22	$20,060,000	$668,667	$6,105,000	$0	$0	$0
Prairie	13.4	$994,571,000	27	$37,756,000	$1,258,533	$95,794,000	$0	$0	$0
Pulaski	503.8	$53,619,942,000	84	$207,580,600	$6,919,353	$18,618,000	$0	$0	$0

County	Population Density	Total Building Exposure	Prior Events 1983-2012	Property Damages	Annualized Property Damages	Crop Exposure	Crop Insurance Paid	Total Estimated Crop Damages (extrapolated based on 79 percent insured)	Annualized Estimated Crop Damages
Randolph	27.6	$1,658,944,000	13	$3,543,200	$118,107	$43,265,000	$0	$0	$0
Saint Francis	44.5	$2,564,014,000	17	$876,100	$29,203	$89,406,000	$0	$0	$0
Saline	148	$8,400,586,000	48	$115,646,500	$3,854,883	$2,822,000	$0	$0	$0
Scott	12.6	$879,767,000	7	$100	$3	$1,430,000	$0	$0	$0
Searcy	12.3	$800,033,000	12	$505,000	$16,833	$719,000	$0	$0	$0
Sebastian	236.4	$15,087,734,000	26	$5,309,750	$176,992	$1,834,000	$0	$0	$0
Sevier	30.2	$1,277,956,000	18	$3,752,000	$125,067	$883,000	$0	$0	$0
Sharp	28.6	$1,804,097,000	19	$27,293,500	$909,783	$805,000	$0	$0	$0
Stone	20.4	$1,045,888,000	20	$34,403,000	$1,146,767	$1,012,000	$0	$0	$0
Union	40.1	$5,376,738,000	37	$28,333,050	$944,435	$921,000	$0	$0	$0
Van Buren	24.4	$1,677,601,000	33	$67,730,200	$2,257,673	$1,276,000	$0	$0	$0
Washington	215.6	$17,212,461,000	29	$4,248,225	$141,608	$7,904,000	$0	$0	$0
White	74.5	$6,825,604,000	73	$8,410,200	$280,340	$34,241,000	$0	$0	$0
Woodruff	12.4	$832,068,000	32	$3,663,000	$122,100	$89,377,000	$0	$0	$0
Yell	23.9	$1,828,144,000	27	$2,825,000	$94,167	$5,557,000	$0	$0	$0

Note: Population density is the number of people per square mile and Crop exposure: (D) Withheld to avoid disclosing data for individual operations.

Table 3.4.9.j provides the calculated ranges applied to determine the Low, Medium-Low, Medium, Medium-High and High vulnerability and **Table 3.4.9.k** provides the rating values of 1-5 for each factor considered in determining overall vulnerability to tornadoes. **Figure 3.4.9.l** that follows provides the mapped results of this analysis by county.

Table 3.4.9.j Factors and Ranges Considered in Tornado Vulnerability Analysis

Factors	Low (1)	Medium-Low (2)	Medium (3)	Medium-High (4)	High (5)
Population Density	8.5-100	101-200	201-300	301-400	400 and >
Total Building Exposure	$400,000-$9 billion	$9.1 billion-$14 billion	$14.1 billion-$20 billion	$20.1 billion-$50 billion	$50.1 billion and >
Prior Event	0-10	11-20	21-40	41-60	61 and >
Annualized Property Damages	0-$200,000	$200,001-$500,000	$500,001-$1,500,000	$1,500,001-$3,000,000	$3,000,001 and >
Crop Exposure	0-$40 million	$40.1 million-$80 million	$80.1 million-$120 million	$120.1 million-$160 million	$160.1 million and >
Annualized Crop Insurance Paid	$100-$1,500	$1,501-$3,000	$3,001-$4,500	$4,501-$6,000	$6,001-$7,500
Overall Vulnerability	5-6 Rating	7-9 Rating	10-12 Rating	13-15 Rating	16-21 Rating

Table 3.4.9.k Vulnerability of Arkansas Counties to Tornadoes

County	Population Density Rating	Total Building Exposure Rating	Prior Event Rating	Annualized Property Damages Rating	Crop Exposure Rating	Crop Insurance Rating	Overall Vulnerability Rating	Tornado Vulnerability
Arkansas	1	1	4	4	5	0	15	**Medium-High**
Ashley	1	1	3	1	2	0	8	**Medium-Low**
Baxter	1	1	2	3	1	0	8	**Medium-Low**
Benton	3	3	4	3	1	0	14	**Medium-High**
Boone	1	1	2	1	1	0	6	**Low**
Bradley	1	1	2	1	1	0	6	**Low**
Calhoun	1	1	2	1	1	0	6	**Low**
Carroll	1	1	2	1	1	0	6	**Low**
Chicot	1	1	3	1	3	0	9	**Medium-**

Tornado

County	Population Density Rating	Total Building Exposure Rating	Prior Event Rating	Annualized Property Damages Rating	Crop Exposure Rating	Crop Insurance Rating	Overall Vulnerability Rating	Tornado Vulnerability
								Low
Clark	1	1	3	5	1	0	11	**Medium**
Clay	1	1	2	2	4	3	13	**Medium-High**
Cleburne	1	1	3	4	1	0	10	**Medium**
Cleveland	1	1	1	1	1	0	5	**Low**
Columbia	1	1	3	1	1	0	7	**Medium-Low**
Conway	1	1	3	3	1	0	9	**Medium-Low**
Craighead	2	2	3	3	4	0	14	**Medium-High**
Crawford	2	1	3	1	1	0	8	**Medium-Low**
Crittenden	1	1	2	3	3	0	10	**Medium**
Cross	1	1	2	2	3	0	9	**Medium-Low**
Dallas	1	1	3	1	1	0	7	**Medium-Low**
Desha	1	1	3	4	4	0	13	**Medium-High**
Drew	1	1	2	1	1	0	6	**Low**
Faulkner	2	2	4	4	1	0	13	**Medium-High**
Franklin	1	1	2	1	1	0	6	**Low**
Fulton	1	1	2	1	1	0	6	**Low**
Garland	2	2	3	3	1	0	11	**Medium**
Grant	1	1	3	1	1	0	7	**Medium-Low**
Greene	1	1	3	3	3	0	11	**Medium**
Hempstead	1	1	3	3	1	0	9	**Medium-Low**
Hot Spring	1	1	3	2	1	0	8	**Medium-Low**
Howard	1	1	3	1	1	0	7	**Medium-Low**
Independence	1	1	3	4	1	0	10	**Medium**
Izard	1	1	3	3	1	0	9	**Medium-Low**
Jackson	1	1	4	4	3	5	18	**High**

County	Population Density Rating	Total Building Exposure Rating	Prior Event Rating	Annualized Property Damages Rating	Crop Exposure Rating	Crop Insurance Rating	Overall Vulnerability Rating	Tornado Vulnerability
Jefferson	1	1	3	1	3	0	9	**Medium-Low**
Johnson	1	1	3	1	1	0	7	**Medium-Low**
Lafayette	1	1	1	1	1	0	5	**Low**
Lawrence	1	1	3	1	3	0	9	**Medium-Low**
Lee	1	1	2	1	4	0	9	**Medium-Low**
Lincoln	1	1	2	1	2	0	7	**Medium-Low**
Little River	1	1	2	1	1	0	6	**Low**
Logan	1	1	2	1	1	0	6	**Low**
Lonoke	1	1	5	4	3	0	14	**Medium-High**
Madison	1	1	2	1	1	0	6	**Low**
Marion	1	1	2	3	1	0	8	**Medium-Low**
Miller	1	1	3	1	1	0	7	**Medium-Low**
Mississippi	1	1	4	3	5	0	14	**Medium-High**
Monroe	1	1	2	1	3	0	8	**Medium-Low**
Montgomery	1	1	1	1	1	0	5	**Low**
Nevada	1	1	2	1	1	0	6	**Low**
Newton	1	1	2	1	1	0	6	**Low**
Ouachita	1	1	3	1	1	0	7	**Medium-Low**
Perry	1	1	2	1	1	0	6	**Low**
Phillips	1	1	3	1	5	1	12	**Medium**
Pike	1	1	2	1	1	0	6	**Low**
Poinsett	1	1	3	4	4	0	13	**Medium-High**
Polk	1	1	3	4	1	0	10	**Medium**
Pope	1	1	3	3	1	0	9	**Medium-Low**
Prairie	1	1	3	3	3	0	11	**Medium**
Pulaski	5	5	5	5	1	0	21	**High**
Randolph	1	1	2	1	2	0	7	**Medium-Low**

County	Population Density Rating	Total Building Exposure Rating	Prior Event Rating	Annualized Property Damages Rating	Crop Exposure Rating	Crop Insurance Rating	Overall Vulnerability Rating	Tornado Vulnerability
Saint Francis	1	1	2	1	3	0	8	**Medium-Low**
Saline	2	1	4	5	1	0	13	**Medium-High**
Scott	1	1	1	1	1	0	5	**Low**
Searcy	1	1	2	1	1	0	6	**Low**
Sebastian	3	3	3	1	1	0	11	**Medium**
Sevier	1	1	2	1	1	0	6	**Low**
Sharp	1	1	2	3	1	0	8	**Medium-Low**
Stone	1	1	2	3	1	0	8	**Medium-Low**
Union	1	1	3	3	1	0	9	**Medium-Low**
Van Buren	1	1	3	4	1	0	10	**Medium**
Washington	3	3	3	1	1	0	11	**Medium**
White	1	1	5	2	1	0	10	**Medium**
Woodruff	1	1	3	1	3	0	9	**Medium-Low**
Yell	1	1	3	1	1	0	7	**Medium-Low**

Figure 3.4.9.l Vulnerability Summary for Tornadoes

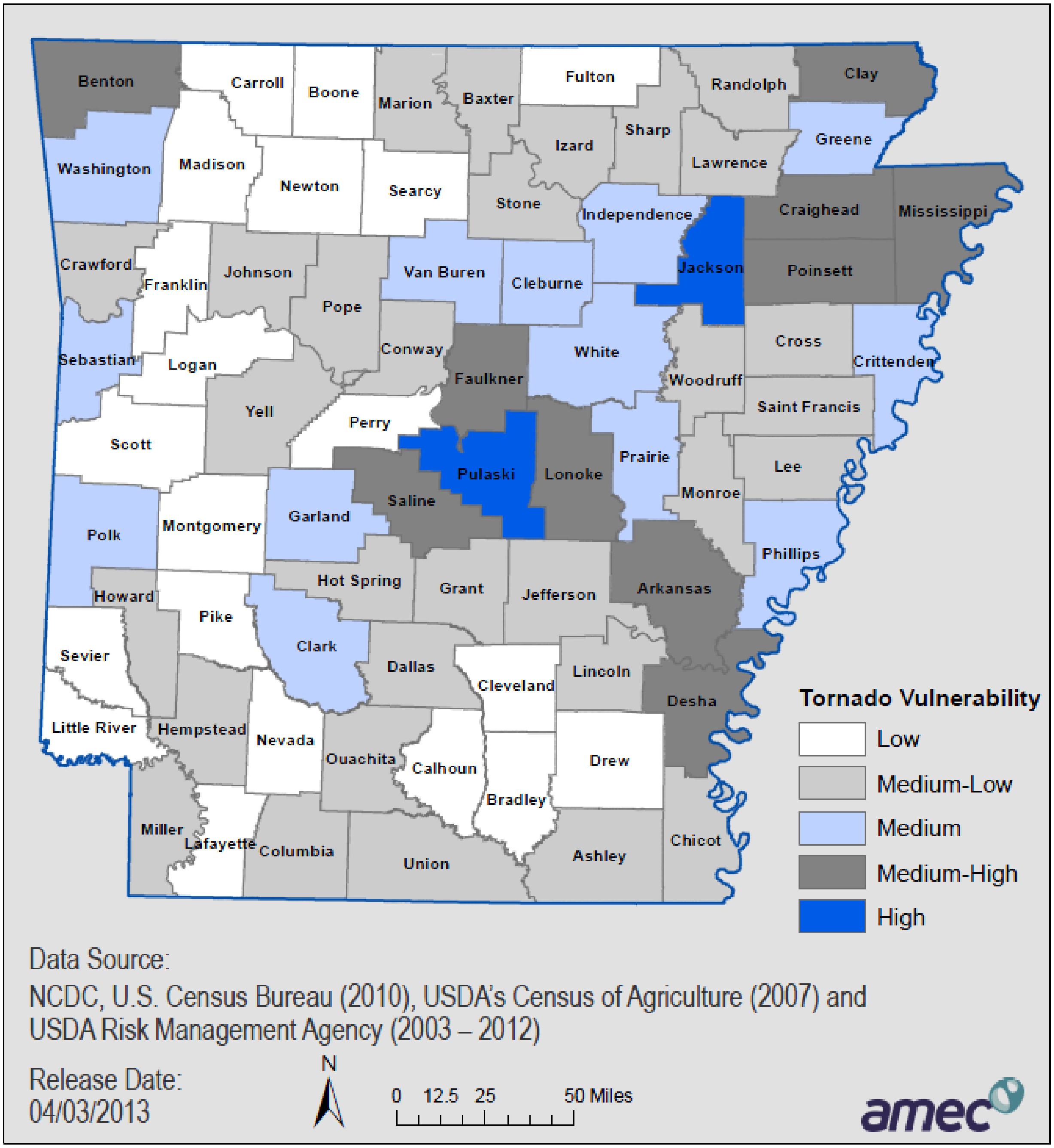


Table 3.4.9.l below lists the top 12 vulnerable counties in Arkansas relative to each other concerning tornadoes based on this analysis. This correlates with the National Weather Service data described previously that an area starting in Clark County moving northeast through Saline, Pulaski, Lonoke and Faulkner Counties, and extending to Jackson, Poinsett, Craighead, Mississippi and Clay Counties is more vulnerable to tornadoes than other parts of Arkansas.

Benton County is the outlier county to this correlation but is considered to have medium-high vulnerability to tornadoes.

Table 3.4.9.l Top 12 Counties: Vulnerable to Tornadoes

County	Overall Vulnerability Rating	Tornado Vulnerability
Pulaski	21	High
Jackson	18	High
Arkansas	15	Medium-High
Benton	14	Medium-High
Craighead	14	Medium-High
Lonoke	14	Medium-High
Mississippi	14	Medium-High
Clay	13	Medium-High
Desha	13	Medium-High
Faulkner	13	Medium-High
Poinsett	13	Medium-High
Saline	13	Medium-High

Mobile Home Vulnerability

Of the more than 560 people killed in the U.S. between 2001 and 2010 by tornadoes, 51 percent were in mobile homes, according to the National Oceanic and Atmospheric Administration.

Mobile homes make up only about 7 percent of the nation's housing. In Arkansas mobile homes represent about 12.6 percent of homes, and that number has tripled since 1980. Mobile homes can be overturned or badly damaged with EF1 wind speeds between 86 to 110 mph and speeds of EF2 or greater will destroy a mobile home.

Table 3.4.9.m provides the number of mobile home units per county according to the U.S. Census Bureau American Community Survey 2005 – 2009.

Table 3.4.9.m Number of Mobile Home Units per County

County	Number of Mobile Homes	County	Number of Mobile Homes
Arkansas	1,671	Lee	897
Ashley	2,116	Lincoln	1,450
Baxter	3,070	Little River	1,166
Benton	5,198	Logan	1,395
Boone	2,065	Lonoke	3,870
Bradley	972	Madison	1,040
Calhoun	955	Marion	1,856
Carroll	1,821	Miller	2,387
Chicot	1,174	Mississippi	2,614
Clark	1,832	Monroe	968
Clay	815	Montgomery	1,578
Cleburne	3,250	Nevada	1,102
Cleveland	932	Newton	720
Columbia	2,364	Ouachita	2,175
Conway	1,782	Perry	1,274
Craighead	3,272	Phillips	1,473
Crawford	2,870	Pike	1,441
Crittenden	2,040	Poinsett	1,785
Cross	1,457	Polk	1,900
Dallas	801	Pope	2,917
Desha	1,051	Prairie	1,020
Drew	2,386	Pulaski	10,307
Faulkner	6,436	Randolph	940
Franklin	1,084	Saint Francis	1,947
Fulton	1,224	Saline	7,391
Garland	6,042	Scott	838
Grant	1,873	Searcy	827
Greene	2,362	Sebastian	2,179
Hempstead	2,042	Sevier	1,227
Hot Spring	3,273	Sharp	1,436
Howard	1,349	Stone	1,877
Independence	2,967	Union	4,576
Izard	1,358	Van Buren	2,201
Jackson	899	Washington	4,877
Jefferson	4,580	White	5,492
Johnson	1,506	Woodruff	512
Lafayette	1,512	Yell	1,704
Lawrence	936	**Statewide Total**	**166,696**

Source: U.S. Census Bureau American Community Survey 2005 – 2009, http://censtats.census.gov/usa/usa.shtml

❖ State Estimates of Potential Losses

To determine potential financial loss estimates to tornadoes in Arkansas, the available historical loss data was annualized to determine future potential losses. As discussed above in the vulnerability overview for tornado, the planning team obtained loss data for the National Climatic Data Center (NCDC) storm events (1983 – 2012). According to this data, the annualized property loss for the State of Aransas from tornadoes is $55 million as can be viewed in (vulnerability overview section).

Table 3.4.9.m provides the annualized property loss damages per county. Pulaski, Clark, and Saline Counties have the highest annualized damage; which are all located in central Arkansas.

❖ Development in Hazard Prone Areas

New development anywhere in Arkansas will be susceptible to tornado impacts. Some of the highest risk tornado counties are also experiencing the greatest increases in population. The following counties were in the top 12 vulnerable to tornadoes and also in the top ten for population gains: Benton, Craighead, Faulkner, Lonoke, Pulaski, and Saline. **Table 3.4.9.n** compares the annualized loss from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these six counties.

Table 3.4.9.n Comparison of Annualized Loss Estimates[1]

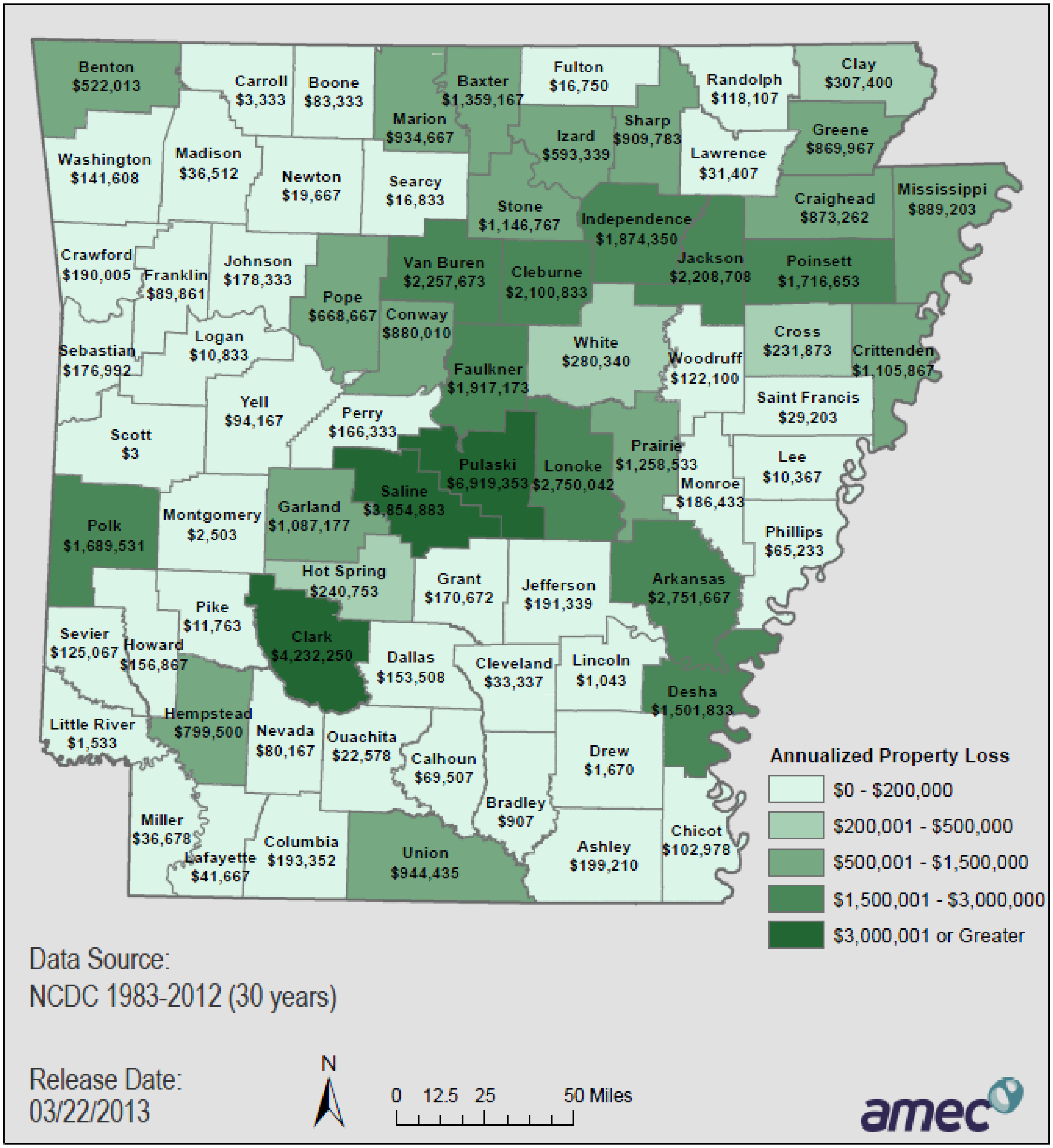
County	Annualized Loss 2010 Plan	Annualized Loss 2013 Plan	Comparison
Benton	$332,638	$522,013	Annualized loss has increased with the increase in population.
Craighead	$707,650	$873,262	Annualized loss has increased with the increase in population.
Faulkner	N/A	$1,917,173	Comparison not available.
Lonoke	N/A	$2,750,042	Comparison not available.
Pulaski	$2,317,600	$6,919,353	Annualized loss has increased with the increase in population.
Saline	N/A	$3,854,883	Comparison not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

New manufactured housing development will be most susceptible to damage, particularly if not anchored properly. The extent of new manufactured housing development is not known but is growing in Arkansas. According to the Arkansas Manufactured Housing Association website http://www.amha.net/, recent trends show that one out of every three new single-family homes (33 percent) is a manufactured home.

Of the more than 560 people killed in the U.S between 2001 and 2010 by tornadoes, 51 percent were in mobile homes, according to the National Oceanic and Atmospheric Administration. People living in mobile homes die because of tornadoes at a rate 20 times higher than people living in permanent homes.

Figure 3.4.9.m Annualized Property Loss from Tornadoes, by County, 1983 – 2012



❖ *Consequence Analysis*

The information in **Table 3.4.9.o** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.9.o. EMAP Consequence Analysis: Tornado

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Health and Safety of Persons Responding to the Incident	Localized impact expected to limit damage to personnel in the areas at the time of the incident.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services.
The Environment	Localized impact expected to be severe for incident areas and moderate to light for other areas affected by the storm or HazMat spills.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.10 Wildfire

❖ *Description/Location*

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke that fills the area for miles around. The wildland-urban interface (WUI) is an area where structures and other human development are adjacent to wildland fuels. This can be subcategorized as wildland-urban interface and wildland-urban intermix, where lower density human development and wildlands are intermingled.

Figure 3.4.10.a Photograph of Wildfire

Source: 2010 Arkansas All-Hazards Mitigation Plan

The wildfire hazard can be described in terms of potential fire behavior as dictated by fuels, topography, and weather. The following paragraphs reflect the fuels, topography, and weather characteristics of Arkansas.

Fuels

Vegetative fuels are characterized by size, continuity, and quantity and are often classified in terms of fire behavior fuel models (FBFM). These fuel characteristics determine responsiveness to weather conditions and ignition. Fuel sources are diverse and include ground fuels (roots, duff), surface fuels (forest litter, dead and down twigs and branches, grass, shrubs), and aerial fuels (the canopies of forest and brush). Manmade structures and other associated combustibles are also considered fuel sources in the WUI. Light surface and canopy fuels, such as cured grasses and drought stressed tree crowns, burn quickly and serve as a catalyst for rapid fire spread.

Using Anderson's (1982) fire behavior fuel models the state can be very generally categorized as agricultural, closed timber litter, or hardwood litter. Arkansas's eastern counties are predominantly agricultural and relatively low hazard vegetation types. The western two-thirds of the state have a mix of closed timber litter (FBFM8-yellow) and hardwood timber litter (FBFM9-red). See **Figure 3.4.10.b.** These fuel models, which are designed to predict surface fire spread, illustrate that hardwood litter will support faster rates of spread and longer flame lengths than closed timber litter (see **Figures 3.4.10.c and d**). However, these surface fuel models do not show the crown fire potential that is more prevalent with the conifer component in the closed timber.

Figure 3.4.10.b Fire Behavior Fuel Models

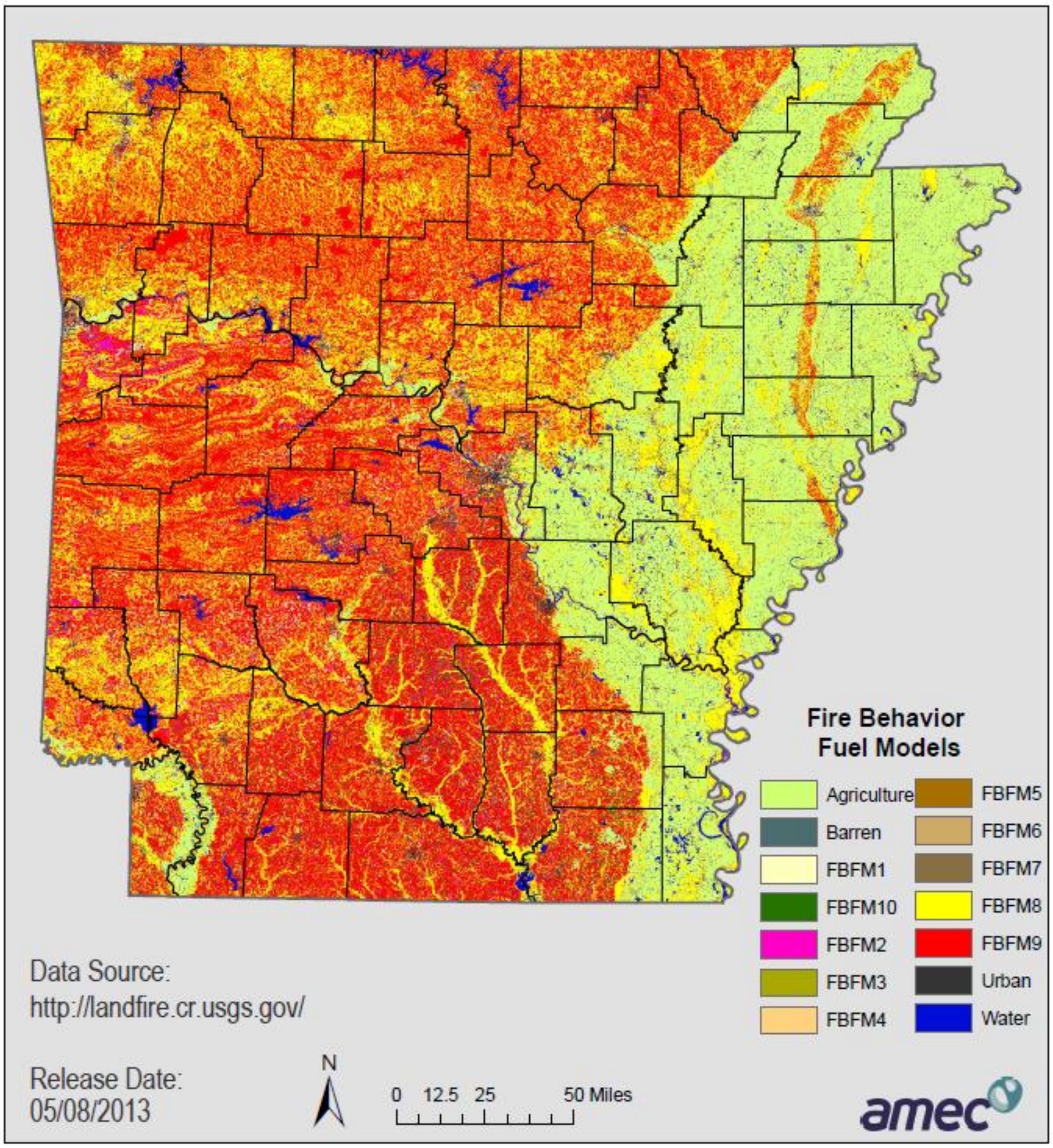


Figure 3.4.10.c Comparison of Headfire Spread Rate Between Hardwood Litter (FBFM9) and Closed Timber Litter (FBFM8)

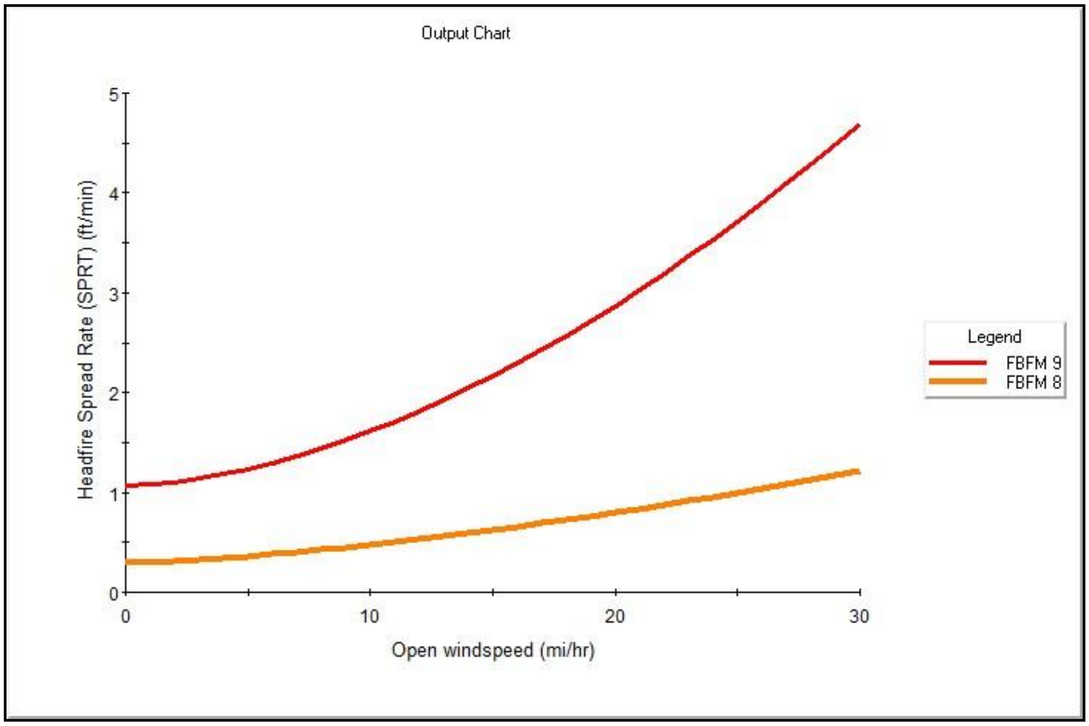
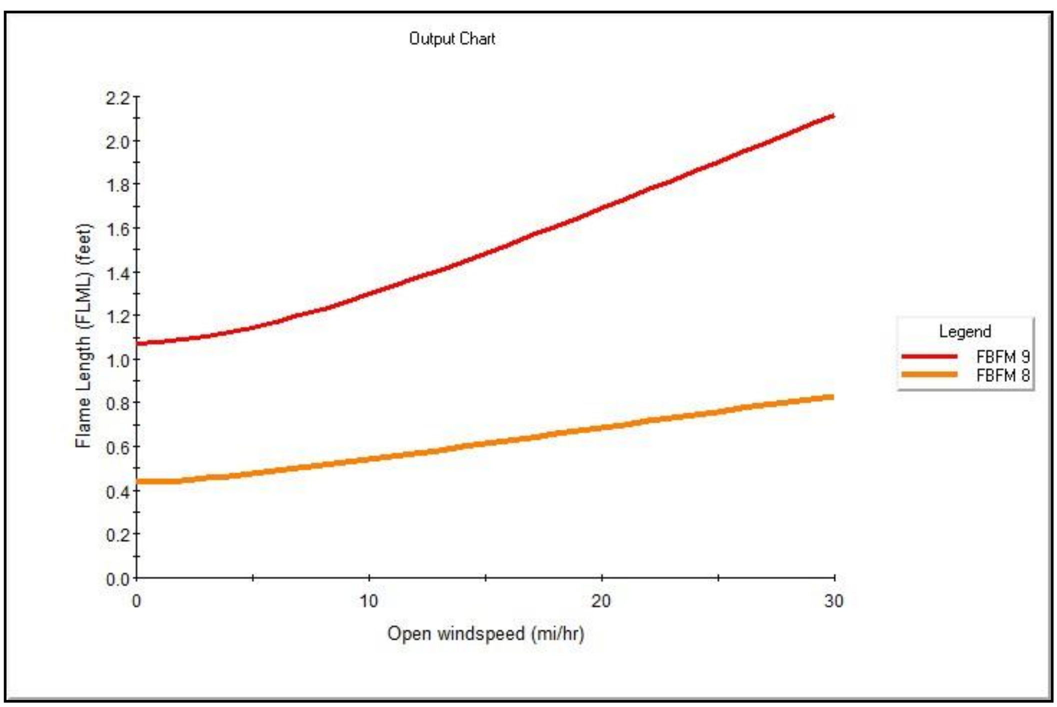


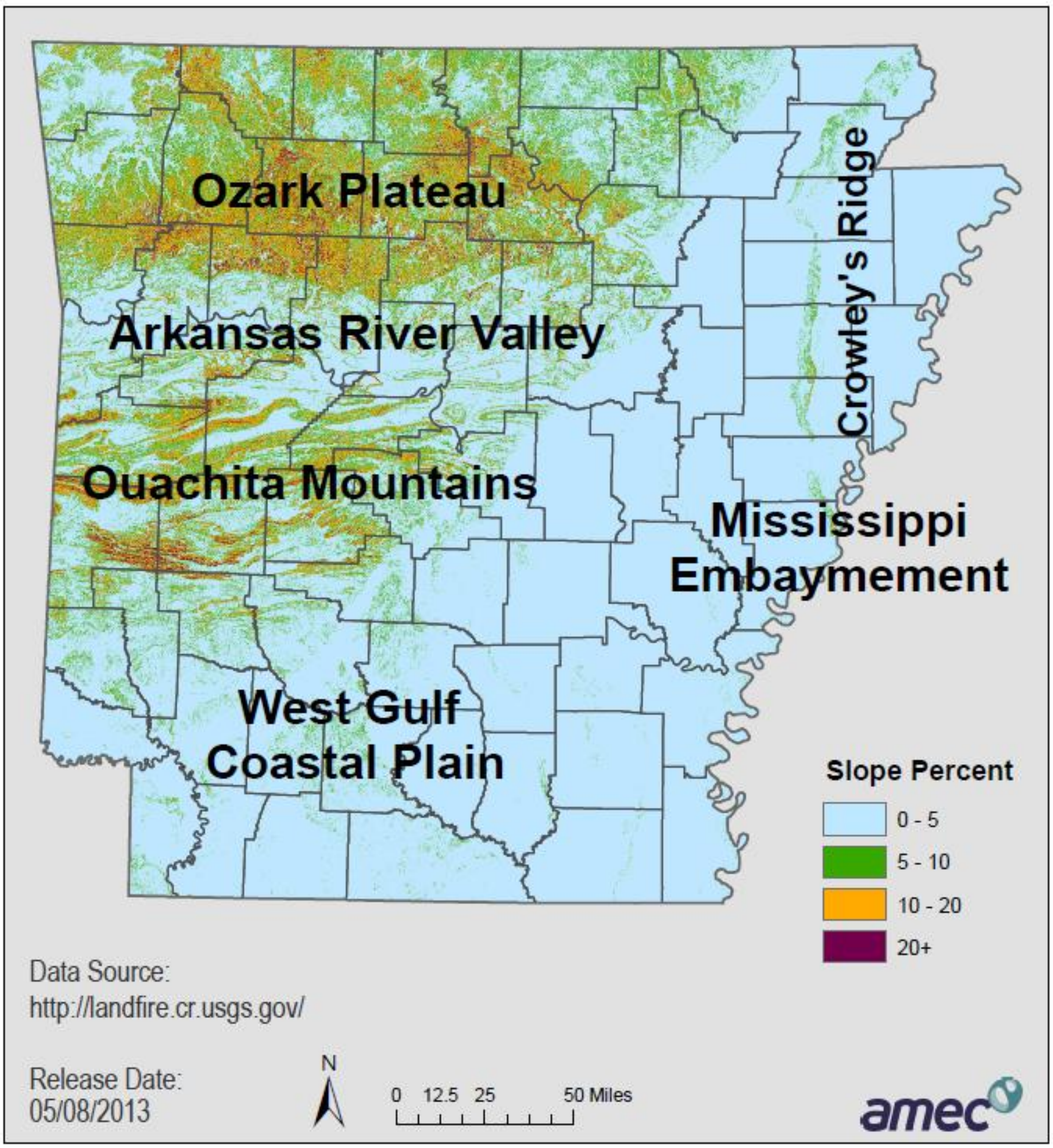
Figure 3.4.10.d Comparison of Flame Length Between Hardwood Litter (FBFM9) and Closed Timber Litter (FBFM8)



Topography

An area's terrain and slope affect its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. Slopes of significant grade are most prevalent in the Boston Mountains and Ouachita Mountains of northwestern Arkansas (See **Figure 3.4.10.e**).

Figure 3.4.10.e Slope Percent

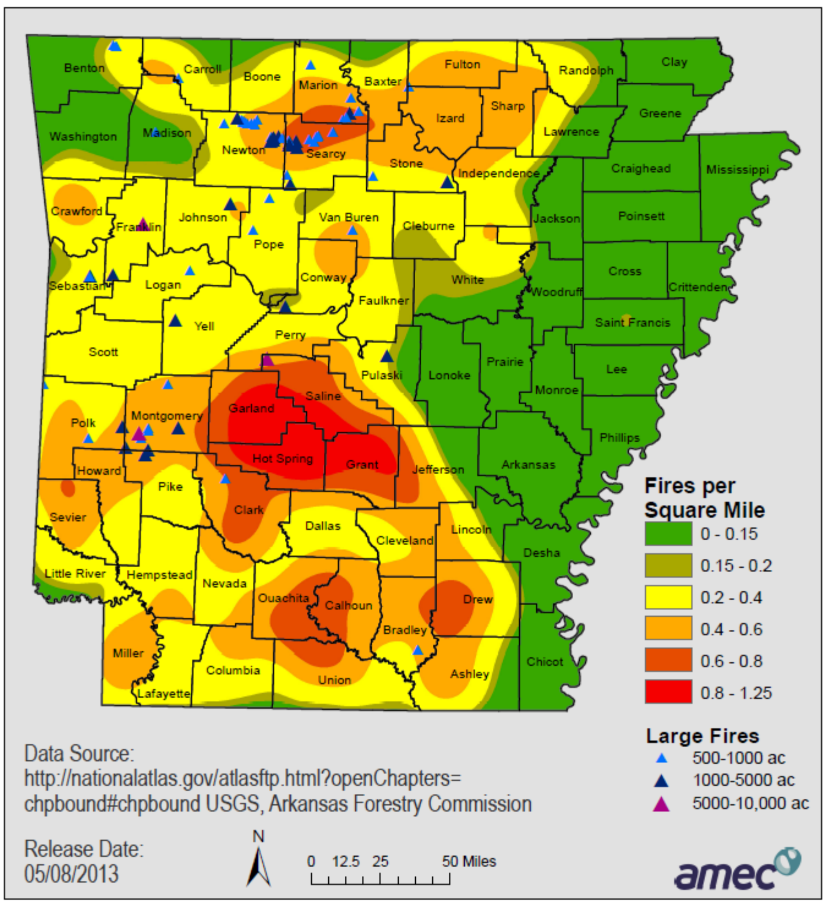


Weather

Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most influential weather factor for fire intensity and the direction and rate of fire spread. In addition to high winds, wind shifts can occur suddenly due to frontal passage, temperature changes, or the interaction of wind with topographical features such as slopes or steep hillsides. The effects of weather on fire behavior are highly localized and impractical to generalize on a statewide basis.

Wildfires have occurred in every county in the state but are most common in the south central to southwest parts of the state within the heavily forested Gulf Coastal Plain and southern Ouachita Mountains. Fires are least common in the heavily agricultural Mississippi Embayment in eastern Arkansas. Large fires have historically been concentrated on the Ozark Plateau and in the Ouachita Mountains (see **Figure 3.4.10.f**).

Figure 3.4.10.f. Historic Fire Occurrence Density



This same distribution of fire occurrence is reflected when fire occurrence is broken down by county and federal jurisdictions (see **Figure 3.4.10.g** and **Table 3.4.10.a**). The state designated wildfire risk zones reflect this historic geographic distribution of fire occurrence (see **Figure 3.4.10.h**).

Figure 3.4.10.g. Fire Occurrence by County, 1997-2012

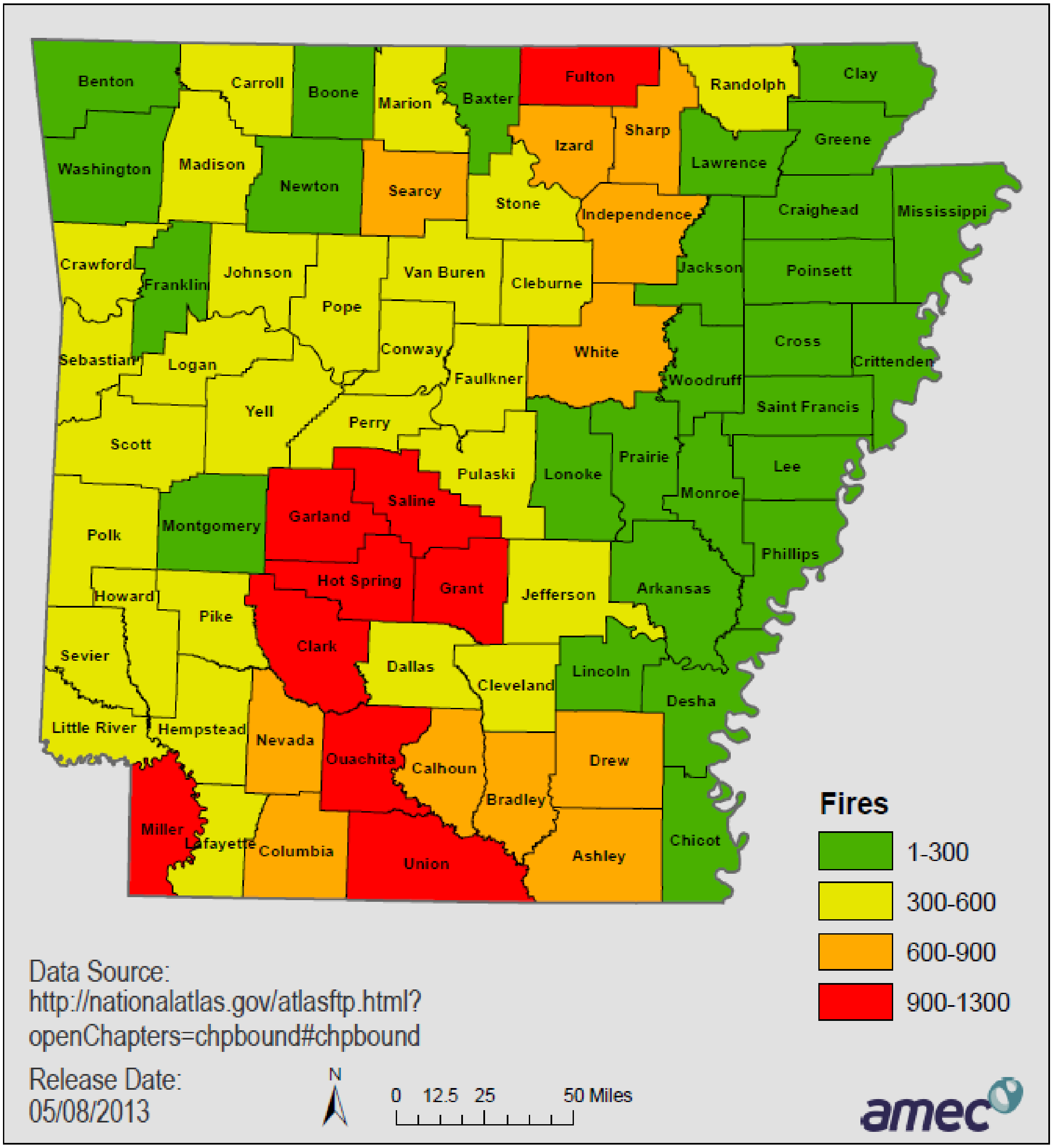


Table 3.4.10.a. Fire Occurrence by County and Federal Agency, 1997-2012

County / Federal Land	# of Fires	County / Federal Land	# of Fires	County	# of Fires	County / Federal Land	# of Fires
Arkansas	34	Drew	836	Lonoke	71	Scott	312
Ashley	722	Faulkner	479	Madison	343	Searcy	633
Baxter	281	Franklin	286	Marion	506	Sebastian	405
Benton	294	Fulton	933	Miller	1008	Sevier	589
Boone	277	Garland	957	Mississippi	9	Sharp	635
Bradley	612	Grant	1198	Monroe	65	Stone	363
Calhoun	693	Greene	80	Montgomery	265	Union	1058
Carroll	438	Hempstead	596	Nevada	629	Van Buren	421
Chicot	48	Hot Spring	1573	Newton	277	Washington	285
Clark	920	Howard	392	Ouachita	1263	White	605
Clay	15	Independence	643	Perry	393	Woodruff	27
Cleburne	403	Izard	844	Phillips	31	Yell	382
Cleveland	470	Jackson	135	Pike	434	Ouachita National Forest	1022
Columbia	669	Jefferson	555	Poinsett	38	Ozark/St. Francis National Forest	852
Conway	574	Johnson	332	Polk	424	Buffalo National River	183
Craighead	106	Lafayette	430	Pope	376	Hot Springs National Park	50
Crawford	559	Lawrence	65	Prairie	34	Pea Ridge National Park	21
Crittenden	3	Lee	20	Pulaski	441	Fish & Wildlife Service	96
Cross	48	Lincoln	285	Randolph	433	Bureau of Indian Affairs	11
Dallas	490	Little River	354	St. Francis	145		
Desha	23	Logan	465	Saline	1212		

❖ *Previous Occurrences*

Historically, the southern United States has led the national wildland fire statistics in both frequency and size of area burned. In this century, major fire years in the south have corresponded to periods of drought. In Arkansas, the drought years of 1930, 1938, 1952, 1963, and 1980 resulted in heavy damage to the state’s timberlands. Record heat and severe drought contributed to the occurrence of over 1000 fires by the end of July in 2012.

From 1997 through 2012, Arkansas averaged 2,230 forest fires per year and 34,700 acres burned. Recent peaks in number of fires occurred in 2006 and 2011 (see **Figure 3.4.10.h**), reflected by peaks in acres burned during these same years (see **Figure 3.4.10.i**).

Figure 3.4.10.h. Number of Fires by Year, 1997-2012

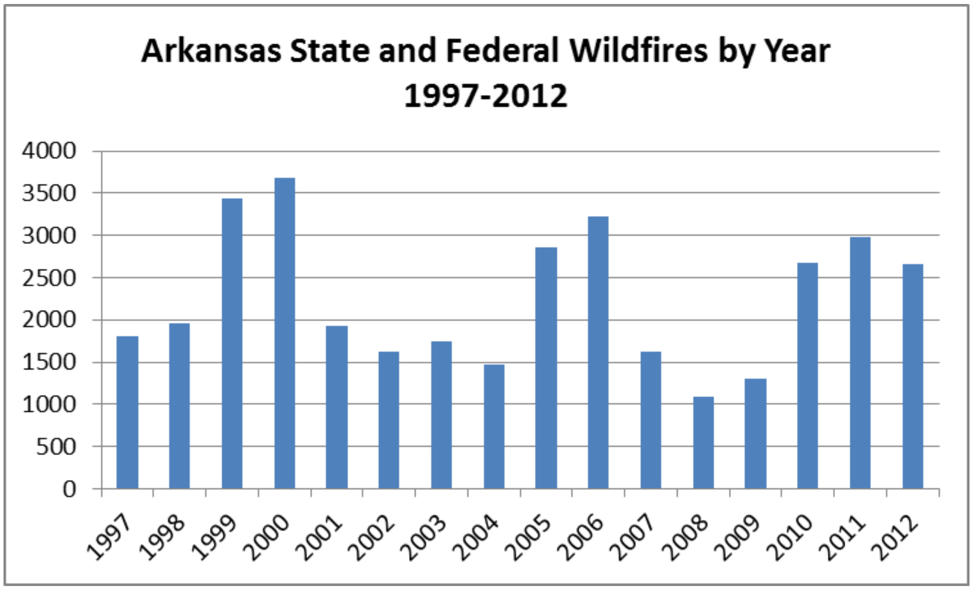
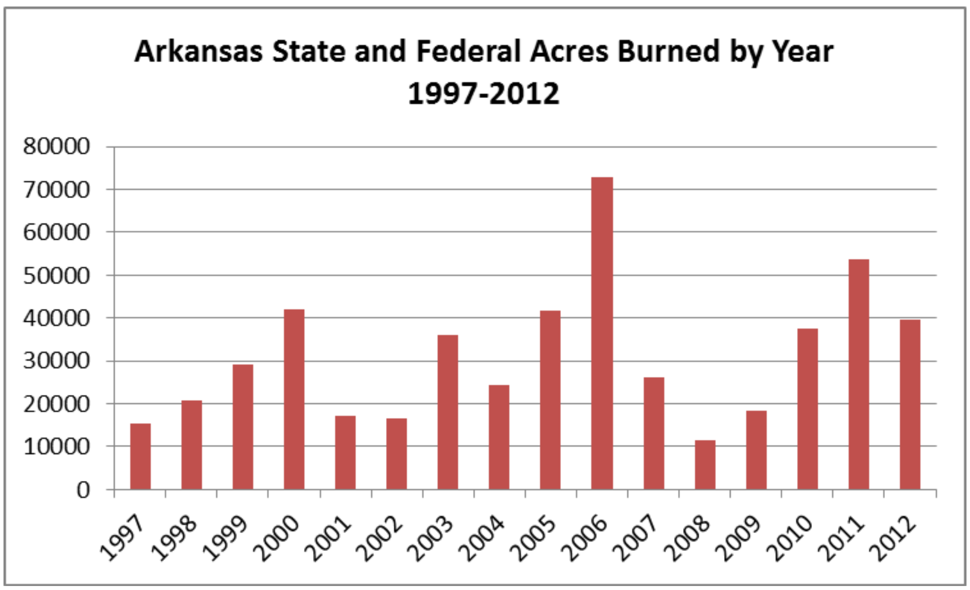


Figure 3.4.10.i. Acres Burned by Year, 1997-2012



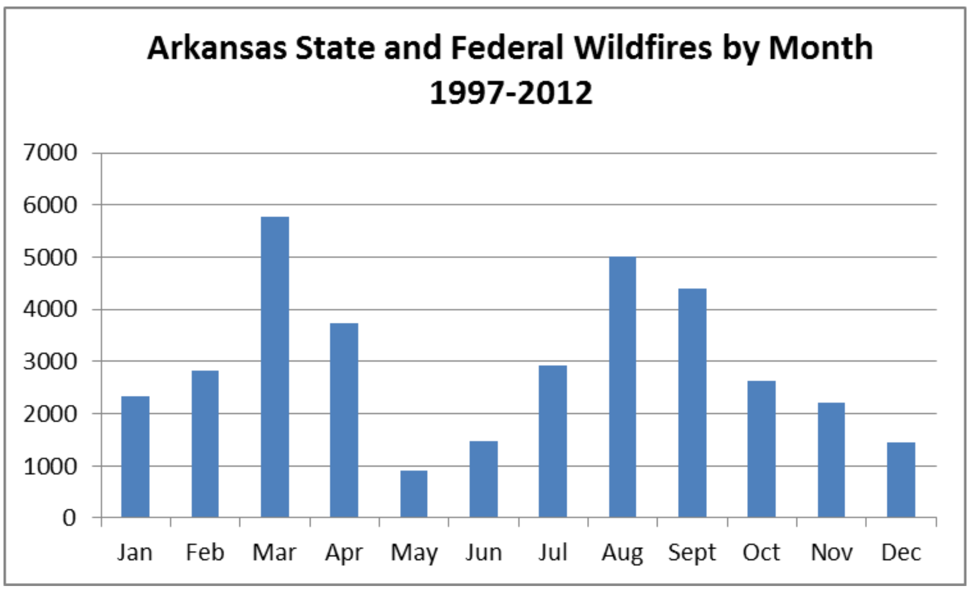
Socioeconomic changes have also led to increased fire activity. Forest fuels increase following human activities like logging and conversion of open areas into timber producing lands. In the early years of the 20th century most of Arkansas' virgin pine forests were logged out leaving behind huge areas of slash. These areas were very susceptible to wildland fires and generally remain high risk areas.

Historic fire occurrence can be used to determine relative risk in terms of geographic location and seasonal occurrence. Northern Arkansas has a single fire season, occurring in the spring with generally larger fires and more frequent fires. Southern Arkansas has two fire seasons, spring and fall, with generally smaller fires and slightly lower frequency of occurrence. **Figure 3.4.10.j** presents a graph of fire occurrences by month in Arkansas.

Wildfires are ignited by natural causes, predominately lightning, or human causes. Federal agencies categorize human caused in terms of equipment, smoking, campfires, debris burning, railroads and arson. Human caused ignitions are associated with travel corridors, population centers, recreational use, and commercial activities.

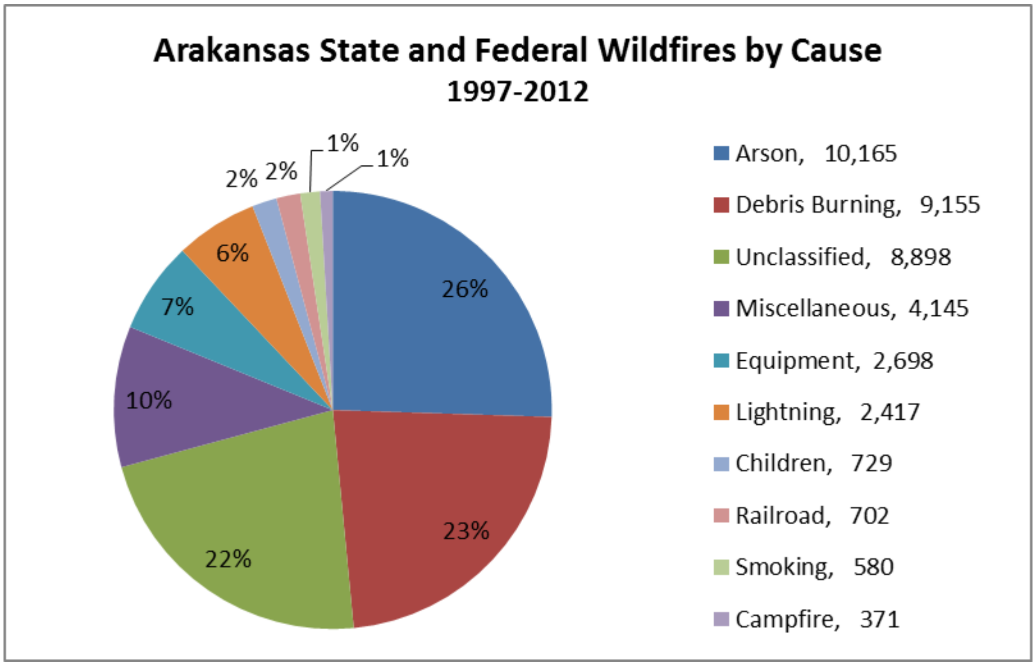
Recent research on wildfires in Arkansas using fire statistics of the Arkansas Forestry Commission (AFC) Individual Fire Reports found that arson was the overwhelming cause of fires. These fires were twice the size on average of all other types of fires.

Figure 3.4.10.j. Historic Fire Occurrence by Month, 1997-2012



The Arkansas Forestry Commission completes a fire report on each fire, its rangers and foresters suppress. Information on a fire report includes the location of the fire, what caused the fire, whose land it was on and how large it was. Based on data from 1997 through 2012, it was found that the majority of fires in Arkansas are incendiary, accounting for 26% of fires. The next most common cause of fires was debris burning which caused 23% of fires. Lightning was the cause of only 6% of the fires in Arkansas (see **Figure 3.4.10.k**). In the summer of 2012 lighting caused over 50% of wildfires, an unusually high proportion.

Figure 3.4.10.k Historic Fire Occurrence by Cause, 1997-2012



Noted wildfires include:

- **October 1963 Eagleton Burn:** Sparks from a railroad train traveling north on its run between New Orleans and Kansas City ignited a major wildfire in the Ouachita National Forest on October 30, 1963 near Mena in Western Arkansas. Conditions were very favorable for fire as October had been one of the driest and hottest months on record in central and western Arkansas. The area was already 30 inches below normal in rainfall and a 30 mile-per hour wind was blowing. Eighteen days in October, including this one, had been classified as Class 5, or extreme fire danger. A fire dispatcher watching from Rich Mountain tower saw smoke when the train passed. He said the fire started at the foot of Blackfork Mountain and within 19 minutes had topped the mountain. "It then began to jump as far ahead as half a mile," he said. The Eagleton Burn, the name given the fire by the Forest Service, raged for 78 hours. It burned 13,673 acres, including 12,322 of the Ouachita National Forest and 1,351 acres of private land. Foresters called in 300 soldiers from Fort Chaffee and every other man they could find to help. A total of 1,077 men fought day and night to bring the fire under control. Men worked another 15 days cleaning up after the fire and extinguishing all burning materials. The Eagleton Burn was the nation's worst forest fire in 1963.

- **2000 Statewide Fires:** There were 41,599 acres of timber destroyed by fires in Arkansas during this year.

- **January 9, 2006 Hamburg:** Several families in Ashley County were evacuated from their homes after a 3,000-acre wildfire jumped a state highway and threatened their houses. No injuries were reported. State Forestry Commission officials said the massive wildfire destroyed four homes, two camping trailers and two outbuildings. Even though firefighters worked through the night, they could not contain the blaze until the next day. The evacuated families lived along Arkansas State Highway 8. Firefighters said the fire was six miles long and one mile wide. Firefighters from four volunteer departments used 11 dozers and two air-tankers to fight the blaze. According to the Associated Press, at least 35 wildfires burned in Arkansas during this same period.

- **March 2010 Wildfires:** AFC personnel responded to 128 fires that burned 3,123 acres and single engine air tankers (SEATs) made 42 water drops across Arkansas Saturday and Sunday. County Judges in Faulkner, Greene and Van Buren Counties have issued burn bans, and more than two-thirds of the state is experiencing moderate wildfire danger conditions.

- **Summer 2012 Wildfires:** Drought and record high temperatures helped feed an unusually busy fire season. This included the Ola Fire which broke out in Yell County in late July and prompted the evacuation of over 1000 people.

Figure 3.4.10.I: Flames from a Wildfire in Yell County, 2012

Source: Arkansas Democrat Gazette; Photo by Benjamin Krain; http://m.arkansasonline.com/photos/2012/dec/

❖ *Probability of Future Hazard Events*

Wildfire is a natural and historic component of the Arkansas landscape, and its future occurrence is a certainty. Records from the past two decades reveal cycles of high and moderate fire occurrence and acres burned. The majority of wildfires are human caused, though the 2012 season illustrated lightning's potential as a major causal force. As population and development continue to grow throughout the state so will the potential for wildfire ignition as well as the values at risk in the wildland-urban interface. The probability of a wildfire event is "**Highly Likely**".

Potential losses from wildfire include: human life, structures and other improvements, natural and cultural resources, the quality and quantity of the water supply, assets such as timber and range, and recreational opportunities, and economic losses. Smoke and air pollution from wildfires can be a severe health hazard. In addition, wildfire can lead to secondary impacts due to vegetation loss such as future flooding and landslides and erosion during heavy rains.

❖ *State Vulnerability Analysis*

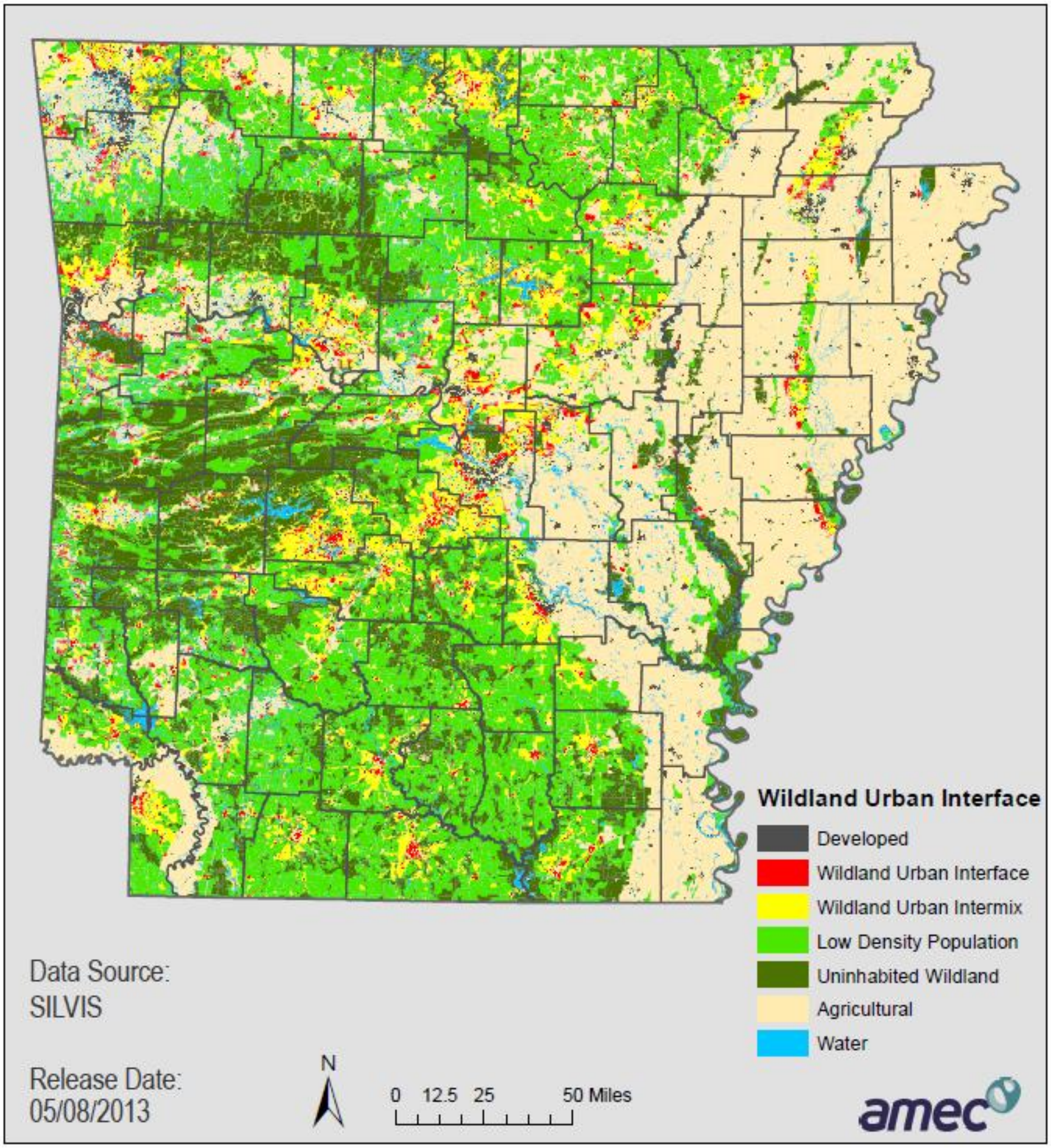
Vulnerabilities to wildfire include:

- Structures and private property;
- Critical infrastructure such as powerlines and roadways;
- Key Resources such as medical facilities, schools, watersheds, reservoirs, and public buildings; and
- Tourism and habitat resources such as trails, ski, dispersed recreation sites, viewsheds, and wildlife habitat.

The highest potential for negative and even deadly impacts of wildland fire is in the wildland-urban interface. Every fire season in the United States catastrophic losses from wildfire plague the wildland-urban interface with the loss of homes and businesses; damage to critical infrastructure; and, in the worst cases, loss of life.

The Silvis Project, at the University of Wisconsin, has undertaken nationwide mapping of the wildland-urban interface based on vegetation and population density mapping. The most recent results, published in 2010, distinguishes between the more densely populated wildland-urban interface versus the wildland-urban intermix with its more dispersed housing patterns. The data illustrates both interface and intermix across the state with notable concentrations in the counties of Greene, Craighead, Faulkner, Pulaski, Saline, and Garland (see **Figure 3.4.10.m**)

Figure 3.4.10.m: Wildland-Urban Interface and Intermix in relationship to other Wildland Categories (Silvus Lab, 2010)



❖ State Estimates of Potential Losses

Figure 3.4.10.n depicts the vulnerability and housing units at risk, rather than potential fire occurrence or behavior as earlier discussed. **Table 3.4.10.b** lists county population and housing in descending order (Silvis lab, 2010) with counties that have had 900 to 1300 wildfires since 1997 highlighted in red. Counties with 600 to 900 fires since 1997 are highlighted in orange. This table compares the WUI vulnerability to the risk of wildfire based on historic occurrence.

Figure 3.4.10.n: Values at Risk in the Wildland-Urban Interface as a Function of Housing Unit Density (Silvus Lab, 2010)

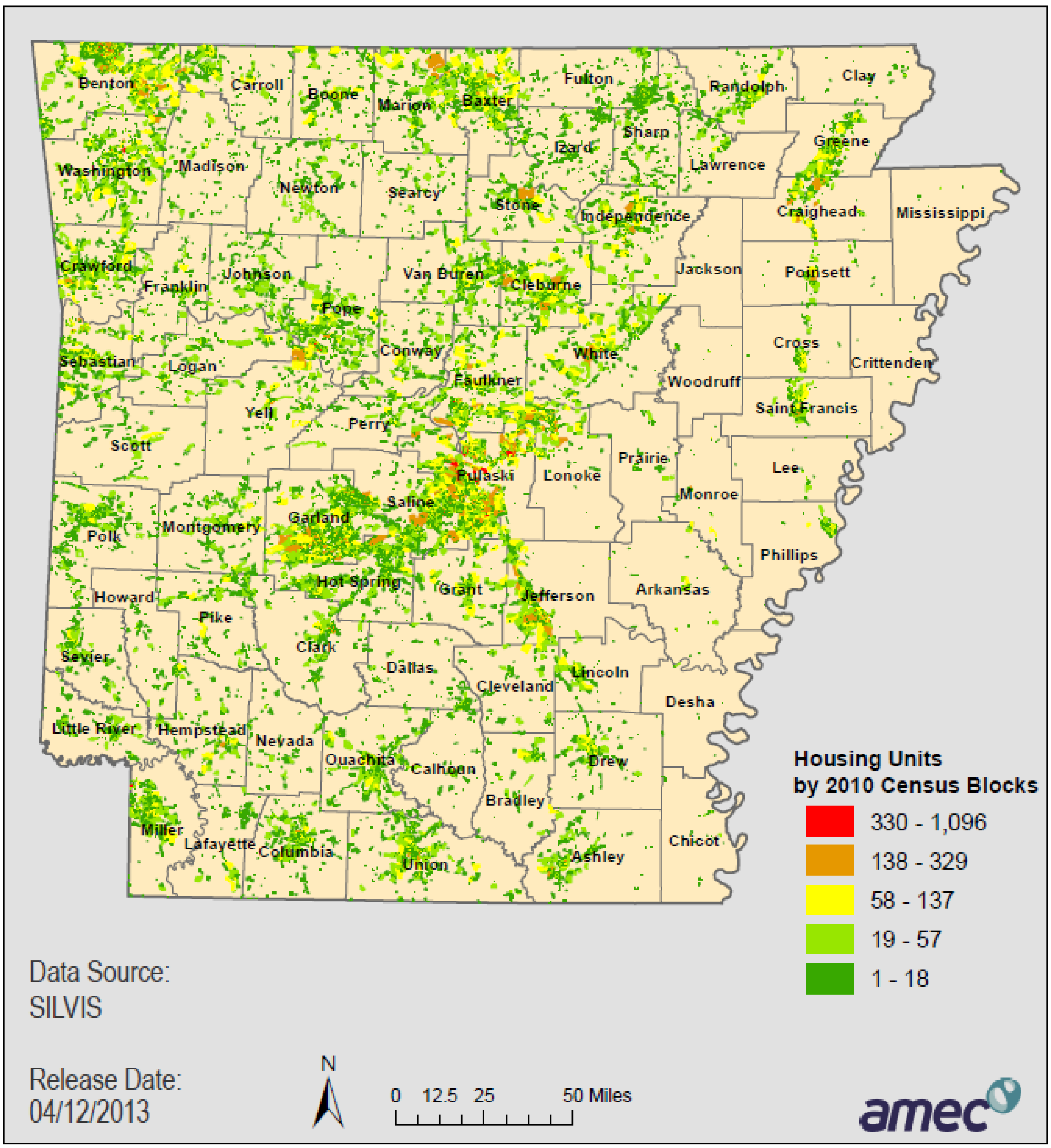


Table 3.4.10.b: Counties in descending order of Housing Units (Silvus Lab, 2010)
(Red cells indicate counties with 900-1300 fires and orange cells indicate 600-900 fires, 1997-2012)

County	Population	Housing Units	Estimated Losses[1] (x$1000)	County	Population	Housing Units	Estimated Losses[1] (x$1000)
Pulaski	192,820	84,444	$8,875,064	Fulton	4,873	3,010	$316,351
Garland	83,340	44,079	$4,632,703	Franklin	6,576	2,955	$310,571
Saline	98,155	41,366	$4,347,567	Perry	6,267	2,934	$308,363
Benton	73,850	33,390	$3,509,289	Hempstead	6,115	2,855	$300,061
Baxter	32,617	18,356	$1,929,216	Dallas	5,865	2,854	$299,955
Union	34,617	16,388	$1,722,379	Conway	5,676	2,609	$274,206
Washington	33,587	15,986	$1,680,129	Howard	5,306	2,539	$266,849
Jefferson	35,482	15,385	$1,616,964	Randolph	5,490	2,499	$262,645
Sebastian	34,792	14,973	$1,573,662	Johnson	5,113	2,363	$248,351
Faulkner	34,603	14,751	$1,550,330	Poinsett	4,716	2,065	$217,032
Pope	32,206	13,902	$1,461,100	Lincoln	4,898	2,063	$216,821
Cleburne	17,999	11,771	$1,237,132	Cleveland	3,840	1,718	$180,562
Hot Spring	25,557	11,663	$1,225,781	Cross	3,967	1,670	$175,517
Ouachita	21,198	10,662	$1,120,576	Newton	2,913	1,643	$172,679
Lonoke	24,419	9,281	$975,433	Lawrence	3,074	1,539	$161,749
Columbia	17,783	8,622	$906,172	Calhoun	2,709	1,427	$149,978
Independence	19,260	8,471	$890,302	Monroe	2,213	1,239	$130,219
Miller	18,451	8,054	$846,475	Prairie	2,313	1,239	$130,219
Clark	15,448	7,518	$790,142	Scott	2,523	1,210	$127,171
Ashley	15,643	7,248	$761,765	Searcy	1,927	1,142	$120,024
White	16,559	7,008	$736,541	Madison	2,432	1,103	$115,925
Sharp	11,231	6,590	$692,609	Nevada	1,695	884	$92,908
St. Francis	14,598	6,467	$679,682	Arkansas	1,434	784	$82,398
Polk	13,224	6,400	$672,640	Woodruff	1,122	565	$59,382
Van Buren	9,700	6,328	$665,073	Jackson	796	338	$35,524
Drew	12,718	5,809	$610,526	Clay	577	333	$34,998
Craighead	14,871	5,797	$609,265	Chicot	493	267	$28,062
Phillips	12,244	5,699	$598,965	Lee	397	176	$18,498
Marion	9,555	5,630	$591,713	Desha	158	110	$11,561
Carroll	9,190	5,560	$584,356	Mississippi	223	100	$10,510
Crawford	12,138	5,363	$563,651	Crittenden	141	65	$6,832
Grant	12,344	5,355	$562,811				
Logan	11,497	5,341	$561,339				
Yell	9,962	4,367	$458,972				
Little River	8,489	4,221	$443,627				
Greene	10,399	4,167	$437,952				
Sevier	10,912	4,125	$433,538				
Bradley	7,926	3,868	$406,527				
Izard	6,706	3,842	$403,794				
Montgomery	5,700	3,773	$396,542				
Boone	7,922	3,648	$383,405				
Pike	7,161	3,575	$375,733				
Stone	6,354	3,496	$367,430				
Lafayette	5,145	3,034	$318,873				

[1] Estimated Losses are based upon US Census, median value of owner-occupied housing units, 2007-2011

❖ Development in Hazard Prone Areas

Greene, Craighead, Faulkner, Pulaski, Saline, and Garland Counties were noted as having significant concentrations of both wildland-urban interface and wildland-urban intermix. Of these, Craighead, Faulkner, Pulaski, and Saline Counties were all in the top 10 counties for both population and housing unit gains. If additional development and population growth begins to occur in the wildland-urban interface and wildland-urban intermix areas, this will increase the vulnerability. **Table 3.4.10.c** compares the estimated loss from the previous Arkansas All-Hazards Mitigation Plan to the current analysis for these four counties.

Table 3.4.10.c Comparison of Estimated Loss[1]

County	Estimated Loss 2010 Plan	Estimated Loss 2013 Plan	Comparison
Craighead	N/A	$609,265	Comparison not available.
Faulkner	N/A	$1,550,330	Comparison not available.
Pulaski	N/A	$8,875,064	Comparison not available.
Saline	N/A	$4,347,567	Comparison not available.

[1]The 2010 All-Hazards Mitigation Plan estimated potential losses by jurisdiction utilizing the FEMA approved local mitigation plans for 62 jurisdictions. This 2013 All-Hazards Mitigation Plan estimates potential loss *Statewide* utilizing a combination of HAZUS, other GIS-based risk modeling, statistical analysis of past historic losses, and hypothetical scenario-based estimates. Due to the limited data available with the local jurisdictional plans in 2010, a comparison of estimated losses for Counties, noted in 2013 as experiencing changes in development, may not be available and/or directly correlate. This table presents the available data and comparative analysis, as applicable.

❖ Consequence Analysis

The information in **Table 3.4.10.d** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.10.d. EMAP Consequence Analysis: Wildfire

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Health and Safety of Persons Responding to the Incident	Localized impact expected to limit damage to personnel in the incident areas at the time of the incident.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
The Environment	Localized impact expected to be severe for incident areas and moderate to light for other areas affected by smoke or HazMat remediation.
Economic and Financial Condition	Local economy and finances may be adversely affected, depending on damage and length of investigations.
Regulatory and Contractual Obligations	Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may temporarily reduce deliveries.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.11 Hazardous Materials

❖ *Description/Location*

Hazardous materials (HAZMAT) are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals are found throughout Arkansas, in areas of industry, agriculture, medicine, research, consumer goods and a multitude of others. HAZMAT can come in the form of explosives, flammable and combustible substances, poisons and radioactive materials. Many HAZMAT do not have a taste or an odor. Some materials can be detected because they cause physical reactions such as watering eyes or nausea. Some HAZMATs exist beneath the surface of the ground and can be recognized by an oil or foam-like appearance. Under normal conditions, these substances are controlled and pose no threat to human life and the environment. But when a release occurs, they can produce disastrous results. These materials, in their various forms, can cause death, serious injury, long-lasting health effects, and can damage buildings, homes, and other property. Such releases may come from both fixed sources, such as a manufacturing or storage facility, or from a transportation source, such as a truck or pipeline. Accidental releases may be due to equipment failure, human error, or a natural or manmade hazard event.

HAZMAT releases pose short- and long-term toxicological threats to humans and to terrestrial and aquatic plants and wildlife. Toxic materials affect people through one of three processes: inhalation, ingestion, or direct skin contact (Federal Emergency Management Agency, 1997). Inhalation exposures result from breathing gases that may have been vented from containers, liquid aerosols generated during venting of pressurized liquids, fumes from spilled acids, vapor created by evaporating liquids, and airborne dust. Ingestion exposures typically result from poor hygiene habits after handling contaminated material, eating contaminated food, or the inhalation of insoluble particles that may become trapped in the mucous membranes. Skin may be affected by direct contact with gas, liquid, or solid forms of HAZMAT.

In some cases, these substances may irritate the skin or eyes, make it difficult to breathe, cause headaches and nausea, or result in other types of illnesses. Some hazardous substances may cause far more severe health effects, including behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (e.g., reproductive impairment, kidney failure, etc.), physical deformations and birth defects (see **Table 3.4.11.a**).

Table 3.4.11.a Effects of Hazardous Materials on Humans

Common Sources	Contaminants	Potential Health Effects
Household items, such as batteries, thermometers, and paints	Mercury	Toxic to kidneys. Can cause eye and skin irritation; chest pain; tremor; fatigue; weakness.
Pesticides	Chlorinated ethanes; DDT; Lindane	Acute symptoms of apprehension, irritability, dizziness, disturbed equilibrium, tremor, and convulsions.
Various commercial and industrial manufacturing processes	Arsenic; beryllium; cadmium; chromium; lead; mercury	All are toxic to kidneys. Decreased mental ability, weakness, headache, abdominal cramps, diarrhea, and anemia. Also affects blood-forming mechanisms and the peripheral nervous system. Long-term exposure to lead can cause permanent kidney and brain damage. Cadmium can cause kidney and lung disease. Chromium, beryllium, arsenic, and cadmium have been implicated as human carcinogens.
Chemical manufacturing	Benzene; ethyl benzene; toluene; xylene	Benzene suppresses bone marrow function, causing blood changes; chronic exposure can cause leukemia. Central nervous system depression: decreased alertness, headaches, sleepiness, loss of consciousness.
Steel and glass manufacturing	Chromium; lead; mercury	All are toxic to kidneys. Lead causes decreased mental ability, weakness, headache, abdominal cramps, diarrhea, and anemia. Also affects blood-forming mechanisms and the peripheral nervous system.

Source: 2010 State Hazard Mitigation Plan

Some hazardous substances produce toxic effects in humans or the environment after a single, episodic release. These toxic effects are referred to as the acute toxicity of a hazardous substance. Other hazardous substances produce toxic effects in humans or the environment after prolonged exposure to the substance, which is called chronic toxicity.

Children are at greater risk of exposure to hazardous substances emitted from waste sites and emergency events. They are more likely to be exposed for several reasons: children play outside more often increasing the likelihood of exposure to chemicals in the environment; since they are shorter than adults are, they breathe more dust and heavy vapors close to the ground; children are also smaller and thus receive higher doses of chemical exposure per body weight; finally, the developing body systems of children can sustain damage if toxic exposures occur during certain growth stages.

Rules and Regulations Regarding Hazardous Materials

The Department of Transportation regulates routes and speed limits used by carriers. They monitor the types of HAZMAT crossing state lines. In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA) of 1986. Title III of this legislation requires that each community in Arkansas establish a Local Emergency Planning Committee (LEPC) to be responsible for developing an emergency plan for the preparation of and the response to chemical emergencies in that community. This emergency plan must include the following:

- Identification of local facilities and transportation routes where HAZMAT are present.
- Procedures for immediate response in case of an accident (this must include a community-wide evacuation plan).
- A plan for notifying the community that an incident has occurred.
- Names of response coordinators at local facilities.
- A plan for conducting exercises to test the plan.

The plan is reviewed by the State Emergency Response Commission (SERC) and publicized throughout the community. The LEPC is required to review, test and update the plan each year.

The Emergency Planning and Community Right-to-Know Act requires that detailed information about hazardous substances in or near communities be available at the public's request. The law provides stiff penalties for companies that fail to comply and allows citizens to file lawsuits against companies and government agencies to force them to obey the law.

Comprehensive Environmental Response, Compensation, Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress on December 11, 1980. This law created a tax on the chemical and petroleum industries and provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. Over five years, $1.6 billion was collected and the tax went to a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites. The CERCLA:

- Established prohibitions and requirements concerning closed and abandoned hazardous waste sites;
- Provided for liability of persons responsible for releases of hazardous waste at these sites; and
- Established a trust fund to provide for cleanup when no responsible party could be identified.

The law authorizes two kinds of response actions:

- Short-term removals, where actions may be taken to address releases or threatened releases requiring prompt response.
- Long-term remedial response actions, that permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately life threatening. These actions can be conducted only at sites listed on EPA's National Priorities List.

Hazardous Materials Incidents

In Arkansas, HAZMAT incidents typically take one of two forms; 1) fixed facility incidents and 2) transportation incidents. The major difference between the two is that it is reasonably possible to identify and prepare for a fixed-site incident, because laws require those facilities to report chemicals and quantities to the Arkansas Department of Emergency Management and to local authorities. Transportation incidents are substantially harder to prepare for because the exact chemicals, quantities and locations cannot be identified until the accident has actually happened. The vulnerability and impacts of a HAZMAT event in Arkansas can differ drastically due to the location of release, surrounding populations, mode of release and other significant scenarios. Because of this fact, the APDMAC has chosen to discuss this portion of the Mitigation Plan in separate sections:

- Fixed Facility Incidents: Commercial Facilities, Superfund Sites, Pine Bluff Arsenal and Meth Labs
- Transportation Incidents: Highway, Railway, Pipeline, Air, and Water

Using the above-identified categories of HAZMAT events, the planning committee has ranked these based on their "Frequency of Occurrence" and "Severity" in **Table 3.4.11.b**. This ranking of hazards is important in the mitigation planning process because it acts as a guide to address specific hazards and how they impact the State of Arkansas. Highway transported HAZMAT events occur most frequently; however, in many cases these are smaller events that do not cause a lot of damage or pose a great risk to surrounding populations. Rail events, on the other hand, have a much lower occurrence rate, but when these events do occur, their results are usually more severe and impact a much broader population.

Table 3.4.11.b Rankings of HAZMAT Hazards

Hazard/Event	Frequency of Occurrence	Severity
Highway	1	3
Commercial Fixed Facility	2	4
Meth Labs	3	5
Rail	4	1
Pipeline	5	2
Water	6	6
Air	7	7
Pine Bluff Arsenal	-	-

Source: 2010 State Hazard Mitigation Plan-revised in 2013 to take Pine Bluff Arsenal out of Ranking due to final destruction of materials.

Fixed Facility Incidents

Generally, with a fixed facility, the hazards are pre-identified, and the facility is required by law to prepare a risk management plan and provide a copy to the local emergency planning committee (LEPC) and local fire departments.

Commercial Facilities

Any location where HAZMATs are fabricated, processed, or stored are at-risk for HAZMAT events. HAZMATs are chemical substances, which if released or misused can pose a threat to the environment or human health. These chemicals are used in industry, agriculture, medicine, research and consumer goods.

HAZMAT incidents in Arkansas have historically occurred at fixed sites (i.e., processing plants, manufacturing plants, etc.). Natural disasters, particularly earthquakes, can cause HAZMAT releases at fixed sites and can hamper response efforts. Rain, high winds and fires can worsen conditions surrounding HAZMAT events, making it more difficult to contain releases and to mitigate the short and long-term effects. Fires involving certain types of HAZMAT may generate more toxic gas or smoke than would otherwise normally be observed in a “normal” fire.

For regulatory purposes, various federal and state organizations such as the U.S. Environmental Protection Agency (EPA), Department of Transportation (DOT), Arkansas Department of Environmental Quality (ADEQ), and the Arkansas Department of Health and Human Services (ADHHS) have defined HAZMAT lists or classes. EPA and ADEQ sort HAZMAT into the following categories: toxic agents (irritants, asphyxiates, anesthetics and narcotics, sensitizers); other types of toxic agents (hepatoxic and nephratoxic agents, carcinogens, mutagens); hazardous wastes; hazardous substances; toxic pollutants; and extremely hazardous substances.

The 1986 Act and subsequent state regulations require that companies report releases of designated hazardous chemicals to EPA and ADEQ, even if those releases do not result in human exposure. Types of releases are:

- Air emissions of gases or particles from a pressure relief valve, smokestack, ruptured reaction vessel, broken pipe or other equipment at a chemical plant or other fixed-site facility; from broken, loose-fitting, or punctured equipment, containers, or cylinders on transportation vehicles; and from solid or liquid discharges onto the ground or into the water;
- Discharges as outflows from sewer or drain outfalls, runoff from spills on land, runoff from water used to control fires, or contaminated groundwater;
- Discharges onto land;
- Transfer of wastewater to public sewage plants; and
- Transfer of wastes to offsite facilities for treatment or storage.

HAZMAT is stored, processed and handled at a range of facilities known as fixed-site facilities. Some examples of fixed-site facilities in Arkansas include:

- Large manufacturing plants, storage terminals, large grain elevators, and landfills (open or closed); (Tyson Chicken, Teris Company).
- Moderate-sized industrial users, warehouses, wastewater/sewage treatment plants, gasoline/propane terminals, wood treatment facilities, electrical substations, and isolated storage tanks for water treatment; and
- Small quantity users and storage facilities such as school/research laboratories, florists/greenhouses, gas stations, hospitals/clinics, dry cleaners, airports, and hardware/automotive stores.

HAZMAT releases at fixed sites can cause a range of contamination from very minimal to catastrophic. The releases can go into the air, onto the surface, or into the ground and possibly into groundwater, or a combination of all. Although releases into the air or onto the ground surface can pose a great and immediate risk to human health, they are generally easier to remediate than those releases which enter into the ground or groundwater. Soil and groundwater contamination may take years to remediate causing possible long-term health problems for individuals and rendering land unusable for many years.

The federal government and the State of Arkansas have a long record of concern about HAZMAT releases and the potential impact on Arkansans and the environment. Several state and federal agencies, including ADEM, ADEQ, ADH, EPA, DOT, and FEMA, provide training, technical assistance, and guidance to local governments, communities, and industry for planning, mitigation, and response for HAZMAT releases.

All locations having HAZMAT on-site must report their type and quantities of HAZMAT to the State of Arkansas 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.

In 2012, there were 1,721 Tier II Facilities housing hazardous chemicals in Arkansas. The number of facilities is illustrated by county in **Table 3.4.11.c.**

Table 3.4.11.c Number of Tier II Facilities Per County, 2012

County	# of Tier II Facilities	County	# of Tier II Facilities
Arkansas	20	Lincoln	6
Ashley	12	Little River	9
Baxter	9	Logan	124
Benton	79	Lonoke	8
Boone	18	Madison	5
Bradley	2	Marion	4
Calhoun	8	Miller	25
Carroll	12	Mississippi	27

County	# of Tier II Facilities	County	# of Tier II Facilities
Chicot	2	Monroe	7
Clark	6	Montgomery	2
Clay	7	Nevada	7
Cleburne	19	Newton	2
Cleveland	1	Ouachita	10
Columbia	180	Perry	2
Conway	34	Phillips	11
Craighead	34	Pike	1
Crawford	31	Poinsett	11
Crittenden	26	Polk	11
Cross	12	Pope	48
Desha	5	Prairie	2
Drew	8	Pulaski	140
Faulkner	35	Randolph	4
Franklin	35	Saint Francis	11
Fulton	2	Saline	19
Garland	18	Scott	4
Grant	1	Searcy	2
Greene	15	Sebastian	117
Hempstead	31	Sevier	5
Hot Springs	13	Sharp	1
Howard	7	Stone	3
Independence	18	Union	38
Izard	6	Van Buren	30
Jackson	10	Washington	67
Jefferson	31	White	86
Johnson	16	Woodruff	5
Lafayette	14	Yell	7
Lawrence	8	County Not Reported	70
Lee	5	**TOTAL**	**1,721**

Source: ADEM, 2013

Superfund Sites

Prior to EPA's regulation of hazardous wastes, much of our country's hazardous wastes were often stored or disposed of improperly -- either in landfills not designed to protect the environment or simply abandoned in open fields or dumped along roadways. In addition, abandoned industrial facilities that used chemicals and other hazardous substances may not have stored or disposed of them properly prior to closing operations.

Citizen concern over the extent of this problem led Congress to establish the Superfund Program in 1980 to locate, investigate and clean up the worst sites nationwide. The EPA administers the Superfund program in cooperation with individual states and tribal governments. Today, these Superfund sites are undergoing long-term cleanup actions which may take several years to fully study the problem, develop the right remedy and clean up the hazardous waste.

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. To evaluate the dangers posed by hazardous waste sites, Environmental Protection Agency (EPA) has developed a scoring system called the Hazard Ranking System. EPA uses the information collected during the assessment phase of the process to score sites according to the danger they may pose to public health and the environment. Sites that score high enough on the Hazard Ranking System are eligible for the National Priorities List. Once a site is scored and meets the criteria, EPA proposes that it be put on the list. A site may also be proposed for the National Priorities List if the Agency for Toxic Substances and Disease Registry issues a health advisory for the site or if the site is chosen as the state's top priority site.

Table 3.4.11.d shows U.S. Environmental Protection Agency Superfund sites in Arkansas. A Superfund site is an uncontrolled or abandoned place where hazardous waste is located, which may affect local ecosystems and/or people. Nine Arkansas sites are currently on the Superfund National Priority list listed.

Table 3.4.11.d Superfund National Priorities List Sites in Arkansas

Site Name	City
Arkwood, Inc.	Omaha
Cedar Chemical Corporation	West Helena
Midland Products	Birta, Ola
Mid-South Wood Products	Mena
Monroe Auto Equipment Co. (Paragould Pit)	Paragould
Mountain Pine Pressure Treating	Plainview
Ouachita Nevada Wood Treater	Reader
Popile, Inc.	El Dorado
Vertac, Inc.	Jacksonville

Source: U.S. Environmental Protection Agency, http://www.epa.gov/superfund/sites/query/queryhtm/nplfin.htm#AR

Pine Bluff Arsenal

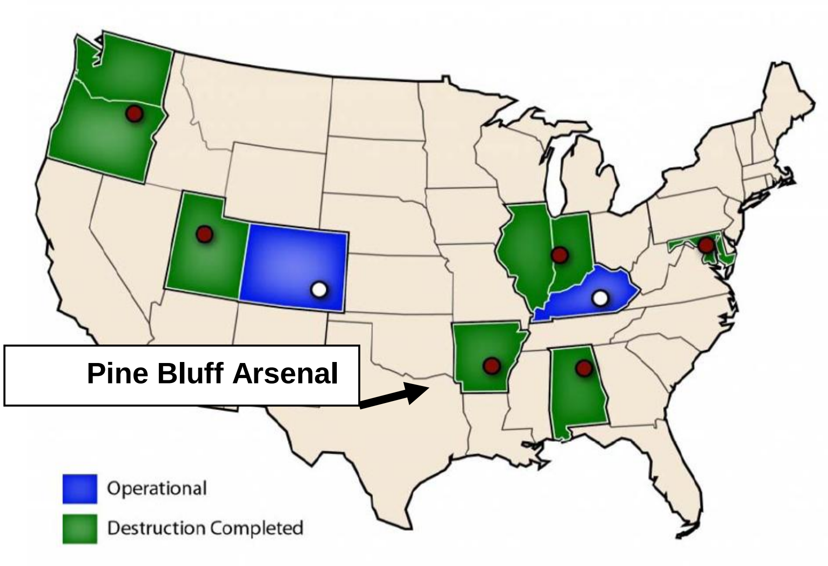
Pine Bluff Arsenal (PBA) is one of nine Army installations in the US that at one time stored chemical weapons. At the time of the 2010 State Plan Update the Pine Bluff Arsenal had not completed the chemical weapons disposal operations. Therefore, it was still considered a potential source for a HAZMAT incident. However, in 2012, decontamination was achieved. As a result, PBA is no longer considered to be an increased risk area for HAZMAT. It should be noted that although decontamination has occurred with respect to the chemical weapons, specific facilities at PBA may meet the threshold for regular reporting requirements under the Community Right to Know Act.

Pine Bluff Arsenal It is located in Jefferson County in southeastern Arkansas. It is 35 miles southeast of Little Rock and eight miles northwest of the city of Pine Bluff. PBA is bordered on the east by the McClellan-Kerr Arkansas River Navigation System and on the west by the Union Pacific Railroad and U.S. Highway 65, making it directly accessible by rail, road, or waterway. PBA is 8 1/2 miles long by 2 3/4 miles wide and covers 14,944 acres.

The Army designed the Pine Bluff Chemical Agent Disposal Facility (PBCDF) to destroy this chemical weapons stockpile, comprising approximately 12 percent of the nation’s original chemical weapons. Chemical weapons disposal operations began at the Arsenal in March 2005 with the GB nerve-agent filled rockets. The second disposal campaign, VX nerve-agent filled rockets, ended February 2008; and the third disposal campaign, VX nerve-agent filled landmines, ended June 2008. Mustard agent-filled ton containers were the fourth and final disposal campaign. Ton container disposal operations began in December 2008 and were completed in November 2010 beginning the closure status. PBCDF began its facility closure phase after the successful completion of the final chemical weapons disposal operations in November 2010. As of April 2012, PBA successfully completed Unventilated Monitoring Tests (UMT). This UMT verifies that decontamination has been achieved so that demolition may proceed. Demolition is expected to be complete in 2013. (Source: KARK 4 News, April 20, 2012 http://arkansasmatters.com/fulltext?nxd_id=532192).

The Chemical Stockpile Emergency Preparedness Program (CSEPP) is a partnership between FEMA and the U.S. Department of the Army that provides emergency preparedness assistance and resources to communities surrounding the Army’s chemical warfare agent stockpiles. According to CSEPP the Pine Bluff chemical stockpile is considered destroyed.

Figure 3.4.11.a CSEPP Map Showing Status of U.S. Army Chemical Stockpiles



Source: FEMA Technological Hazards Division, http://www.fema.gov/technological-hazards-division-0/chemical-stockpile-emergency-preparedness-program:

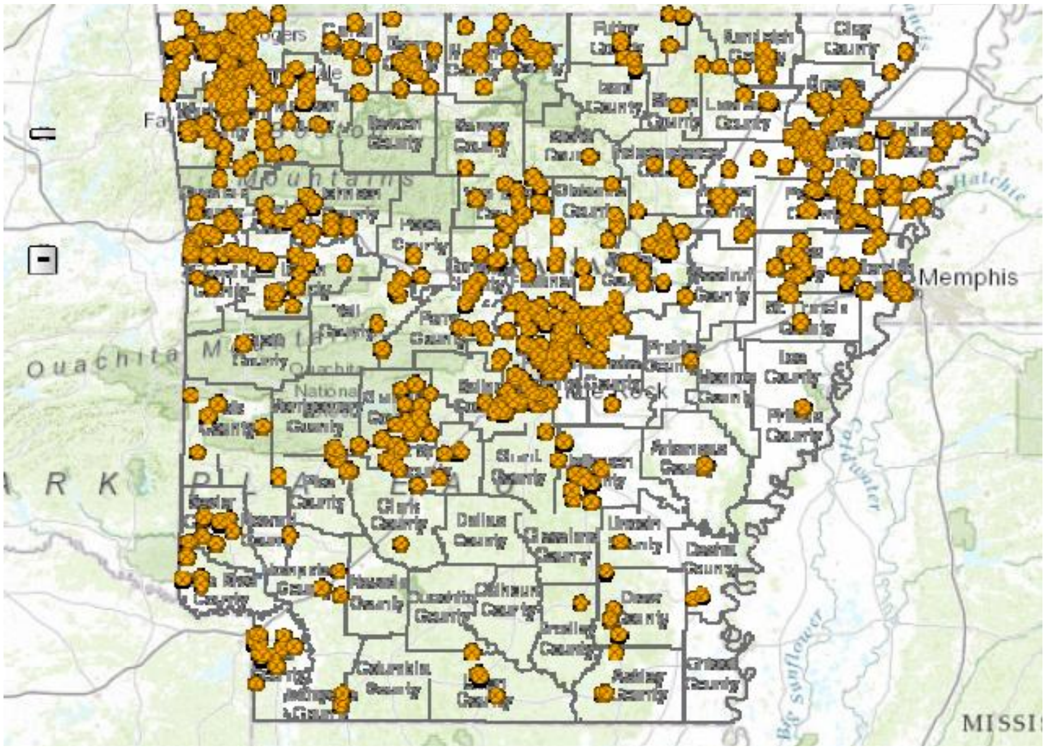
Meth Labs

Meth (methamphetamine) labs present extreme dangers to residents of Arkansas from explosions and exposure to hazardous chemicals. Breathing the fumes and handling substances can cause injury and even death. These labs are considered hazardous waste sites and should only be entered by trained and equipped professionals.

A typical meth lab is a collection of chemical bottles, hoses and pressurized cylinders. The cylinders can take many forms, from modified propane tanks to fire extinguishers, scuba tanks and soda dispensers. The tanks contain anhydrous ammonia or hydrochloric acid – both highly poisonous and corrosive. Labs are frequently abandoned, and the potentially explosive and very toxic chemicals are left behind. Chemicals may also be burned or dumped in woods or along roads.

All regions of Arkansas are considered to be areas affected by meth lab events. The meth production problem is growing and their locations are shifting from isolated, rural facilities to houses, trailers and apartments in more densely populated urban areas. Meth labs have been found in places as small as a bathroom and have been located within every county in Arkansas. The threat is so widespread that Arkansas is one of the leading states in methamphetamine production. The map in **Figure 3.4.11.b** provides the locations of meth contaminated properties in Arkansas.

Figure 3.4.11.b Map of Methamphetamine Contaminated Properties



Source: Arkansas Department of Environmental Quality, 2013
http://www.adeq.state.ar.us/hazwaste/branch_programs/clcc.htm#FAQ

Transportation Hazardous Materials Incidents

Transportation HAZMAT Incidents can occur when HAZMAT are being transported from one location to another in the normal course of business for manufacturing, refining, or other industrial purposes. Additionally, HAZMAT Incidents can occur as hazardous waste is transported for final storage and/or disposal.

The transportation of hazardous wastes is regulated by federal regulatory agencies (U.S. Department of Transportation and U.S. Environmental Protection Agency) as well as Arkansas regulatory agencies (Arkansas Highway Police and Arkansas Department of Environmental Quality (ADEQ)). The ADEQ-Hazardous Waste Division administers the transportation, storage and disposal of hazardous material wastes requiring the most stringent management because of their potential danger to human health and the environment. All hazardous wastes shipped in or through Arkansas must be properly contained and labeled, and transported only by permitted hazardous waste transporters. Arkansas Hazardous Waste Manifest forms must be used as shipping papers to document the shipment of hazardous wastes in or through Arkansas. Hazardous wastes may only be shipped to permitted hazardous waste treatment, storage and disposal facilities (TSDFs).

Highway

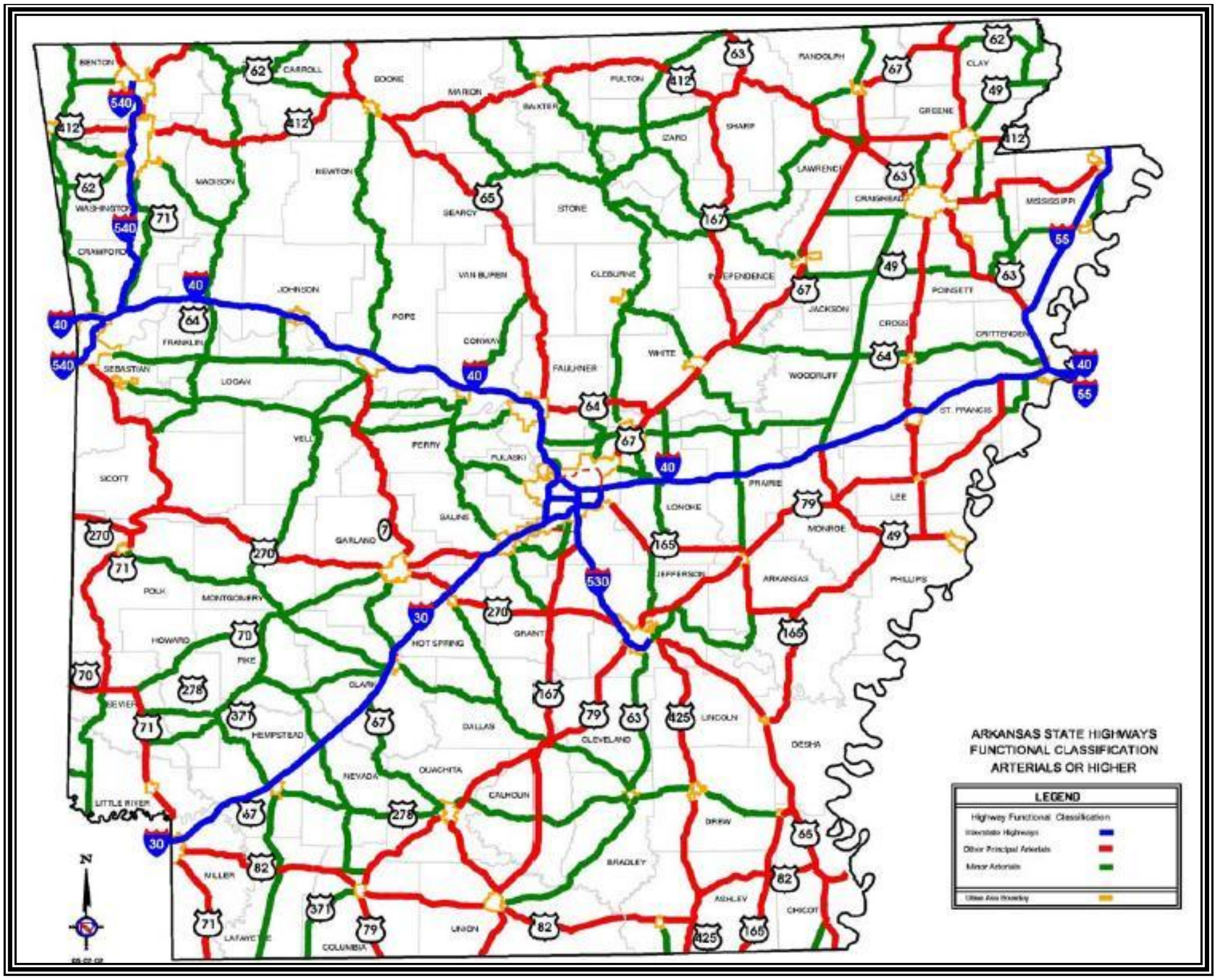
Arkansas has a high level of HAZMAT transported on its highways and interstates every day. Two major interstates flow through the Arkansas borders. Interstate 30 and Interstate 40 intersect Arkansas' largest city and state capital, Little Rock (see **Table 3.4.11.c**). The main corridor of Interstate 40 runs east and west across Arkansas. Interstate 40 connects the east and west coasts of the US starting in Wilmington, NC and ending in Los Angeles, CA. Intestate 30 runs from Little Rock south to Dallas, TX. Both Interstates are used heavily for HAZMAT transportation.

Figure 3.4.11.c I-40 and I-30 Intersect in Little Rock

Source: Arkansas Department of Highway and Transportation

Transportation of HAZMAT on highways, county roads and city streets, involves tanker trucks, trailers and certain types of specialized bulk-cargo vehicles. Because of the distances traveled, it is not surprising that trucks are responsible for the greatest number of HAZMAT events in Arkansas and the rest of the country.

Figure 3.4.11.d Major Highways and Interstates in Arkansas



Source: Arkansas Department of Highway and Transportation

Railway

The volume of HAZMAT moving by rail in the US has more than doubled since 1980, with approximately 1.7 million carloads now moving each year. In 2001, though, only 32 rail accidents resulted in a release of HAZMAT. An astounding 99 percent of rail HAZMAT shipments reached their final destinations without a release caused by an accident. Overall HAZMAT accident rates have fallen 87 percent since 1980 and 30 percent since 1990.

Based on data from the Research and Special Programs Administration (RSPA) of the U.S. Department of Transportation, the railroad rate of unintentional releases of HAZMAT — the vast majority of which are minor leaks from valves and fittings — has fallen by 65 percent since 1980 and 47 percent since 1990. In the ten years from 1992 to 2001, only three persons died because of exposure to HAZMAT in rail transportation, according to RSPA data. The RSPA data also show that trucks have 10 to 15 times as many hazardous material spills as do railroads despite having comparable HAZMAT ton-mileage.

Two types of HAZMAT releases from railroad events are of the most concern: 1) Collisions and derailments that result in large spills or discharges, or air releases during fires; and, 2) Releases from leaks in fittings, seals, or relief valves, and improper closure or defective equipment. These releases account for approximately 70 percent of all railroad-related incidents each year.

Tank cars used to transport HAZMAT must meet strict U.S. DOT specifications. For example, they must be equipped with pressure relief devices (to protect the tank in the event of fire) and double shelf couplers (designed to prevent tank punctures by a coupler). Commodities that pose a higher risk in transportation are transported in stronger tanks with thermal protection systems and steel “head shields” at each end of the car (providing further protection against puncture).

Figure 3.4.11.e Railway Hazardous Materials Incident

Source: 2010 State Hazard Mitigation Plan

The alternative is to ship hazardous material by truck instead of rail, but rail is 16 times safer than truck. Based on the best information between 1981 and 2004, there were 10 deaths related to HAZMAT transported by rail, and 278 deaths involving HAZMAT transported by truck.

Railroads carry an estimated 22 percent of the chlorine that is produced in the US and 66 percent of the chlorine that is transported. Railroads carry about 1.7 million carloads of HAZMAT annually, including about 35,000 carloads of chlorine. Chlorine is used to purify more than half of the nation’s water supplies and is found in 85 percent of all pharmaceuticals.

Federal Railroad Administration: The Federal Railroad Administration (FRA) was created by the Department of Transportation Act of 1966 (49 U.S.C. 103, Section 3(e)(1)). The purpose of FRA is to: promulgate and enforce rail safety regulations; administer railroad assistance programs; conduct research and development in support of improved railroad safety and national rail transportation policy; and consolidate government support of rail transportation activities. Today, the FRA is one of ten agencies within the U.S. Department of Transportation concerned with intermodal transportation. It operates through seven divisions under the offices of the administrator and deputy administrator.

The movement of HAZMAT throughout the railroad industry provides an excellent example of the dynamic interrelationship between shippers, carriers, freight car builders, maintenance and repair companies, and federal, state, and tribal governments. Under authority delegated by the secretary of transportation, the Federal Railroad Administration administers a safety program that oversees the movement of HAZMAT (including dangerous goods), such as petroleum, chemical, and nuclear products, throughout the nation's rail transportation system, including shipments transported to and from international organizations. The Federal Railroad Administration also has authority to oversee the movement of a package marked to indicate compliance with a federal or international HAZMAT standard, even if such a package does not contain a hazardous material. Their current HAZMAT safety regulatory program includes the following items:

- Hazardous Materials Incident Reduction Program,
- Tank Car Facility Conformity Assessment Program,
- Tank Car Owner Maintenance Program Evaluations,
- Spent Nuclear Fuel and High-Level Nuclear Waste Program,
- Railroad Industrial Hygiene Program,
- Rulemaking, Approvals, and Exemptions,
- Partnerships in Domestic and International Standards-Related Organizations (e.g., AAR, ASME, TDG/CGSB), and
- Education, Safety Assurance, and Accident Investigation.

Arkansas Railways: Arkansas is served by over 25 railroad companies. There are three Class I railroads providing service with long-haul deliveries to national market areas and intermodal rail/truck service providers:

- Burlington Northern & Santa Fe Railway,
- Kansas City Southern Railway, and
- Union Pacific Railroad

The largest Class I railroad in Arkansas, in terms of miles of track, is the Union Pacific Railroad. The remaining 23 are Class III railroads, commonly referred to as short line railroads providing switching services, railcar spotting and feeder railcar services to the Class I railroads.

Table 3.4.11.e Arkansas Railway Information

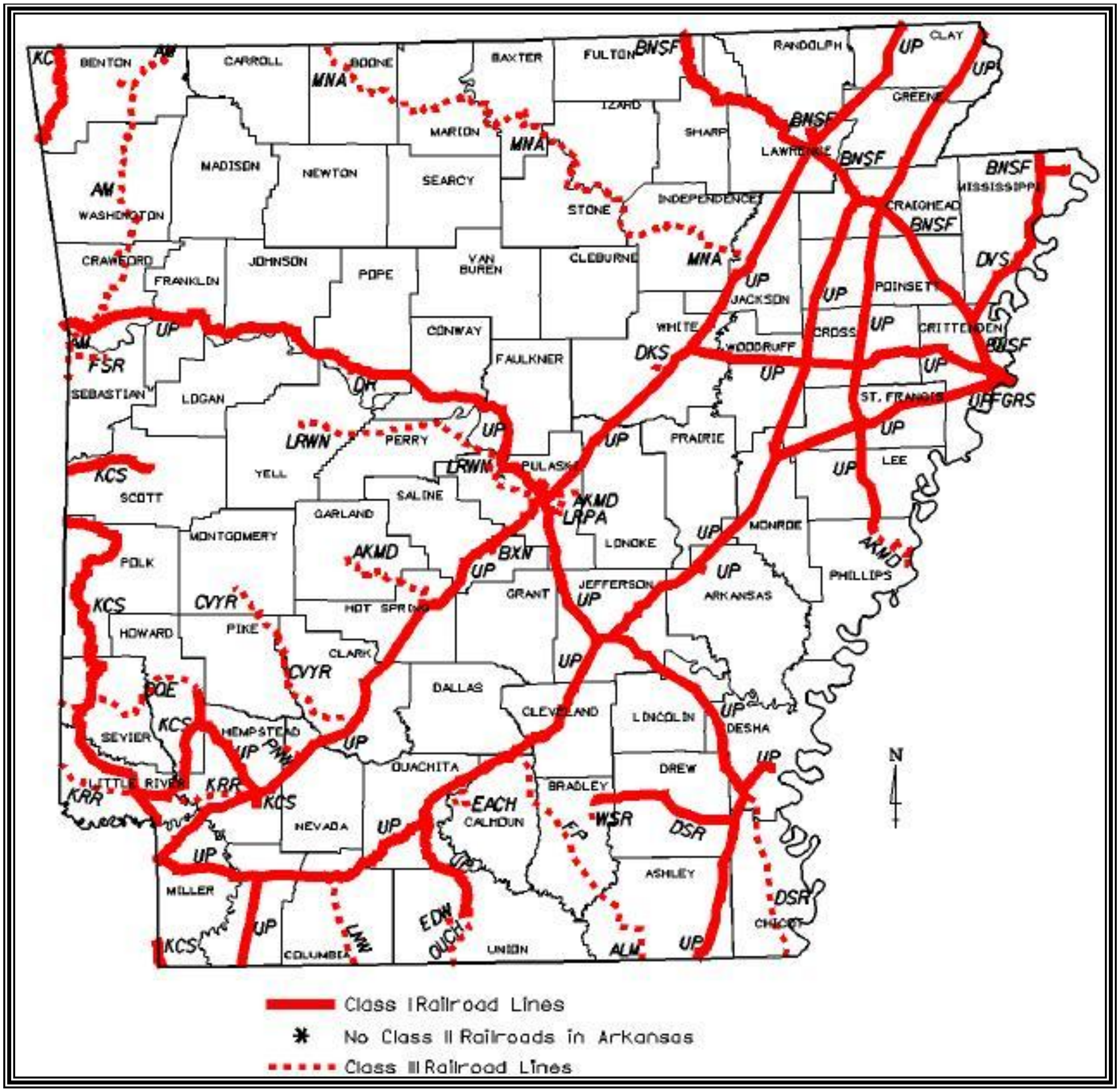
Type of railroad	Number of railroads		Miles operated[2] United States	Miles operated[2] Arkansas		
	United States	Arkansas		Excluding trackage rights	Including trackage rights	Percent of U.S. total
Total	562	25	172,101	2,761	3,674	2.1
Class I	8	3	120,597	1,864	2,714	2.3
Regional	35	1	20,978	182	182	0.9
Local	304	16	21,512	606	669	3.1
Switching and terminal	213	5	7,425	109	109	1.5
Canadian[1]	2	0	1,589	0	0	0.0

Railroad	Miles operated in Arkansas[1]
Class I railroads	2,714
Burlington Northern and Santa Fe Railway Company	1,045
Kansas City Southern Railway Company	217
Union Pacific Railroad Company	1,452
Regional railroads	182
Missouri & Northern Arkansas Railroad	182
Local railroads	669
Arkansas & Missouri Railroad	122
Arkansas, Louisiana & Mississippi Railroad	70
Arkansas Midland Railroad Company	69
Caddo Valley Railroad Company	53
De Queen & Eastern Railroad	45
Delta Southern Railroad	89
East Texas Central Railroad	53
Kiamichi Railroad Company	20
Little Rock & Western Railway, L.P.	79
Louisiana & North West Railroad Company	25

Source: 2010 State Hazard Mitigation Plan

The majority of the rail freight shipped in Arkansas is considered bulk cargo, which consists of basic commodities in loose form and large quantities. The foremost inbound commodities by rail are coal and grain. Dominant outbound commodities transported by rail are stone, riprap and primary forest materials.

Figure 3.4.11.f Class I, II, and III Rail Lines in Arkansas



Source: Union Pacific Railroad

Railroads are considered to be a safe way to transport HAZMAT throughout Arkansas. Thanks to massive infrastructure and equipment investments, safer operating procedures and improvements in tank car design, railroads keep improving their HAZMAT safety records. Railroads, tank car owners, tank car builders and chemical companies engage in continuing cooperative programs to improve HAZMAT transportation safety.

The principal freight transportation services provided by Class I railroads are long-haul deliveries to national market areas, customer support services and freight exchanges at international ports of entry. They also arrange for overseas shipments and transportation of goods between Canada, Mexico and the United States.

Table 3.4.11.f Class I Mainline Track Mileage

Railroad	Track Mileage	% of Total
Union Pacific	1,464	77%
Kansas City Southern	221	12%
Burlington Northern and Santa Fe	208	11%

Source: 2010 State Hazard Mitigation Plan

Union Pacific is Arkansas' largest railroad, serving the state's food processing, forest products and poultry industries. Major commodities hauled by UP in the state include soybeans, cotton, rice, bauxite, manganese and glass. The railroad is a vital link for western coal, used by Arkansas Power & Light electrical generating plants at Newark and White Bluff. In addition to Arkansas Power and Light, Union Pacific's customers in Arkansas include Minnesota Mining & Manufacturing Company, Union Corporation and Georgia Pacific. The chief service area for Union Pacific Railroad includes the states west of the Mississippi River with major destination points in the western states of California and Washington, and the Gulf states of Texas and Louisiana.

Figure 3.4.11.g Union Pacific Routes

Source: Union Pacific Railroad

North Little Rock is the hub of Union Pacific's operations in Arkansas, where the railroad operates the $40 million Downing B. Jenks locomotive repair shop, the largest and most modern on the system. North Little Rock is also the site of the system's second largest freight car classification yard. In addition to Union Pacific's facilities in Little Rock, Union Pacific operates a $70 million state-of-the-art, 600-acre intermodal facility at Marion, 10 miles west of Memphis, and a classification yard at Pine Bluff. Amtrak operates passenger train service over Union Pacific's main line through the state, connecting St. Louis with Texas.

The North Little Rock locomotive overhaul and maintenance facilities are the largest of their kind on the Union Pacific Railroad (UPRR) and among the largest in the world. The Jenks Shop locomotive complex employs more than 1,100 skilled and dedicated workers, who perform heavy maintenance on a fleet of 7,000 locomotives that pull more than 2,000 trains each day throughout the western two-thirds of the United States.

The majority of the complex is dominated by the main Jenks Shop heavy locomotive repair facility, with more than 272,000 square feet of space, 227,000 of which is devoted to the main shop floor.

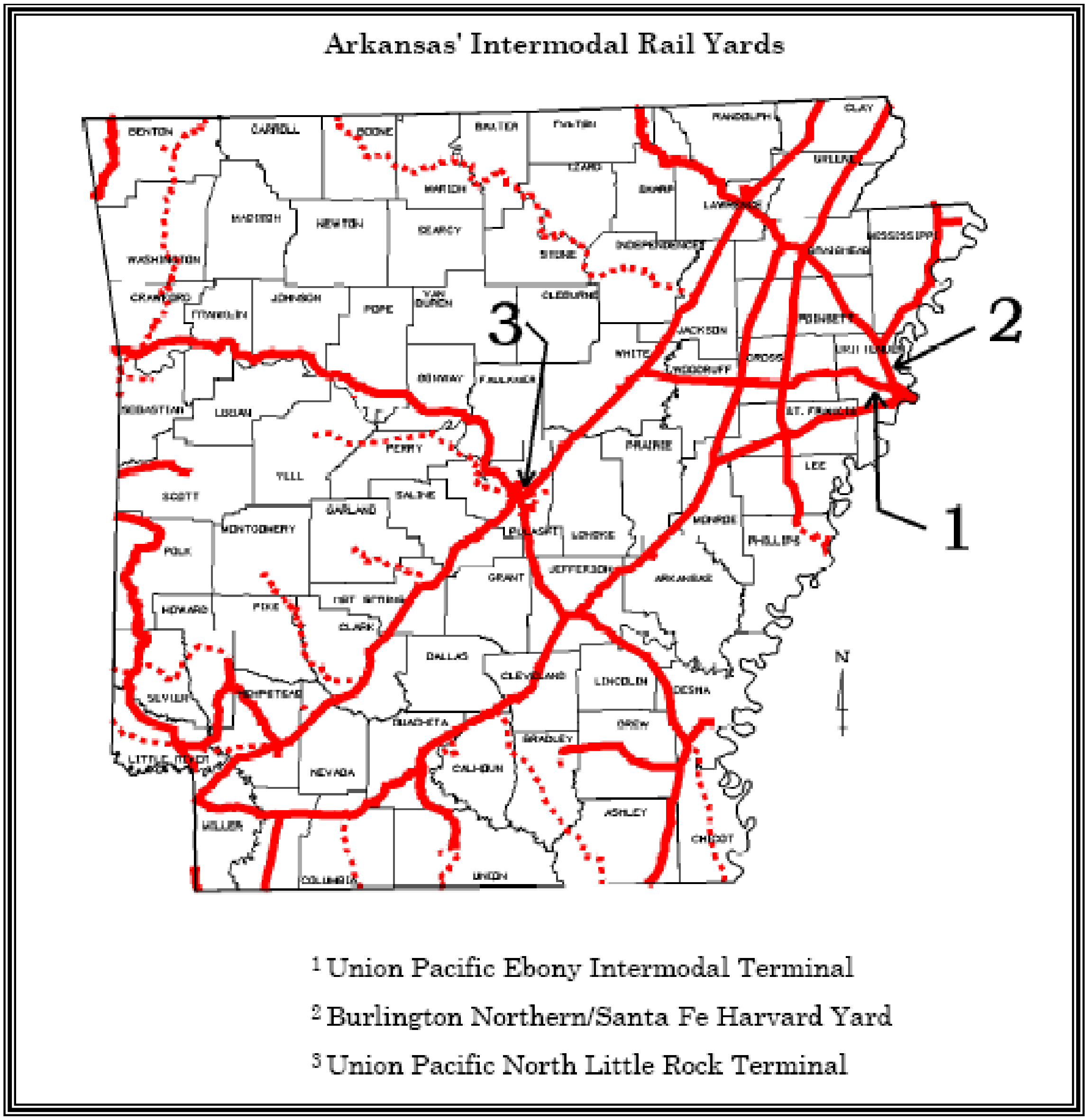
Three types of intermodal rail transportation services occur in Arkansas: TOFC (trailer-on-flatcar) shipments, COFC (container-on-flatcar) movements, and transload services. An example of an in-state trans-load shipment is finished lumber trucked to a warehouse for temporary storage, then loaded into a railcar for shipment to market. Three intermodal rail/truck yards are operated by Class I railroads in Arkansas. The map below shows the locations of these key intermodal rail yards in Arkansas.

Marion Intermodal Railport: The Marion Intermodal Railport in Marion, Arkansas is one of the largest railports in the world. The facility can handle more than 375,000 trailers or containers annually. Its ramp was designed to hold 326 railcars. Additionally, the terminal's storage facilities will store 748 railcars and its parking capacity will accommodate 2,600 trailers and containers. Railports are where the rail systems meet trucking, water and pipeline transportation. HAZMAT may be transported by several modes before reaching the rail portion of the trip. When it comes time to load materials from one mode to rail, it takes place at an intermodal yard. Containers of materials of

Figure 3.4.11.h. Intermodal Rail Yard in Marion

Source: 2010 State Hazard Mitigation Plan all types are transferred from one mode to another. This transfer of modes increases the chances of a HAZMAT event occurring.

Figure 3.4.11.i Arkansas' Intermodal Rail Yards



Source: Union Pacific Railroad

Pipelines

There are over 30,000 miles of hazardous liquid and natural gas pipelines in Arkansas. Pipelines carry gas, oil and other liquids. These pipelines include large-diameter lines carrying energy products to population centers, as well as small-diameter lines that may deliver natural gas to businesses and households into suburban neighborhoods.

According to the U.S. Department of Transportation, pipelines are by far the safest way to transport petroleum products and are recognized as the most economical way of distributing vast quantities of oil from production fields to refineries and from refineries to consumers. Nevertheless, they can and sometimes do rupture, posing serious risks. The Arkansas Department of Emergency Management encourages everyone in Arkansas to learn about pipelines and the products they carry, as well as a few simple steps that can be taken to help ensure pipeline safety in the community.

Figure 3.4.11.j Pipeline System

Source: 2010 State Hazard Mitigation Plan

Arkansas Pipeline Safety Office: Pipeline safety laws fall under federal authority in Title 49, United States Code. Chapter 601 of Title 49 establishes the framework for promoting pipeline safety via federal authority for regulation of inter-state pipeline facilities and federal delegation to the state for all or part of the responsibility for intra-state pipeline facilities under an annual certification or agreement. Arkansas statute §23-15-204 empowers the Arkansas Public Service Commission to obtain a certification with the federal government to regulate gas pipeline safety of intra-state natural gas operators. This responsibility is carried out within the Commission's General Staff by the Gas and Water Section's Pipeline Safety Office. The Pipeline Safety Office utilizes a staff of six inspectors under the direction of the Chief, Pipeline Safety to enforce pipeline safety rules. The pipeline safety rules are contained in the Arkansas Gas Pipeline Code.

The Pipeline Safety Office works closely with the Federal Office of Pipeline Safety (OPS). OPS is directly responsible for inter-state gas and liquid hydrocarbon pipelines in the State.

Arkansas is in OPS's Southern Region located in Atlanta, GA. Other states in the Southern Region include Mississippi, Tennessee, Alabama, Georgia, Florida, North Carolina, South Carolina, Kentucky and the U.S. Territory of Puerto Rico. Each year, OPS evaluates the Pipeline Safety Office's program for compliance with federal certification requirements. The Pipeline Safety Office consistently receives the highest evaluations in the nation highlighted by a perfect score during the most recent evaluation. Federal pipeline safety regulations require pipeline operators to conduct continuing educational programs to educate a wide variety of stakeholders -- including the public, government agencies, local officials and excavators -- on pipeline safety issues.

Over 65 percent of the counties within Arkansas have a considerable level of threat to a pipeline incident whether accidental or human caused. The map in **Figure 3.4.11.k** and **Figure 3.4.11.l** shows the locations of these major pipelines within Arkansas.

Figure 3.4.11.k Major Pipelines within Arkansas

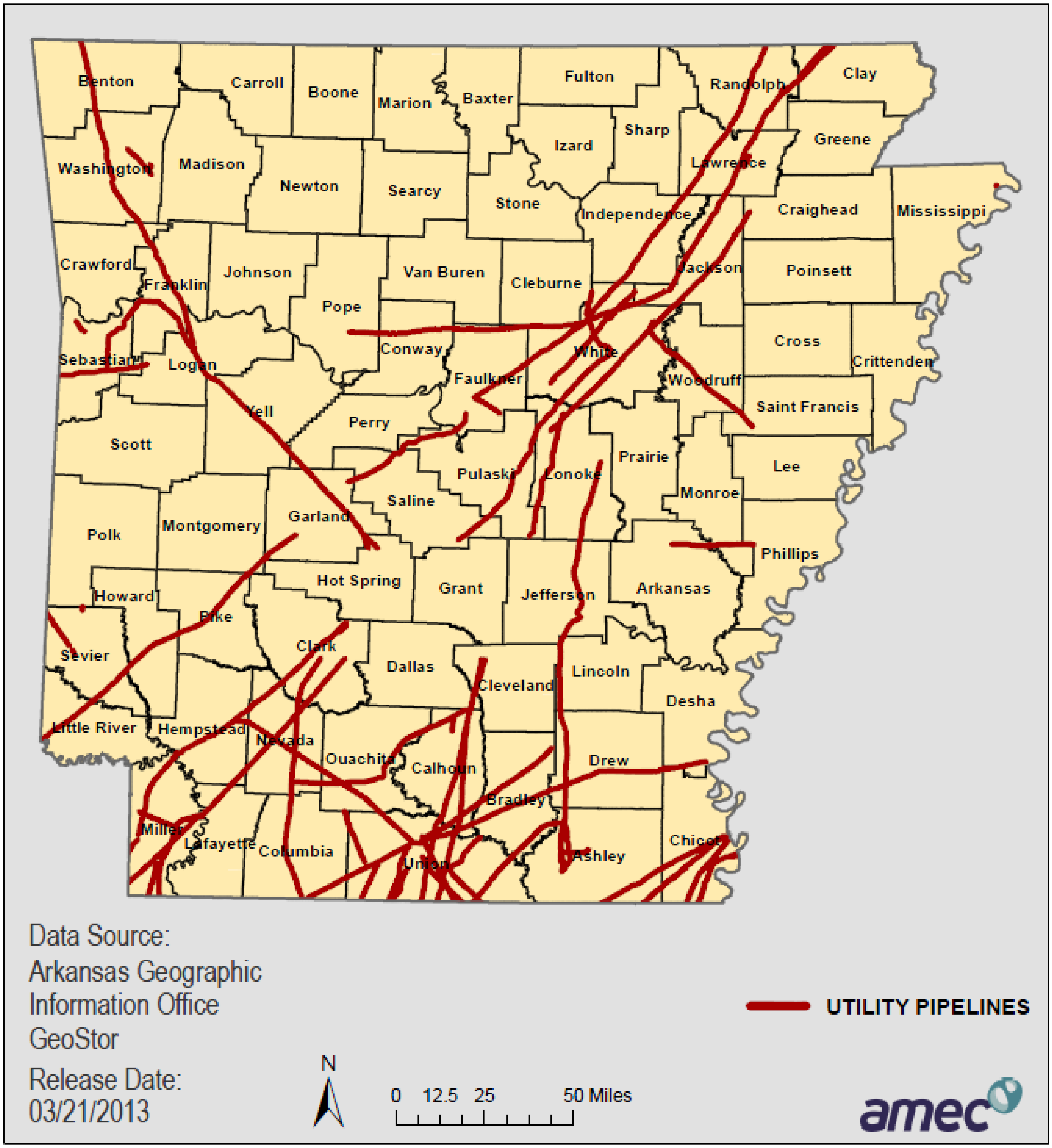
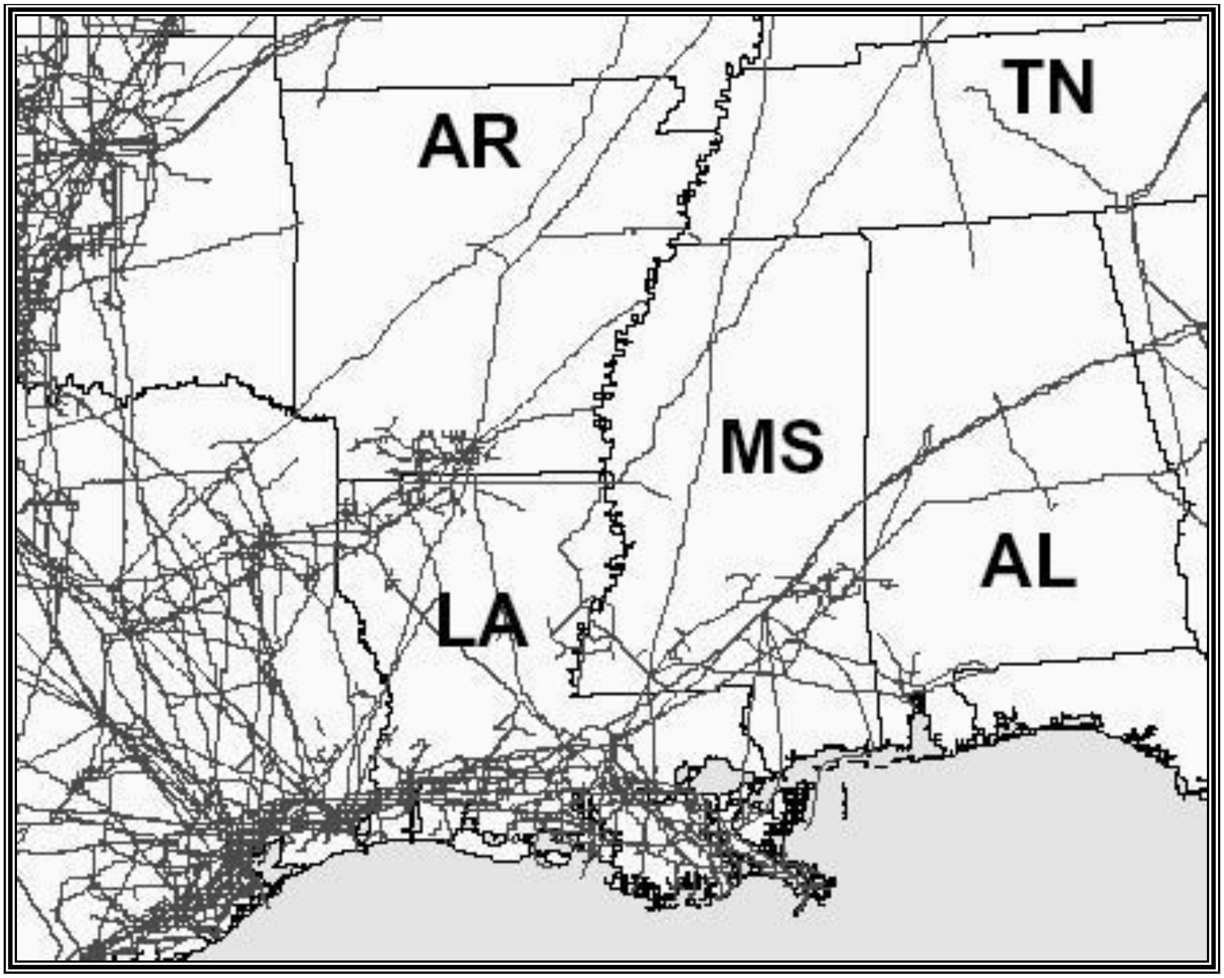


Figure 3.4.11.l Natural Gas Pipelines in Arkansas



Source: OPS

Table 3.4.11.k provides the 2011 mileage of Arkansas pipelines by pipeline system as reported by the U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration's Pipeline Safety Stakeholder Communications.

Table 3.4.11.g Arkansas Pipeline Mileage

Pipeline System	Mileage
Gas Transmission Line	8,133
Hazardous Liquid Line	1,805
Gas Gathering Line	129
Gas Distribution	20,104
Total	**30,171**

Source: U.S. Department of Transportation, Pipeline Safety Stakeholder Communications, http://primis.phmsa.dot.gov/comm/reports/safety/AR_detail1.html?nocache=3112,
* Gas distribution service lines (the connection between the distribution line and the end user) are not included in the gas distribution mileage. The total number of miles for that service is 676,192.

All mileages are for 2011 and are approximate as some data sources may not have contained a complete record of state pipeline mileage.

Table 3.4.11.h shows the breakdown of gas transmission line and hazardous liquid line mileage (the first two categories in **Table 3.4.11.g**) by county.

Table 3.4.11.h Gas Transmission Line and Hazardous Liquid Line Mileage by County.

County	Gas Miles	Liquid Miles	Percent of Total
Arkansas	117	0	1.10%
Ashley	199	0	1.90%
Baxter	43	0	0.40%
Benton	150	11	1.60%
Boone	42	0	0.40%
Bradley	95	0	0.90%
Calhoun	53	139	1.90%
Carroll	42	0	0.40%
Chicot	365	20	3.80%
Clark	242	0	2.40%
Clay	110	67	1.70%
Cleburne	45	3	0.40%
Cleveland	39	58	0.90%
Columbia	168	80	2.40%
Conway	129	0	1.20%
Craighead	82	29	1.10%
Crawford	19	0	0.20%
Crittenden	87	14	1.00%
Cross	7	0	0.00%
Dallas	24	20	0.40%
Desha	27	0	0.20%
Drew	129	0	1.20%
Faulkner	180	51	2.30%
Franklin	269	0	2.60%
Fulton	0	18	0.10%
Garland	77	36	1.10%
Grant	142	113	2.50%
Greene	60	80	1.40%
Hempstead	142	0	1.40%
Hot Spring	292	0	2.90%
Howard	71	17	0.80%
Independence	26	63	0.90%
Izard	61	23	0.80%
Jackson	277	93	3.70%
Jefferson	225	16	2.40%
Johnson	109	0	1.10%
Lafayette	58	1	0.50%
Lawrence	141	46	1.80%
Lee	90	0	0.90%
Lincoln	112	0	1.10%
Little River	45	18	0.60%
Logan	145	0	1.40%
Lonoke	114	80	1.90%
Madison	128	0	1.20%
Marion	21	0	0.20%
Miller	207	0	2.00%
Mississippi	128	0	1.20%
Monroe	22	0	0.20%

County	Gas Miles	Liquid Miles	Percent of Total
Montgomery	6	6	0.10%
Nevada	201	0	2.00%
Ouachita	129	0	1.20%
Perry	12	1	0.10%
Phillips	162	0	1.60%
Pike	42	26	0.60%
Poinsett	55	0	0.50%
Polk	50	0	0.50%
Pope	141	0	1.40%
Prairie	19	0	0.20%
Pulaski	197	143	3.40%
Randolph	99	27	1.20%
Saint Francis	69	35	1.00%
Saline	107	16	1.20%
Scott	10	0	0.10%
Sebastian	209	2	2.10%
Sevier	40	14	0.50%
Sharp	18	0	0.10%
Stone	24	0	0.20%
Union	316	210	5.20%
Van Buren	49	0	0.40%
Washington	206	0	2.00%
White	476	206	6.80%
Woodruff	105	22	1.20%
Yell	80	0	0.80%
Total	8,210	1,804	100%

Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration Table extracted from: http://primis.phmsa.dot.gov/comm/reports/safety/AR_detail1.html | Report generated on: 03/04/13

Water Transported HAZMAT Hazard Profile

The State Hazard Mitigation Team views water transported HAZMAT events as an extremely low priority to the State in comparison with other HAZMAT related hazards. The APDMAC has decided not to include a detailed section of water transported HAZMAT events in the mitigation planning efforts at this time. The reason for this decision is that the Planning committee recognizes that historically, Arkansas has virtually no major water transported HAZMAT events on record. No accounts have been found of significant loss of life or property. A HAZMAT event by water does not pose a risk of vulnerability or impact on the State of Arkansas at this time. In the future, should the planning committee find otherwise, a section on water transported HAZMAT events will be added.

Air Transported HAZMAT Hazard Profile

The State Hazard Mitigation Team views air transported HAZMAT events as the lowest priority to the State of Arkansas in comparison to other HAZMAT related hazards. The Planning committee has decided not to include a detailed section of air transported HAZMAT events in the mitigation planning efforts at this time. The reason for this decision is that the Planning committee recognizes that historically, Arkansas has virtually no major air transported HAZMAT events on record. No accounts have been found of significant loss of life or property. A HAZMAT event by air does not pose a risk of vulnerability or impact on the State of Arkansas at this time. In the future, should the Planning committee find otherwise, a section on air transported HAZMAT events will be added.

Previous Occurrences

Fixed Facilities

Commercial Facility Incidents

According to ADEM, in 2012, there were 143 Fixed Facility HAZMAT Incidents reported. In 2011, there were 122 incidents reported.

Specific Incidents: Commercial Facilities

- ***June 2010:*** In Fayetteville at the University of Arkansas emergency personnel reported cleaning up approximately 500 milliliters of phenol that spilled from a broken container overnight at the Plant Sciences Building on Maple Street. Officials reported no injuries as a result of the spill.
- ***February 21, 2005:*** The NRC received a report from Maytag of Searcy, AR of a 2,500-gallon release of muriatic acid from a storage tank into a storm water ditch. The incident was discovered on February 21, 2005 at 12:30 PM (CST). The material entered a storm water ditch which was a tributary to the Little Red River. There were no reports of any fires, injuries or evacuations.
- ***January 2, 2005:*** The National Response Center was notified of a fire that occurred at the Teris Company facility in El Dorado, AR. The fire started shortly after 8:00 AM in a warehouse that stores 4,000-5,000 drums of hazardous waste. Local fire and police responded and ordered an evacuation of homes that could possibly be impacted by the smoke and fumes. No injuries or fatalities were reported. No major arteries were closed, however local roads near the facility were shut down. There was no threat of any water supply contamination. The fire was allowed to burn itself out to keep firefighters out of the vicinity of the hazardous waste.
- ***January 13, 1999:*** An explosion of a naptha tank at the Cross Oil Refinery located in Smackover, Arkansas. The incident resulted in the death of three contractor workers who were working on the tank valve when the explosion occurred. The fire was extinguished with no off-site impact reported. The cause of the fire and explosion are unknown and under investigation.
- ***May 8, 1997:*** Shortly after 1:00 PM clouds of foul-smelling smoke began pouring from an herbicide and pesticide packaging plant in West Helena, Arkansas. An alert was sounded, employees evacuated, and the West Helena fire department was called. As three firefighters prepared to enter the plant, the chemical compounds exploded, collapsing a solid concrete block wall, and killing all three firefighters. As the odorous smoky cloud drifted away from the plant, authorities ordered residents in a 2-mile area downwind of the plant to evacuate and those in the 2- to 3-mile zone to shelter in place

Meth Lab Hazardous Materials Incidents

According to the U.S. Drug Enforcement Administration, from 2004 to 2012, there have been 5,100 documented methamphetamine lab incidents in the State of Arkansas. **Table 3.4.11.i** provides the number in each year.

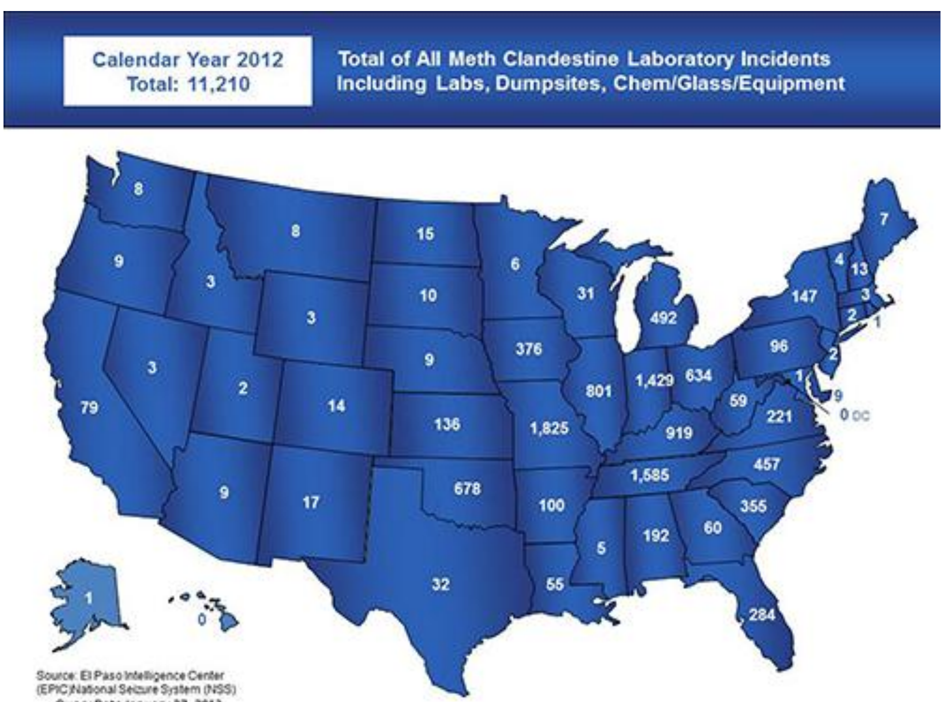
Table 3.4.11.i Number of Arkansas Methamphetamine Incidents Per Year, 2004-2012

Year	# of Incidents
2004	1,339
2005	692
2006	432
2007	368
2008	401
2009	662
2010	814
2011	292
2012	100
Total	**5,100**

Source: U.S. Drug Enforcement Agency Website, http://www.justice.gov/dea/resource-center/meth-lab-maps.shtml

The map in **Figure 3.4.11.m** shows that in the 2012 calendar year, there were 100 Methamphetamine Lab incidents in the State of Arkansas.

Figure 3.4.11.m 2012 U.S. Methamphetimine Lab Incidents, Totals by State



Source: U.S. Drug Enforcement Agency Website, http://www.justice.gov/dea/resource-center/meth-lab-maps.shtml

Specific Incidents-Meth Lab

- ***January 9, 2009:*** Officers noticed the light on after hours and walked into a funeral home through an open door. Inside, police said they found all the components necessary to build a meth lab. Officers arrested an employee at the funeral home, when he returned. The man faced charges of possession of drug paraphernalia with intent to manufacture, possession of drug paraphernalia with intent to use, manufacture of methamphetamine, and possession of pseudoephedrine with intent to manufacture.
- ***July 31, 2006:*** A call to report a structure fire led Pulaski County officials to a burning meth lab. The fire happened on Russenberger Road in Little Rock just before 7:30 AM. A deputy driving through the area spotted heavy smoke and found a mobile home engulfed in flames. During a search of the property authorities discovered meth ingredients, a small amount of the finished product and several firearms, including four silencers and a sawed-off shotgun. Several suspects were arrested and no injuries were reported.
  June 21, 2005: A Jonesboro man died after he suffered a concussion and breathed in toxic fumes during a methamphetamine lab explosion. The firefighters said they found the man after being sent to a suspicious fire in the woods.

Figure 3.4.11.n ***June 21, 2005 Meth Explosion Site***

Source: 2010 State Hazard Mitigation Plan

- ***April 2, 2005:*** In North Little Rock, three children were pulled out of a meth lab fire after an explosion. Fire crews found a meth lab in the bedroom where the fire started. The children were taken to a local hospital where they were treated and released.
- ***March 25, 2005:*** A house exploded in downtown Lonoke. The heat from the fire was so intense that it slightly melted the wall of the Terminex business next door. Officials believe the meth lab was being operated in the laundry room, which is just walking distance from a hot water heater. Because of its proximity to the meth lab, they believe the heat set off the explosion.

- ***March, 2004:*** Five people were injured when a home in Little Rock exploded because of an active meth lab.
- ***October 3, 2003:*** An explosion echoed through the Cherrywood addition in Sherwood the result of a meth lab gone awry. The fire was caused by the ignition of chemicals used in the manufacturing of methamphetamine, according to a press release from the Sherwood, Arkansas police department. No one was in the house when officials arrived. Shortly after the fire, the SPD received a call concerning a man on Marlar Avenue who was severely burned. The components of a meth lab were found in the man's car, which then ignited while parked on Marlar Avenue. Burned skin hung from the man, and the sight and sound indicated that it was a chemical burn. Because Hale's car contained meth chemicals, several houses on Marlar were evacuated until the chemicals were disposed of.

Transportation Incidents

The U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration's Hazmat Intelligence Portal includes a HAZMAT Incident Report Database for transportation-related HAZMAT incidents. Incidents from this database were retrieved for the 10-year period from 2/18/2003 to 2/18/2013. During this time frame, there were 1,715 transportation HAZMAT incidents in Arkansas that resulted in 1 fatality, 23 injuries requiring hospitalization, 3,210 people to be evacuated and 337 hours of closure of a main transport artery. The breakdown by mode of transportation follows:

- Highway, 1,606
- Rail: 77
- Air: 30
- Water: 2

Table 3.4.11.j provides county-level summary data.

Table 3.4.11.j U.S. Dept. of Transportation Hazardous Materials Incidents, 2003-2013

Incident County	Highway	Rail	Air	Water	Total Amount of Damages	Total Hazmat Fatalities	Total Hazmat Hospitalized Injuries	Total Evacuated	Hours Major Artery Closed
Arkansas	4	0	0	0	$84,255	0	0	4	3
Ashley	7	0	0	0	$0	0	0	0	0
Baxter	5	0	0	0	$0	0	0	0	0
Benton	49	1	0	0	$777,303	0	0	0	17
Boone	36	0	0	0	$4,056	0	0	0	0
Calhoun	1	0	0	0	$850	0	0	0	0
Carroll	3	0	0	0	$124,000	0	0	0	0
Chicot	1	0	0	0	$6,455	0	0	0	0

Incident County	Highway	Rail	Air	Water	Total Amount of Damages	Total Hazmat Fatalities	Total Hazmat Hospitalized Injuries	Total Evacuated	Hours Major Artery Closed
Clark	2	1	0	0	$17,300	0	0	0	1
Clay	7	0	0	0	$4,320	0	0	0	0
Cleburne	2	0	0	2	$206,751	0	0	0	5
Cleveland	1	0	0	0	$0	0	0	0	0
Columbia	1	1	0	0	$10	0	0	0	0
Conway	2	0	0	0	$501	0	0	0	0
Craighead	88	0	6	0	$223,293	0	0	0	2
Crawford	28	4	0	0	$22,047	0	1	0	1
Crittenden	87	6	0	0	$67,736	0	0	10	2
Dallas	2	0	0	0	$2,500	0	0	0	0
Desha	1	0	0	0	$11,000	0	0	0	0
Drew	11	0	0	0	$1,950	0	0	0	0
Faulkner	18	0	0	0	$5,075	0	0	0	0
Franklin	2	0	0	0	$98,263	0	0	0	0
Fulton	2	1	0	0	$234,465	0	0	0	0
Garland	24	0	1	0	$6,770	0	0	0	0
Grant	3	0	0	0	$87,338	0	0	0	3
Hempstead	6	0	0	0	$67,700	0	0	0	0
Hot Spring	9	0	0	0	$159,292	0	0	153	0
Independence	3	0	0	0	$114,000	0	0	31	9
Jackson	8	0	0	0	$607,164	0	0	0	28
Jefferson	25	17	0	0	$379,249	0	0	10	12
Johnson	5	0	0	0	$130,500	0	0	0	0
Lafayette	1	0	0	0	$990	0	0	0	0
Lawrence	5	2	0	0	$2,344,100	0	0	800	96
Lee	1	0	0	0	$110,000	0	0	0	0
Lincoln	1	0	0	0	$0	0	0	0	0
Little River	3	3	0	0	$28,600	0	0	2	0
Logan	2	0	0	0	$36,000	0	0	0	0
Lonoke	3	0	0	0	$40,500	0	0	0	0
Marion	1	0	0	0	$28,000	0	0	0	0
Miller	67	2	0	0	$222,452	1	20	1028	36
Mississippi	19	1	0	0	$15,735	0	0	0	0
Monroe	1	0	0	0	$0	0	0	0	0
Montgomery	1	0	0	0	$96,452	0	0	1	16
Nevada	9	1	0	0	$200,681	0	0	0	4

Incident County	Highway	Rail	Air	Water	Total Amount of Damages	Total Hazmat Fatalities	Total Hazmat Hospitalized Injuries	Total Evacuated	Hours Major Artery Closed
Ouachita	16	0	0	0	$102,330	0	0	0	5
Perry	2	0	0	0	$317,516	0	0	0	8
Phillips	3	0	0	0	$8,699	0	0	0	0
Poinsett	3	0	0	0	$41,998	0	0	0	0
Polk	7	0	0	0	$361,888	0	0	0	0
Pope	7	0	0	0	$51,990	0	0	0	0
Prairie	3	0	0	0	$12,100	0	0	0	0
Pulaski	760	30	9	0	$1,271,611	0	0	165	41
Randolph	1	0	0	0	$53,000	0	0	0	0
Saint Francis	13	0	0	0	$10,600	0	0	0	0
Saline	4	0	0	0	$452,334	0	0	306	10
Scott	1	0	0	0	$5,850	0	0	0	0
Searcy	1	0	0	0	$151,650	0	0	0	0
Sebastian	66	0	3	0	$48,317	0	0	0	0
Sevier	1	1	0	0	$17,710	0	0	695	0
Sharp	12	1	0	0	$329,901	0	1	0	0
Stone	1	0	0	0	$560	0	0	0	0
Union	69	5	0	0	$463,720	0	1	0	38
Van Buren	2	0	0	0	$68,600	0	0	0	0
Washington	67	0	11	0	$12,396	0	0	0	0
White	8	0	0	0	$423,850	0	0	5	0
Woodruff	2	0	0	0	$0	0	0	0	0
Yell	0	0	0	0	$0	0	0	0	0
Total	**1,606**	**77**	**30**	**2**	**$10,774,273**	**1**	**23**	**3,210**	**337**

Specific Incidents: Highway

- **October 18, 2006:** A tractor-trailer containing 22 tons of hot oil used to make asphalt had an accident in Pine Bluff, Arkansas which resulted in it leaking oil into a ditch and onto the road. No injuries were reported, but part of the street was closed for the cleanup.
- **August 26, 2006:** An overturned tanker in North Little Rock caused a major fuel spill and backup on Interstate 440. The effects were still being felt on the roadways hours after the accident. It happened just after 10 AM when a truck overturned in the westbound lanes of 440 near Highway 70. Something caused the truck to overturn, unleashing nearly 7,500 gallons of fuel across the highway. Fire and HAZMAT crews were on the scene working to try to stop the spill, but were only able to reduce it.
- **October 23, 2005:** A 59-year-old man died from injuries he sustained after his tank truck hauling gasoline went off a northwest Arkansas road and exploded. The truck went off U.S. 62 in Carroll County and hit a utility pole near the border with Benton County.
- **May 21, 2005:**The National Response Center received a telephone report of a 1,000 gallon fuel spill from an overturned tractor trailer. The incident occurred on Hwy. 62 in Pearidge, Arkansas. The driver was fatally injured and Hwy. 62 was closed. There were no further reports of any community impact. The source of the spill was secured, material contained, and cleanup completed.
- **November 14, 2003:** The National Response Center received a report from Sugg Oil Company of a tanker truck rollover and fire in Garfield, Arkansas. The tanker truck was carrying 2,000 gallons of gasoline and 6,000 gallons of diesel when the accident occurred. However, some good Samaritans were able to pull the injured driver from the truck before flames consumed the entire vehicle. The fire was on-going and several local fire departments responded to the accident. The responders applied foam to the surrounding area but decided to let the fire continue and burn itself out. Contractors (HAZMAT) were on the scene and when the fire was extinguished they performed the cleanup. The incident occurred in a very rural area, therefore no evacuations were required and community impact was limited to a one-lane closure of Highway 62.
- **June 4, 2003:** Hazardous material work crews cleaned up a toxic chemical spill in Texarkana, Arkansas where 45 concentrated gallons of a deadly pesticide known as Methyl Parathion leaking from two different areas in a tractor-trailer rig. The truck was delivering pesticide and insecticide supplies. The truck driver discovered this pesticide leaking after he opened the truck's back door. The liquid pesticide has an initial garlic scent that could be fatal if inhaled or absorbed through a person's skin in small quantities. The leakage occurred after something ruptured all three 15-gallon plastic drums containing the substance.

    To avoid exposing the public to deadly vapors which collected within the tractor-trailer's rig, Arkansas Police and Fire Department personnel closed streets. Work crews dressed in protective suits and oxygen masks opened the rig to air out the vapors.

Specific Incidents: Railway

- **2007 to 2010**: No major railway incidents reported
- **October 15, 2005**: Texarkana, Arkansas, was the scene of a fiery rail accident that caused the evacuation of hundreds of homeowners. Seven empty train cars and a tanker containing a flammable gas derailed in a switchyard, exploding in a ball of fire. The rail car that exploded was carrying a tank of propylene gas and was hit by a Union Pacific freight train en route from Chicago. At least two homes were destroyed – including one where the victim died – and several vehicles were totaled in the quarter-mile area surrounding the accident. A plume of smoke covered the south end of the city, and at least seven people went to hospital emergency rooms with complaints of respiratory problems. Officers went door to door, urging thousands of people in a 2-by-5 mile area to move to the north side of town.

Figure 3.4.11.o October 15, 2005 Rail Accident in Texarkana

Source: 2010 State Hazard Mitigation Plan

- **1995**: Twenty-one cars derailed in Corning, AR causing the temporary evacuation of approximately 400 residents. The derailment caused a rupture in one of the train's tank cars and its contents of liquefied petroleum gas were allowed to burn completely before the residents could return home. The derailment was blamed on tracks warped by the summer's heat.
- **June 9, 1985**: A derailment of a St. Louis Southwestern Railway Company freight train resulted in the release of HAZMAT near Pine Bluff, Arkansas.
- **October 3, 1982**: A side collision of two Missouri Pacific Railroad Company freight trains occurred at Glasie Junction, near Possum Grape, Arkansas.
- **July 9, 1982**: An automobile and Missouri Pacific Railroad Freight Train collided on Woodland Drive in Lake View, Arkansas.
- **March 29, 1978**: A St. Louis Southwestern Railway Company freight train derailed and ruptured its contents of vinyl chloride near Lewisville, Arkansas.

Pipeline Incidents

Reports from the U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration's provide detail and incident history for the pipeline systems in the State of Arkansas between 2002 and March 2013. Significant incidents are those incidents reported by pipeline operators with any of the following conditions met: 1) fatality or injury requiring in-patient hospitalization; 2) $50,000 or more in total costs, measured in 1984 dollars; 3) highly volatile liquid releases of five barrels or more or other liquid releases of 50 barrels or more; 4) liquid releases resulting in an unintentional fire or explosion. According to these reports, there were 33 pipeline incidents that caused 4 fatalities, 4 injuries and $9,440,709 Million in damages over the 13 year period (2002-2013). **Table 3.4.11.k** gives the incident details for each county with significant incident records. The counties not listed did not have any pipeline incidents reported.

Specific Incidents: Pipelines

- **January 25, 2012:** Excavation damage to a Lion Oil Trading & Transportation, Inc. pipeline in El Dorado Arkansas resulted in 90 barrels of spilled hazardous liquid. Property damages were estimated at $42,532.
- **October 23, 2011:** Lightning caused damaged to a natural gas transmission pipeline in Hot Springs, Arkansas operated by Centerpoint Energy Gas Transmission. Estimated damages were $183,917.
- **December 28, 2010:** External corrosion to a Centerpoint Energy Gas Transmission pipeline in Blackwell, Arkansas caused a leak. Damages were estimated to be $241,669.
- **May 12, 2009:** Incorrect operation of a TE Products Pipeline Company hazardous liquid pipeline in Searcy, Arkansas caused three fatalities and nearly $4 Million in property damages.
- **July 1, 2008:** A vehicle caused damages to a Mississippi River Transmission Corporation gas transmission pipeline in College City, Arkansas, resulting in one injury, and $142,690 in property damages.
- **November 18, 2007:** A malfunction of control/relief equipment caused a 5,800 gallon spill to a hazardous liquid pipeline operated by TE Products Pipeline Company, LLC in Walnut Ridge, Arkansas.
- **October 12, 2006:** A spill at a pipeline facility in Rogers, Arkansas resulted in 67,000 gallons of gasoline being spilled into the surrounding soil. Residents near the terminal were told to monitor their water wells for contamination. Much of the gasoline was in the soil in a containment area around a tank that overflowed at the site. The soil had to be removed to get rid of the spilled fuel.
- **October 19, 2005:** More than 500 gallons of oil from a Lion Oil Company pipeline leaked south of Magnolia, Arkansas. Lion Oil had reported that the leak was equivalent to about 13 42-gallon barrels of oil. The leak, reported Wednesday, occurred in lines transporting oil into Lion Oil lines from other areas. The Environmental Protection Agency and the Arkansas Department of Environmental Quality were notified.

- **March 13, 2004:** The National Response Center received notification that a 20-inch underground distribution pipeline had discharged up to 300 barrels of gasoline 5 miles northwest of Richmond, AR. The cause of the spill was determined to be corrosion on a blow down valve. The leak was discovered on the 12th of March; however, the quantity could not be determined as the pipeline was underground. The majority of the product entered an unnamed dry ditch leading to Hurricane Creek. No evidence of chemicals, however, was observed on the water. One private citizen was evacuated by the local sheriff due to the vapors and has since been returned. No water supply was contaminated.
- **January 31, 2003:** A 4-inch above-ground gathering pipeline ruptured and released approximately 50 barrels of crude oil into an unnamed tributary that flows into Brushee Creek. The release occurred two miles north of Louanne, Arkansas in Ouachita County. Two sets of booms were deployed on Brushee Creek and two vacuum trucks were on site to assist in cleanup operations.
- **October 1, 1982:** Mississippi River Transmission Corp. Natural Gas Flash Fire, Pine Bluff, Arkansas.

Table 3.4.11.k Details of Arkansas Significant Pipeline Incidents by County, 2002-2013

County	# of Incidents	Fatalities	Injuries	Property Damage	Gross Barrels Spilled	Net Barrels Lost
Ashley	1	0	0	$205,904	0	0
Chicot	1	0	0	$411,528	0	0
Conway	2	0	0	$353,464	0	0
Crawford	1	0	0	$385,061	0	0
Dallas	1	0	0	$120,843	500	247
Faulkner	2	0	0	$503,964	0	0
Garland	3	0	2	$151,935	0	0
Grant	1	0	0	$237,635	0	0
Howard	1	0	0	$125,966	0	0
Jefferson	2	0	1	$147,050	0	0
Lawrence	3	0	1	$565,958	5,800	5,800
Logan	1	0	0	$275,402	0	0
Miller	1	0	0	$271,013	0	0
Pike	1	0	0	$183,917	0	0
Pulaski	3	0	0	$331,442	195	1
Randolph	1	0	0	$143,509	0	0
Sebastian	2	1	0	$12,349	73	0
Saint Francis	1	0	0	$161,780	0	0
Union	2	0	0	$473,310	104	31
Washington	1	0	0	$424,664	0	0
White	1	3	0	$3,945,503	0	0
Not Reported	1	0	0	$8,500	28	28
Total	**33**	**4**	**4**	**$9,440,697**	**6,700**	**6,107**

Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration, http://primis.phmsa.dot.gov/comm/reports/safety/IncDetSt_st_AR_flt_sig.html?nocache=999#_all

Notes: The costs shown are in 2012 dollars. For years 2002 and later, property damage is estimated as the sum of all public and private costs reported in the 30-day incident report. For years prior to 2002, accident report forms did not include a breakdown of public and private costs so property damage for these years is reported total property damage field in the report.

❖ *Probability of Future Hazard Events*

Fixed Facility Incidents

Commercial Facility Incidents

Based on the many reported occurrences each year (143 in 2012 alone) and the continuing presence of these various hazardous materials, the probability of future HAZMAT related accidents at commercial facilities throughout the State of Arkansas is considered **"Highly Likely"**.

Superfund Site Incidents

These sites are indentified for clean-up, but do not necessarily pose a risk for "incidents". The probability for incidents at these sites is considered **"Unlikely"**.

Pine Bluff Arsenal Incidents

With the disposal of the chemical stockpile at this site complete, any future incidents are considered **"Unlikely"**.

Methamphetamine Lab Incidents

There were 5,100 Meth-lab incidents from 2004-2012 (9 years). This translates to an average of 567 incidents per year. Based on the high number of past occurrences and the continuing prevalence of this highly addictive substance, the probability for future events in considered **"Highly Likely"**.

Transportation Incidents

Highway, Railway, Air, and Water

During the 10 year period from 2003-2013 (partial years), there were 1,715 HAZMAT Incidents connected with transport via highway, rail, air, and water. This translates to an annual average of 172 incidents. The breakdown by specific mode of transport, with associated annual average and probability are provided in **Table 3.4.11.l**.

Table 3.4.11.l Transportation Incidents Annual Average and Probability (2003-2012)

Mode	# of Events 2003 to 2013	Annual Average	Probability
Highway	1,606	161	Highly Likely
Rail	77	8	Possible
Air	30	3	Possible
Water	2	.2	Unlikely

Pipeline Incidents

There are a large number of pipelines crisscrossing the State carrying a variety of substances. These pipelines are maintained and safety is an important issue for the pipeline owners and the surrounding areas. There is a high probability that small pipeline events will occur, however the chances of a large scale/significant incidents occurring are relatively small. In the 11 year period from 2002-2013 (2/2002) to 2/2013), there were 33 Significant Events reported to the: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration. This translates to an annual average of 3 events per year. Therefore the State's overall probability rating is considered **"Possible"** for future pipeline events to occur.

❖ State Vulnerability Analysis

Due to the prevalence of hazardous materials fixed facilities and the variety of modes of transportation that carry HAZMAT within Arkansas, the entire State is viewed to be vulnerable to a HAZMAT Incidents of one form or another. However, some locations are more vulnerable to the impacts of a HAZMAT Incident due to various factors such as:

- Number of commercial fixed facilities with HAZMAT,
- Presence of major transportation routes'
- Presence of pipelines'
- Pattern of occurrence of previous incidents, and
- Population in proximity to facilities and various transportation routes.

To analyze vulnerability to HAZMAT events and how this varies by jurisdiction in the State of Arkansas, these factors were taken into account. **Table 3.4.11.m** provides combined data for the number of Tier II Chemical Facilities and miles of gas transmission and HAZMAT liquid pipelines per county. Results of an analysis based on 1 point for each facility and 1 point for each pipeline are provided in order of total points from greatest to least.

Table 3.4.11.m Combined Analysis, # of Tier II Facilities and Miles of Pipelines by County

County	# of Tier II Facilities	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Total (based on 1 point for each facility and 1 point for each pipeline mile)
White	86	476	206	768
Union	38	316	210	564
Pulaski	140	197	143	480
Columbia	180	168	80	428
Chicot	2	365	20	387
Jackson	10	277	93	380

County	# of Tier II Facilities	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Total (based on 1 point for each facility and 1 point for each pipeline mile)
Sebastian	117	209	2	328
Hot Springs	13	292	0	305
Franklin	35	269	0	304
Washington	67	206	0	273
Jefferson	31	225	16	272
Logan	124	145	0	269
Faulkner	35	180	51	266
Grant	1	142	113	256
Clark	6	242	0	248
Benton	79	150	11	240
Miller	25	207	0	232
Ashley	12	199	0	211
Nevada	7	201	0	208
Lonoke	8	114	80	202
Calhoun	8	53	139	200
Lawrence	8	141	46	195
Pope	48	141	0	189
Clay	7	110	67	184
Hempstead	31	142	0	173
Phillips	11	162	0	173
Conway	34	129	0	163
Greene	15	60	80	155
Mississippi	27	128	0	155
Craighead	34	82	29	145
Saline	19	107	16	142
Ouachita	10	129	0	139
Arkansas	20	117	0	137
Drew	8	129	0	137
Madison	5	128	0	133
Woodruff	5	105	22	132
Garland	18	77	36	131

County	# of Tier II Facilities	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Total (based on 1 point for each facility and 1 point for each pipeline mile)
Randolph	4	99	27	130
Crittenden	26	87	14	127
Johnson	16	109	0	125
Lincoln	6	112	0	118
Saint Francis	11	69	35	115
Independence	18	26	63	107
Cleveland	1	39	58	98
Bradley	2	95	0	97
Howard	7	71	17	95
Lee	5	90	0	95
Izard	6	61	23	90
Yell	7	80	0	87
Van Buren	30	49	0	79
Lafayette	14	58	1	73
Little River	9	45	18	72
Pike	1	42	26	69
Cleburne	19	45	3	67
Poinsett	11	55	0	66
Polk	11	50	0	61
Boone	18	42	0	60
Sevier	5	40	14	59
Carroll	12	42	0	54
Baxter	9	43	0	52
Crawford	31	19	0	50
Dallas	0	24	20	44
Desha	5	27	0	32
Monroe	7	22	0	29
Stone	3	24	0	27
Marion	4	21	0	25
Prairie	2	19	0	21
Fulton	2	0	18	20

County	# of Tier II Facilities	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Total (based on 1 point for each facility and 1 point for each pipeline mile)
Cross	12	7	0	19
Sharp	1	18	0	19
Perry	2	12	1	15
Montgomery	2	6	6	14
Scott	4	10	0	14
Newton	2	0	0	2
Searcy	2	0	0	2

A combined analysis of previous available transportation and pipeline incidents was also conducted. For this analysis, incidents reported by county were annualized for highway, rail, air, and water incidents as well as significant pipeline incidents to determine the total annual average for these categories of incidents. **Table 3.4.11.n** provides the results of this in analysis in order from highest amount of incidents to lowest.

Table 3.4.11.n Combined Average Annual Highway and Pipeline Incidents by County

County	Highway Annual Avg.	Rail Annual Avg.	Air Annual Avg.	Water Annual Avg.	Pipeline Annual Avg.	Total Annual Average
Pulaski	76.00	3.00	0.90	0.00	0.27	80.17
Craighead	8.80	0.00	0.60	0.00	0.00	9.40
Crittenden	8.70	0.60	0.00	0.00	0.00	9.30
Washington	6.70	0.00	1.10	0.00	0.09	7.89
Union	6.90	0.50	0.00	0.00	0.18	7.58
Sebastian	6.60	0.00	0.30	0.00	0.18	7.08
Miller	6.70	0.20	0.00	0.00	0.09	6.99
Benton	4.90	0.10	0.00	0.00	0.00	5.00
Jefferson	2.50	1.70	0.00	0.00	0.18	4.38
Boone	3.60	0.00	0.00	0.00	0.00	3.60
Crawford	2.80	0.40	0.00	0.00	0.09	3.29
Garland	2.40	0.00	0.10	0.00	0.27	2.77
Mississippi	1.90	0.10	0.00	0.00	0.00	2.00
Faulkner	1.80	0.00	0.00	0.00	0.18	1.98

County	Highway Annual Avg.	Rail Annual Avg.	Air Annual Avg.	Water Annual Avg.	Pipeline Annual Avg.	Total Annual Average
Ouachita	1.60	0.00	0.00	0.00	0.00	1.60
Saint Francis	1.30	0.00	0.00	0.00	0.09	1.39
Sharp	1.20	0.10	0.00	0.00	0.00	1.30
Drew	1.10	0.00	0.00	0.00	0.00	1.10
Nevada	0.90	0.10	0.00	0.00	0.00	1.00
Lawrence	0.50	0.20	0.00	0.00	0.27	0.97
Hot Springs	0.90	0.00	0.00	0.00	0.00	0.90
White	0.80	0.00	0.00	0.00	0.09	0.89
Jackson	0.80	0.00	0.00	0.00	0.00	0.80
Ashley	0.70	0.00	0.00	0.00	0.00	0.70
Clay	0.70	0.00	0.00	0.00	0.00	0.70
Polk	0.70	0.00	0.00	0.00	0.00	0.70
Pope	0.70	0.00	0.00	0.00	0.00	0.70
Hempstead	0.60	0.00	0.00	0.00	0.00	0.60
Little River	0.30	0.30	0.00	0.00	0.00	0.60
Baxter	0.50	0.00	0.00	0.00	0.09	0.59
Johnson	0.50	0.00	0.00	0.00	0.00	0.50
Arkansas	0.40	0.00	0.00	0.00	0.00	0.40
Cleburne	0.20	0.00	0.00	0.20	0.00	0.40
Saline	0.40	0.00	0.00	0.00	0.00	0.40
Grant	0.30	0.00	0.00	0.00	0.09	0.39
Conway	0.20	0.00	0.00	0.00	0.18	0.38
Clark	0.20	0.10	0.00	0.00	0.00	0.30
Fulton	0.20	0.10	0.00	0.00	0.00	0.30
Carroll	0.30	0.00	0.00	0.00	0.00	0.30
Independence	0.30	0.00	0.00	0.00	0.00	0.30
Lonoke	0.30	0.00	0.00	0.00	0.00	0.30
Phillips	0.30	0.00	0.00	0.00	0.00	0.30
Poinsett	0.30	0.00	0.00	0.00	0.00	0.30
Prairie	0.30	0.00	0.00	0.00	0.00	0.30
Dallas	0.20	0.00	0.00	0.00	0.09	0.29
Logan	0.20	0.00	0.00	0.00	0.09	0.29
Columbia	0.10	0.10	0.00	0.00	0.00	0.20

County	Highway Annual Avg.	Rail Annual Avg.	Air Annual Avg.	Water Annual Avg.	Pipeline Annual Avg.	Total Annual Average
Franklin	0.20	0.00	0.00	0.00	0.00	0.20
Perry	0.20	0.00	0.00	0.00	0.00	0.20
Sevier	0.10	0.10	0.00	0.00	0.00	0.20
Van Buren	0.20	0.00	0.00	0.00	0.00	0.20
Woodruff	0.20	0.00	0.00	0.00	0.00	0.20
Chicot	0.10	0.00	0.00	0.00	0.09	0.19
Randolph	0.10	0.00	0.00	0.00	0.09	0.19
Calhoun	0.10	0.00	0.00	0.00	0.00	0.10
Cleveland	0.10	0.00	0.00	0.00	0.00	0.10
Desha	0.10	0.00	0.00	0.00	0.00	0.10
Lafayette	0.10	0.00	0.00	0.00	0.00	0.10
Lee	0.10	0.00	0.00	0.00	0.00	0.10
Lincoln	0.10	0.00	0.00	0.00	0.00	0.10
Madison	0.10	0.00	0.00	0.00	0.00	0.10
Monroe	0.10	0.00	0.00	0.00	0.00	0.10
Montgomery	0.10	0.00	0.00	0.00	0.00	0.10
Scott	0.10	0.00	0.00	0.00	0.00	0.10
Searcy	0.10	0.00	0.00	0.00	0.00	0.10
Stone	0.10	0.00	0.00	0.00	0.00	0.10
Howard	0.00	0.00	0.00	0.00	0.09	0.09
Pike	0.00	0.00	0.00	0.00	0.09	0.09
Bradley	0.00	0.00	0.00	0.00	0.00	0.00
Cross	0.00	0.00	0.00	0.00	0.00	0.00
Greene	0.00	0.00	0.00	0.00	0.00	0.00
Izard	0.00	0.00	0.00	0.00	0.00	0.00
Marion	0.00	0.00	0.00	0.00	0.00	0.00
Newton	0.00	0.00	0.00	0.00	0.00	0.00
Yell	0.00	0.00	0.00	0.00	0.00	0.00

Population in proximity to fixed facilities and HAZMAT transportation routes is a concern for emergency management officials in response to a HAZMAT incident. Although clean up can be costly, the primary concern in this type of incident is protection of people. **Table 3.4.11.o** provides the number of population in ½ mile proximity to Tier II Chemical Facilities, Major Highways/Interstates, Railways, and Major Pipelines. The ½ mile area was chosen since this is the recommended Initial Isolation Zone for HAZMAT incidents if the chemical has not yet been identified (U.S. DOT 2012 Emergency Response Guidebook)

Table 3.4.11.o Population in Proximity to Transportation Routes and Hazardous Materials Facilities

County	Population in 1/2 mile of Major Hwy /Interstate	Population in 1/2 mile of Railway	Population in 1/2 mile of Major Pipeline	Population in 1/2 mile of Tier II Facilities
Arkansas	17,235	8,870	66	4,325
Ashley	17,368	5,128	3,883	3,395
Baxter	25,727	1,550	NA	1,885
Benton	92,605	30,223	1,287	31,387
Boone	20,920	1,402	NA	3,666
Bradley	8,275	5,630	802	2,411
Calhoun	3,877	652	1,300	16
Carroll	14,662	NA	NA	5,153
Chicot	10,148	8,283	767	2,759
Clark	16,776	4,911	773	3,807
Clay	12,345	7,557	326	4,733
Cleburne	14,813	NA	138	2,362
Cleveland	4,345	1,835	98	97
Columbia	17,716	7,720	842	6,884
Conway	13,425	5,430	484	3,381
Craighead	58,804	24,169	6	12,927
Crawford	32,816	15,899	7	5,850
Crittenden	42,543	25,545	NA	8,317
Cross	15,148	11,967	NA	3,688
Dallas	7,324	4,042	320	4
Desha	13,304	7,408	25	3,016
Drew	12,292	6,017	664	3,160
Faulkner	43,021	14,675	4,526	4,878
Franklin	12,395	2,783	1,095	2,126
Fulton	6,054	756	NA	136
Garland	50,927	17,385	1,596	7,577

County	Population in 1/2 mile of Major Hwy /Interstate	Population in 1/2 mile of Railway	Population in 1/2 mile of Major Pipeline	Population in 1/2 mile of Tier II Facilities
Grant	10,102	0	NA	526
Greene	24,583	9,619	NA	6,029
Hempstead	17,725	10,274	656	4,770
Hot Springs	17,585	7,944	704	4,241
Howard	9,814	6,158	172	2,976
Independence	20,248	7,531	1,005	3,545
Izard	5,063	679	NA	615
Jackson	8,101	6,776	998	3,769
Jefferson	57,245	20,684	370	13,681
Johnson	15,578	1,831	NA	2,333
Lafayette	5,741	3,387	93	529
Lawrence	12,419	9,458	757	3,366
Lee	4,035	4,805	NA	2,627
Lincoln	5,697	1,762	393	1,143
Little River	5,133	6,821	302	2,102
Logan	14,898	0	587	3,078
Lonoke	16,818	8,171	8,724	2,882
Madison	6,515	NA	NA	1,003
Marion	9,078	2,702	NA	319
Miller	20,199	9,973	3,088	2,613
Mississippi	42,424	19,602	7	12,844
Monroe	7,434	5,444	39	2,368
Montgomery	4,798	470	215	226
Nevada	6,731	3,267	994	197
Newton	3,755	NA	NA	25
Ouachita	14,673	11,440	1,604	3,534
Perry	3,753	1,810	2	588
Phillips	17,443	9,692	11	6,078
Pike	7,762	2,135	383	8
Poinsett	6,975	10,683	NA	4,916
Polk	12,465	6,187	4	3,876

County	Population in 1/2 mile of Major Hwy /Interstate	Population in 1/2 mile of Railway	Population in 1/2 mile of Major Pipeline	Population in 1/2 mile of Tier II Facilities
Pope	24,949	12,660	499	7,024
Prairie	5,377	223	NA	1,179
Pulaski	210,563	97,118	13,200	90,028
Randolph	9,341	NA	1,389	513
Saint Francis	16,910	14,501	22	5,492
Saline	33,955	11,132	2,634	8,262
Scott	7,364	2,238	NA	278
Searcy	3,838	NA	NA	818
Sebastian	75,827	30,936	6,066	33,394
Sevier	10,361	5,865	1,950	3,000
Sharp	6,305	751	NA	724
Stone	3,623	NA	NA	196
Union	23,323	13,805	7,612	8,897
Van Buren	7,988	NA	NA	741
Washington	109,803	35,816	7,626	34,000
White	26,302	12,568	8,690	15,397
Woodruff	5,701	4,166	126	447
Yell	11,135	2,707	231	1,530

Source: Highway, Railway, and Pipeline data from Arkansas Geographic Information Office, Tier II Facilities from Arkansas Department of Emergency Management, and Population Data from HAZUS MH 2.1 (derived from U.S. Census)

Another factor in determining vulnerability to HAZMAT incidents is proximity of special populations. Special populations are particularly vulnerable to the impacts of a HAZMAT incident because of the inherent potential difficulties involved in the evacuation. **Table 3.4.11.p** shows the number of special population facilities in each county that are located within ½ mile of a Tier II reporting chemical facility (2012).

Table 3.4.11.p Special Population Facilities Within ½ Mile of a Tier II Chemical Facility

County	# of Hospitals in 1/2 mile of Tier II	# of Hospice Facilities in 1/2 mile of Tier II	# of End-Stage Renal Dialysis Facilities in 1/2 mile of Tier II	# of Compre-hensive Rehab Facilities in 1/2 mile of Tier II	# of Colleges in 1/2 mile of Tier II	# of Educational Facilities in 1/2 mile of Tier II	# of Aging Facilities in 1/2 mile of Tier II	# of Correctional Institutions in 1/2 mile of Tier II	Total
Arkansas	1	0	1	0	0	3	2	1	8
Ashley	0	0	0	0	0	3	2	0	5
Baxter	0	0	0	0	1	3	1	0	5
Benton	0	0	0	0	1	20	4	0	25
Boone	0	0	0	0	1	0	2	0	3
Bradley	1	0	1	0	0	1	0	0	3
Calhoun	0	0	0	0	0	0	0	0	0
Carroll	2	0	0	0	0	7	1	0	10
Chicot	0	0	1	0	0	2	0	0	3
Clark	0	0	0	0	1	2	0	0	3
Clay	0	1	0	0	0	6	0	0	7
Cleburne	0	0	0	0	1	1	0	0	2
Cleveland	0	0	0	0	0	0	0	0	0
Columbia	1	2	1	0	1	3	0	0	8
Conway	1	0	0	0	0	5	4	0	10
Craighead	3	0	2	0	0	9	4	0	18
Crawford	0	0	0	0	0	16	0	0	16
Crittenden	1	1	1	0	0	5	4	0	12
Cross	1	0	0	0	0	4	1	0	6
Dallas	0	0	0	0	0	0	0	0	0
Desha	1	0	0	0	0	2	4	0	7
Drew	0	1	0	0	0	4	1	1	7
Faulkner	1	1	1	0	1	6	2	1	13
Franklin	0	0	0	0	0	1	0	0	1
Fulton	0	0	0	0	0	2	0	0	2
Garland	3	1	1	0	0	5	5	0	15
Grant	0	0	0	0	0	0	0	0	0
Greene	0	0	1	0	0	4	2	0	7

County	# of Hospitals in 1/2 mile of Tier II	# of Hospice Facilities in 1/2 mile of Tier II	# of End-Stage Renal Dialysis Facilities in 1/2 mile of Tier II	# of Compre-hensive Rehab Facilities in 1/2 mile of Tier II	# of Colleges in 1/2 mile of Tier II	# of Educational Facilities in 1/2 mile of Tier II	# of Aging Facilities in 1/2 mile of Tier II	# of Correctional Institutions in 1/2 mile of Tier II	Total
Hempstead	0	0	0	0	1	6	1	0	8
Hot Springs	0	0	0	0	0	3	1	0	4
Howard	0	0	0	0	0	0	2	0	2
Independence	1	1	1	0	2	3	0	1	9
Izard	0	0	0	0	0	2	0	0	2
Jackson	1	0	0	0	0	0	0	0	1
Jefferson	0	2	1	0	0	11	3	0	17
Johnson	0	0	0	0	0	3	1	0	4
Lafayette	0	0	0	0	0	1	0	0	1
Lawrence	0	0	0	0	0	0	0	0	0
Lee	0	0	0	0	0	1	0	0	1
Lincoln	0	0	0	0	0	3	1	0	4
Little River	1	1	0	0	0	2	0	0	4
Logan	1	0	0	0	0	3	1	0	5
Lonoke	0	0	0	0	0	2	0	0	2
Madison	0	0	0	0	0	1	0	0	1
Marion	0	0	0	0	0	0	0	0	0
Miller	0	0	0	0	0	1	0	0	1
Mississippi	1	0	0	0	1	7	0	0	9
Monroe	0	1	0	0	0	0	1	0	2
Montgomery	0	0	0	0	0	1	0	0	1
Nevada	0	0	0	0	0	0	1	0	1
Newton	0	0	0	0	0	0	0	0	0
Ouachita	0	1	0	0	0	1	0	0	2
Perry	0	0	0	0	0	1	0	0	1
Phillips	0	0	0	1	0	2	1	0	4
Pike	0	0	0	0	0	0	0	0	0
Poinsett	0	0	0	0	0	4	1	0	5
Polk	0	1	0	0	0	3	3	0	7
Pope	0	2	0	0	1	7	1	0	11

County	# of Hospitals in 1/2 mile of Tier II	# of Hospice Facilities in 1/2 mile of Tier II	# of End-Stage Renal Dialysis Facilities in 1/2 mile of Tier II	# of Compre-hensive Rehab Facilities in 1/2 mile of Tier II	# of Colleges in 1/2 mile of Tier II	# of Educational Facilities in 1/2 mile of Tier II	# of Aging Facilities in 1/2 mile of Tier II	# of Correctional Institutions in 1/2 mile of Tier II	Total
Prairie	0	0	0	0	0	1	0	0	1
Pulaski	11	2	1	0	3	62	13	1	93
Randolph	0	0	0	0	0	0	0	0	0
Saint Francis	0	1	0	0	0	4	0	0	5
Saline	1	0	1	0	0	3	2	0	7
Scott	0	0	0	0	0	1	0	0	1
Searcy	0	0	0	0	0	2	1	0	3
Sebastian	2	1	0	0	0	16	5	1	25
Sevier	1	0	0	0	0	0	2	0	3
Sharp	0	0	0	0	0	1	0	0	1
Stone	0	0	0	0	0	0	0	0	0
Union	1	0	1	0	1	7	5	1	16
Van Buren	0	0	0	0	0	0	1	0	1
Washington	2	0	1	0	1	14	5	2	25
White	2	1	1	0	0	11	4	0	19
Woodruff	0	0	0	0	0	0	0	0	0
Yell	1	0	0	0	0	0	1	0	2

Source: Special Population Facilities from Arkansas Geographic Information Office, Tier II Facilities from Arkansas Department of Emergency Management, and Population Data from HAZUS MH 2.1 (derived from U.S. Census)

❖ State Estimates of Potential Losses

Sufficient data is not available at this time to make estimates of potential losses by jurisdiction for all types of HAZMAT Incidents. However the following assumptions have been made that begin the process of estimating these actual losses:

- Most HAZMAT events are localized and affect only the immediate area.
- Most events are small in nature and are quickly contained and cleaned.
- Fixed sites can be identified through the federal reporting requirements and some historical event data is available by jurisdiction.
- Maps for highways, railroads and pipelines are available thereby designating the jurisdictions at risk to these specific hazards.

- Most HAZMAT events involve an immediate response and an expedited cleanup with relatively fixed costs. Depending on the size and location of a release, the associated costs can range from a few thousand dollars to hundreds of thousands of dollars.
- Losses could include limited loss of life, injuries and sickness for the general population and for the first responders.
- Losses could include the financial costs for response and cleanup.
- There could be significant loss of reputation or confidence in associated organizations.
- There could be short-term impacts to the local economy due to a major event.

Of the 1,715 transportation incidents that occurred over the 10 year period from February 2003 to February 2013, estimates of dollar damages were provided for 413 of the incidents with a total of $10,774,273 in reported damages. This translates to an average of $26,087 per incident and $1,077,427 per year.

This same data source also reported 1 fatality in this 10-year span as well as 23 injuries, 3,210 evacuations and 337 miles of major transport routes closed for a period of time. Based on this data, the average per incident and per year impacts are as follows:

Fatalities: .0006 per incident / 0.1 per year

Injuries: .013 per incident / 2.3 per year

Evacuations: 1.87 per incident / 321 per year

Miles of Transport Route Closure: .20 miles per incident / 33.7 miles per year

Interstate 40 runs through Arkansas from Wilmington, NC to Los Angeles, CA and is a major connector between the east and west coasts. Interstate 30 runs from Little Rock to Dallas, TX. Both corridors are vital for transportation throughout Arkansas. Force of closure for any length of time could cause major transportation problems within the State.

Clean up of methamphetamine labs is unique from other HAZMAT clean up in that it usually involves contamination of an entire structure and its contents. According to the Institute for Intergovernmental Research, the average cost of cleanup is $5,000 but some cost as much as $150,000. Based on the more conservative estimate of $5,000 and the 5,100 meth lab incidents in Arkansas from 2004 to 2012 (9 years), this translates to 567 incidents per year with annual clean up costs estimated at $2,835,000.

THE FOLLOWING HYPOTHETICAL SCENARIO IS FOR INSTRUCTIONAL AND ILLUSTRATIVE PURPOSES ONLY*

The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people and then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work close with local responders, state agencies, and EPA to ensure that cleanup is done safely and in accordance with federal and state laws.

As mentioned, it is difficult to determine the potential losses to existing development because of the variable nature of a HAZMAT spill. For example, a spill of a toxic airborne chemical in a populated area could have great potential for loss of life and by contrast, the spill of a very small amount of a chemical in a rural agricultural area would be much less costly and possible limited to remediation of soil.

For scenario-based cost-estimate purposes, the personnel and materials needed for a spill at a fixed facility at an easily remediated area are listed below in **Table 3.4.11.q**. The costs for the cleanup are estimates only.

Table 3.4.11.q Potential Cost Estimate for HAZMAT Spill Remediation

Classification	Rates Per Hour/Unit	Number of Hours/Units	Total Cost
Project Manager	$90.00	24	$2,160
Health & Safety Supervisor	$86.00	24	$2,064
Environmental Tech	$50.00	12	$600
Foreman	$55.00	24	$1,320
Equipment Operator	$56.50	24	$1,356
Laborer	$45.00	24	$1,080
Truck, 4 wheel drive	$680/wk	1	$680
Backhoe, Case 416B	$320.00/day	2	$640
Forklift, 3 ton all terrain	$160.00/day	2	$320
Skimmer	$250.00/day	2	$500
Pump, 4”	$80.00/day	3	$240
Drums, chemical, 17H or 17E	$90.00	25	$2,250
Drums, 95 gallon	$295.00	25	$7,375
Vermiculite per bag	$15.00	6	$90
Acid Suits	$70.00/each	6	$420
Gloves	$4.00/pair	30	$120
Total			**$21,215**

❖ Development in Hazard Prone Areas

Structures located near fixed facilities, highways and other high traffic roadways are most at risk to a HAZMAT event. Any development that takes place in these areas will place more people and structures in the risk area for HAZMAT events, however since most hazardous material spills are localized to an extremely small area this will not have an effect on the overall risk assessment for this hazard.

White, Union, Pulaski, Columbia, and Chicot counties were ranked highest in regards to Tier II Chemical Facilities and miles of gas transmission. White and Pulaski are also noted as counties with the greatest population and housing unit gains from 2000 to 2010.

❖ Consequence Analysis

This hazard could have a significant impact on the public health, the environment, private property and the economy. The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people, then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work closely with federal and state agencies and the local jurisdiction to ensure that cleanup is done safely and in accordance with federal and state laws.

Table 3.4.11.r. EMAP Consequence Analysis: Hazardous Materials Incidents

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Localized impact expected to be severe for plume area and moderate to light for other adversely affected areas.
Health and Safety of Persons Responding to the Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the plume area of the incident, possibly for extended period.
Delivery of Services	Localized disruption of roads and/or utilities may postpone delivery of some services.
The Environment	Localized impact expected to be severe for plume area. Remediation required.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage, extent of cleanup, and length of investigation.
Regulatory and Contractual Obligations	Regulatory requirements must be fulfilled. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Reputation of or Confidence in the Entity	Localized impact expected to primarily adversely affect HazMat source owner and local entities.

3.4.12 Nuclear Events

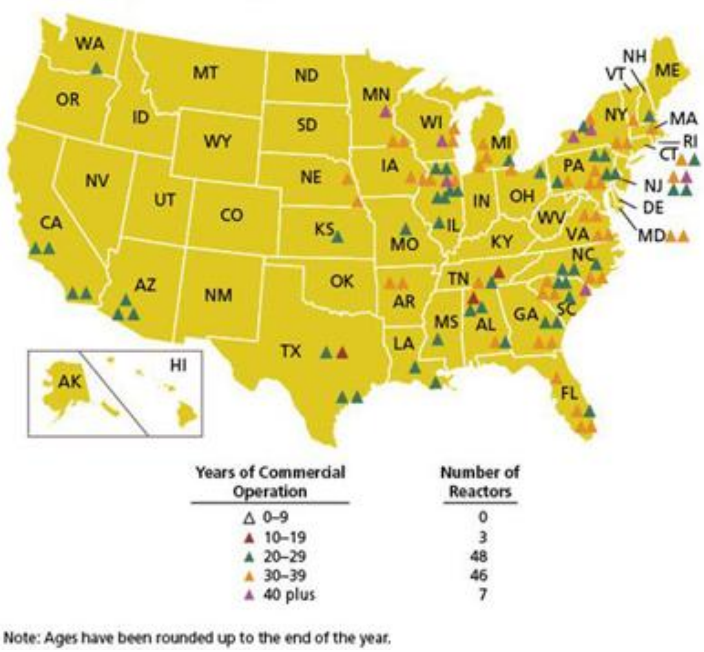
❖ *Description/Location*

A nuclear reactor is a device in which nuclear chain reactions are initiated, controlled and sustained at a steady rate. Nuclear reactors are used for many purposes, but the most significant current uses are for the generation of electrical power and, in rare cases, for the production of plutonium for use in nuclear weapons. Currently all commercial nuclear reactors are based on nuclear fission, and are considered problematic by some for their safety and health risks. Conversely, some consider nuclear power to be a safe and pollution-free method of generating electricity.

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 Nuclear Regulatory Commission (NRC). Offsite plans (which are closely coordinated with the utility's onsite emergency response plan) are evaluated by the Federal Emergency Management Agency (FEMA) and provided to the NRC, which must consider the FEMA findings when issuing or maintaining a license.

As of 2013, there are 104 licensed to operate nuclear power plants in the U.S. (69 Pressurized Water Reactors and 35 Boiling Water Reactors), which generate about 20 percent of the U.S.'s electrical use.

Figure 3.4.12.a U.S. Commercial Nuclear Power Reactors-Years of Operation by the End of 2010.



Source: U.S. Nuclear Regulatory Commission

Nuclear Sites in Arkansas

The history of nuclear reactors found within the State of Arkansas dates back to the 1960s. During the late 60s, construction began of the only two reactor sites found within the State of Arkansas, the Southwest Experimental Fast Oxide Reactor (SEFOR) and Arkansas Nuclear One (ANO).

Southwest Experimental Fast Oxide Reactor (SEFOR): The Southwest Experimental Fast Oxide Reactor (SEFOR) was constructed for the U.S. Atomic Energy Commission's (AEC) Division of Reactor Development and Technology in the late 1960s. It was built and managed by a consortium of energy and engineering firms to test the viability and safety of the fission process of "breeder reactors." The AEC and the consortium conducted experiments at SEFOR from 1969-1972. This research focused on containing the by-product of the breeder reactor's fission process.

In 1975 the Southwest Atomic Energy Associates handed SEFOR over to the University of Arkansas through a quitclaim deed. Prior to the handover, all of the fissionable material was removed from the SEFOR site. For a very short time the site was used by the university as a low-level calibration facility due to the major shielding provided by the structure. After the ownership had been transferred to the university, several potential hazards from the site were recognized and all operations were ceased. None of the university's use of SEFOR ever involved a functioning reactor. In preparation for shutting down the facility, the large chamber that once housed the radioactive materials was filled with concrete. Since closure, the SEFOR facility has deteriorated and remains an idle facility.

SEFOR is located one mile east of Strickler, Arkansas in a rural part of the northwest corner of the State. The University of Arkansas and the city of Fayetteville are located 17 miles to the northeast. The SEFOR site is not operational and not a radiological hazard. However, the site poses other environmental concerns that require remediation. In 2009, the University of Arkansas received funds from the U.S. Department of Energy for a "characterization study" to determine what would be required for cleaning up the site. The University now is awaiting funds from the federal government for a complete clean up.

Arkansas Nuclear One (ANO): The facility site of Arkansas Nuclear One is the only active nuclear reactor that remains in the State of Arkansas. Arkansas Nuclear One is a two-unit pressurized water reactor nuclear power plant located in Russellville, Arkansas. It is owned and operated by Entergy Nuclear.

Figure 3.4.12.b Nuclear Reactor at Arkansas Nuclear One

Source: Arkansas Hazard Mitigation Plan, 2010

Each nuclear unit at ANO can generate enough energy to meet the electricity needs of the entire city of Little Rock during peak demand periods common in the summer months. Unit 1 uses water from Lake Dardanelle and the Illinois Bayou. It uses and returns 760,000 gallons of water per minute for cooling purpose. Unit 2 uses water from a re-circulating water system from a 447-foot tall cooling tower. Unit 1 and Unit 2 together supply 1,823 megawatts of power, which is equal to approximately 30 percent of the total energy demand of the State.

Table 3.4.12.a Arkansas Nuclear One System Information

Unit 1 Nuclear System					
Capacity Net MW(e)	Generation in 2003 Megawatt hours	Capacity Factor	Type	Online Date	License Expiration Date
846	6,779,485	91.2 %	PWR	May 21, 1974	May 20, 2034
Unit 2 Nuclear System					
Capacity Net MW(e)	Generation in 2003 Megawatt hours	Capacity Factor	Type	Online Date	License Expiration Date
930	7,921,241	97 %	PWR	Sept. 1,1978	July 18, 2038

Source: U.S. Nuclear Regulatory Commission, http://www.nrc.gov/info-finder/reactor/ano1.html

Although construction and operation of nuclear power plants are closely monitored and regulated by the NRC, an accident, though unlikely, is possible. The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like) formation. The area the radioactive release may affect is determined by the amount released from the plant, wind direction and speed and weather conditions (i.e., rain, snow, etc.) which would quickly drive the radioactive material to the ground, hence causing increased deposition of radionuclides.

If a release of radiation occurs, the levels of radioactivity will be monitored by authorities from federal and state government.

❖ *Previous Occurrences*

There have been no previous major events recorded at Arkansas Nuclear One.

The last biennial Radiological Emergency Preparedness (REP) exercise was conducted on April 11, 2012 in the plume exposure pathway emergency planning zone (EPZ) around Arkansas Nuclear One (ANO) located near Russellville, Pope County, Arkansas. Based on the results of the exercise, the planning and preparedness for the State of Arkansas and affected local jurisdictions provide reasonable assurance that appropriate measures can be taken to protect public health and safety on the event of a radiological emergency.

❖ *Probability of Future Hazard Events*

The probability of future events at ANO is rated as **"Unlikely"**. This is based on the low rate of nuclear site events that have occurred over time. The firm regulations upheld by the NRC, Entergy and staff at ANO, as well as the Nuclear Regulatory Commission's approach to risk analysis for nuclear reactors and their findings at ANO, ensure its safe operation.

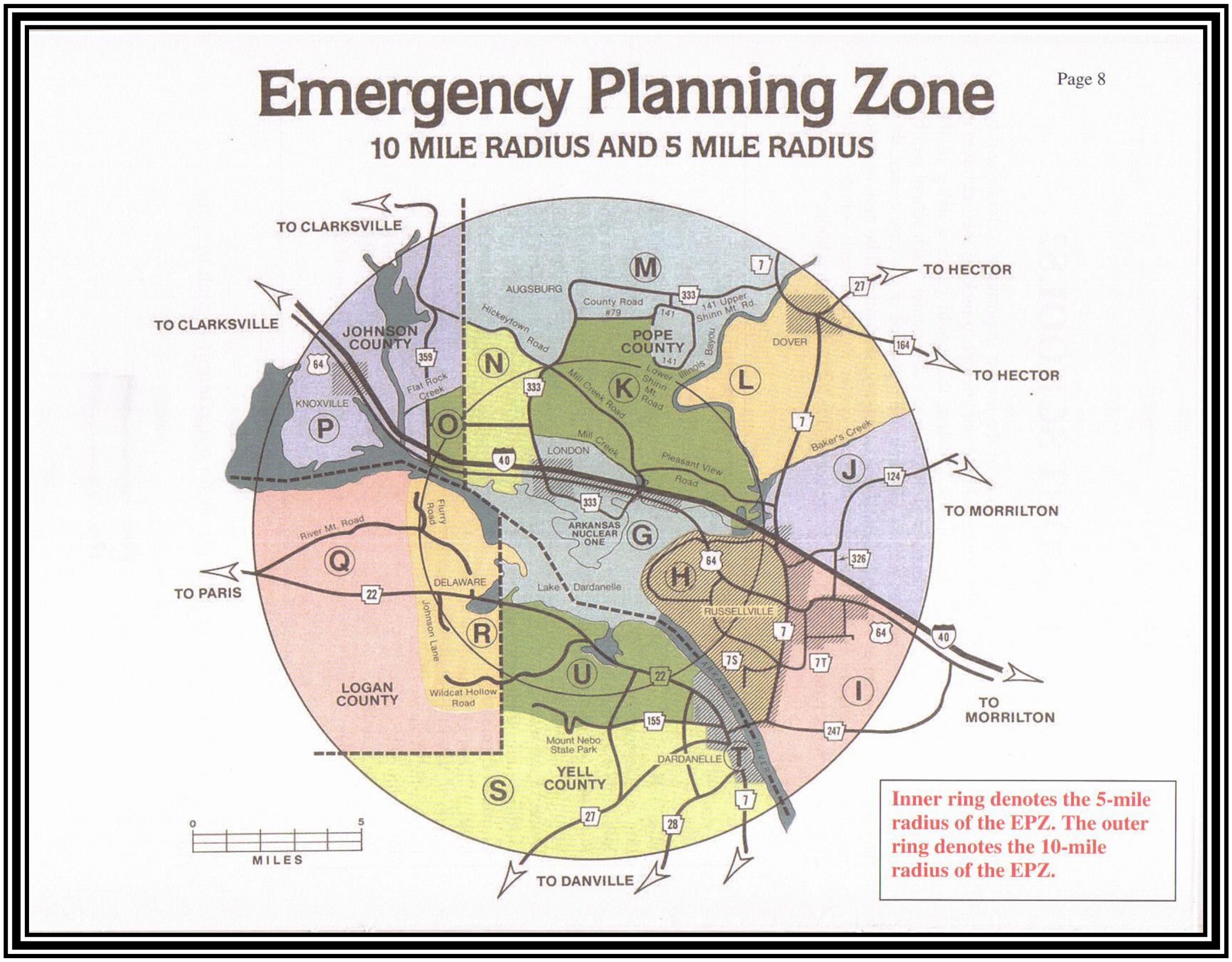
The amount of radioactivity released by a nuclear power plant is monitored continuously to be sure it does not go above allowed levels. The same sophisticated monitoring equipment provides exact information about any accidental release. The risk to the public from radioactivity released from nuclear power plants is much smaller than the risk we receive naturally every day. Nuclear plants add less than one percent of our total background radiation exposure.

❖ *State Vulnerability Analysis*

The Nuclear Regulatory Commission defines two emergency planning zones around nuclear power plants: a plume exposure pathway zone with a radius of 10 miles, concerned primarily with exposure to, and inhalation of, airborne radioactive contamination, and an ingestion pathway zone of about 50 miles, concerned primarily with ingestion of food and liquid contaminated by radioactivity.

The counties of Pope, Johnson, Logan and Yell are within the ANO 10 mile Emergency Planning Zone (EPZ) and have a relatively higher radiological risk than other counties, but the potential for an incident is extremely low.

Figure 3.4.12.c The Emergency Planning Zone around Arkansas Nuclear One



Source: Arkansas Nuclear One

❖ *State Estimates of Potential Losses*

The potential danger from an accident is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like formation) of radioactive gases and particles. The major hazards to people in the vicinity of the plume are radiation exposure to the body from the cloud and particles deposited on the ground, inhalation of radioactive materials and ingestion of radioactive materials.

❖ *Development in Hazard Prone Areas*

Federal regulations require emergency planning for the area within up to a 50-mile radius of a nuclear power plant. The 2010 U.S. population within 10 mile (EPZ) of Arkansas Nuclear One was 44,139, an increase of 17.2 percent in a decade, according to an analysis of U.S. Census data for msnbc.com. The 2010 U.S. population within the 50 mile EPZ was 308,219, an increase of 13.3 percent since 2000. The towns of London and Russellville, Arkansas are the closest jurisdictions to the plant.

❖ *Consequence Analysis*

The information in **Table 3.4.12.b** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.12.b. EMAP Consequence Analysis: Nuclear Events

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Health and Safety of Persons Responding to the Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained and protected personnel.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require temporary relocation of operations.
Property, Facilities, and Infrastructure	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Delivery of Services	Localized disruption of lines of communication and destruction of facilities may postpone delivery of some services.
The Environment	May cause extensive damage in isolated cases and some denial or delays in the use of some areas. Remediation needed.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of investigation.
Regulatory and Contractual Obligations	Regulatory requirements must be fulfilled. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.13 Terrorism Event

❖ *Description/Location*

Terrorism is defined in the Code of Federal Regulations 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" (28 C.F.R. Section 0.85). The threat of terrorism, both international and domestic, is ever present, and an attack is likely to occur when least expected.

Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction.

International terrorism involves groups or individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside the United States or whose activities transcend national boundaries.

In the United States, most terrorist incidents have involved small extremist groups who use terrorism to achieve a designated objective. Local, state and federal law enforcement officials monitor suspected terrorist groups and try to prevent or protect against a suspected attack. Additionally, the US government works with other countries to limit the sources of support for terrorism.

In Arkansas the Terrorism Research Center, in Fulbright College, University of Arkansas, http://trc.uark.edu/index.php/home, was created in 2003 to facilitate research on terrorism, extreme violence and the effectiveness of intervention strategies.

The Southern Poverty Law Center reports that in 2012, there were 26 active hate groups in Arkansas as seen in **Table 3.4.13.a**. Although no major terrorist acts have been attributed to any of these groups, their involvement in violent acts is meant to disrupt governmental functions and cannot be discounted.

Table 3.4.13.a. Alphabetical List of Hate Groups in Arkansas, 2012

Name	Type	City	County
American Aryan Reich	Neo-Nazi	Little Rock	Pulaski
Aryan Nations 88	Neo-Nazi		
Aryan Terror Brigade	Racist Skinhead		
Blood and Honour America Division	Racist Skinhead		
Christian Books and Things	General Hate	Harrison	Boone
Church of Jesus Christ	Christian Identity	Bergman	Boone

Name	Type	City	County
Council of Conservative Citizens	White Nationalist	Little Rock	Pulaski
Creativity Alliance	Neo-Nazi		
Heritage Connection	Racist Music	Harrison	Boone
International Keystone Knights of the Ku Klux Klan Inc.	Ku Klux Klan	Colt	Saint Francis
International Keystone Knights of the Ku Klux Klan Inc.	Ku Klux Klan	Vanndale	Cross
Kingdom Identity Ministries	Christian Identity	Harrison	Boone
Knights of the Ku Klux Klan	Ku Klux Klan	Concord	Cleburne
Knights of the Ku Klux Klan	Ku Klux Klan	Harrison	Boone
Ku Klux Klan LLC	Ku Klux Klan	Compton	Newton
League of the South	Neo-Confederate	Mammoth Spring	Fulton
Nation of Islam	Black Separatist	Pine Bluff	Jefferson
Nation of Islam	Black Separatist	Little Rock	Pulaski
Ozark Craft LC	General Hate	Harrison	Boone
South Africa Project	White Nationalist		
Tightrope	Racist Music	Calico Rock	Izard
Tony Alamo Christian Ministries	General Hate	Fort Smith	Sebastian
Tony Alamo Christian Ministries	General Hate	Fouke	Miller
True Invisible Empire Traditionalist American Knights of the Ku Klux Klan	Ku Klux Klan		
White Pride Home School Resource Center	General Hate	Bergman	Boone
White Revolution	Neo-Nazi	Mountain View	Stone

Source: Southern Poverty Law, www.splcenter.org

Before the September 11, 2001 attacks in New York and the Pentagon, most terrorist incidents in the United States have been bombing attacks, involving detonated and un-detonated explosive devices, tear gas, and pipe and fire bombs. The effects of terrorism can vary significantly from loss of life and injuries to property damage and disruptions in services such as electricity, water supply, public transportation and communications. The U.S. government has attempted to reduce vulnerability to terrorist incidents by developing infrastructure protection programs for critical infrastructure and key resource facilities and increased security at airports.

While we can never predict what target a terrorist will choose, we do know some of the factors they use when selecting a target. Terrorists want to achieve one or more of the following:

- Produce a large number of victims,

- Attack places that have a symbolic value,
- Get the greatest possible media attention, and
- Produce mass panic.

Terrorists also select targets best suited for the type of material being used. For example, some biological agents are not effective in sunlight. Most chemical agents are more effective indoors with limited airflow. A radioactive material will be most effective where large numbers of people will pass close by without detecting it. Terrorists are likely to target heavily populated, enclosed areas like stadiums, government buildings, sporting events, airport terminals, subways, shopping malls and industrial manufacturing facilities. For this reason, it is critical that employers and local government agencies have some type of anti-terrorism plan in place should a terrorist act occur.

A terrorist attack can take several forms, depending on the technological means available to the terrorist, the nature of the political issue motivating the attack, and the points of weakness of the terrorist's target. Bombings have been the most frequently used terrorist method in the United States. Other possibilities include an attack at transportation facilities, an attack against utilities or other public services or an incident involving chemical or biological agents.

❖ *Previous Occurrences*

Arkansas has been fortunate to escape a major terrorist incident. The State has experienced white supremacists rallies and they have been suspected in assaults and cross burnings over the years.

- **June 1, 2009:** Man opened fire with a rifle at a U.S. military recruiting office in Little Rock killing one private and injuring another as he intended to kill as many Army personnel as possible. He faced charges in engaging in a terrorist act.
- ***April 19, 1995:*** The Alfred P. Murrah Federal Building, a United States Government complex located in downtown Oklahoma City, Oklahoma on 200 N.W. 5th Street, was the target of the Oklahoma City bombing. On the morning of April 19, 1995, Timothy McVeigh parked a rented Ryder truck with explosives in front of the complex and, at 9:02 AM. CDT (14:02 UTC), a massive explosion occurred which sheared the entire north side of the building, killing 168 people. The bombing was the most destructive incident of terrorism on American soil until the September 11, 2001 terrorist attacks in New York, Washington, D.C., and Pennsylvania.

Figure 3.4.13.a Murrah Federal Building in Oklahoma City

Source: Arkansas All Hazard Plan, 2010

❖ *Probability of Future Hazard Events*

There is no sure way to predict future terrorism events. The probability of a major terrorist event in the State of Arkansas is very low, however planning must be done as part of the larger national Homeland Security initiatives. The probability for this hazard based on past occurrences is considered **"Unlikely"**.

❖ *State Vulnerability Analysis*

The bombing of the Murrah Federal Building in the neighboring state of Oklahoma made it clear that the risk of terrorism in Arkansas is a viable one. Since Arkansas is primarily rural, terrorists could very well gather materials, make plans and carry out those plans undetected. Additionally, the people of Arkansas are, by nature, friendly and trusting. This particular type of atmosphere could be viewed by a terrorist as an invitation to violence. It isn't hard for anyone to get the necessary materials needed to carry out a terrorist attack. The know-how to assemble weapons and deliver them is easily found – often on the Internet. And a laboratory isn't needed – they can be made in a kitchen often in a vessel the size of a mayonnaise jar.

There are several locations in Arkansas that could be very attractive targets to a terrorist. The State has a nuclear power plant, a chemical weapons storage facility, numerous railroad bridges and trestles and ocean-bound river traffic on the Mississippi, Ouachita, White and Arkansas Rivers. Commercial trucks haul toxic chemicals throughout Arkansas. Furthermore, the State has a number of large arenas that could be targets of a terror attack. Terrorist events are largely targeted at populated areas and events. Within Arkansas, there are many daily public events and gatherings where thousands of people congregate. During a college football season at the

University of Arkansas in Fayetteville, it is common to have 70,000+ fans in the stadium on any given Saturday. During Wal-Mart's annual stockowners meeting each year, high profile executives, celebrities, and thousands of stockowners meet in Bud Walton Arena. Verizon Arena in Little Rock hosts concerts and events weekly to a capacity crowd of 18,000. Any of these locations could be a target for a terrorist event and if it were to take place, it would result in a catastrophic loss of life.

Table 3.4.13.b Large Capacity Venues in Arkansas

Facility	County	Capacity
Verizon Arena	Pulaski	18,000
Razorback Stadium	Washington	71,000
Bud Walton Arena	Washington	19,368
Liberty Bank Stadium (on campus of ASU)	Craighead	30,964
War Memorial Stadium	Pulaski	55,000
Little Rock Air Force Base – Air Show	Pulaski	200,000
Arkansas State Fair Complex	Pulaski	15,000
Hot Springs Convention Center	Garland	6,000
War Eagle Fair	Benton	130,000

The Arkansas Department of Emergency Management and Homeland Security have identified 14 critical infrastructure and key resource (CI/KR) locations within the state which they determine to be credible targets for terrorist events. The data and details of these 14 structures cannot be provided within the mitigation plan due to the sensitivity of the data.

Commercial Agriculture Impact Analysis

A terrorist event using biological agents could be an extreme danger for the agricultural industry and economy in Arkansas. Depending on the type of biological weapon, the agriculture industry could be more affected than the human population. An example of biological events that could be introduced could be the Avian Flu, Mad Cow Disease, or Foot and Mouth Disease. The introduction of any of these into the agricultural industry from a terrorist event would force the closure of production plants, the destruction of animals and result in the loss of millions and possibly billions of dollars to agricultural companies and the small farmer.

The broiler industry (broilers, turkeys and chicken eggs) in Arkansas is approximately $2.728 billion dollars in 2011 and approximately 50 percent of the State's agricultural Gross National Product (GNP) is this bird-related industry.

According to the *Economic Contribution to Arkansas Agriculture 2012* report by the University of Arkansas, Division of Agriculture, agriculture in general accounted for 256,244 jobs, nearly one in every six jobs in Arkansas. Direct labor in agriculture is almost $9.8 billion, 16 percent of the State's total labor income.

The value of beef cattle and calves in Arkansas was $484,752 in 2011. Cattle are raised in every county and there is an estimated 1.6 million head of cattle in Arkansas as January 1, 2012.

❖ *State Estimates of Potential Losses*

Potential losses from Terrorism include all infrastructure, critical facilities, humans, crops and animals. The degree of impact would be directly related to the type of incident and the target. Potential losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of human life, injuries to persons, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment. Secondary effects of infrastructure failure could include public safety hazards, spread of disease, increased morbidity and mortality among the local and distant populations, public panic and long-lasting damage to the environment. Terrorism events are rare occurrences and specific amounts of estimated losses for previous occurrences are not available due to the complexity and multiple variables associated with these types of hazards. In some instances, information about these events is secure and unavailable to the public in order to maintain national security and prevent future attacks.

As discussed previously, it is difficult to quantify potential losses in terms of the jurisdictions most threatened by CBRNE (chemical, biological, radiological, nuclear, and high yield explosive) attack events due to the many variables and human element. A number of factors add to this difficulty:

- Location of the attack,
- Populations in the attacked area,
- Available resources for response and recovery,
- Time of day and year,
- Level of success of the attack, and
- Residual effects of the attack.

Therefore, for the purposes of this plan, the loss estimates will take into account several hypothetical scenarios. Please note that these hypothetical scenarios are included to provide a sample methodology for local jurisdictions to estimate potential losses. The hypothetical scenarios include: a chemical attack, a biological attack, an improvised explosive device (IED) attack, and a radiological attack. For comparative purposes, these hypothetical attack scenarios will all be staged at the same venue, a college football stadium in a university city in Arkansas during a home football game. The hypothetical stadium is situated on less than one square mile in an urban area and has a seating capacity of approximately 35,000 persons. Surface area and parking structures are located adjacent to the stadium.

Analysis of vulnerable populations is aided by a program developed by Johns Hopkins University in 2006 called Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) http://www.hopkins-cepar.org/EMCAPS/EMCAPS.html which utilizes scenarios developed by the Department of Homeland Security.

****THE FOLLOWING HYPOTHETICAL SCENARIOS ARE FOR INSTRUCTIONAL AND ILLUSTRATIVE PURPOSES ONLY****

Chemical Attack – Toxic Gas

Scenario Overview: A bomb is attached to a tractor trailer tanker carrying compressed chlorine near the parking lot of a home football game and all the contents are released through a 3-ft hole. The entire contents of the tank escape to the atmosphere and the plume spreads to the surrounding area and stadium. The plume spreading and the affect on the population are calculated agent directly contaminates the stadium and the immediate surrounding area. This particular type of attack would cause harm to humans and could render portions of the stadium unusable for a short time period in order 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 boycott of games resulting in a loss of revenue and tourism dollars.

Assumptions: (1) The population density at the stadium on game day is high – approximately 93 percent of the seats, 20,000 are filled and an additional 1,500 persons remain outside the stadium in the adjacent parking areas. (2) Compressed Chlorine is extremely toxic and may damage eyes, skin and respiratory tract. Death sometimes results from secondary respiratory infections. (3) The rate of "worried well" is equal to 9 times the number of Injury Level 5 cases with the eye irritation, coughing and skin irritation.

Described Losses:

Injury Level 5	Eye Irritation, coughing, skin irritation	2,400 persons
Injury Level 4	Eye Irritation, headache, throat irritation	6,431 persons
Injury Level 3	Eye Pain & swelling, headache, throat irritation, rapid breathing, chest pain	5,241 persons
Injury Level 2	Eye Pain & swelling, headache, throat irritation, chest pain, lung inflammation	2,583 persons
Injury Level 1	Eye Pain & swelling, headache, threat irritation, restricted airflow, vomiting, possible chemical burns	952 persons
Injury Level 0	Deaths	535 persons
	Total "Worried Well" Cases (9 times the number of affected cases)	21,600 persons

Notes: Victims will require large numbers of positive pressure ventilation and there will be a large demand to decontaminate the facilities and area.

Biological Attack – Food Contamination GI Anthrax

Scenario Overview: Anthrax bacteria was inserted into hot dogs at a processing plant. Those contaminated hotdogs were shipped to the university food department and were sold at the concession stands at this football game. Everyone who consumed the hot dogs developed GI anthrax (attach rate = 100%) over the next several days. The bacteria is not communicable so only the people that ate the hot hogs became ill.

Assumptions: (1) The number of people that ate the contaminated hotdogs was 3,000.

Described Losses:

Infected Population	3,000 persons
Fatalities – 25 percent	750 persons

Improvised Explosive Device Attack – ANFO

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a panel van to a parking area during a time when stadium patrons are leaving their cars and entering the stadium and detonated. Potential losses with this type of scenario include both human and structural assets.

Assumptions: (1) The population density in the parking lot during the beginning and ending of the games is high, at least 1 person /25 square feet. (2) The quantity of ANFO used is 4,000 lbs, similar to that used by Timothy McVeigh in the Oklahoma City bombing. (3) The Lethal Air Blast Range for such a vehicle is 200 feet according to the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) Standards. (4) The Falling Glass Hazard distance is 2,750 feet according to BATF Explosive Standards.

Described Losses:

Total Dead	1,391 persons
Total Traumatic Injuries	2,438 persons
Total Urgent Care Injuries	11,935 persons
Injuries not Requiring Hospitalization	4,467 persons
Structures and Other Physical Assets (Damages would certainly 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.)	Vehicles – Replacement cost for approximately 100 vehicles @ $15,000 per vehicle inside the 200 ft BATF described Lethal Air Blast range = $ 150,000 Repair / repainting cost for approximately 500 vehicles @ $ 4,000 per vehicle inside the BATF described Falling Glass Hazard = $2,000,000

Radiological Dispersion Device – Dirty Bomb Attack

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a panel van to a parking area during a time when stadium patrons are leaving their cars and entering the stadium and detonated. Potential losses with this type of scenario include both human and structural assets. The bomb also contains 2,700 Curies of Cesium-137 (Cs-137).

Assumptions: (1) The population density in the parking lot during the beginning and ending of the games is high, at least 1 person /25 square feet. (2) The quantity of ANFO used is 4,000 lbs, similar to that used by Timothy McVeigh in the Oklahoma City bombing. (3) The Lethal Air Blast Range for such a vehicle is 200 feet according to the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) Standards. (4) The Falling Glass Hazard distance is 2,750 feet according to BATF Explosive Standards.

Described Losses:

Total Dead	1,391 persons
Total Traumatic Injuries	2,438 persons
Total Urgent Care Injuries	11,935 persons
Injuries not Requiring Hospitalization	4,467 persons
Radiological Poisoning Injuries that Need Aggressive Treatment	13
Radiological Poisoning Injuries that Need Non-Critical Treatment	440
Radiological Poisoning Injuries that could Self Medicate with Proper Public Information	62,378
Structures and Other Physical Assets (Damages would certainly 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.)	Vehicles – Replacement cost for approximately 100 vehicles @ $15,000 per vehicle inside the 200 ft BATF described Lethal Air Blast range = $ 150,000 Repair / repainting cost for approximately 500 vehicles @ $ 4,000 per vehicle inside the BATF described Falling Glass Hazard = $2,000,000

❖ Development in Hazard Prone Areas

As more and more large public events are held in Arkansas, more potential may exist for these venues to become targets of attack. With human-caused hazards such as this that can have multiple variables involved, increases in development are not always a factor in determining risk, although the physical cost of the event may increase with the increased or newly developed areas.

❖ Consequence Analysis

The information in **Table 3.4.13.m** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.13.c. EMAP Consequence Analysis: Terrorism Event

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Health and Safety of Persons Responding to the Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained and protected personnel.
Continuity of Operations	Damage to facilities/personnel in the area of the incident may require relocation of operations and lines of succession execution.
Property, Facilities, and Infrastructure	Facilities and infrastructure in the area of the incident may be extensive for explosion, moderate to light for HazMat.
Delivery of Services	Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
The Environment	May cause extensive damage, creating denial or delays in the use of some areas. Remediation needed.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of investigation.
Regulatory and Contractual Obligations	Regulatory waivers may be needed. Fulfillment of contracts may be difficult. Demands may overload ability to deliver.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.4.14 Major Disease Outbreak

❖ *Description/Location*

The HMC identified and ranked all the various biological-related hazards that may potentially affect the state. A variety of factors have been considered including the following:

- Methods of transmission.
- Naturally occurring and human-caused.
- Human diseases and animal-related illnesses.

Methods for Transmission

There are two major types of infectious diseases that can develop into epidemics: common source and host-to-host. Common source epidemics arise from a contaminated source, such as water or food, while host-to-host infections are transmitted from one infected individual to another via various, perhaps indirect, routes. Each of these different types of infection has factors that affect the response, surveillance, quarantine and treatment. The following chart lists some of the most common infectious diseases and their typing for transmission.

Table 3.4.14.a Common Source Epidemic Diseases

Common Source Epidemic Diseases			
Disease	**Causative Agent**	**Infection Sources**	**Reservoirs**
Anthrax	*Bacillus anthracis* (B)	Milk or meat from infected animals	Cattle, swine, goats, sheep, horses
Bacillary Dysentery	*Shigella dysenteriae* (B)	Fecal contamination of food and water	Humans
Botulism	*Clostridium botulinum* (B)	Soil-contaminated food	Soil
Brucellosis	*Brucella melitensis* (B)	Milk or meat from infected animals	Cattle, swine, goats, sheep, horses
Cholera	*Vibrio cholerae* (B)	Fecal contamination of food and water	Humans
Giardiasis	*Giardia* spp. (P)	Fecal contamination of water	Wild mammals
Hepatitis	Hepatitis A,B,C,D,E (V)	Infected humans	Humans
Paratyphoid	*Salmonella paratyphi* (B)	Fecal contamination of food and water	Humans
Typhoid Fever	*Salmonella typhi* (B)	Fecal contamination of food and water	Humans

Table 3.4.14.b Host to Host Epidemics

Host-to-host Epidemics			
Disease	**Causative Agent**	**Infection Sources**	**Reservoirs**
Respiratory Diseases			
Diphtheria	*Corynebacterium diphtheriae* (B)	Human cases and carriers; infected food	Humans
Hantavirus Pulmonary Syndrome	Hantavirus (V)	Inhalation of contaminated fecal material	Rodents
Meningicoccal meningitis	*Neisseria eningitides* (B)	Human cases and carriers	Humans
Pneumonococcal Pneumonia	*Streptococcus pneumoniae* (B)	Human carriers	Humans
Tuberculosis	*Mycobacterium tuberculosis* (B)	Sputum from human cases; contaminated milk	Humans, cattle
Whooping Cough	*Bordetella pertussis* (B)	Human cases	Humans
German Measles	Rubella virus (V)	Human cases	Humans
Influenza	Influenza virus (V)	Human cases	Humans, animals
Measles	Measles virus (V)	Human cases	Humans
Sexually transmitted diseases			
HIV-Disease	HIV (V)	Infected body fluids, blood, semen, etc.	Humans
Chlamydia	*Chlamydia trachomatis* (B)	Urethral, vaginal, and anal secretions	Humans
Gonorrhea	*Neisseria gonorrheae* (B)	Urethral and vaginal secretions	Humans
Syphilis	*Treponema pallidum* (B)	Infected exudate or blood	Humans
Trichomoniasis	*Trichomonas vaginalis* (P)	Urethral, vaginal, prostate secretions	Humans
Vector-borne diseases			
Epidemic Typhus	*Rickettsia prowazekii* (B)	Bite by infected louse	Humans, lice
Lyme Disease	*Borrelia burgdorferi* (B)	Bite from infected tick	Rodents, deer, ticks
Malaria	*Plasmodium* spp. (P)	Bite from infected Anopheles mosquito	Humans, mosquitoes
Plague	*Yersinia pestis* (B)	Bite by infected flea	Wild rodents
Rocky Mountain Spotted Fever	*Rickettsia rickettsii* (B)	Bite by infected tick	Ticks, rabbits, mice
Direct-contact diseases			

Host-to-host Epidemics			
Disease	**Causative Agent**	**Infection Sources**	**Reservoirs**
Psittacosis	*Chlamydia psittaci* (B)	Contact with birds or bird excrement	Wild and domestic birds
Rabies	Rabies virus (V)	Bite by carnivore	Wild and domestic carnivores
Tularemia	*Franciscella tularensis* (B)	Contact with rabbits	Rabbits

This list does not include all of the potential threats but it gives a good idea of the number of diseases that can affect the human and animal population and their methods for transmission. Based on the characteristics of the disease, the risk assessment changes and different mitigation strategies are required. Viruses and other living organisms tend to be specialized and affect only limited species. Diseases such as Mad Cow, Avian Flu, Exotic Newcastle Disease, Foot and Mouth Disease, Swine Flu and others are only dangerous to specific species and generally not to humans. Likewise, some diseases only affect humans and not animals. Some of the dangers related to this factor involve viruses that mutate and become able to move between species. While there are a number of biological diseases/agents that are of concern to the State of Arkansas, the following categories of disease are being addressed in this plan: Human diseases such as vaccine preventable disease, food borne diseases, community associated infections having significant recurring impact on the morbidity of Arkansans and diseases affecting the animal populations in Arkansas, specifically beef cattle and poultry.

The following descriptions are general and it should be noted that individuals may experience more or less severe consequences based upon their own circumstances.

Human and Animal Disease

Arkansas's public health and health care communities must be prepared to rapidly identify and contain a wide range of biological agents. Each year local public health units and the Arkansas Department of Health investigate disease "outbreaks" of routine illnesses such as foodborne illness and sexually transmitted diseases. There have also been outbreaks of vaccine-preventable diseases such as mumps. During 2009, a pandemic "scare" served as a wake-up call to the public health and medical care communities regarding the requirements for personnel, pharmaceuticals, equipment and public education during large scale disease outbreaks. A few of the diseases are profiled below.

Pandemic Influenza

A pandemic is a global disease outbreak. A pandemic flu is a human flu that causes a global outbreak, or pandemic, of serious illness. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine.

This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The Centers for Disease Control and Prevention (CDC) has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation.

During 2009 and 2010 health professionals around the globe worked to combat the H1N1 influenza virus. This influenza virus circulated across the globe and caused one of the most robust worldwide vaccination campaigns since the 1970s. Health professionals continue to monitor the possibility of an avian (bird) flu pandemic associated with a highly pathogenic avian H5N1 virus. Since 2003, avian influenza has been spreading through Asia. A growing number of human H5N1 cases contracted directly from handling infected poultry have been reported in Asia, Europe, and Africa, and more than half the infected people have died. There has been no sustained human-to-human transmission of the disease, but the concern is that H5N1 will evolve into a virus capable of human-to-human transmission.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Norovirus

Noroviruses are a group of related, single-stranded RNA, non-enveloped viruses that cause acute gastroenteritis in humans. The most common symptoms of acute gastroenteritis are diarrhea, vomiting, and stomach pain. Norovirus is the official genus name for the group of viruses previously described as “Norwalk-like viruses” (NLV).

The incubation period for norovirus-associated gastroenteritis in humans is usually between 24 and 48 hours, but cases can occur within 12 hours of exposure. Norovirus infection usually presents as acute-onset vomiting, watery non-bloody diarrhea with abdominal cramps, and nausea. Low-grade fever also occasionally occurs, and diarrhea is more common than vomiting in children. Dehydration is the most common complication, especially among the young and elderly, and may require medical attention. Symptoms of norovirus infection usually last 24 to 72 hours.

Recovery is usually complete and there is no evidence of any serious long-term sequelae. Studies with volunteers given the virus have shown that asymptomatic infection may occur in as many as 30% of infections, although the role of asymptomatic infection in norovirus transmission is not well understood.

Noroviruses are transmitted primarily through the fecal-oral route, either by consumption of fecally contaminated food or water or by direct person-to-person spread. Environmental and fomite contamination may also act as a source of infection. Good evidence exists for transmission due to aerosolization of vomitus that presumably results in droplets contaminating surfaces or entering the oral mucosa and being swallowed. No evidence suggests that infection occurs through the respiratory system.

Noroviruses are highly contagious and as few as 10 viral particles may be sufficient to infect an individual. During outbreaks of norovirus gastroenteritis, several modes of transmission have been documented; for example, initial food borne transmission in a restaurant, followed by secondary person-to-person transmission to household contacts. Although pre-symptomatic viral shedding may occur, shedding usually begins with the onset of symptoms and may continue for two weeks or more after recovery. It is unclear to what extent viral shedding over 72 hours after recovery signifies continued infectivity.

Salmonellosis

Salmonellosis is an infection with bacteria called *Salmonella*. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts four to seven days, and most persons recover without treatment. However, in some persons, the diarrhea may be so severe that the patient needs to be hospitalized. In these patients, the *Salmonella* infection may spread from the intestines to the blood stream, and then to other body sites and can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness.

Salmonella is actually a group of bacteria that can cause diarrheal illness in humans. They are microscopic living creatures that pass from the feces of people or animals to other people or other animals. There are many different kinds of *Salmonella* bacteria. *Salmonella* serotype Typhimurium and *Salmonella* serotype Enteritidis are the most common in the United States. *Salmonella* germs have been known to cause illness for over 100 years. They were discovered by an American scientist named Salmon, for whom they are named.

Many different kinds of illnesses can cause diarrhea, fever, or abdominal cramps. Determining that *Salmonella* is the cause of the illness depends on laboratory tests that identify *Salmonella* in the stool of an infected person. Once *Salmonella* has been identified, further testing can determine its specific type.

Avian Flu (H5N1)

Avian Influenza is an infection caused by avian (bird) influenza (flu) viruses. These influenza viruses occur naturally among birds. Wild birds worldwide carry the viruses in their intestines, but usually do not get sick from them. However, Avian Influenza is very contagious among birds and can make some domesticated birds, including chickens, ducks, and turkeys, very sick and die. Infected birds shed influenza virus in their saliva, nasal secretions, and feces. Susceptible birds become infected when they have contact with contaminated secretions or excretions or with surfaces that are contaminated with secretions or excretions from infected birds. Domesticated birds may become infected with Avian Influenza virus through direct contact with infected waterfowl or other infected poultry, or through contact with surfaces (such as dirt or cages) or materials (such as water or feed) that have been contaminated with the virus.

The highly pathogenic form can spread very rapidly through flocks of poultry. This form may cause disease that affects multiple internal organs and has a mortality rate that can reach 90-100% often within 48 hours.

The risk from Avian Influenza is generally low to most people because the viruses occur mainly among birds and do not usually infect humans. However, more than 100 human cases of Avian Influenza infection have been reported since 1997. Most cases of Avian Influenza infection in humans have resulted from contact with infected poultry (e.g., domesticated chicken, ducks, and turkeys) or surfaces contaminated with secretion/excretions from infected birds. The spread of Avian Influenza viruses from one ill person to another has been reported very rarely, and transmission has not been observed to continue beyond one person.

During an outbreak of Avian Influenza among poultry, there is a possible risk to people who have contact with infected birds or surfaces that have been contaminated with secretions or excretions from infected birds. Symptoms of Avian Influenza in humans have ranged from typical human influenza-like symptoms (e.g., fever, cough, sore throat, and muscle aches) to eye infections, pneumonia, severe respiratory diseases (such as acute respiratory distress), and other severe and life-threatening complications.

The Arkansas poultry industry is approximately a $3.2 billion business for the state and accounts for approximately 50% of the state's agriculture. Therefore, the areas with the largest concentration of chicken and turkey farms are the most at-risk to this hazard.

The northwest corner of the state has the largest poultry industry and infrastructure so this area is considered the most likely to be affected.

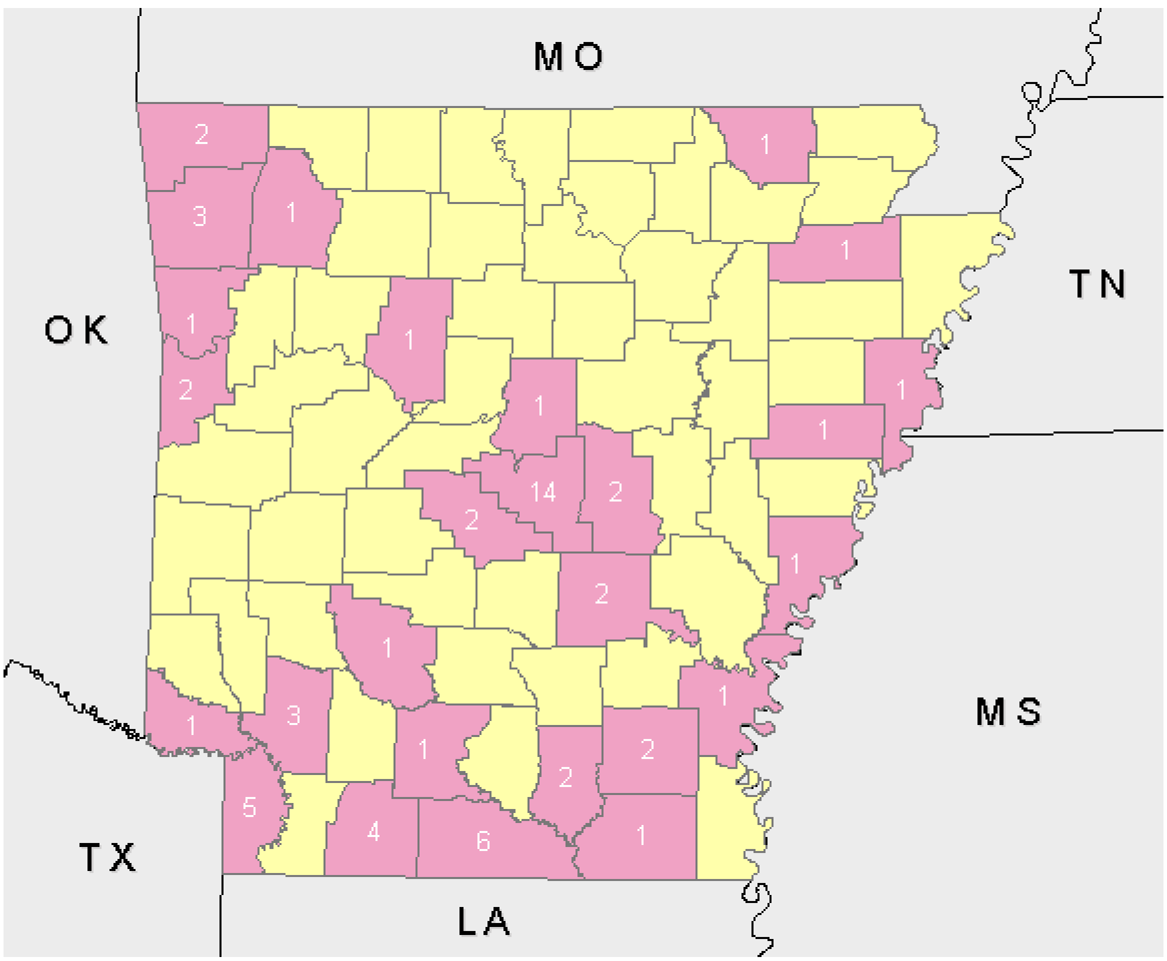
West Nile Virus

The West Nile Virus (WNV) was first detected in the Western Hemisphere in 1999 and has since rapidly spread across the North American continent into all 48 continental states, seven Canadian provinces, and throughout Mexico. In addition, WNV activity has been detected in Puerto Rico, the Dominican Republic, Jamaica, Guadeloupe and El Salvador. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall.

West Nile Virus was first isolated from an adult woman in the West Nile District of Uganda in 1937. The virus became recognized as a cause of severe human meningitis or encephalitis (inflammation of the spinal cord and brain) in elderly patients during an outbreak in Israel in 1957. West Nile Virus has been described in Africa, Europe, the Middle East, west and central Asia, and most recently, North America.

Statistically, a person's risk of contracting West Nile is low, and less than 1% of those infected develop serious illness from the virus. Those at highest risk for serious illness are the elderly and those with lowered immune systems. However, people of all ages can develop serious illness, so it is important for everyone to protect themselves from mosquito bites to minimize the risk of infection. People over 50 are at higher risk to become severely ill. People over the age of 50 are more likely to develop serious symptoms of WNV and should take special care to avoid mosquito bites. Being outside means a person is at risk. The more time someone is outdoors, the more time that person can be bitten by an infected mosquito. People must pay attention to avoiding mosquito bites if they spend a lot of time outside, either working or playing. Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

Figure 3.4.14.a 2012 Human West Nile Cases



Source: USGS, 2013

Foot and Mouth Disease (FMD)

FMD is a highly contagious and economically devastating disease of cattle and swine. It also affects sheep, goats, deer, and other cloven-hoofed (split-toed) ruminants. Many affected animals recover, but the disease leaves them debilitated. FMD causes severe losses in the production of meat and milk. Because it spreads widely and rapidly and because it has grave economic as well as physical consequences, FMD is one of the most dreaded animal diseases for livestock owners.

Vesicles (blisters) in the mouth, on the tongue and lips, on the teats, or between the toes—and the resulting excessive salivation or lameness— are the best-known signs of the disease. Blisters may not be observed until they have ruptured. Other signs, including fever, reduced feed consumption, and abortions, also may appear in affected animals during an FMD outbreak. Prior to and during the occurrence of such clinical signs, the virus can be shed through exhaled air, lesions, milk, semen, and blood, making its transmission difficult to control. Direct contact between animals can transmit the disease, as can most animal products, and even inanimate objects. The virus has a remarkable capacity for remaining viable in carcasses, in animal byproducts, in water, in such materials as straw and bedding, and even in pastures.

FMD can be confused with several similar—but less harmful— domestic diseases, such as vesicular stomatitis, bovine virus diarrhea, and foot rot. There are two other foreign animal diseases that are clinically identical to FMD in swine – swine vesicular disease and vesicular exanthema of swine. Whenever blisters or other typical signs are observed and reported, tests must be conducted to determine whether the disease causing them is FMD.

The disease does not affect human safety. People, however, can spread the virus to animals. FMD can remain in human nasal passages for as long as 28 hours and can be carried on soiled footwear, clothing and other items for several days. Livestock producers need to watch their livestock for blisters around the mouth or muzzle, excessive drooling, lameness, and other signs of FMD in their herd. Swine and cattle typically show signs of the disease within two to seven days of exposure. Sheep and goats may display minimal clinical signs of the disease after an incubation period of up to fourteen days.

Mad Cow Disease (Bovine Spongiform Encephalopathy (BSE))

Bovine Spongiform Encephalopathy (BSE) is the scientific term for a disease that affects the brains of cattle. Soon after BSE was first discovered in the United Kingdom, it became more commonly known as "Mad Cow Disease," most likely because of the emotional response it generated with the public. Mad Cow Disease is a slowly progressive, degenerative, fatal disease affecting the central nervous system of adult cattle.

Unlike most livestock diseases, BSE is not caused by a bacterial or viral infection, but rather is the result of infectious prions. These are unique proteins that may bond with a cow's brain cells, altering their composition and ultimately leading to the animal's death. In cattle with BSE, these ***abnormal prions initially occur in the small intestines and tonsils, and are found in central***

nervous tissues, such as the brain and spinal cord, and other tissues of infected animals experiencing later stages of the disease. Mad Cow Disease is believed to be transferred to cattle when they eat these infectious proteins, yet science has shown the disease can only affect those cows that are genetically susceptible.

A similar disease, scrapie, has affected sheep in the United Kingdom since at least the mid-18th century. Scientists believe that through centuries of close contact in rural England, the disease managed to transfer to cattle, where it was first identified in 1985. In the years that followed, more than 180,000 cows became infected in the U.K. The British practice of processing central nervous tissue into animal feed allowed the prions to spread rapidly through their herds. As the British exported feed and live animals to various regions of the world, cases of BSE began to appear in other countries.

The disease, which is believed to be caused by an agent smaller than most viruses, has an incubation period of two to eight years and is invariably fatal. There is neither any treatment nor a vaccine to prevent the disease, and there is no test to detect the disease in a live animal. There is no evidence that BSE spreads by contact between adult cattle or, in nature, from cattle to other species. It has spread to native cattle in 19 countries, mostly in Europe, probably mainly through the practice of mixing BSE-contaminated ruminant products into animal feed as an added source of protein.

Since 1990, the U.S. Department of Agriculture (USDA) has conducted aggressive surveillance of the highest risk cattle going to slaughter in the United States. In 1997, the United States banned materials that can possibly contain prions from cattle feed, while also eliminating these specified risk materials from the human food supply. This firewall feed ban, in place now for nearly seven years, ensures that BSE cannot spread through American herds the way it did in Europe, where such a feed ban did not occur until after Mad Cow Disease had reached epidemic proportions.

In 1998, USDA commissioned the Harvard Center for Risk Analysis to conduct an analysis and evaluation of the US regulatory measures to prevent the spread of BSE in the US and to reduce the potential exposure of US consumers to BSE. The Harvard study concluded that, if introduced, due to the preventive measures currently in place in the US, BSE is extremely unlikely to become established in the United States.

❖ *Previous Occurrences*

Pandemic Influenza

There have been four acknowledged pandemics in the past century:

- 1918–19 Spanish flu (H1N1) – This flu is estimated to have sickened 20-40% of the world's population. Over 20 million people lost their lives. Between September 1918 and

April 1919, 500,000 Americans died. The flu spread rapidly; many died within a few days of infection, others from secondary complications. The attack rate and mortality was highest among adults 20-50 years old; the reasons for this are uncertain. Recently, the origin of the pandemic was traced to an outbreak of influenza in Haskell County, Kansas, in January 1918. Army personnel in Haskell County reported to Camp Funston (now Ft. Riley), which meant soldiers and their friends and families likely carried the virus from the county to the camp. Camp Funston sent a constant stream of soldiers to other American locations and to Europe, enabling the spread of the disease throughout the country and around the world. By the end of 1918, the Kansas death toll was around 12,000.

- 1957–58 Asian flu (H2N2) – This virus was quickly identified because of advances in technology, and a vaccine was produced. Infection rates were highest among school children, young adults, and pregnant women. The elderly had the highest rates of death. A second wave developed in 1958. In total, there were about 70,000 deaths in the United States. Worldwide deaths were estimated between one and two million. Information about how this pandemic affected Kansas was not available.
- 1968–69 Hong Kong flu (H3N2) – This strain caused approximately 34,000 deaths in the United States and more than 700,000 deaths worldwide. It was first detected in Hong Kong in early 1968 and spread to the United States later that year. Those over age 65 were most likely to suffer fatal consequences. This virus returned in 1970 and 1972 and still circulates today.
- 2009 H1N1 Influenza – The Lancet Infectious Diseases Online First provided global estimates of how many people died as a result of the 2009 H1N1 influenza pandemic. The estimated range of deaths were from between 151,700 and 575,400 people who perished worldwide from 2009 H1N1 virus infection during the first year the virus circulated. A disproportionate number of deaths occurred in Southeast Asia and Africa, where access to prevention and treatment resources are more likely to be limited. These global estimates are more than 15 times higher than the number of laboratory-confirmed deaths reported to the World Health Organization (WHO). WHO has acknowledged for some time that official, lab-confirmed reports are an underestimate of actual number of influenza deaths. The estimated number of deaths was similar to previous mortality estimates during the first 12 months of 2009 H1N1 virus circulation in some countries, including the United States. Estimates are that 80% of 2009 H1N1 deaths were in people younger than 65 years of age which differs from typical seasonal influenza epidemics during which 80-90% of deaths are estimated to occur in people 65 years of age and older.

Foodborne Diseases

- September 2006 - *E. coli* O157 Infections in the spinach industry. Throughout the month, spinach contaminated with E. coli entered the US supermarket distribution chain that ultimately resulted in 111 reported cases in 21 states. The Food and Drug Administration (FDA) issued various warnings and a nationwide recall was implemented for multiple brands.

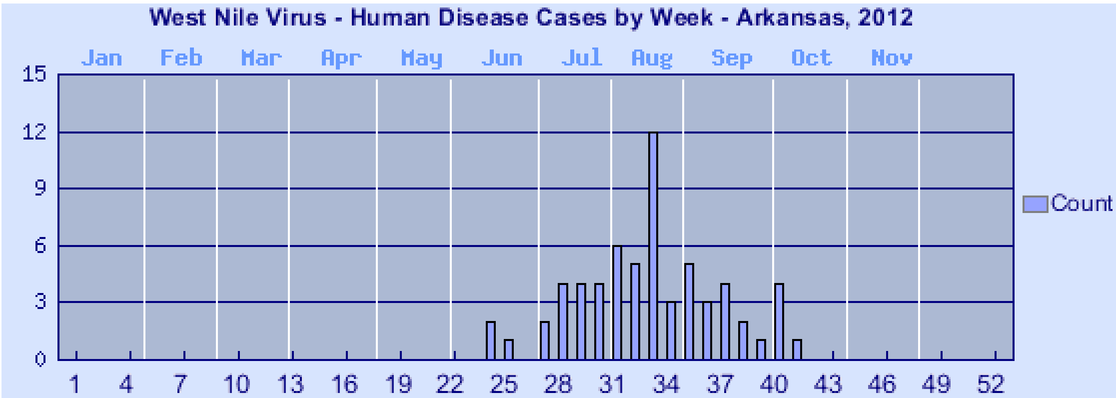
- March 2007 – Pet Food Contamination and Recall – The FDA learned that certain pet foods containing vegetable proteins imported into the United States from China were sickening and killing cats and dogs. A portion of the tainted pet food was used to produce farm animal feed and fish feed. The FDA and the U.S. Department of Agriculture discovered that some animals that ate the tainted feed had been processed into human food. Government scientists determined a very low risk to human health from consuming food from animals that ate tainted feed. All tainted pet food, animal and fish feed, and vegetable proteins were recalled and destroyed.

- October 2010 -- Epidemiologic investigations conducted by public health officials in 11 states since April identified 29 restaurants or event clusters where more than one ill person with the outbreak strain had eaten. Data from these investigations suggest that shell eggs were a likely source of infections in many of these restaurants or event clusters. Wright County Egg, in Galt, Iowa, was an egg supplier in 15 of these 29 restaurants or event clusters. Traceback investigations were completed for several of these clusters. A formal traceback was conducted by state partners in California, Colorado, and Minnesota, in collaboration with FDA and CDC, to find a common source of shell eggs. Wright County Egg in Iowa was found as the common source of the shell eggs associated with four of the clusters. Cases were noted in Arkansas.

- November 2011 -- A total of 147 persons infected with any of the five outbreak-associated subtypes of Listeria monocytogenes were reported to CDC from 28 states. The number of infected persons identified in each state was as follows: Alabama (1), Arkansas (1), California (4), Colorado (40), Idaho (2), Illinois (4), Indiana (3), Iowa (1), Kansas (11), Louisiana (2), Maryland (1), Missouri (7), Montana (2), Nebraska (6), Nevada (1), New Mexico (15), New York (2), North Dakota (2), Oklahoma (12), Oregon (1), Pennsylvania (1), South Dakota (1), Texas (18), Utah (1), Virginia (1), West Virginia (1), Wisconsin (2), and Wyoming (4).

- April 2012 – Illness associated with a yellowfin tuna product used to make dishes like sushi and sashimi sold at restaurants and grocery stores has been linked with an outbreak of salmonella sickened more than 100 people in 20 states and the District of Columbia, federal health authorities reported. Cases were reported in these states and the District of Columbia: Alabama (2), Arkansas (1), Connecticut (5), District of Columbia (2), Florida (1), As Georgia (5), Illinois (10), Louisiana (2), Maryland (11), Massachusetts (8), Mississippi (1), Missouri (2), New Jersey (7), New York (24), North Carolina (2), Pennsylvania (5), Rhode Island (5), South Carolina (3), Texas (3), Virginia (5), and Wisconsin (12).

Figure 3.4.14.b 2012 West Nile Cases by Week



Mad Cow Disease (Bovine Spongiform Encephalopathy (BSE))

- December, 23, 2003 -- The U.S. Department of Agriculture reported that a cow in Washington State had tested positive for BSE.
- December 2004 -- A second possible case of bovine spongiform encephalopathy (BSE) in the US proved to be a false alarm when the tests came back negative. But the US border remained closed to Canadian beef because of the one confirmed BSE case found in Canada in 2003.
- January 2, 2005 -- Confirmed case in Canada.
- January 11, 2005 -- The Canadian Food Inspection Agency (CFIA) announced that Canada's national surveillance program has detected bovine spongiform encephalopathy (BSE) in an Alberta beef cow of seven years of age. As part of its surveillance program, the CFIA took control of the carcass. No part of the animal entered the human food or animal feed systems.
- June 24, 2005 -- Agriculture Secretary Mike Johanns announced that the U.S. Department of Agriculture has received final test results from The Veterinary Laboratories Agency in Weybridge, England, confirming that a sample from an animal that was blocked from the food supply in November 2004 has tested positive for BSE.
- March 15, 2006 -- The USDA announced the confirmation of BSE in a cow in Alabama. The case was identified in a non-ambulatory (downer) cow on a farm in Alabama. The animal was euthanized by a local veterinarian and buried on the farm. The age of the cow was estimated by examination of the dentition as 10-years-old. It had no ear tags or distinctive marks; the herd of origin could not be identified despite an intense investigation.
- April 24, 2012 -- The USDA confirmed a BSE case in a dairy cow in California. This cow was tested as part of the USDA targeted BSE surveillance at rendering facilities in

the United States. The cow was 10 years and 7 months old and was classified as having the L-type BSE strain.

❖ Probability of Future Hazard Events

Each year the Centers for Disease Control 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 APDMAC determined the possibility of a large-scale major disease outbreak to be "limited."

❖ State Vulnerability Analysis

Any major disease outbreak in the State of Arkansas is going to have a profound effect on the population and the economy. Even events outside of the state but within the US could have adverse effects on Arkansas. Biological hazards will not impact the state the way that floods and tornadoes do with physical damage, but rather there is a severe impact to human and animal health as detailed above. However, any type of outbreak will have a rippling effect on the state's economy and infrastructure as people deal with the disaster and then go through the recovery phase. Along with economic issues there could be significant impacts to reputations of entities, individuals and organizations involved in the response.

The entire state is vulnerable to a major disease outbreak. As evidenced by Annual Survey of Notifiable Disease, US, published by the Centers for Disease Control, nearly all counties in Arkansas have connections with one or multiple disease outbreaks each year. Potential casualty losses are anticipated to be greatest in counties with higher populations, higher pediatric populations and higher elderly populations. Health professional shortage areas and rural areas are more susceptible to having limited medical capabilities and by extension are more susceptible to the possibility of being overwhelmed because of a large surge of patients seeking care. The percentage of uninsured Arkansans for 2010 was 17.5 percent compared to 15.5 percent nationally. In Arkansas, the percentage of uninsured children aged 0-17 was 6.6% and for adults aged 18-64 was 25.8%.

Although infectious diseases do not respect geographic boundaries, several populations in Arkansas are at specific risk to infectious diseases. Communicable diseases are most likely to spread quickly in institutional settings such as dormitories, long-term care facilities, day care facilities, schools, etc.

The APDMAC ranked the disease outbreak as catastrophic based on a pandemic scenario. The magnitude of an infectious disease outbreak is related to the ability of the public health and medical communities to stop the spread of the disease. Most disease outbreaks that cause catastrophic numbers of deaths are infectious in nature, meaning that they are spread from person to person. The key to reducing the catastrophic nature of the event is to stop the spread of disease. This is generally done in three ways: (1) identification and isolation of the ill, (2) quarantine of those exposed to the illness to prevent further spread, and (3) education of the public about methods to prevent transmission. Public health and health care providers routinely utilize all three methods to reduce morbidity and mortality from infectious disease. However, the capacity of the health care system is severe limited. For example, local health units have specific pandemic influenza response plans, and mass prophylaxis plans, most departments have only a few staff members. Most local health units would need to rely on volunteers, pre-scripted messages and procedures and the cooperation of the public in order to respond effectively to a large scale pandemic. Similarly, hospitals in Arkansas have emergency response and pandemic influenza plans, but little excess capacity exists to care for and/or isolate hundreds, even thousands of patients. Because of these limitations in personnel and equipment, the health care community is planning to utilize "community containment" measures. These measures which could include closure of schools, day cares and other public events would have far-reaching economic impacts on the community and might shutdown facilities for 30 days or more. Closure of the day cares or schools would have a serious impact on business as parents might not be able to find child care elsewhere.

Due to the nature of biological hazards, facilities are not in danger of actual physical damage. The majority of the facilities impacted will be private facilities such as hospitals, laboratories, poultry operations, etc.

State facilities that are considered vulnerable during severe biological outbreaks include:

- Public or quasi-public hospitals and medical facilities;
- Testing and monitoring laboratories;
- Public health and animal health agencies involved in response and surveillance; and
- Research facilities at university locations.

❖ *State Estimates of Potential Losses*

It is very difficult to estimate losses by jurisdiction related to disease outbreak events. There are a wide variety of diseases that can affect the human and animal populations throughout the state and each one would result in slightly different losses for different jurisdictions. Also, there is not enough historical data to support a detailed analysis on this subject. Potential losses are subject to a variety of factors:

- Type of disease outbreak – human versus animal, contagious versus exposure, etc.
- Speed of identification and containment.
- Contamination issues at responding medical facilities.
- Location of outbreak – surrounding population and level of responding resources.

- Management of the flow of public information and the resulting level of panic in the general population.

Losses are expected to be heaviest in the jurisdictions immediately affected by the outbreak as they would be hardest hit and have the least time to respond and enact containment measures. Nearby jurisdictions would then be impacted as well but to a lesser degree. Financial losses could be extreme as local jurisdictions respond and recover. The anthrax attacks in 2001 cost the federal government millions and millions of dollars and the mad cow and FMD outbreaks in Great Britain resulted in losses of billions of dollars. Due to the many factors and the wide range of potential losses, the APDMAC is not currently prepared to make specific estimations.

According to *The Annual Impact of Seasonal Influenza in the US: Measuring Disease Burden and Costs* by Molinari et al., nationally the economic burden of influenza medical costs, medical costs plus lost earnings, and the total economic burden were $10.4 billion, $26.8 billion and $87.1 billion respectively. The financial burden of healthcare-associated infections nationally has been estimated at $33 billion annually. There is no data currently available on the economic impact of previous illness in Arkansas. Using pandemic influenza as the worst case scenario for estimating potential losses, the Department of Health and Human Services Pandemic Influenza Plan estimates that 30% of the population could be affected. The Arkansas Pandemic Influenza Plan utilizes this 30% estimate and further assumes that: (a) 50% of the affected population would require outpatient treatment , (b) 11% of the affected population would need to be hospitalized at some point, and (c) 2% of those affected would die.

The U.S. Centers for Disease Control and Prevention (CDC) estimates 76 million people suffer foodborne illnesses each year in the United States, accounting for 325,000 hospitalizations and more than 5,000 deaths. Foodborne disease is extremely costly. Health experts estimate that the yearly cost of all foodborne diseases in this country is $5 to $6 billion in direct medical expenses and lost productivity. Infections with the bacteria *Salmonella* alone account for $1 billion yearly in direct and indirect medical costs.

❖ Development in Hazard Prone Areas

Buildings, infrastructure, and critical facilities are not vulnerable to this hazard. It affects only persons susceptible to the illness. The impacts and potential losses are largely economic and are dependent on the type, extent, and duration of the illness. As the population of Arkansas ages, the vulnerability to this hazard is likely to increase. The counties of Baxter, Sharp, Marion, Izard, Cleburne, Stone, Van Buren, Montgomery, Fulton and Searcy have the largest percent of population over 65 years of age.

❖ *Consequence Analysis*

The information in **Table 3.4.14.c** provides the Consequence Analysis of Potential for Detrimental Impacts of Hazards done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.4.14.c. EMAP Consequence Analysis: Major Disease Outbreak

Subject	Detrimental Impacts
Health and Safety of Persons in the Area at Time of Incident	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Health and Safety of Persons Responding to the Incident	Adverse impact expected to be severe for unprotected personnel and uncertain for trained and protected personnel, depending on the nature of the incident.
Continuity of Operations	Danger to personnel in the area of the incident may require relocation of operations and lines of succession execution.
Property, Facilities, and Infrastructure	Access to facilities and infrastructure in the area of the incident may be denied until decontamination completed.
Delivery of Services	Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
The Environment	Incident may cause denial or delays in the use of some areas. Remediation needed.
Economic and Financial Condition	Local economy and finances adversely affected, possibly for an extended period of time.
Regulatory and Contractual Obligations	Regulatory waivers may be needed. Fulfillment of contracts may be difficult. Demands may overload ability to deliver.
Reputation of or Confidence in the Entity	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

3.5 Jurisdictional Risk Assessment

Requirements §201.4(c)(2)(ii) and §201.4(c)(2)(iii): [The state risk assessment shall include 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.

Plan Update §201.4(d)(2): Plan must be reviewed and revised to reflect changes in development.

3.5.1 Overview and Analysis of Local Plan Vulnerability Assessments

As a part of the 2013 plan update process, the APDMAC reviewed the ADEM and FEMA approved local hazard mitigation plans. As of April 2013, 54 local hazard mitigation plans in Arkansas have been reviewed and included in this local risk assessment analysis. ADEM maintains the status of local plans on their website at http://www.adem.arkansas.gov/ADEM/Divisions/Admin/Mitigation/index.aspx under "Approved Hazard Mitigation Plans". The 54 local plans included in this analysis include six single-jurisdiction plans and 48 county-level plans as follows:

Table 3.5.a. Local Plans Included in Risk Assessment Analysis

Single Jurisdiction and County-Level Plans		
Ashley	Drew	Mountain View City
Beebe Schools	Faulkner	Ouachita
Benton	Foreman City	Perry
Bradley	Franklin	Pike
Calhoun	Fulton	Poinsett
Chicot	Garland	Polk
Clark	Hot Spring	Pope
Clay	Howard	Prairie
Cleburne	Independence	Saint Francis
Columbia	Johnson	Saline
Conway	Lafayette	Scott
County Line School District	Lawrence	Sebastian
Craighead	Lincoln	Sevier
Crawford	Lonoke	Sharp
Crittenden	Marion	Union
Cross	Mena City	Washington

Single Jurisdiction and County-Level Plans		
Dallas	Monroe	White County Education Cooperative
Desha	Montgomery	Woodruff

This analysis involved gathering information on how the local jurisdiction ranked the hazards to provide the basis of a vulnerability overview as well as potential losses (dollar value and land affected) for each hazard, as available. The local plans in Arkansas only included natural hazards. There are no manmade or technological hazards in any local plans in Arkansas. Most local plans used a Priority Risk Hazard Ranking to rate their hazards and used the same factors of probability, magnitude, severity and warning time. These weighted factors created numeric ranking numbers of 1 through 4. The numeric rankings have been converted to hazard ranking levels as follows: 3.0 to 4.0 = High, 2.0 to 2.9 = Moderate and 1.0 to 1.9 = Low. This ranking system was employed by 70 percent of the available local plans enabling these local plans to be summarized and evaluated consistently.

The remainder of local mitigation plans either did not use a hazard ranking system or only assigned a Probability of Future Events rating. The Probability of Future Events rating is based on quantified criteria of historical events for that jurisdiction. This information was not gathered for this local plan analysis because the methodology varied greatly in the local plans.

Based on the analysis of all the approved local plans, **Table 3.5.b** summarizes the hazard rankings (High, Moderate, and Low) for each of the 13 natural hazards considered in local plans.

The local risk assessment summary allowed for an analysis of which hazards are of high concern to counties. **Figures 3.5.a, b, c, and d** show all the hazards and the number of local plans that ranked them at each of the scale levels: High, Moderate, and Low. For the dam hazard, information was gathered as to how many plans included actual dam inundation maps with the plans. Thirty-one percent of the plans included dam inundation maps but all local plans had a description and/or aerial map of impact area. The data indicates that the top ranked hazards statewide are: Tornado, Winter Storms, Flood, Severe Storms and High Winds.

Table 3.5.b. Local Risk Assessment Hazards Ranking Summary

Hazard	High	Moderate	Low	N/A
Dam Failure	1	13	22	18
Drought	1	25	12	16
Earthquake	2	20	12	20
Expansive Soils	0	5	19	30
Extreme Heat	1	21	15	17
Flood	12	26	0	16
High Winds	10	26	2	16
Landslide	0	4	14	36
Land Subsidence	0	0	6	48

Hazard	High	Moderate	Low	N/A
Severe Storms	12	26	0	16
Tornado	36	2	0	16
Wildfire	4	28	5	17
Winter Storms	24	14	0	16

Source: Arkansas Local Hazard Mitigation Plans, April 2013

Figure 3.5.a Local Plan Risk Summary for Dam Failure, Earthquake, and Drought

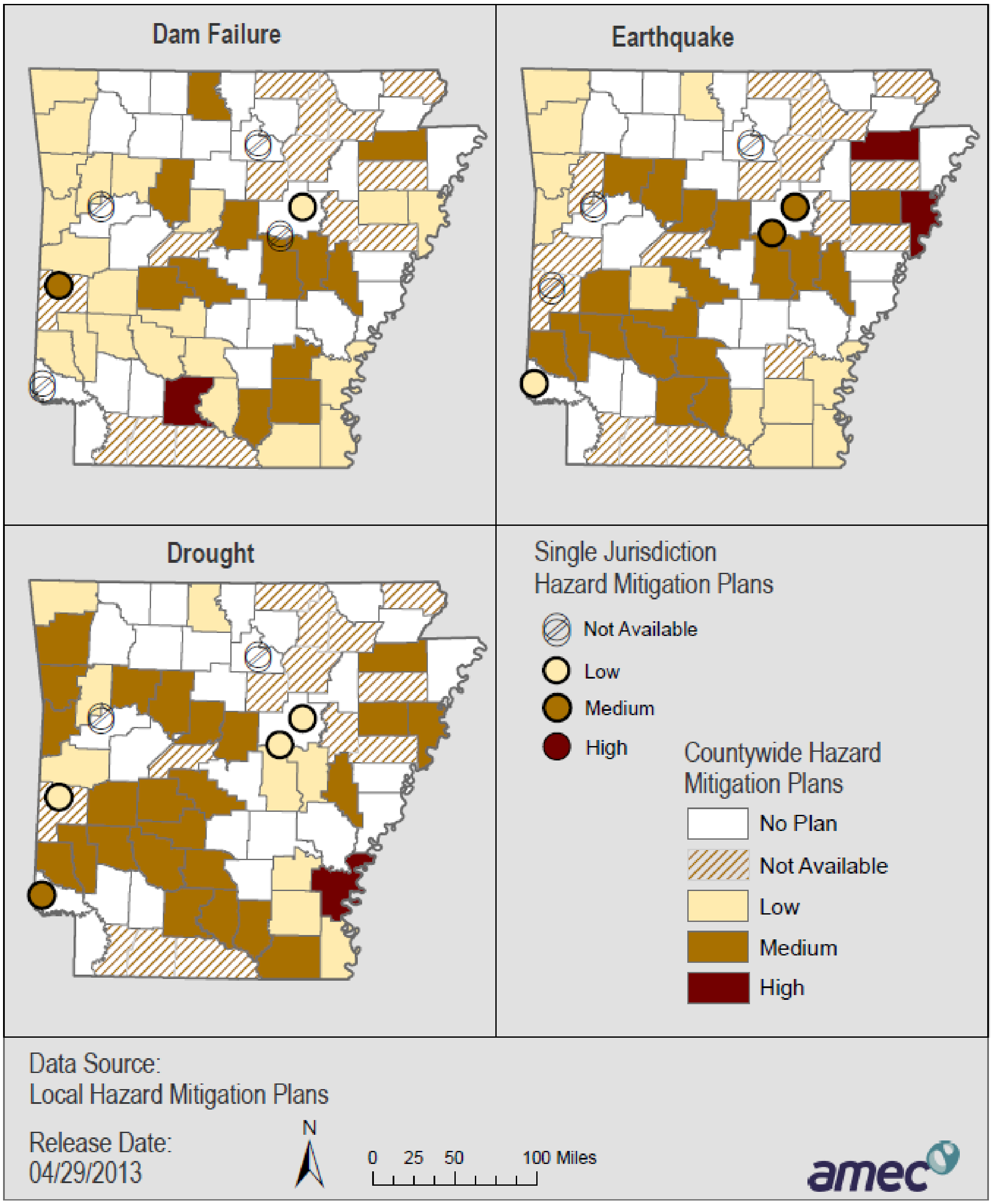


Figure 3.5.b Local Plan Risk Summary for Expansive Soils, Flood, and Extreme Heat

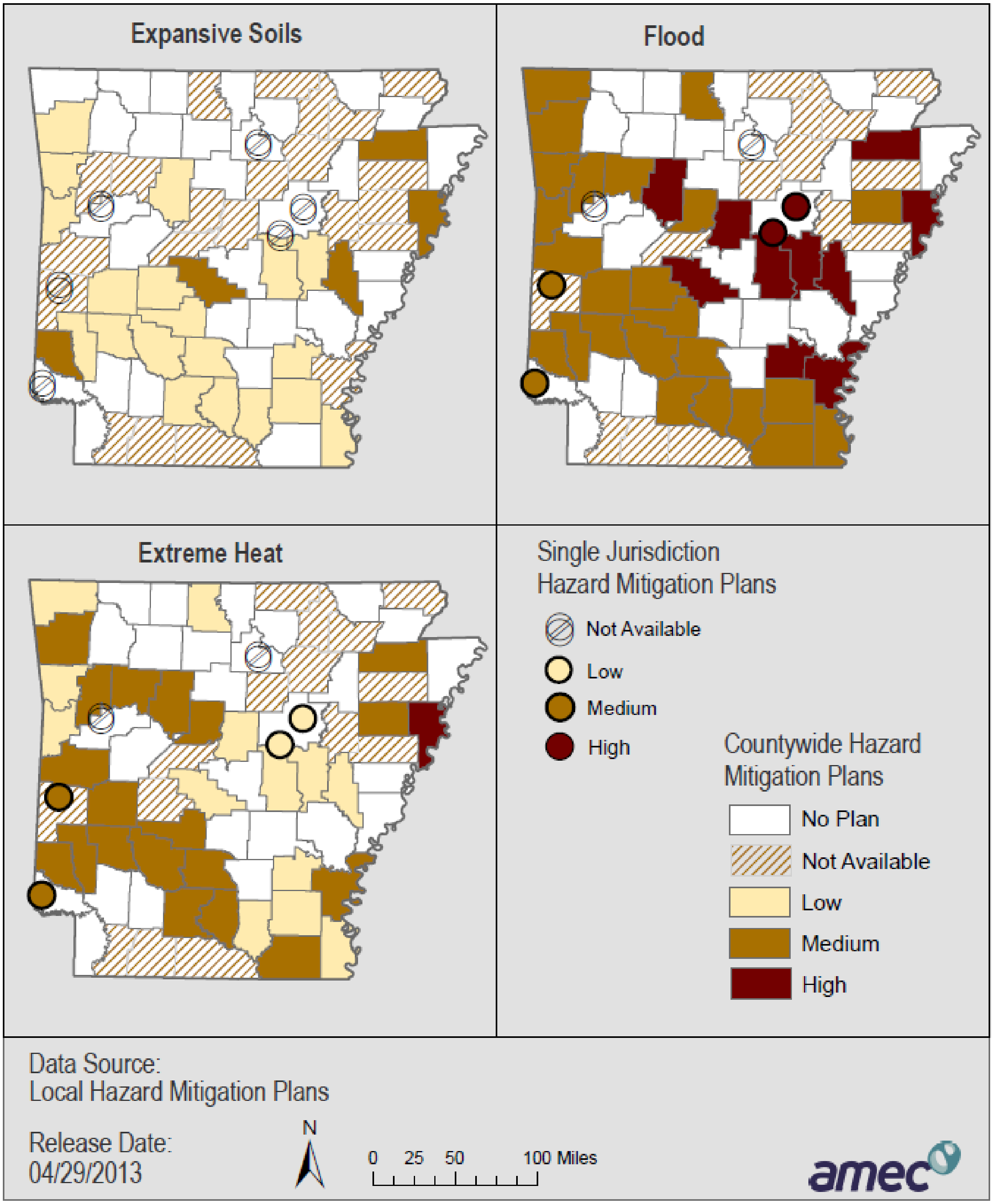


Figure 3.5.c Local Plan Risk Summary for High Winds, Land Subsidence, and Landslide

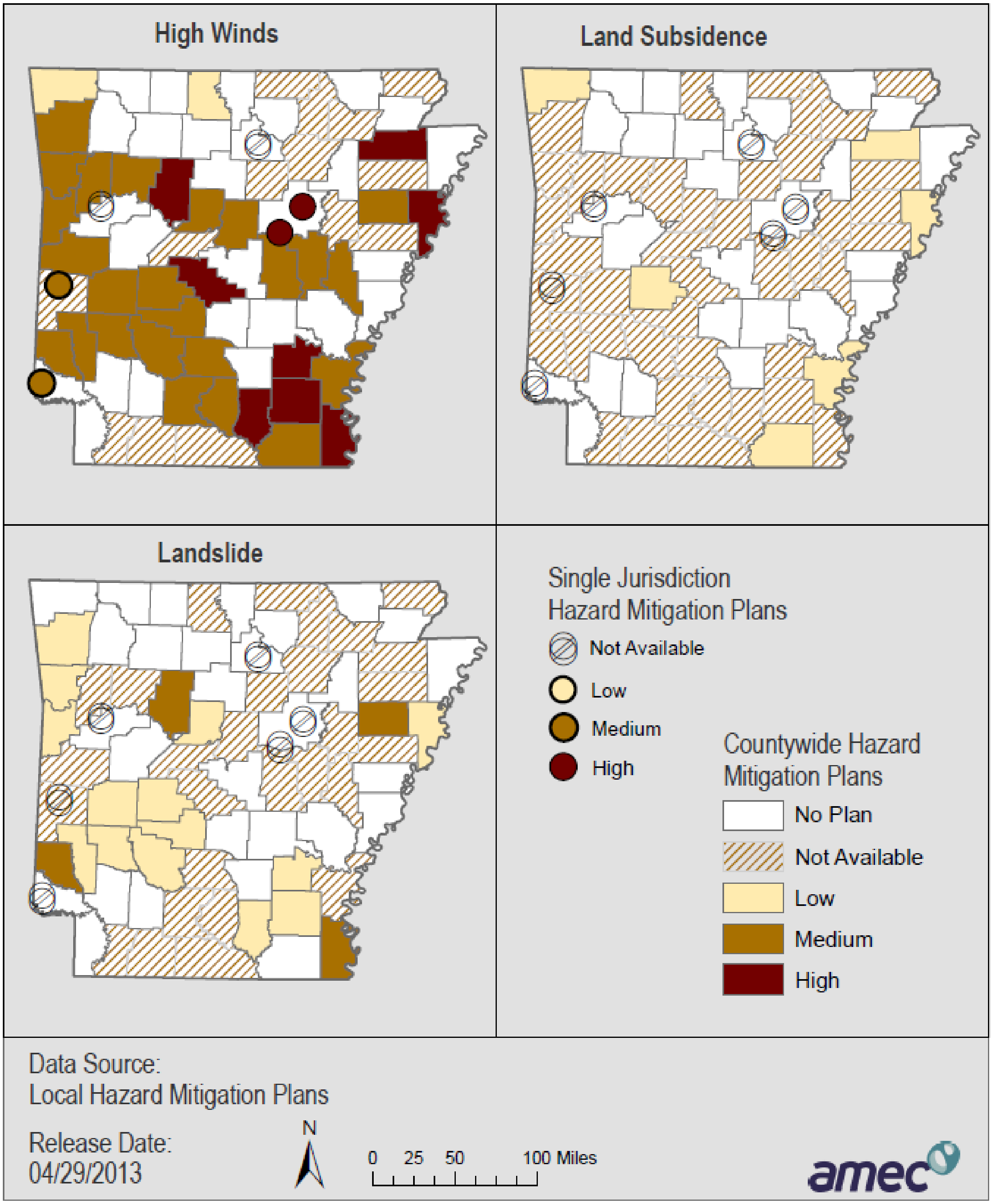


Figure 3.5.d Local Plan Risk Summary for Severe Storms, Wildfire, Tornado, and Winter Storms

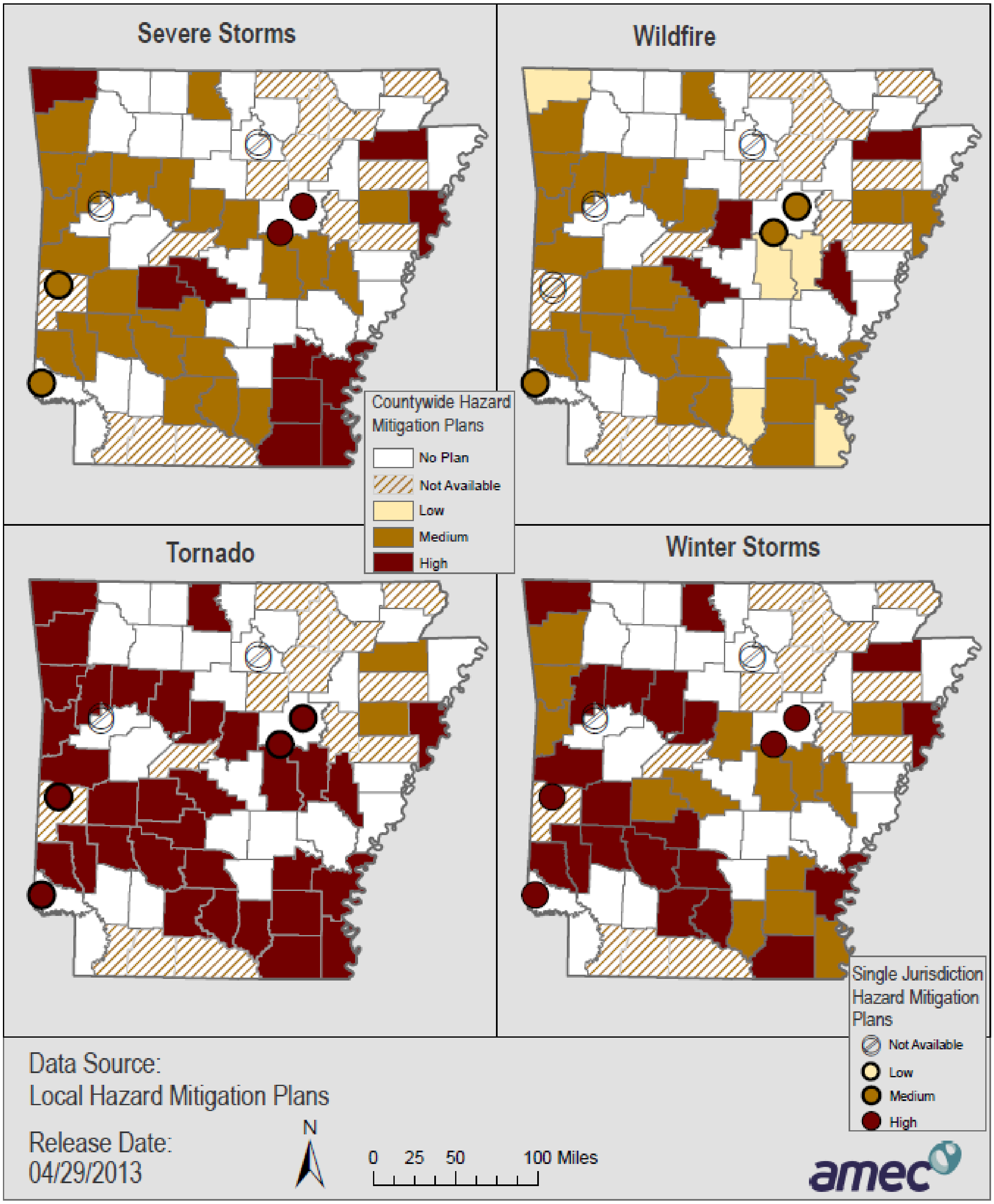


Table 3.5.c shows the rankings each local plan assigned these hazards. The counties shaded in green did not have an approved plan at the time this analysis was developed and n/a = not available for Hazard Ranking.

Table 3.5.c. Priority Risk Hazard Rankings by County

County or Jurisdiction	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flood	High Winds	Landslide	Land Subsidence	Severe Storms	Tornado Risk	Wildfires	Winter Storms
Arkansas													
Ashley	L	M	L		M	M	M		L	H	H	M	H
Baxter													
Beebe Schools (White County)	n/a	L	M	n/a	L	H	H	n/a	n/a	H	H	M	H
Benton	L	L	L	n/a	L	M	L	n/a	L	H	H	L	H
Boone													
Bradley	M	M	L	L	L	M	H	L	n/a	M	H	L	M
Calhoun	L	M	M	L	M	M	M	n/a	n/a	M	H	M	H
Carroll													
Chicot	L	L	L	L	L	M	H	M	n/a	H	H	L	M
Clark	L	M	M	L	M	M	M	L	n/a	M	H	M	H
Clay	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cleburne	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cleveland													
Columbia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Conway	L	M	M	n/a	M	M	M	L	n/a	M	H	M	H
County Line School District (Logan & Franklin Counties)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Craighead	M	M	H	M	M	H	H	n/a	L	H	M	H	H
Crawford	L	M	L	L	L	M	M	L	n/a	M	H	M	M
Crittenden	L	M	H	M	H	H	H	L	L	H	H	M	H
Cross	L	M	M	n/a	M	M	M	M	n/a	M	M	M	M
Dallas	L	M	M	L	M	M	M	n/a	n/a	M	H	M	H
Desha	L	H	L	N/A	M	H	M	N/A	L	H	H	M	H

County or Jurisdiction	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flood	High Winds	Landslide	Land Subsidence	Severe Storms	Tornado Risk	Wildfires	Winter Storms
Drew	M	L	L	L	L	M	H	L	n/a	H	H	M	M
Faulkner	M	M	M	n/a	L	H	M	n/a	n/a	M	H	H	M
Foreman City (Little River County)	n/a	M	L	n/a	M	M	M	n/a	n/a	M	H	M	H
Franklin	L	L	n/a	n/a	M	M	M	n/a	n/a	M	H	M	H
Fulton	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Garland	M	M	L	L	n/a	M	M	L	L	H	H	M	M
Grant													
Greene													
Hempstead													
Hot Spring	L	M	M	L	M	M	M	L	n/a	M	H	M	H
Howard	L	M	M	L	M	M	M	L	n/a	M	H	M	H
Independence	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Izard													
Jackson													
Jefferson													
Johnson	L	M	M	n/a	M	M	M	n/a	n/a	M	H	M	H
Lafayette	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lawrence	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lee													
Lincoln	M	L	n/a	L	L	H	H	L	n/a	H	H	M	M
Little River													
Logan													
Lonoke	M	L	M	L	L	H	M	n/a	n/a	M	H	L	M
Madison													
Marion	M	L	L	n/a	L	M	L	n/a	n/a	M	H	M	H
Mena City (Polk County)	M	L	n/a	n/a	M	M	M	n/a	n/a	M	H	n/a	H
Miller													

County or Jurisdiction	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flood	High Winds	Landslide	Land Subsidence	Severe Storms	Tornado Risk	Wildfires	Winter Storms
Mississippi													
Monroe	M	M	M	M	L	H	M	n/a	n/a	M	H	H	M
Montgomery	L	M	M	L	M	M	M	L	n/a	M	H	M	H
Mountain View City (Stone County)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nevada													
Newton													
Ouachita	H	M	M	L	M	M	M	n/a	n/a	M	H	M	H
Perry	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phillips													
Pike	L	M	M	L	M	M	M	L	n/a	M	H	M	H
Poinsett	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polk	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pope	M	M	M	L	M	H	H	M	n/a	M	H	M	H
Prairie	M	L	M	L	L	H	M	n/a	n/a	M	H	L	M
Pulaski													
Randolph													
Saint Francis	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Saline	M	M	M	M	L	H	H	n/a	n/a	H	H	H	M
Scott	L	L	n/a	n/a	M	M	M	n/a	n/a	M	H	M	H
Searcy													
Sebastian	L	M	L	L	L	M	M	L	n/a	M	H	M	M
Sevier	L	M	M	M	M	M	M	M	n/a	M	H	M	H
Sharp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Stone													
Union	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Van Buren													

County or Jurisdiction	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flood	High Winds	Landslide	Land Subsidence	Severe Storms	Tornado Risk	Wildfires	Winter Storms
Washington	L	M	L	L	M	M	M	L	n/a	M	H	M	M
White													
White County Education Cooperative	L	L	M	n/a	L	H	H	n/a	n/a	H	H	M	H
Woodruff	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Yell													

Source: Arkansas Local Hazard Mitigation Plans, April 2013. The counties highlighted in green do not have an approved plan at the time of this analysis was developed. H=High, M=Moderate, L=Low Ranking Hazards, n/a=not available.

3.5.2. Overview and Analysis of Local Plan Potential Loss Estimates

The analysis of potential losses (dollar value and land affected) was based on data extracted from local plans' hazard extent/impact sections or previous events sections for the four overall highest ranking hazards of Flood, Tornado, High Winds and Winter Storms as well as the Wildfire hazard. The hazard of severe storms was not included in this analysis because the elements of severe storms (thunderstorm winds, hail, and lightning) were not always all evaluated in the hazard. The wildfire hazard was also included since almost every local plan had the number of acres burned in wildfires. There are some local plans that are listed as n/a for the hazard in **Table 3.5.c**, and it is included in the loss estimate analysis because the local plan included that hazard but did not give it a Priority Risk Hazard Ranking. The **Figures 3.5.e, f, and g**, show the annualized losses from local plans for Flood, High Winds, and Tornado. **Table 3.5.d** and **Table 3.5.e** show the total losses, the number of years taken into considerations for the annualized losses, and the annual losses per Arkansas county or jurisdiction.

Most local plans gathered historical losses from the National Weather Services' National Climatic Data Center (NCDC) for the Flood, Tornado, and High Winds. NFIP insurance claims were also gathered and reported in the Flood potential losses.

For Dam Failure, Drought, Expansive Soils, Extreme Heat, Landslide, and Land Subsidence sufficient details regarding potential losses were not available from the local plans to conduct a viable analysis. Most local plans identified this deficiency with mitigation action items to address potential loss estimates for these hazards in future updates.

Figure 3.5.e Average Annual Losses for Flood

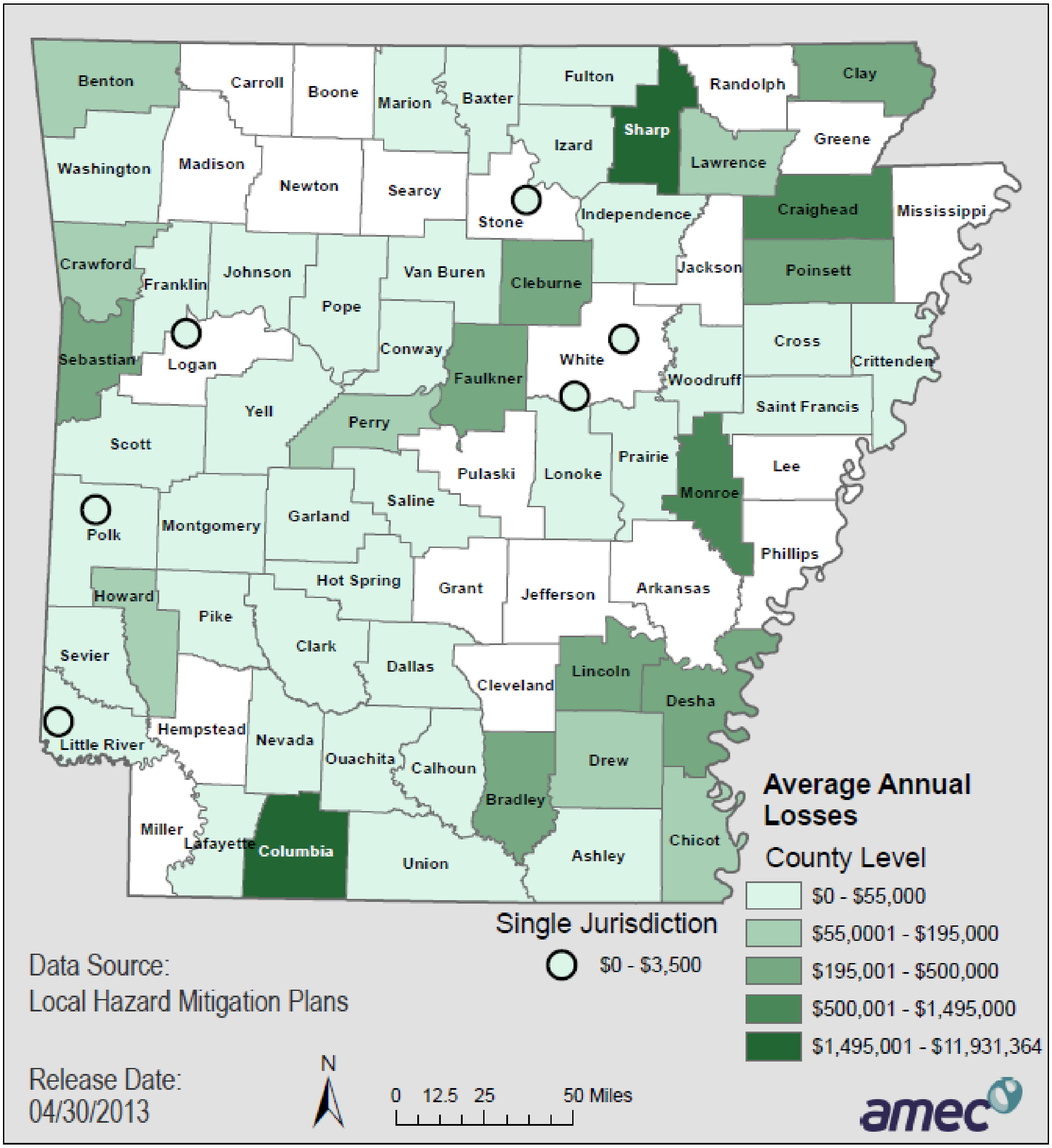


Figure 3.5.f Average Annual Losses for High Winds

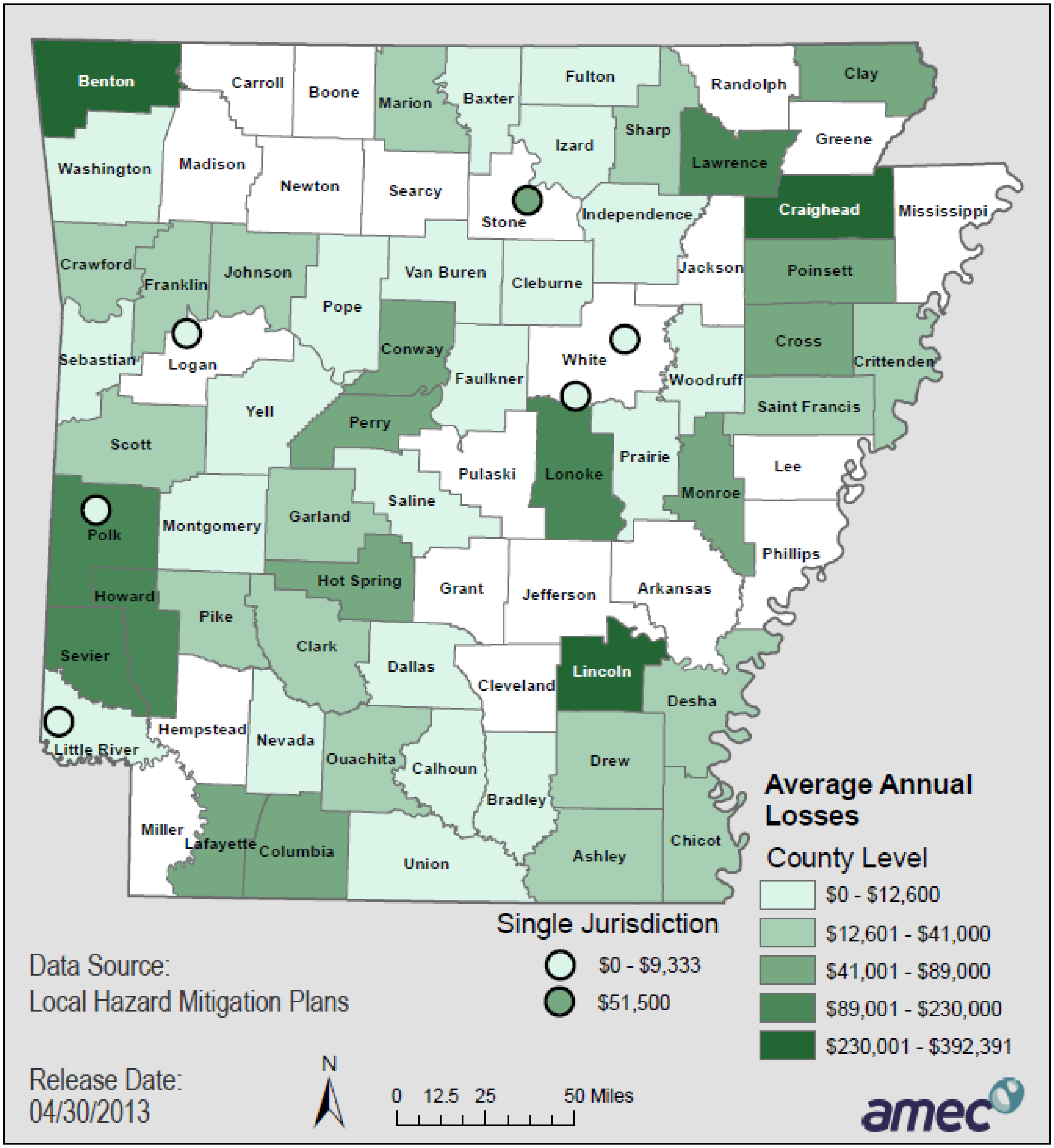


Figure 3.5.g Average Annual Losses for Tornado

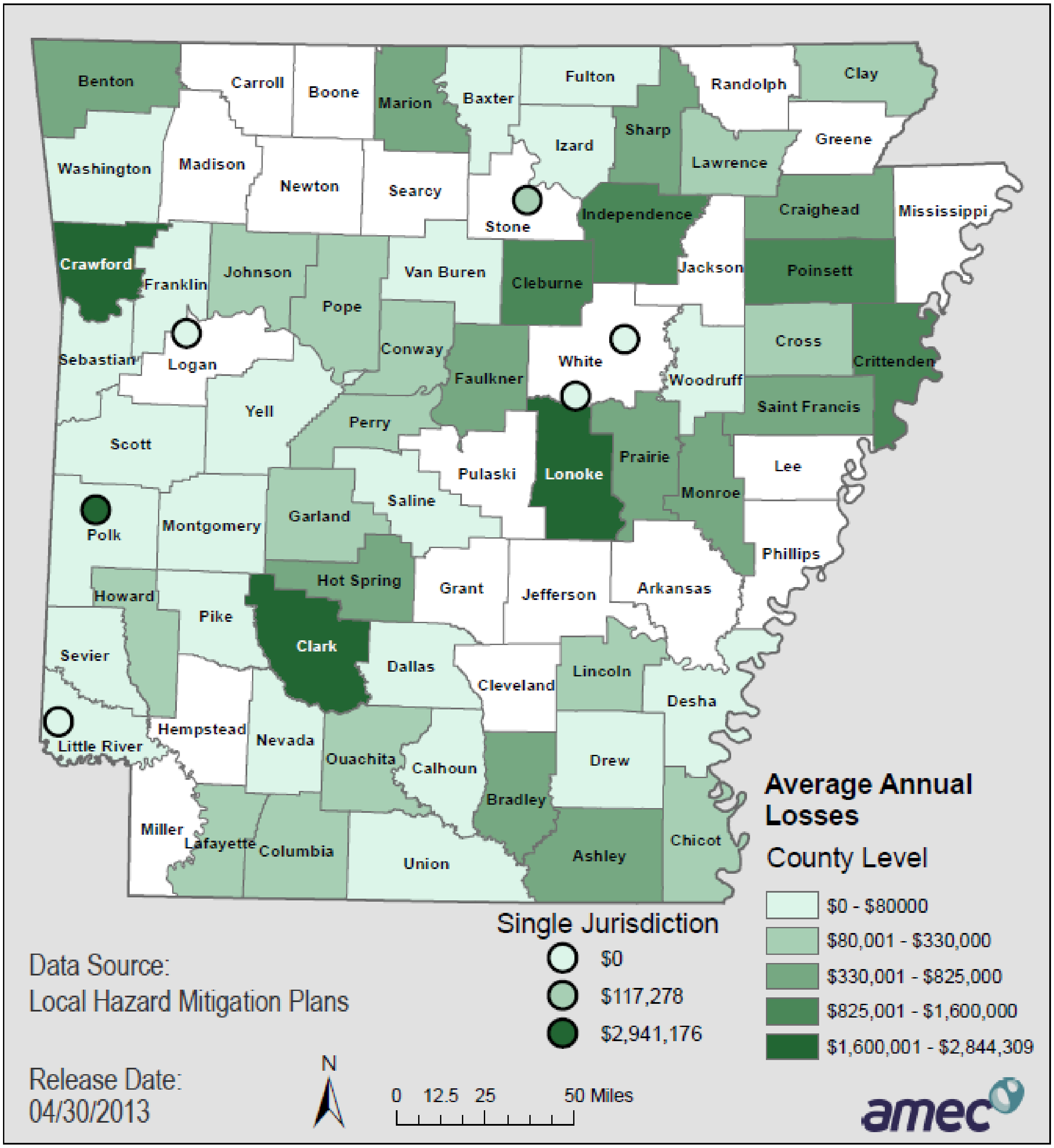


Table 3.5.d Local Plans Summary of Average Annual Losses for Flood, Tornado and High Winds

County or Jurisdiction	Flood Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Tornado Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	High Winds Total $ Losses	Number of Years	AVG Annual Loss
Arkansas									
Ashley	$144,000	6	$24,000	$38,321,000	50	$766,420	$497,000	13	$38,231
Baxter									
Beebe Schools (White County)	n/a			n/a			n/a		
Benton	$2,715,000	23	$118,043	$19,293,000	58	$332,638	$9,025,000	23	$392,391
Boone									
Bradley	$1,370,000	7	$195,714	$30,400,000	50	$608,000	$71,000	49	$1,449
Calhoun	$64,000	13	$4,923	$2,958,000	58	$51,000	$55,000	15	$3,667
Carroll									
Chicot	$1,400,000	8	$175,000	$5,620,000	48	$117,083	$820,000	50	$16,400
Clark	$50,000	10	$5,000	$130,235,500	47	$2,770,968	$181,000	13	$13,923
Clay	$3,843,000	14	$274,500	$9,502,000	40	$237,550	$504,000	7	$72,000
Cleburne	$3,000,000	10	$300,000	$63,353,000	53	$1,195,340	$571,000	53	$10,774
Cleveland									
Columbia	$131,245,000	11	$11,931,364	$7,083,000	50	$141,660	$846,000	14	$60,429
Conway	n/a			$7,403,100	55	$134,602	$816,000	14	$58,286
County Line School District (Logan & Franklin Counties)	n/a			n/a			n/a		
Craighead	$8,700,000	12	$725,000	$36,100,000	49	$736,735	$3,787,000	12	$315,583
Crawford	$990,000	17	$58,235	$156,437,000	55	$2,844,309	$326,000	13	$25,077
Crittenden	$217,000	6	$36,167	$31,501,000	38	$828,974	$404,000	13	$31,077
Cross	$218,000	8	$27,250	$9,809,000	57	$172,088	$1,128,000	16	$70,500
Dallas	$50,000	14	$3,571	$1,130,000	42	$26,905	$101,000	15	$6,733

County or Jurisdiction	Flood Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Tornado Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	High Winds Total $ Losses	Number of Years	AVG Annual Loss
Desha	$5,000,000	10	$500,000	$1,130,000	50	$22,600	$206,000	13	$15,846
Drew	$1,370,000	12	$114,167	$3,600,000	46	$78,261	$206,000	12	$17,167
Faulkner	$2,536,250	8	$317,031	$39,700,000	53	$749,057	$178,000	15	$11,867
Foreman City (Little River County)	$55,000	16	$3,438	n/a			$140,000	15	$9,333
Franklin	$670,000	16	$41,875	$3,491,000	47	$74,277	$509,000	15	$33,933
Fulton	n/a			$808,000	14	$57,714	$130,000	14	$9,286
Garland	$100,000	14	$7,143	$4,259,000	52	$81,904	$502,222	14	$35,873
Grant									
Greene									
Hempstead									
Hot Spring	n/a			$32,755,000	53	$618,019	$642,000	14	$45,857
Howard	$1,365,000	14	$97,500	$6,233,000	55	$113,327	$2,945,000	14	$210,357
Independence	n/a			$60,386,000	52	$1,161,269	n/a		
Izard									
Jackson									
Jefferson									
Johnson	$21,000	12	$1,750	$8,478,000	55	$154,145	$163,000	12	$13,583
Lafayette				$1,475,000	13	$113,462	$675,000	14	$48,214
Lawrence	$1,122,000	14	$80,143	$1,371,000	14	$97,929	$1,986,000	14	$141,857
Lee									
Lincoln	$4,500,000	12	$375,000	$3,500,000	35	$100,000	$2,800,000	12	$233,333
Little River									
Logan									
Lonoke	$52,000	10	$5,200	$91,533,000	57	$1,605,842	$1,247,000	14	$89,071
Madison									
Marion	$7,669,000	19	$403,632	$33,790,000	50	$675,800	$282,000	19	$14,842

County or Jurisdiction	Flood Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Tornado Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	High Winds Total $ Losses	Number of Years	AVG Annual Loss
Mena City (Polk)	$3,500	1	$3,500	$50,000,000	17	$2,941,176	$10,000	15	$667
Miller									
Mississippi									
Monroe	$10,517,000	15	$701,133	$39,838,000	52	$766,115	$726,000	15	$48,400
Montgomery	n/a			$55,000	8	$6,875	$10,000	14	$714
Mountain View City (Stone County)	n/a			$6,333,000	54	$117,278	$721,000	14	$51,500
Nevada									
Newton									
Ouachita	$762,000	16	$47,625	$5,553,000	48	$115,688	$241,000	16	$15,063
Perry	$1,750,000	14	$125,000	$4,400,000	16	$275,000	$662,000	16	$41,375
Phillips									
Pike	n/a			$280,000	50	$5,600	$236,000	16	$14,750
Poinsett	$7,630,000	26	$293,462	$60,000,000	52	$1,153,846	$930,000	15	$62,000
Polk	$724,000	17	$42,588	$183,763	60	$3,063	$255,000	2	$127,500
Pope	n/a			$6,052,800	56	$108,086	n/a		
Prairie	$0	8	$0	$38,780,000	55	$705,091	$266,000	50	$5,320
Pulaski									
Randolph									
Saint Francis	$209,000	6	$34,833	$28,377,000	51	$556,412	$655,000	39	$16,795
Saline	$0	9		$81,577,500	54	$1,510,694	$251,000	52	$4,827
Scott	$465,000	16	$29,063	$55,000	58	$948	$500,000	16	$31,250
Searcy									
Sebastian	$4,185,000	17	$246,176	$159,342,000	57	$2,795,474	$630,000	50	$12,600
Sevier	$115,000	15	$7,667	$3,505,000	54	$64,907	$2,412,000	15	$160,800
Sharp	$17,950,000	12	$1,495,833	$27,279,000	56	$487,125	$1,051,000	48	$21,896
Stone									

County or Jurisdiction	Flood Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Tornado Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	High Winds Total $ Losses	Number of Years	AVG Annual Loss
Union	n/a			n/a			n/a		
Van Buren									
Washington	n/a			n/a			n/a		
White									
White County Education Cooperative	n/a			n/a			n/a		
Woodruff	n/a			n/a			n/a		
Yell									
Totals	**$222,776,750**		**$18,852,526**	**$1,353,265,663**		**$28,281,254**	**$41,299,222**		**$2,662,396**

Source: Arkansas Local Hazard Mitigation Plans, April 2013

The **Figure 3.5.h** shows the average annual losses from local plans for Wind Storms and **Figure 3.5.i** shows the average annual acres burned from Wildfires. **Table 3.5.e** shows the total losses, the number of years taken into considerations for the annualized losses, and the annual losses per Arkansas county or jurisdiction. Most local plans gathered historical losses from the National Weather Services' National Climatic Data Center (NCDC) and local response agencies for their potential Winter Storm losses. Several local plans described ice storms as being the most dangerous and costly for local jurisdictions. For the Wildfire hazard, all local plans gathered historical wildfire events from the Arkansas Forestry Commission.

Figure 3.5.h Average Annual Losses for Winter Storms

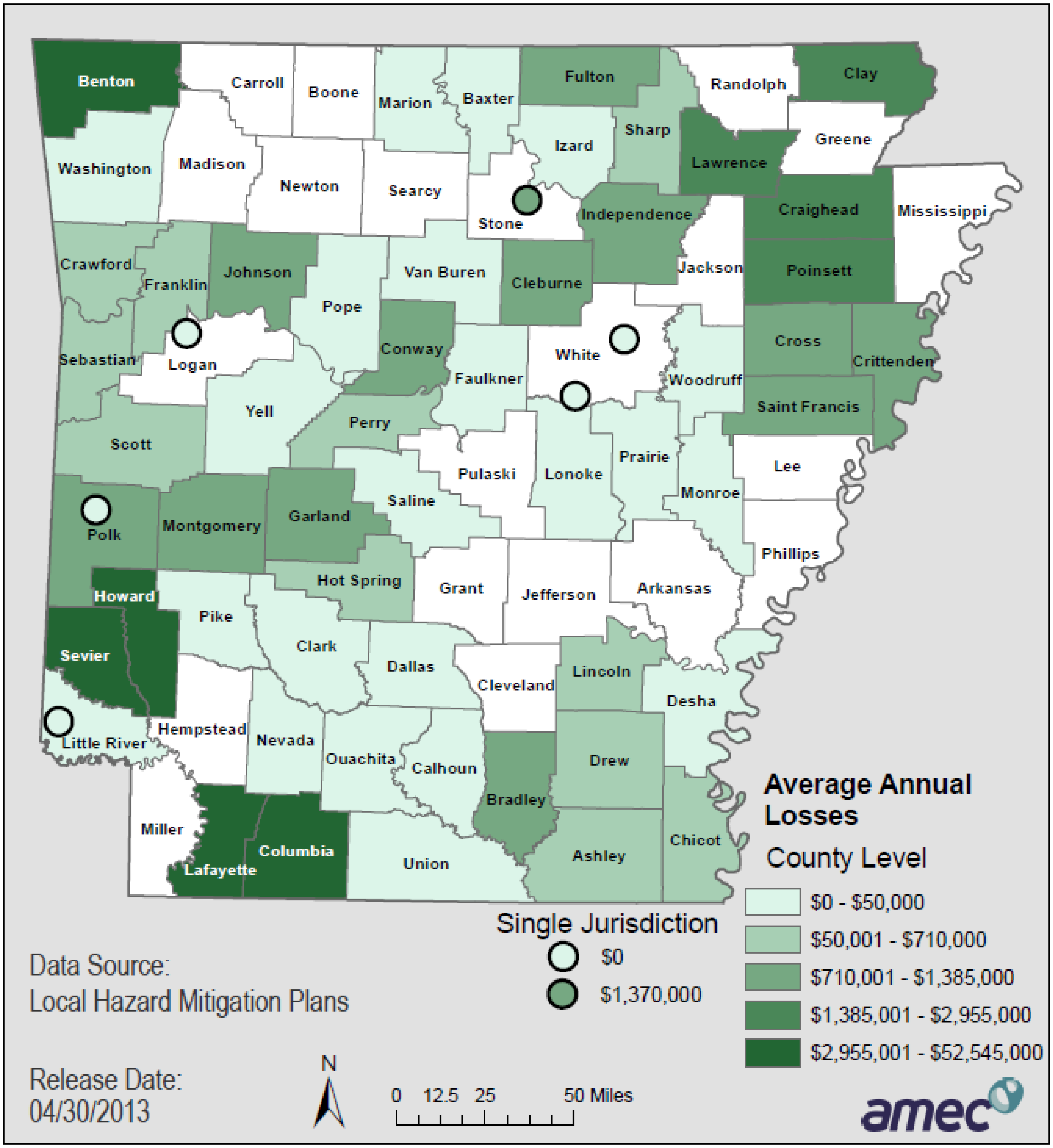


Figure 3.5.i Average Annual Acres Burned from Wildfires

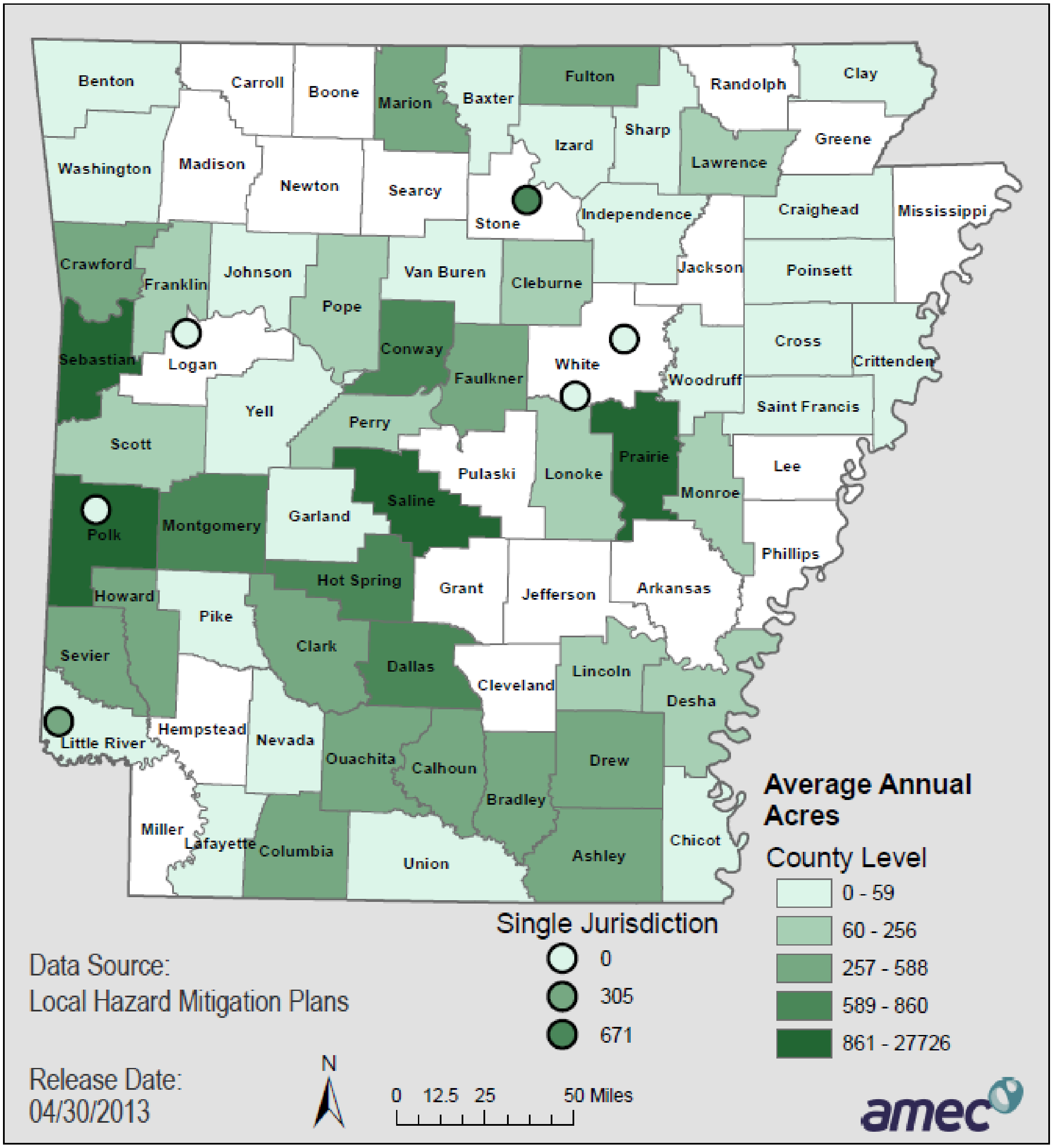


Table 3.5.e Local Plans Summary of Average Annual Losses for Winter Storms and Wildfire

County or Jurisdiction	Winter Storm Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Wildfire Acres Burned	Number of Years	AVG Annual Acres Burned
Arkansas						
Ashley	$2,315,000	6	$385,833	2,991	8	374
Baxter						
Beebe Schools (White County)	n/a			n/a		
Benton	$67,970,000	23	$2,955,217	n/a		
Boone						
Bradley	$4,920,000	6	$820,000	3,068	8	384
Calhoun	$500,000	10	$50,000	3,010	8	376
Carroll						
Chicot	$2,300,000	7	$328,571	267	8	33
Clark	n/a			6,571	14	469
Clay	$22,712,000	12	$1,892,667	450,588	18	59
Cleburne	$14,180,000	14	$1,012,857	2,045	8	256
Cleveland						
Columbia	$525,450,000	10	$52,545,000	4,704	8	588
Conway	$10,000,000	10	$1,000,000	10,948	15	730
County Line School District (Logan & Franklin Counties)	n/a			n/a		
Craighead	$22,225,000	12	$1,852,083	187	8	23
Crawford	$10,925,000	17	$642,647	1,570	4	393
Crittenden	$12,000,000	11	$1,090,909	32	8	4
Cross	$12,667,000	15	$844,467	459	8	57
Dallas	$500,000	10	$50,000	6,882	8	860
Desha	n/a			735	8	92
Drew	$4,900,000	12	$408,333	2,459	8	307
Faulkner	n/a			4,959	12	413
Foreman City (Little River County)	n/a			2,439	8	305

County or Jurisdiction	Winter Storm Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Wildfire Acres Burned	Number of Years	AVG Annual Acres Burned
Franklin	$10,500,000	15	$700,000	1,586	8	198.25
Fulton	$10,000,000	14	$714,286	4,704	8	588
Garland	$15,060,000	14	$1,075,714	n/a		
Grant						
Greene						
Hempstead						
Hot Spring	$5,000,000	14	$357,143	6,882	8	860
Howard	$525,950,000	14	$37,567,857	3,010	8	376
Independence	$13,680,000	12	$1,140,000			
Izard						
Jackson						
Jefferson						
Johnson	$10,000,000	10	$1,000,000	781	14	56
Lafayette	$525,450,000	14	$37,532,143	449	8	56
Lawrence	$22,212,000	16	$1,388,250	948	8	119
Lee						
Lincoln	$5,000,000	12	$416,667	1,082	8	135
Little River						
Logan						
Lonoke	n/a			2,321	12	193
Madison						
Marion	$119,680	19	$6,299	11,501	21	548
Mena City (Polk)	n/a			n/a		
Miller						
Mississippi						
Monroe	no			1,881	12	157
Montgomery	$10,000,000	12	$833,333	6,882	8	860
Mountain View City (Stone County)	$19,180,000	14	$1,370,000	5,371	8	671
Nevada						

County or Jurisdiction	Winter Storm Total $ Losses	Number of Years	AVG Annual Loss (Property and Crop)	Wildfire Acres Burned	Number of Years	AVG Annual Acres Burned
Newton						
Ouachita	$500,000	10	$50,000	2,439	8	305
Perry	$10,550,000	16	$659,375	980	8	123
Phillips						
Pike	$0			n/a		
Poinsett	$27,000,000	15	$1,800,000	332	8	42
Polk	$20,500,000	17	$1,205,882	450,588	18	25,033
Pope	n/a			2,605	14	186
Prairie	n/a			304,989	12	25,416
Pulaski						
Randolph						
Saint Francis	$12,667,000	15	$844,467	449	8	56
Saline	n/a			304,989	11	27,726
Scott	$10,500,000	16	$656,250	1,136	8	142
Searcy						
Sebastian	$10,925,000	16	$682,813	450,588	18	25,033
Sevier	$525,950,000	13	$40,457,692	3,721	8	465
Sharp	$19,180,000	56	$342,500	n/a		
Stone						
Union	n/a			n/a		
Van Buren						
Washington	n/a			n/a		
White						
White County Education Cooperative	n/a			n/a		
Woodruff	n/a			n/a		
Yell						
Totals	**$2,523,487,680**		**$196,679,256**	**2,074,128**	**419**	**115,067**

Source: Arkansas Local Hazard Mitigation Plans, April 2013

Earthquake Loss Estimation

The Earthquake hazard was not analyzed in this local plan analysis since most of the local plans utilized the reports from the Mid-America Earthquake Center. This data is a comprehensive overview of the eight state regions that would incur more significant losses in the event of a 7.7 magnitude earthquake on the New Madrid Fault. Arkansas is considered to be one of the top three states affected in this scenario in terms of damages. Using this data, a more detailed loss estimation can be utilized for the State of Arkansas with special focus on the top "at risk" counties: Arkansas, Clay, Craighead, Crittenden, Cross, Greene, Independence, Jackson, Lawrence, Lee, Mississippi, Monroe, Phillips, Poinsett, Prairie, Randolph, Saint Francis, White, and Woodruff Counties. According to the data the State can expect significant damages, well into the billions of dollars, with a large portion of this damage occurring in the previously mentioned "at-risk" counties. **Table 3.5.f** illustrates the expected economic losses to the State. Note that the highest amount of damage would be to the utilities state wide.

Table 3.5.f Direct Economic Loss for Arkansas ($ millions)

Buildings	Transportation	Utilities	Total
$18,167	$2,347	$18,515	$39,029

Source: Mid-America Earthquake Center

This scenario data also includes an estimated number of injuries and fatalities expected. Although, over 15 thousand casualties are predicted, nearly 75 percent of the injuries would be minor and require no hospitalization. Practically 650 fatalities would be expected with almost all being in the top "at-risk" counties. Mentioned previously, of these counties Crittenden, Mississippi, and Craighead Counties are the most significantly impacted with an estimated two to three thousand casualties in each of the three counties.

Based on this data the state of Arkansas could experience catastrophic losses in the event of a 7.7 magnitude earthquake, especially to the northeastern counties which are located in the New Madrid Seismic Zone (NMSZ).

3.6 Assessing Vulnerability and Estimating Potential Losses of State Owned and Operated Facilities

Requirement §201.4(c)(2)(ii) and §201.4(c)(2)(iii):

[The state risk assessment shall include an overview and analysis of the state's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in] the state risk assessment. State owned critical or operated facilities located in the identified hazard areas shall also be addressed.

[The State risk assessment shall include 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 plan must be formally adopted by the State prior to submittal to [FEMA] for final review and approval.

As Arkansas remains vulnerable to natural and man-made hazards, state-owned or operated facilities are at risk to incur damage from hazard events. The state's resources, both monetary and fixed assets, depend heavily upon these facilities and their continuity. This section assesses vulnerability and potential losses to state-owned or operated facilities. According to the regulatory requirements of the Disaster Mitigation Act, the State must provide an overview vulnerability analysis and loss estimates for state-owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas. To perform this analysis, identified

Figure 3.6.a Storm Clouds over Arkansas State Capitol

Source: Governor's Office; Photographer Kirk Jordan hazard areas exist for the following hazards: dam failure, levee failure, and flood. Therefore, for those hazards, a more comprehensive analysis was completed, including loss estimates. For the remaining hazards, clearly identified hazard areas are not established due to data limitations or the random nature of the hazard (as with severe thunderstorms). For these hazards, where appropriate, the statewide vulnerability analysis was utilized to identify state-owned facilities within counties indicated to have increased vulnerability. For some of the hazards addressed, a narrative is provided to discuss vulnerability of state-owned facilities. Where data is available, vulnerability and loss estimation are described in more detail by hazard in this section.

State-Owned and Leased Facilities

In the 2010 Mitigation Plan update, state building and structure data was obtained from the Arkansas Insurance Department (AID), Arkansas Building Authority (ABA), and the University of Arkansas System. It was determined, at that time that the AID data was more consistent and was therefore used exclusively for the exposure analysis of state facilities.

For this 2013 plan update, state building and structure data was requested from the AID, ABA, the University of Arkansas System, and the Arkansas State Highway and Transportation Department. **Table 3.6.a** summarizes the state-owned and leased facilities data obtained for this 2013 plan update.

Table 3.6.a State-Owned and Leased Facilities

Source/Inventory	No. of Facilities	GIS Formant and/or Latitude/Longitude
Arkansas Insurance Department	5,440	No; Street Address Only
Arkansas Building Authority	• Awaiting data	• Awaiting data
University of Arkansas System	• Awaiting data	• Awaiting data
Arkansas State Highway and Transportation Department	7,303	Yes; 2 bridges w/o lat/long 2 bridges w lat/long error

Table 3.6.b presents the state-owned and leased facilities data obtained for this 2013 plan update by County.

Table 3.6.b. Facilities Insured by County

County	No. of State Owned/Leased Facilities	Total Replacement Value (Bldg and Contents)	County	No. of State Owned/Leased Facilities	Total Replacement Value (Bldg and Contents)
Arkansas	37	$4,372,148	Lee	44	$114,564,418
Ashley	9	$1,479,006	Lincoln	179	$240,337,962
Baxter	58	$62,198,479	Little River	22	$4,877,586
Benton	83	$119,440,207	Logan	143	$115,489,781
Boone	47	$78,969,622	Lonoke	42	$8,093,342
Bradley	56	$25,374,278	Madison	34	$13,486,367
Calhoun	8	$1,741,646	Marion	29	$9,550,586
Carroll	20	$1,997,601	Miller	31	$97,394,083
Chicot	82	$68,225,878	Mississippi	80	$104,472,423
Clark	118	$313,804,475	Monroe	8	$1,816,862
Clay	32	$7,905,110	Montgomery	16	$1,624,964
Cleburne	15	$30,669,988	Nevada	23	$3,932,116
Cleveland	8	$559,005	Newton	13	$2,386,146
Columbia	123	$282,952,831	Ouachita	116	$92,963,819
Conway	100	$43,303,440	Perry	12	$630,743
Craighead	323	$853,613,403	Phillips	29	$17,160,563
Crawford	53	$19,074,712	Pike	53	$12,658,864
Crittenden	45	$83,046,346	Poinsett	45	$20,561,075
Cross	74	$21,935,911	Polk	43	$30,362,945
Dallas	11	$2,256,688	Pope	192	$388,460,857
Desha	30	$3,732,384	Prairie	29	$3,069,770
Drew	28	$6,012,582	Pulaski	595	$2,200,566,224
Faulkner	363	$812,053,371	Randolph	50	$60,044,096
Franklin	22	$18,602,787	Saline	82	$64,600,823
Fulton	38	$9,500,122	Scott	146	$164,486,922
Garland	184	$94,601,645	Searcy	21	$2,073,301
Grant	12	$5,557,560	Sebastian	12	$2,304,107
Greene	70	$24,614,322	Sevier	70	$53,446,216
Hempstead	107	$60,361,400	Sharp	8	$1,033,822
Hot Spring	109	$241,817,654	St. Francis	13	$6,258,938
Howard	32	$9,174,089	Stone	62	$33,012,957
Independence	40	$13,128,532	Union	77	$99,052,507
Izard	37	$86,321,513	Van Buren	12	$1,664,257
Jackson	90	$181,840,124	Washington	153	$55,134,707
Jefferson	236	$330,825,651	White	86	$124,118,772
Johnson	28	$4,319,405	Woodruff	5	$899,696
Lafayette	21	$5,595,098	Yell	60	$12,562,490
Lawrence	56	$17,276,297			
			Total	5440	$8,113,410,407

Source: Arkansas Insurance Department

Critical Facility Determination

The next step in providing for a meaningful analysis was the determination of critical facilities from the inventories available. For the 2010 Mitigation Plan update, the most critical facilities were determined to be those facilities with a total replacement cost greater than $5.0 million dollars, as provided by AID.

In addition, GIS datasets were developed for the following critical facility categories:

- Emergency Response;
- Schools and Universities;
- Medical Facilities;
- Infrastructure;
- Private Business; and
- Transportation.

For the 2013 plan update, these GIS datasets were obtained from the Arkansas Geographic Information Office (AGIO) and reviewed for state building and structure data. **Table 3.6.c** and **Figure 3.6.b** summarize and present the critical facilities as identified in the AGIO datasets and in the AID dataset as having replacement values greater than $5.0 million. **Appendix B** presents the full AGIO datasets highlighting the state building and structure data.

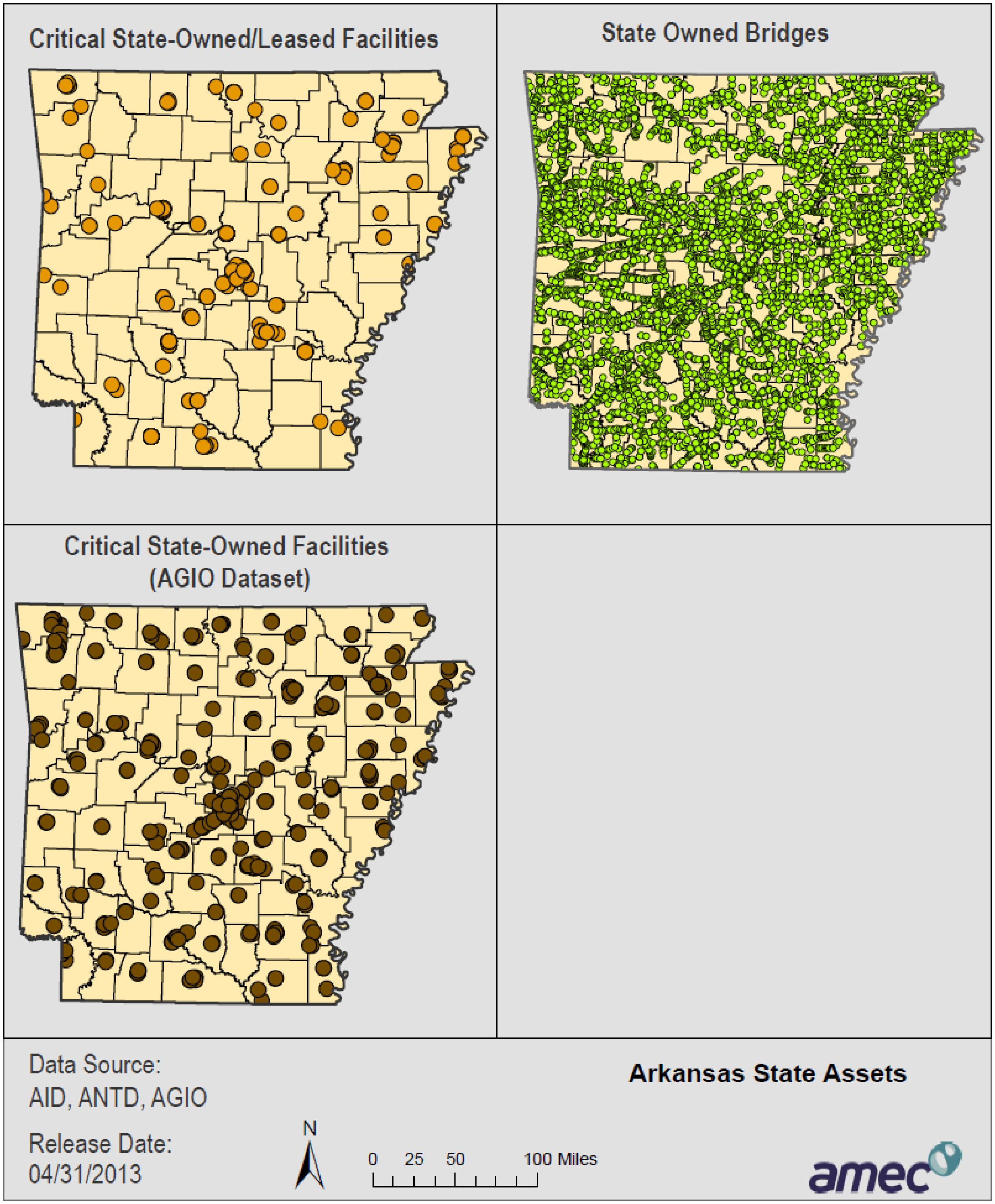
Table 3.6.c State-Owned /Leased Critical Facilities

County	Total # of State-Owned Facilities	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of State-Owned Bridges
Arkansas	37	-	-	75
Ashley	9	-	-	69
Baxter	58	6	$52,004,086	35
Benton	83	5	$97,093,682	156
Boone	47	3	$58,885,429	55
Bradley	56	-	-	50
Calhoun	8	-	-	66
Carroll	20	-	-	67
Chicot	82	2	$41,268,922	57
Clark	118	20	$241,485,374	113
Clay	32	-	-	85
Cleburne	15	2	$23,781,633	28
Cleveland	8	-	-	61
Columbia	123	19	$211,753,893	75
Conway	100	2	$17,587,250	76
Craighead	323	35	$696,125,909	175
Crawford	53	-	-	176
Crittenden	45	6	$60,202,216	163
Cross	74	1	$5,092,398	93
Dallas	11	-	-	81

County	Total # of State-Owned Facilities	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of State-Owned Bridges
Desha	30	-	-	50
Drew	28	-	-	85
Faulkner	363	40	$626,549,203	124
Franklin	22	1	$7,361,419	83
Fulton	38	-	-	65
Garland	184	4	$37,084,464	152
Grant	12	-	-	96
Greene	70	1	$6,886,216	93
Hempstead	107	2	$13,304,362	132
Hot Spring	109	4	$196,436,161	126
Howard	32	-	-	60
Independence	40	-	-	97
Izard	37	3	$66,526,478	42
Jackson	90	6	$149,823,662	111
Jefferson	236	12	$203,920,416	151
Johnson	28	-	-	108
Lafayette	21	-	-	47
Lawrence	56	1	$6,905,290	99
Lee	44	1	$93,614,016	54
Lincoln	179	6	$162,941,831	59
Little River	22	-	-	49
Logan	143	3	$65,308,841	81
Lonoke	42	-	-	135
Madison	34	1	$7,861,265	92
Marion	29	1	$6,349,013	39
Miller	31	1	$85,128,428	161
Mississippi	80	8	$68,402,598	182
Monroe	8	-	-	78
Montgomery	16	-	-	88
Nevada	23	-	-	101
Newton	13	-	-	41
Ouachita	116	5	$50,617,262	90
Perry	12	-	-	81
Phillips	29	-	-	59
Pike	53	-	-	63
Poinsett	45	1	$5,849,665	127
Polk	43	2	$13,428,347	102
Pope	192	21	$283,229,787	101
Prairie	29	-	-	66
Pulaski	595	76	$1,807,308,512	381
Randolph	50	3	$26,176,489	84
Saline	82	6	$98,449,015	100
Scott	146	-	-	123
Searcy	21	-	-	44
Sebastian	12	2	$19,715,120	171
Sevier	70	-	-	72
Sharp	8	-	-	54
St. Francis	13	3	$22,272,436	154
Stone	62	2	$12,747,340	55
Union	77	8	$72,572,594	124

County	Total # of State-Owned Facilities	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of State-Owned Bridges
Van Buren	12	-	-	50
Washington	153	2	$12,450,737	171
White	86	8	$75,477,729	205
Woodruff	5	-	-	62
Yell	60	-	-	128
TOTAL	**5440**	**335**	**$5,809,979,488**	**7303**

Figure 3.6.b. State-Owned /Leased Critical Facilities



3.6.1 Dam and Levee Failure

Dams

To determine state-owned facilities that are potentially vulnerable to dam failure, the Arkansas Insurance Department (AID), the Arkansas State Highway and Transportation Department, and the Arkansas Geographic Information Office (AGIO) datasets were identified by their proximity to state-regulated significant and high hazard dams. The facilities that were within 5 miles of a dam were identified for further analysis. A total of 542 facilities and 3,034 bridges from the AID, AGIO, and AHTD inventories were identified in potential inundation zones of state-regulated significant and high hazard dams. **Table 3.6.1.a** provides additional details regarding critical facilities and total replacement value and **Figure 3.6.1.a** shows the locations.

Table 3.6.1.a State-Owned /Leased Facilities in Potential Inundation Zones by County

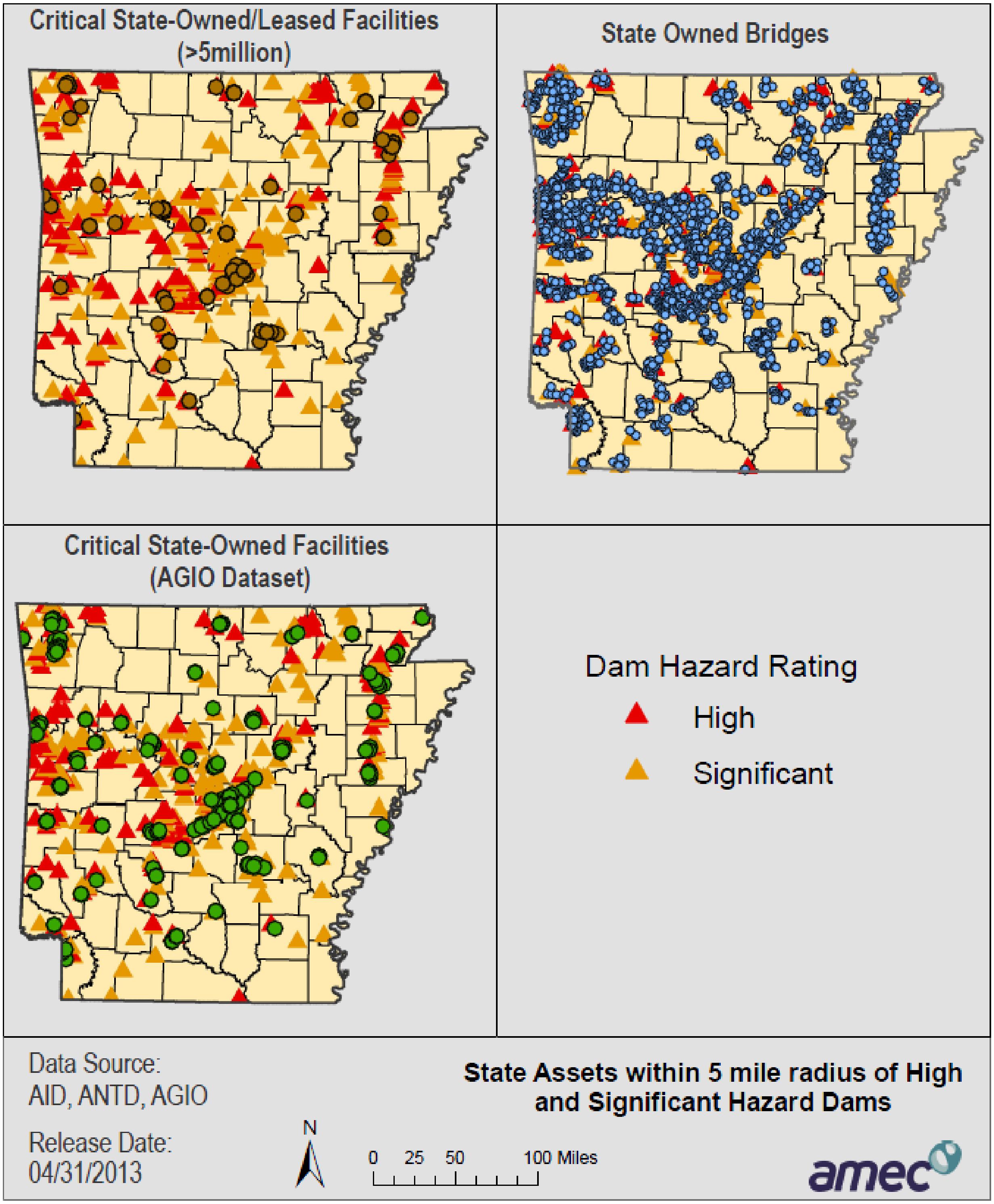
County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	-	-	6	17
Baxter	6	$52,004,086	4	26
Benton	4	$75,797,981	6	115
Calhoun	-	-	-	9
Carroll	-	-	-	8
Clark	15	$184,157,089	5	47
Clay	-	-	2	9
Cleburne	2	$23,781,633	4	15
Cleveland	-	-	-	4
Columbia	-	-	-	6
Conway	2	$17,587,250	2	52
Craighead	35	$696,125,909	8	106
Crawford	-	-	3	154
Cross	1	$5,092,398	4	40
Dallas	-	-	2	10
Desha	-	-	-	8
Drew	-	-	1	22
Faulkner	40	$626,549,203	8	66
Franklin	1	$7,361,419	2	60
Fulton	-	-	-	16
Garland	4	$37,084,464	8	121
Grant	-	-	-	21
Greene	1	$6,886,216	4	50

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Hempstead	-	-	-	8
Hot Spring	1	$16,902,314	3	56
Howard	-	-	2	23
Independence	-	-	-	40
Izard	-	-	-	7
Jackson	-	-	-	4
Jefferson	9	$105,878,028	18	103
Johnson	-	-	2	52
Lafayette	-	-	-	10
Lawrence	1	$6,905,290	-	23
Lee	-	-	-	3
Lincoln	-	-	-	12
Little River	-	-	2	7
Logan	3	$65,308,841	5	50
Lonoke	-	-	1	49
Marion	1	$6,349,013	-	2
Miller	1	$85,128,428	8	85
Montgomery	-	-	2	36
Nevada	-	-	-	13
Ouachita	2	$15,239,343	6	41
Perry	-	-	2	63
Phillips	-	-	2	5
Pike	-	-	1	12
Poinsett	-	-	2	40
Polk	1	$6,756,549	3	65
Pope	21	$283,229,787	9	82
Prairie	-	-	1	11
Pulaski	74	$1,793,916,540	105	363
Randolph	3	$26,176,489	4	47
St. Francis	3	$22,272,436	6	67
Saline	6	$98,449,015	9	87
Scott	-	-	3	50
Searcy	-	-	2	11
Sebastian	2	$19,715,120	7	149
Sevier	-	-	2	15
Sharp	-	-	3	33
Stone	-	-	-	2
Union	-	-	-	2

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Van Buren	-	-	1	17
Washington	2	$12,450,737	11	107
White	1	$7,232,966	8	142
Yell	-	-	1	58

A precise loss estimate based on depth-damage information for state-owned facilities in potential dam inundation areas was not possible due to data limitations. However, by applying a 50 percent damage estimate to the total replacement cost of the 242 AID facilities determined to be in potential inundation zones of state-regulated dams, losses could be $ $2,152,169,271.

Figure 3.6.1.a. State-Owned /Leased Facilities in Potential Inundation Zones



Levees

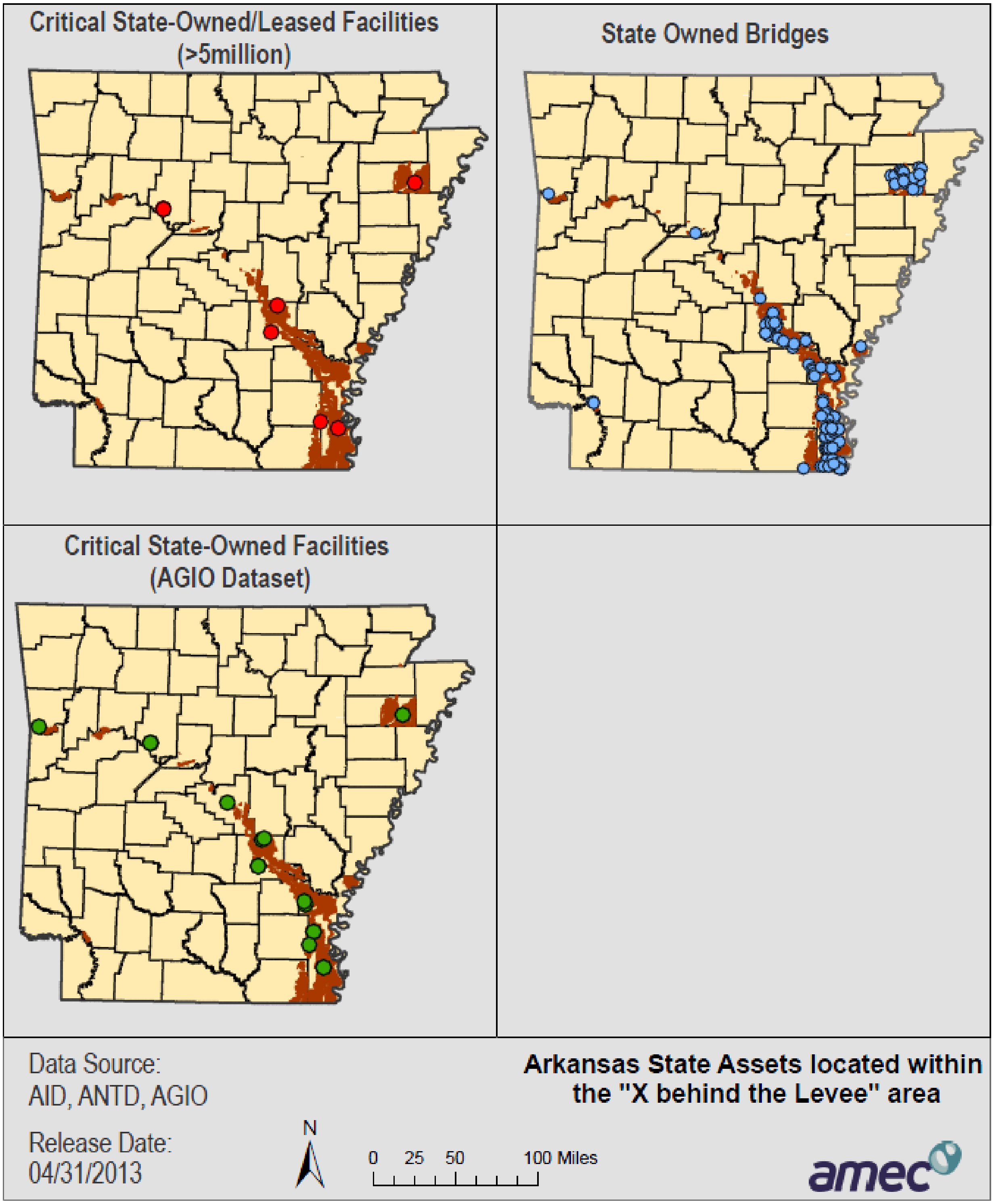
To determine state-owned facilities that are potentially vulnerable to levee failure, the Arkansas Insurance Department (AID), the Arkansas State Highway and Transportation Department, and the Arkansas Geographic Information Office (AGIO) datasets were identified by their location within levee protected areas. A total of 25 facilities and 112 bridges from the AID, AGIO, and AHTD inventories were identified in within a levee protected area. **Table 3.6.1.b** provides additional details regarding critical facilities and total replacement value and **Figure 3.6.1.b** shows the locations.

Table 3.6.1.b State-Owned /Leased Facilities in Levee Protected Areas by County

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Ashley	-	-	-	1
Chinot	2	$41,268,922	3	39
Conway	-	-	-	1
Crawford	-	-	1	1
Desha	-	-	4	12
Drew	-	-	-	-
Greene	-	-	-	-
Hempstead	-	-	-	2
Independence	-	-	-	-
Jefferson	2	$65,721,234	4	21
Johnson	-	-	-	-
Lincoln	-	-	-	2
Logan	-	-	-	-
Poinsett	1	$5,849,665	1	32
Pope	-	-	2	-
Pulaski	4	$62,810,960	1	1

A precise loss estimate based on depth-damage information for state-owned facilities in potential levee inundation areas was not possible due to data limitations. However, by applying a 50 percent damage estimate to the total replacement cost of all 9 AID facilities determined to be in potential inundation zones of state-regulated dams, losses could be $87,825,390.

Figure 3.6.1.b. State-Owned /Leased Facilities in Levee Protected Areas



3.6.2 Drought

Structures that are part of the AID, AHTD, and the AGIO datasets are not directly vulnerable to losses as a result of drought. However, the shrink-swell cycle that occurs as soils swell during wet periods and shrink during drought periods can cause damage to AHTD roads and bridges as well as other concrete components, and structure foundations. Most of the impacts associated with drought are to crop land, not facilities. The conservation and wildlife management areas owned and operated by the Arkansas Game and Fish Commission would be impacted as streams, lakes, and ponds can shrink in size or completely dry up causing death to fish and other wildlife and loss of recreation-based revenue.

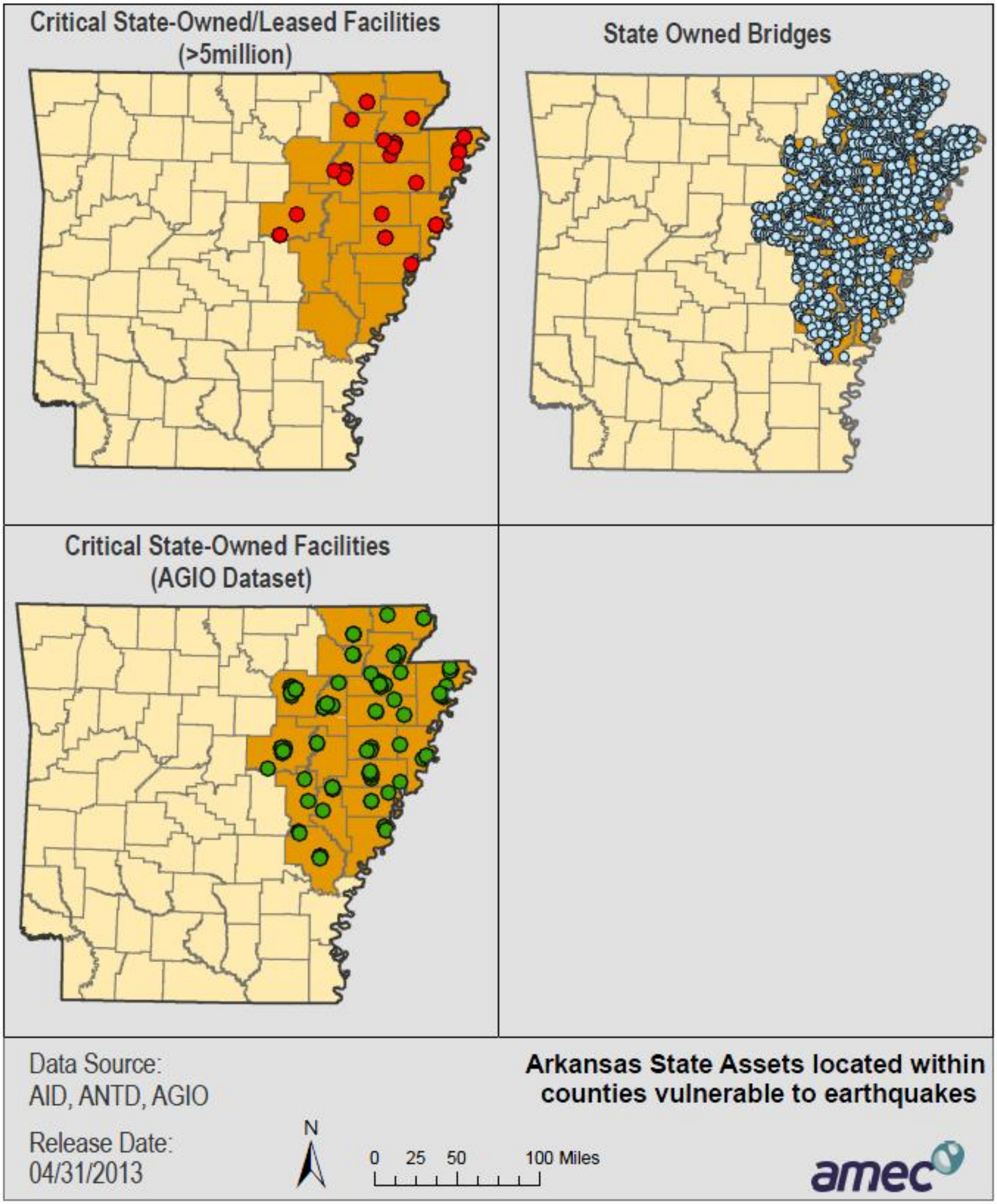
3.6.3 Earthquakes

The counties in **Table 3.6.3.a** below are those counties that are located within the identified critical area for earthquakes (See Section 3.4.3). The table provides the total number of facilities determined to be critical and the total replacement value. **Figure 3.6.3.a** shows the locations. Information is also provided for the number of state-owned bridges in these counties.

Table 3.6.3.a State-Owned /Leased Facilities in Critical Earthquake Area

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	-	-	8	75
Clay	-	-	3	85
Craighead	35	$696,125,909	11	174
Crittenden	6	$60,202,216	7	163
Cross	1	$5,092,398	4	93
Greene	1	$6,886,216	4	93
Independence	-	-	9	97
Jackson	6	$149,823,662	9	111
Lawrence	1	$6,905,290	3	98
Lee	1	$93,614,016	3	54
Mississippi	8	$68,402,598	8	182
Monroe	-	-	4	78
Phillips	-	-	6	58
Poinsett	1	$5,849,665	4	127
Prairie	-	-	2	66
Randolph	3	$26,176,489	4	84
Saint Francis	3	$22,272,436	8	154
White	8	$75,477,729	9	203
Woodruff	-	-	2	62

Figure 3.6.3.b. State-Owned /Leased Facilities in Earthquake Critical Areas



3.6.4 Expansive Soils

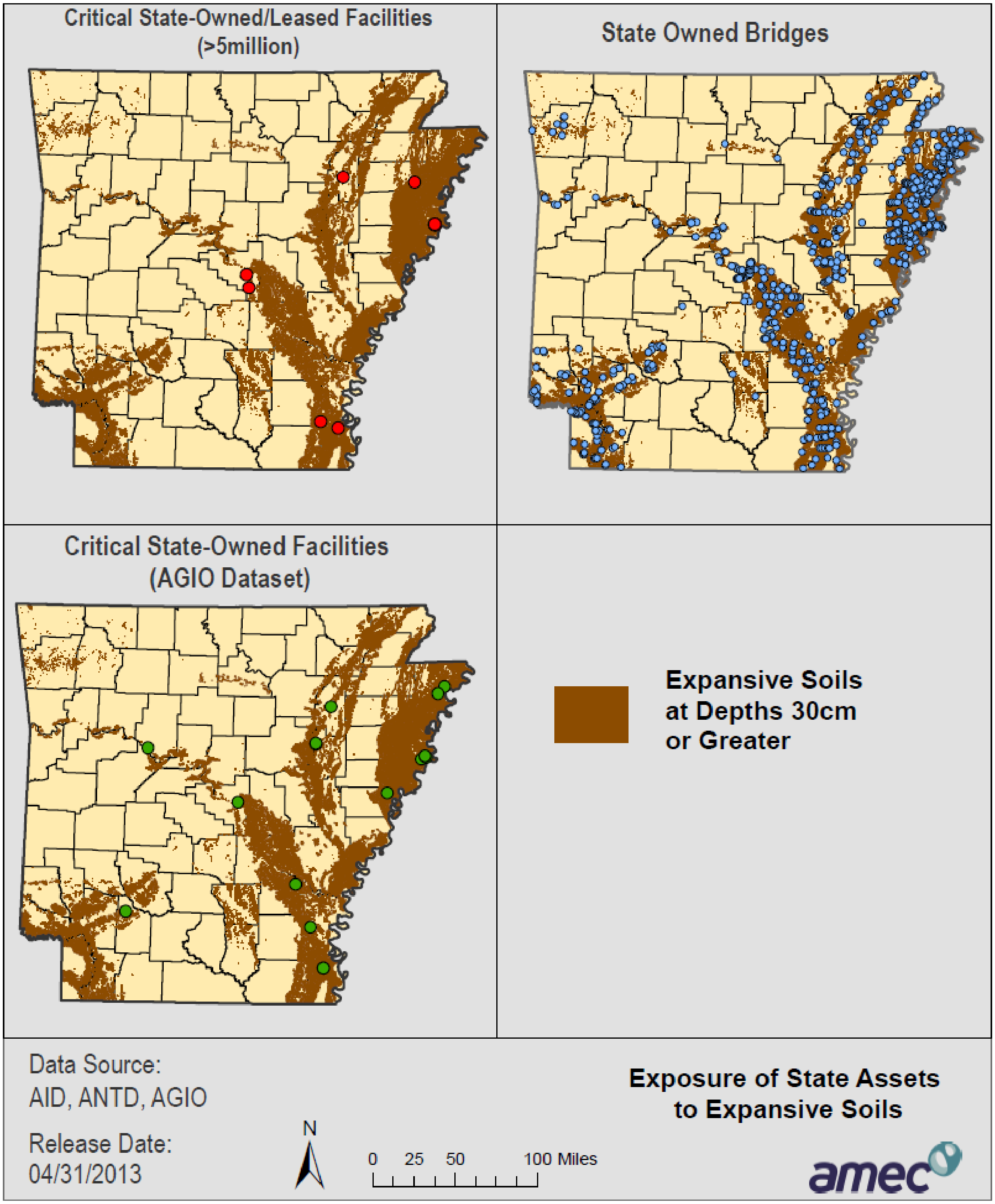
To determine state-owned facilities that are potentially vulnerable to expansive soils, the available GIS data from the AID, AHTD, and the AGIO datasets was compared against the available expansive soils data from the USDA Natural Resources Conservation Service (NRCS). The Assistant State Conservation Engineer and Senior Soil Scientist with the NRCS provided GIS data for soils within Arkansas which have been interpreted to be very expansive down to a depth of 30 cm or greater. It was determined that by selecting soils depths 30cm or greater, soils that are only expansive at depths shallower than typical building foundations and/or sub-grades would be removed from consideration. (See Section 3.4.4). **Table 3.6.4.a** provides the results of the analysis and **Figure 3.6.4.a** shows the locations of the facilities.

Table 3.6.4.a State-Owned /Leased Facilities in Expansive Soils Areas

County	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	-	-	-	6
Ashley	-	-	-	7
Bradley	-	-	-	1
Chicot	2	$41,268,922	2	30
Clark	-	-	-	14
Clay	-	-	-	15
Cleveland	-	-	-	2
Conway	-	-	-	7
Craighead	-	-	-	13
Crittenden	6	$60,202,216	6	143
Cross	-	-	-	17
Desha	-	-	1	12
Drew	-	-	-	14
Faulkner	-	-	-	7
Franklin	-	-	-	1
Greene	-	-	-	23
Hempstead	-	-	-	20
Hot Spring	-	-	-	1
Howard	-	-	-	5
Independence	-	-	-	2
Jackson	1	$53,894,175	1	14
Jefferson	-	-	-	31
Lafayette	-	-	-	14
Lawrence	-	-	-	21
Lee	-	-	1	7
Lincoln	-	-	1	15
Little River	-	-	-	11
Lonoke	-	-	-	26
Miller	-	-	-	40
Mississippi	-	-	2	104
Monroe	-	-	-	28

County	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Nevada	-	-	1	3
Perry	-	-	-	2
Phillips	-	-	-	7
Poinsett	1	$5,849,665	-	43
Pope	-	-	1	0
Prairie	-	-	-	12
Pulaski	2	$11,823,715	1	61
Randolph	-	-	-	5
Searcy	-	-	-	1
Sebastian	-	-	-	6
Sevier	-	-	-	8
St. Francis	-	-	-	53
Stone	-	-	-	1
Washington	-	-	-	8
White	-	-	-	15
Woodruff	-	-	2	19
Yell	-	-	-	4

Figure 3.6.4.a. State-Owned /Leased Facilities in Expansive Soils Areas



3.6.5 Flood

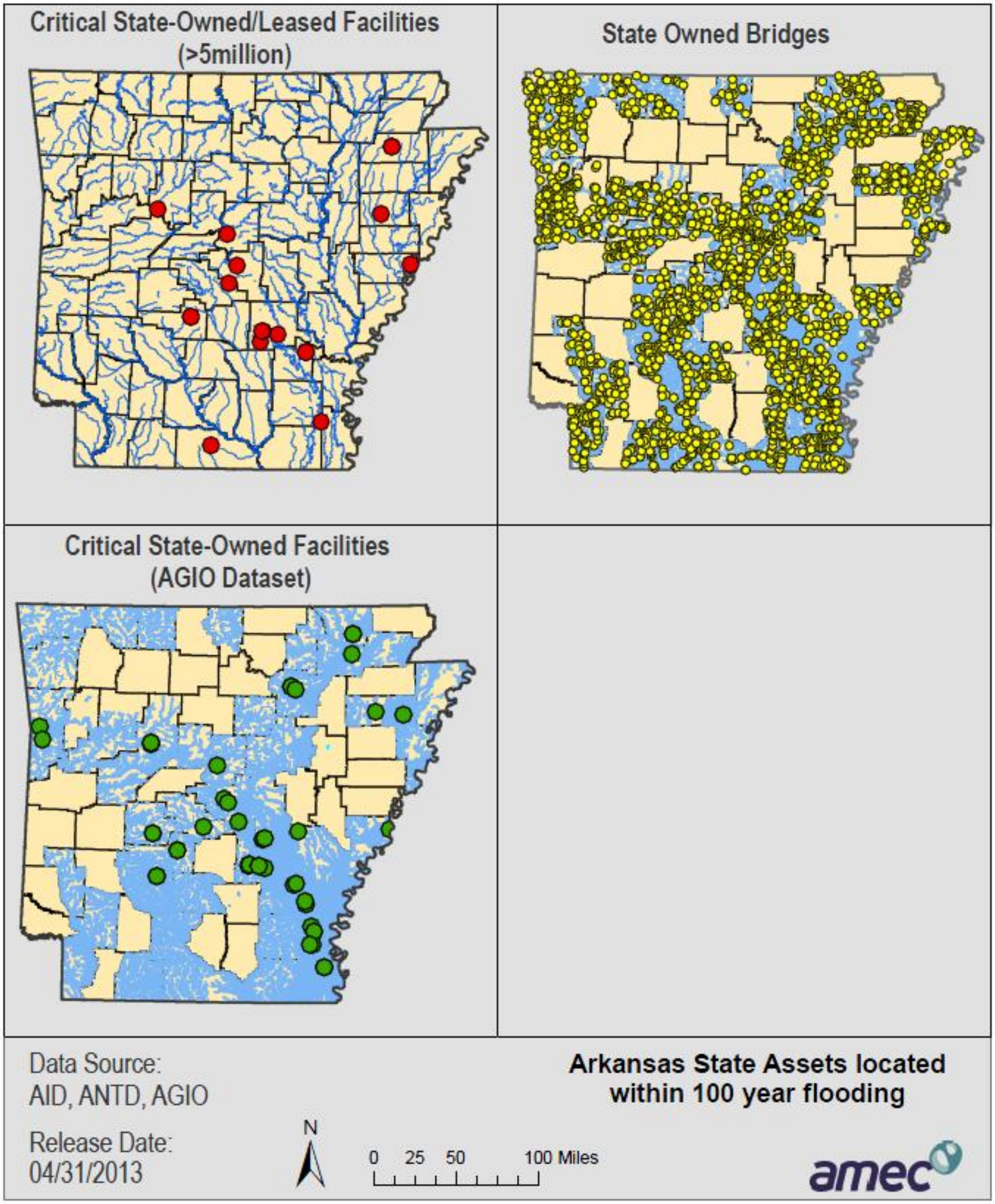
To determine which state owned facilities are located within the 100-year floodplain, the available GIS data from the AID, AHTD, and the AGIO datasets was compared against the available DFIRM floodplains. **Table 3.6.5.a** provides the results of the analysis and **Figure 3.6.5.a** shows the locations of the facilities. At a conservative loss estimate of 20 percent, damages to state-owned facilities as a result of flood could be $8,164,718.

Table 3.6.5.a State-Owned /Leased Facilities in 100-Year Floodplain by County

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	-	-	1	58
Ashley	-	-	-	60
Baxter	-	-	-	17
Benton	-	-	-	80
Boone	-	-	-	28
Carroll	-	-	-	30
Chicot	1	$3,450,150	4	56
Clark	-	-	2	82
Cleburne	-	-	-	17
Columbia	-	-	-	66
Conway	-	-	-	41
Craighead	2	$985,547	-	0
Crawford	-	-	1	83
Crittenden	-	-	-	50
Cross	1	$676,229	-	0
Dallas	-	-	-	63
Desha	-	-	5	50
Drew	-	-	-	77
Faulkner	1	$2,754,000	1	84
Franklin	-	-	-	12
Garland	-	-	2	64
Greene	-	-	-	64
Hempstead	-	-	-	95
Hot Spring	2	$8,195,629	2	63
Howard	-	-	-	42
Independence	-	-	3	74
Jefferson	4	$4,795,386	12	107
Johnson	-	-	-	50
Lawrence	-	-	1	71

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Lee	1	$2,677,868	-	0
Lincoln	2	$2,730,527	2	50
Logan	-	-	-	58
Lonoke	-	-	-	78
Miller	-	-	-	96
Mississippi	-	-	-	58
Ouachita	-	-	-	60
Phillips	-	-	1	41
Poinsett	-	-	2	102
Pope	1	$287,513	3	52
Pulaski	2	$12,580,167	3	126
Randolph	-	-	2	70
Saline	-	-	1	41
Sebastian	-	-	1	94
Sharp	-	-	-	34
Union	1	$1,690,574	-	73
Washington	-	-	-	85
White	-	-	-	146
Yell	-	-	-	68

Figure 3.6.5.a. State-Owned /Leased Facilities in 100-Year Floodplain



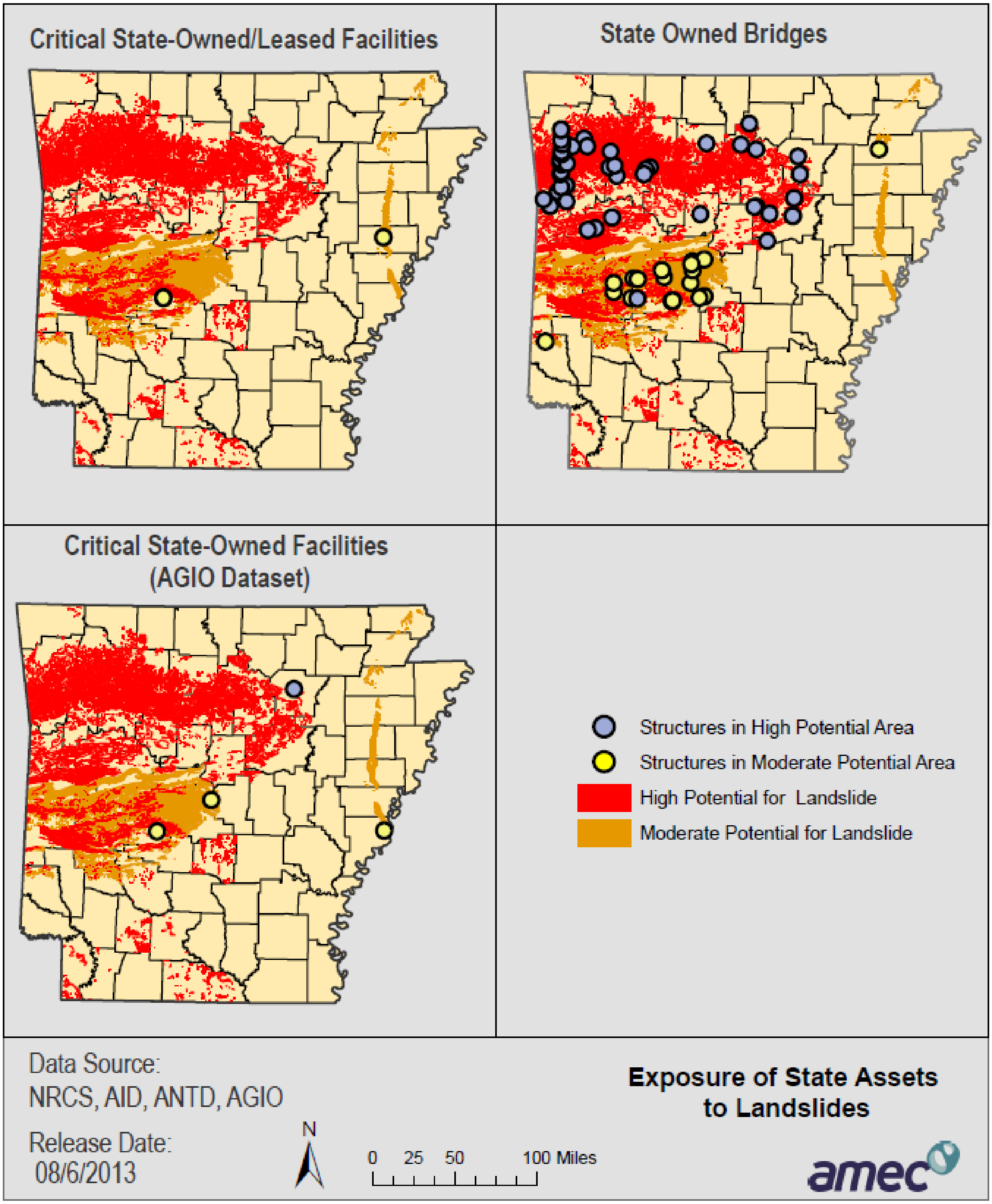
3.6.6 Landslides

To determine state-owned facilities that are potentially vulnerable to landslides, the available GIS data from the AID, AHTD, and the AGIO datasets was compared against the available landslide data from the USDA Natural Resources Conservation Service (NRCS). The Assistant State Conservation Engineer and Senior Soil Scientist with the NRCS provided GIS data for soils within Arkansas which have been interpreted to have high- and moderate-potential for landslides (See Section 3.4.6). These landslide-prone soils are defined by the setting of the clay soil on top of a weaker shear plane. NRCS has determined the high and moderate distinctions. **Table 3.6.6.a** provides the results of the analysis and **Figure 3.6.6.a** shows the locations of the facilities.

Table 3.6.6.a State-Owned /Leased Facilities in Potential Landslide Areas

County	Landslide Potential	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Conway	High	-	-	-	1
Craighead	Moderate	-	-	-	1
Crawford	High	-	-	-	13
Garland	Moderate	3	$28,563,194	1	6
Garland	High	-	-	-	1
Independence	High	-	-	1	2
Johnson	High	-	-	-	6
Logan	High	-	-	-	3
Lonoke	High	-	-	-	1
Madison	High	-	-	-	3
Montgomery	Moderate	-	-	-	3
Perry	Moderate	-	-	-	2
Phillips	Moderate	-	-	1	-
Pulaski	Moderate	-	-	1	1
Saline	Moderate	-	-	-	6
Searcy	High	-	-	-	1
Sebastian	High	-	-	-	4
Sevier	Moderate	-	-	-	1
St. Francis	Moderate	2	$16,262,708	-	-
Stone	High	-	-	-	3
Washington	High	-	-	-	11
White	High	-	-	-	6

Figure 3.6.6.a State-Owned /Leased Facilities in Potential Landslide Areas



3.6.7 Severe Thunderstorms

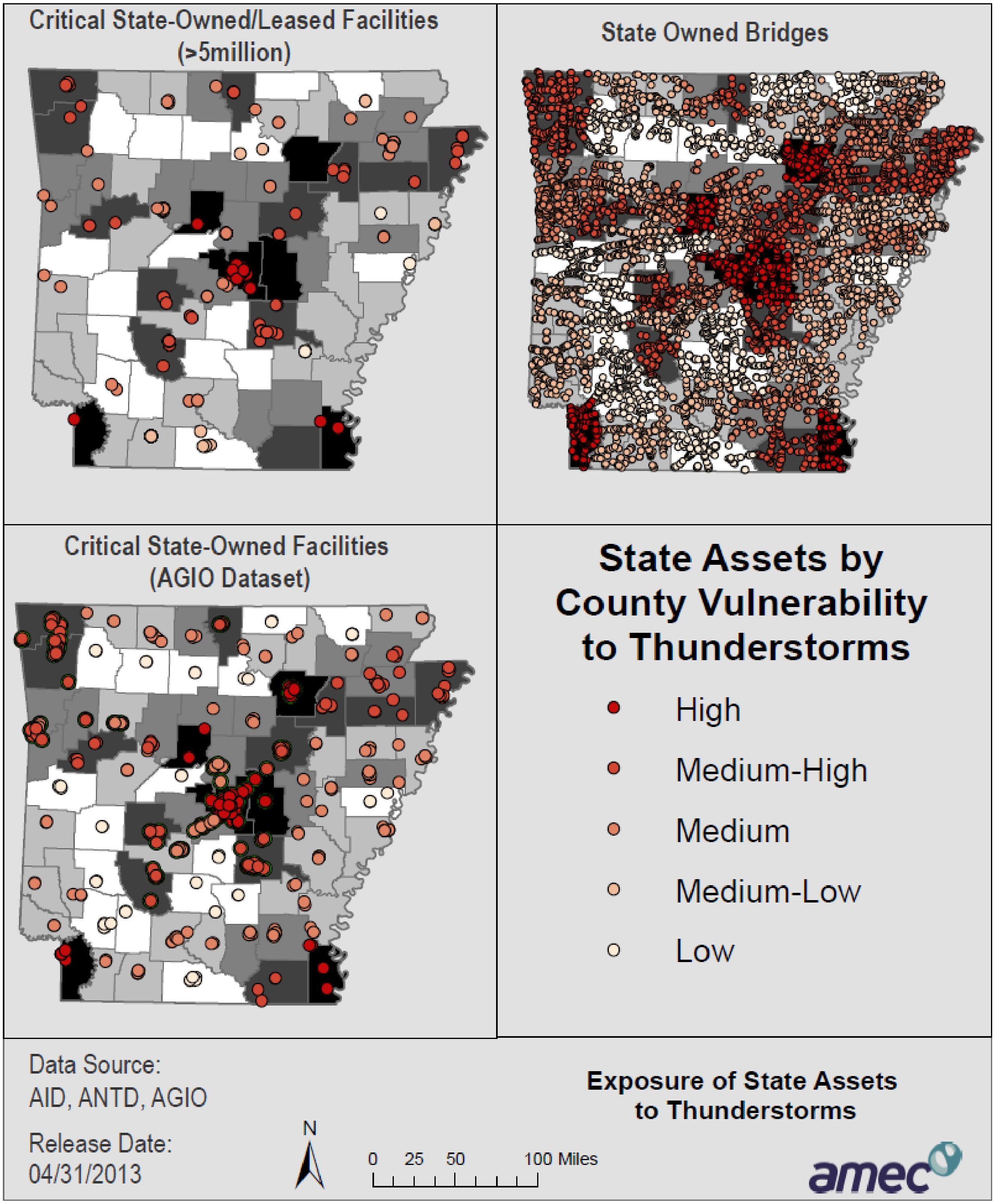
Table 3.6.7.a presents the countywide vulnerability to severe thunderstorms (See Section 3.4.7) along with the total number of facilities determined to be critical and the total replacement value (building and contents value). Information is also provided for the AGIO datasets and the number of state-owned bridges in these counties. **Figure 3.6.7.a** shows the locations of the facilities.

Table 3.6.7.a State-Owned /Leased Facilities in Severe Thunderstorm Vulnerable Areas

County	Vulnerability to Thunderstorms	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	Medium-Low	-	-	8	75
Ashley	Medium-High	-	-	4	69
Baxter	Medium-High	6	$52,004,086	4	35
Benton	Medium-High	5	$97,093,682	8	156
Boone	Medium-Low	3	$58,885,429	8	55
Bradley	Medium	-	-	5	50
Calhoun	Medium-Low	-	-	2	66
Carroll	Medium-Low	-	-	3	67
Chicot	High	2	$41,268,922	5	57
Clark	Medium-High	20	$241,485,374	6	113
Clay	Medium-Low	-	-	3	85
Cleburne	Medium	2	$23,781,633	4	28
Cleveland	Low	-	---	2	61
Columbia	Medium-Low	19	$211,753,893	5	75
Conway	High	2	$17,587,250	3	76
Craighead	Medium	35	$696,125,909	11	175
Crawford	Medium	-	---	3	176
Crittenden	Medium-Low	6	$60,202,216	7	163
Cross	Medium-Low	1	$5,092,398	4	93
Dallas	Low	-	-	3	81
Desha	Medium-Low	-	-	5	50
Drew	Medium	-	-	13	85
Faulkner	Medium	40	$626,549,203	10	124
Franklin	Medium	1	$7,361,419	2	83
Fulton	Low	-	-	2	65
Garland	Medium-High	4	$37,084,464	10	152
Grant	Low	-	-	2	96
Greene	Medium	1	$6,886,216	4	93
Hempstead	Low	2	$13,304,362	8	132
Hot Spring	Medium-Low	4	$196,436,161	6	126
Howard	Medium-Low	-	-	3	60
Independence	High	-	-	9	97
Izard	Medium-Low	3	$66,526,478	4	42
Jackson	Medium-High	6	$149,823,662	9	111
Jefferson	Medium-High	12	$203,920,416	25	151
Johnson	Medium-Low	-	-	6	108
Lafayette	Medium-Low	-	-	2	47
Lawrence	Medium	1	$6,905,290	3	99

County	Vulnerability to Thunderstorms	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Lee	Low	1	$93,614,016	3	54
Lincoln	Medium-Low	6	$162,941,831	2	59
Little River	Medium-Low	-	-	2	49
Logan	Medium-High	3	$65,308,841	5	81
Lonoke	High	-	-	5	135
Madison	Low	1	$7,861,265	2	92
Marion	Medium	1	$6,349,013	3	39
Miller	High	1	$85,128,428	8	161
Mississippi	Medium-High	8	$68,402,598	8	182
Monroe	Medium-Low	-	-	4	78
Montgomery	Low	-	-	2	88
Nevada	Low	-	-	2	101
Newton	Low	-	-	2	41
Ouachita	Medium-Low	5	$50,617,262	8	90
Perry	Low	-	-	2	81
Phillips	Medium-Low	-	-	6	59
Pike	Low	-	-	2	63
Poinsett	Medium-High	1	$5,849,665	4	127
Polk	Medium-Low	2	$13,428,347	3	102
Pope	Medium	21	$283,229,787	11	101
Prairie	Medium	-	-	2	66
Pulaski	High	76	$1,807,308,512	114	381
Randolph	Low	3	$26,176,489	4	84
Saline	Medium	6	$98,449,015	9	100
Scott	Low	-	-	3	123
Searcy	Low	-	-	2	44
Sebastian	Medium	2	$19,715,120	9	171
Sevier	Medium-Low	-	-	2	72
Sharp	Medium-Low	-	-	3	54
St. Francis	Medium	3	$22,272,436	8	154
Stone	Low	2	$12,747,340	2	55
Union	Low	8	$72,572,594	7	124
Van Buren	Medium	-	-	1	50
Washington	Medium-High	2	$12,450,737	14	171
White	Medium-High	8	$75,477,729	9	205
Woodruff	Medium-Low	-	-	2	62
Yell	Medium-Low	-	-	4	128
TOTAL		**335**	**$5,809,979,488**		**7303**

Figure 3.6.7.a State-Owned /Leased Facilities in Severe Thunderstorm Vulnerable Areas



Note, in addition to the color-coding of the state assets, the countywide vulnerability is also color-coded, in the background, to assist in the location and identification of the state assets.

3.6.8 Severe Winter Weather

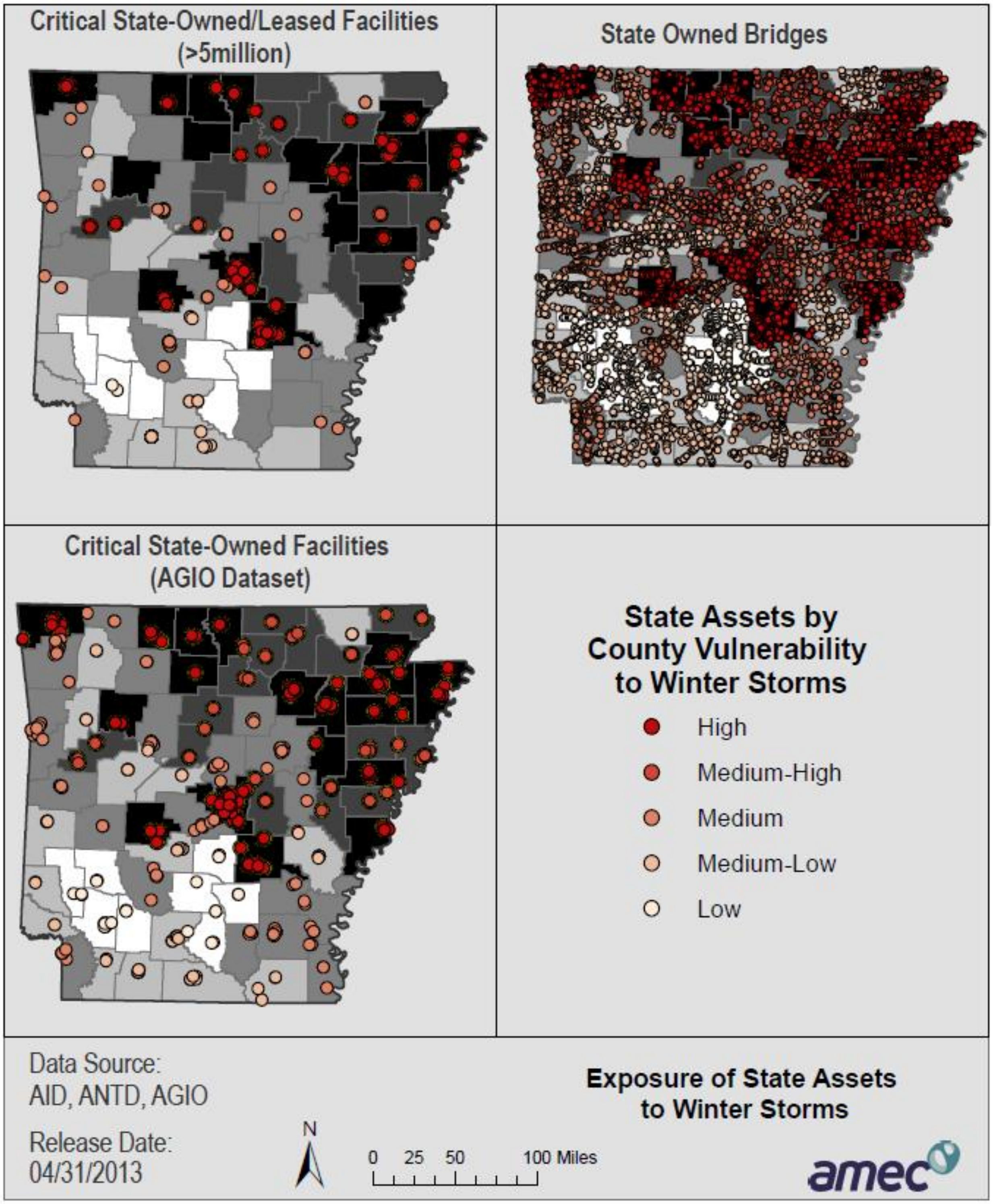
Table 3.6.8.a presents the countywide vulnerability to severe winter weather (See Section 3.4.8) along with the total number of facilities determined to be critical and the total replacement value (building and contents value). Information is also provided for the AGIO datasets and the number of state-owned bridges in these counties. **Figure 3.6.8.a** shows the locations of the facilities.

Table 3.6.8.a State-Owned /Leased Facilities in Severe Winter Weather Vulnerable Areas

County	Vulnerability to Winter Storms	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	Medium-Low	-	-	8	75
Ashley	Medium-Low	-	-	4	69
Baxter	High	6	$52,004,086	4	35
Benton	High	5	$97,093,682	8	156
Boone	High	3	$58,885,429	8	55
Bradley	Medium	-	-	5	50
Calhoun	Low	-	-	2	66
Carroll	Medium	-	-	3	67
Chicot	Medium	2	$41,268,922	5	57
Clark	Medium	20	$241,485,374	6	113
Clay	Medium-High	-	-	3	85
Cleburne	Medium	2	$23,781,633	4	28
Cleveland	Low	-	---	2	61
Columbia	Medium-Low	19	$211,753,893	5	75
Conway	Medium-High	2	$17,587,250	3	76
Craighead	High	35	$696,125,909	11	175
Crawford	Medium	-	---	3	176
Crittenden	Medium-High	6	$60,202,216	7	163
Cross	Medium-High	1	$5,092,398	4	93
Dallas	Low	-	-	3	81
Desha	Medium	-	-	5	50
Drew	Medium	-	-	13	85
Faulkner	Medium	40	$626,549,203	10	124
Franklin	Medium-Low	1	$7,361,419	2	83
Fulton	Medium-High	-	-	2	65
Garland	High	4	$37,084,464	10	152
Grant	Low	-	-	2	96
Greene	High	1	$6,886,216	4	93
Hempstead	Low	2	$13,304,362	8	132
Hot Spring	Medium-Low	4	$196,436,161	6	126
Howard	Low	-	-	3	60
Independence	High	-	-	9	97
Izard	Medium-High	3	$66,526,478	4	42
Jackson	High	6	$149,823,662	9	111
Jefferson	High	12	$203,920,416	25	151
Johnson	High	-	-	6	108
Lafayette	Medium-Low	-	-	2	47
Lawrence	Medium-High	1	$6,905,290	3	99

County	Vulnerability to Winter Storms	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Lee	Medium-High	1	$93,614,016	3	54
Lincoln	Medium	6	$162,941,831	2	59
Little River	Medium-Low	-	-	2	49
Logan	Medium-High	3	$65,308,841	5	81
Lonoke	Medium-High	-	-	5	135
Madison	Medium-Low	1	$7,861,265	2	92
Marion	High	1	$6,349,013	3	39
Miller	Medium	1	$85,128,428	8	161
Mississippi	High	8	$68,402,598	8	182
Monroe	Medium-High	-	-	4	78
Montgomery	Medium	-	-	2	88
Nevada	Low	-	-	2	101
Newton	Medium	-	-	2	41
Ouachita	Medium-Low	5	$50,617,262	8	90
Perry	Medium-Low	-	-	2	81
Phillips	High	-	-	6	59
Pike	Low	-	-	2	63
Poinsett	High	1	$5,849,665	4	127
Polk	Medium-Low	2	$13,428,347	3	102
Pope	Medium	21	$283,229,787	11	101
Prairie	Medium	-	-	2	66
Pulaski	High	76	$1,807,308,512	114	381
Randolph	Medium-Low	3	$26,176,489	4	84
Saline	Medium	6	$98,449,015	9	100
Scott	Medium	-	-	3	123
Searcy	High	-	-	2	44
Sebastian	Medium	2	$19,715,120	9	171
Sevier	Medium-Low	-	-	2	72
Sharp	Medium-High	-	-	3	54
St. Francis	High	3	$22,272,436	8	154
Stone	Medium-High	2	$12,747,340	2	55
Union	Medium-Low	8	$72,572,594	7	124
Van Buren	Medium-High	-	-	1	50
Washington	Medium	2	$12,450,737	14	171
White	Medium	8	$75,477,729	9	205
Woodruff	High	-	-	2	62
Yell	Medium-Low	-	-	4	128
TOTAL		**335**	**$5,809,979,488**		**7303**

Figure 3.6.8.a State-Owned /Leased Facilities in Severe Winter Weather Vulnerable Areas



Note, in addition to the color-coding of the state assets, the countywide vulnerability is also color-coded, in the background, to assist in the location and identification of the state assets.

3.6.9 Tornado

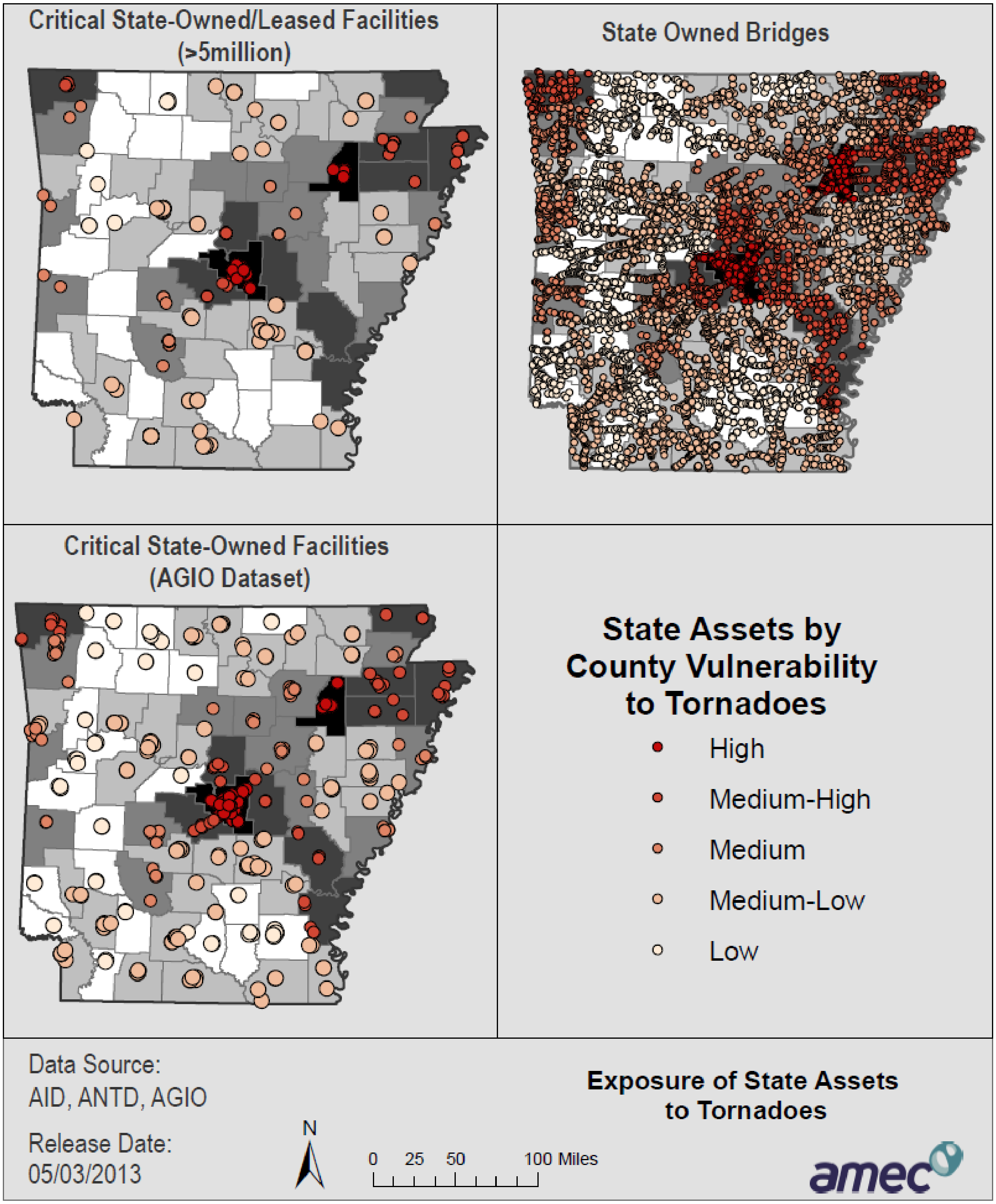
Table 3.6.9.a presents the countywide vulnerability to tornadoes (See Section 3.4.9) along with the total number of facilities determined to be critical and the total replacement value (building and contents value). Information is also provided for the AGIO datasets and the number of state-owned bridges in these counties. **Figure 3.6.9.a** shows the locations of the facilities.

Table 3.6.9.a State-Owned /Leased Facilities in Tornado Vulnerable Areas

County	Vulnerability to Tornadoes	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	Medium-High	-	-	8	75
Ashley	Medium-Low	-	-	4	69
Baxter	Medium-Low	6	$52,004,086	4	35
Benton	Medium-High	5	$97,093,682	8	156
Boone	Low	3	$58,885,429	8	55
Bradley	Low	-	-	5	50
Calhoun	Low	-	-	2	66
Carroll	Low	-	-	3	67
Chicot	Medium-Low	2	$41,268,922	5	57
Clark	Medium	20	$241,485,374	6	113
Clay	Medium-High	-	-	3	85
Cleburne	Medium	2	$23,781,633	4	28
Cleveland	Low	-	---	2	61
Columbia	Medium-Low	19	$211,753,893	5	75
Conway	Medium-Low	2	$17,587,250	3	76
Craighead	Medium-High	35	$696,125,909	11	175
Crawford	Medium-Low	-	---	3	176
Crittenden	Medium	6	$60,202,216	7	163
Cross	Medium-Low	1	$5,092,398	4	93
Dallas	Medium-Low	-	-	3	81
Desha	Medium-High	-	-	5	50
Drew	Low	-	-	13	85
Faulkner	Medium-High	40	$626,549,203	10	124
Franklin	Low	1	$7,361,419	2	83
Fulton	Low	-	-	2	65
Garland	Medium	4	$37,084,464	10	152
Grant	Medium-Low	-	-	2	96
Greene	Medium	1	$6,886,216	4	93
Hempstead	Medium-Low	2	$13,304,362	8	132
Hot Spring	Medium-Low	4	$196,436,161	6	126
Howard	Medium-Low	-	-	3	60
Independence	Medium	-	-	9	97
Izard	Medium-Low	3	$66,526,478	4	42
Jackson	High	6	$149,823,662	9	111
Jefferson	Medium-Low	12	$203,920,416	25	151
Johnson	Medium-Low	-	-	6	108
Lafayette	Low	-	-	2	47
Lawrence	Medium-Low	1	$6,905,290	3	99
Lee	Medium-Low	1	$93,614,016	3	54

County	Vulnerability to Tornadoes	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Lincoln	Medium-Low	6	$162,941,831	2	59
Little River	Low	-	-	2	49
Logan	Low	3	$65,308,841	5	81
Lonoke	Medium-High	-	-	5	135
Madison	Low	1	$7,861,265	2	92
Marion	Medium-Low	1	$6,349,013	3	39
Miller	Medium-Low	1	$85,128,428	8	161
Mississippi	Medium-High	8	$68,402,598	8	182
Monroe	Medium-Low	-	-	4	78
Montgomery	Low	-	-	2	88
Nevada	Low	-	-	2	101
Newton	Low	-	-	2	41
Ouachita	Medium-Low	5	$50,617,262	8	90
Perry	Low	-	-	2	81
Phillips	Medium	-	-	6	59
Pike	Low	-	-	2	63
Poinsett	Medium-High	1	$5,849,665	4	127
Polk	Medium	2	$13,428,347	3	102
Pope	Medium-Low	21	$283,229,787	11	101
Prairie	Medium	-	-	2	66
Pulaski	High	76	$1,807,308,512	114	381
Randolph	Medium-Low	3	$26,176,489	4	84
Saline	Medium-High	6	$98,449,015	9	100
Scott	Low	-	-	3	123
Searcy	Low	-	-	2	44
Sebastian	Medium	2	$19,715,120	9	171
Sevier	Low	-	-	2	72
Sharp	Medium-Low	-	-	3	54
St. Francis	Medium-Low	3	$22,272,436	8	154
Stone	Medium-Low	2	$12,747,340	2	55
Union	Medium-Low	8	$72,572,594	7	124
Van Buren	Medium	-	-	1	50
Washington	Medium	2	$12,450,737	14	171
White	Medium	8	$75,477,729	9	205
Woodruff	Medium-Low	-	-	2	62
Yell	Medium-Low	-	-	4	128
TOTAL		**335**	**$5,809,979,488**		**7303**

Figure 3.6.9.a State-Owned /Leased Facilities in Tornado Vulnerable Areas



Note, in addition to the color-coding of the state assets, the countywide vulnerability is also color-coded, in the background, to assist in the location and identification of the state assets.

3.6.10 Wildfire

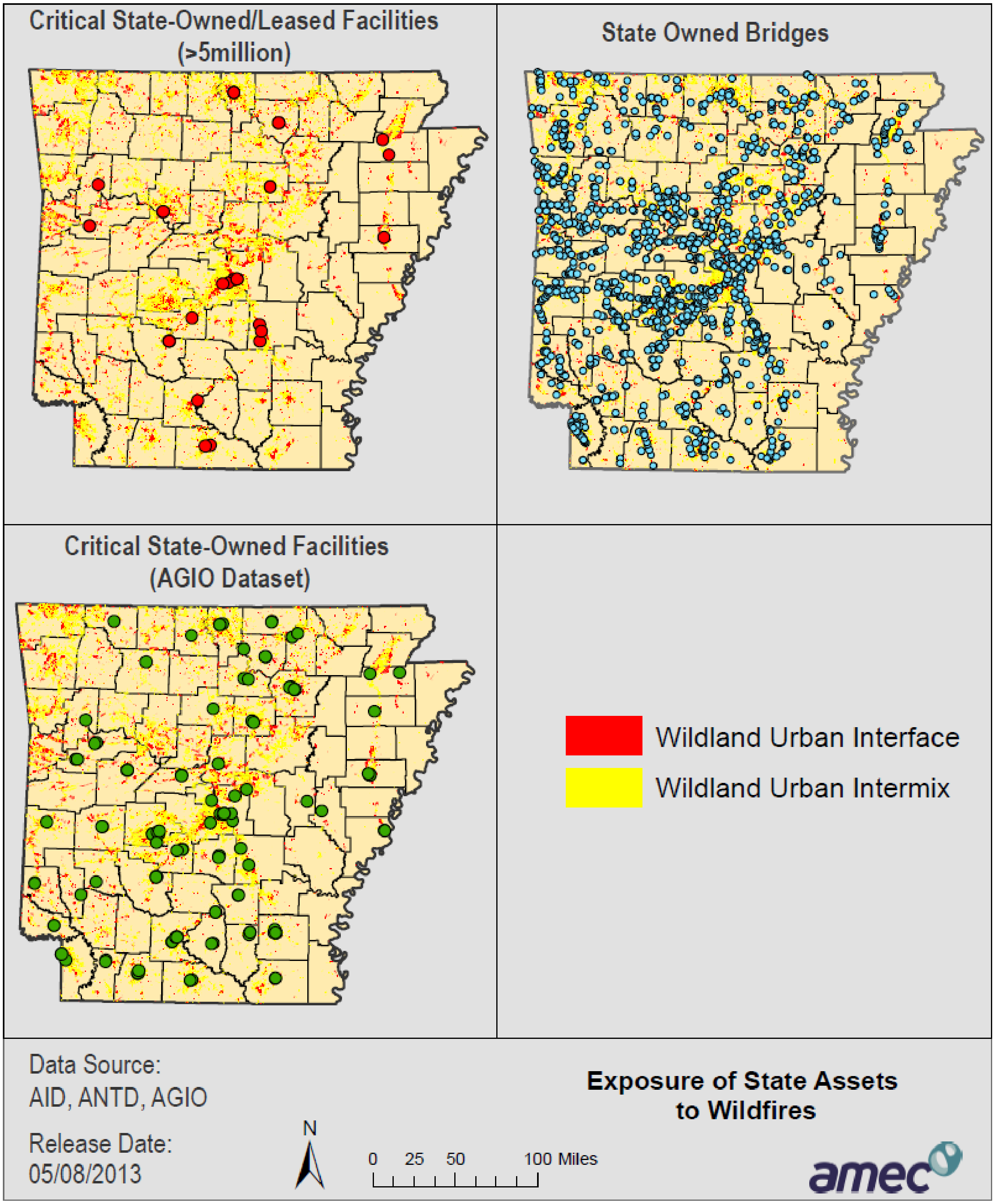
To determine state-owned facilities that are potentially vulnerable to wildfire, the available GIS data from the AID, AHTD, and the AGIO datasets was compared against the available wildand urban interface and intermix areas provided from the University of Wisconsin-Madison SILVUS Lab. The Silvis Project, at the University of Wisconsin, has undertaken nationwide mapping of the wildland-urban interface based on vegetation and population density mapping. The most recent results, published in 2010, distinguishes between the more densely populated wildland-urban interface versus the wildland-urban intermix with its more dispersed housing patterns (See Section 3.4.10). **Table 3.6.10.a** provides the results of the analysis and **Figure 3.6.10.a** shows the locations of the facilities.

Table 3.6.10.a State-Owned /Leased Facilities in Wildfire Vulnerable Areas

County	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	-	-	-	6
Ashley	-	-	2	20
Baxter	5	$45,123,160	3	14
Benton	-	-	-	26
Boone	-	-	-	12
Bradley	-	-	3	2
Calhoun	-	-	2	5
Carroll	-	-	1	15
Clark	5	$45,371,070	3	21
Cleburne	2	$23,781,633	3	10
Cleveland	-	-	2	7
Columbia	-	-	4	11
Conway	-	-	-	21
Craighead	2	$14,622,293	1	15
Crawford	-	-	-	33
Cross	-	-	-	6
Dallas	-	-	2	8
Drew	-	-	6	10
Faulkner	-	-	1	27
Franklin	1	$7,361,419	1	14
Fulton	-	-	2	10
Garland	-	-	5	63
Grant	-	-	2	21
Greene	-	-	-	12
Hempstead	-	-	-	18
Hot Spring	1	$7,720,312	3	52
Howard	-	-	1	13
Independence	-	-	6	27
Izard	2	$17,811,298	2	16
Jackson	-	-	-	5
Jefferson	3	$22,500,017	1	36
Johnson	-	-	-	5
Lafayette	-	-	2	4

County	# of State Owned Critical Facilities (> $5M)	Total Replacement Value for State-Owned Critical Facilities	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Lawrence	-	-	-	7
Lincoln	-	-	-	7
Little River	-	-	2	5
Logan	2	$13,831,014	4	27
Lonoke	-	-	-	24
Madison	-	-	-	11
Marion	-	-	1	10
Miller	-	-	3	36
Monroe	-	-	1	4
Montgomery	-	-	2	38
Nevada	-	-	-	6
Newton	-	-	1	7
Ouachita	1	$10,864,530	6	22
Perry	-	-	2	30
Phillips	-	-	2	5
Pike	-	-	1	20
Poinsett	-	-	1	2
Polk	-	-	1	45
Pope	2	$15,353,836	-	40
Prairie	-	-	1	6
Pulaski	5	$156,301,635	10	77
Randolph	-	-	-	8
Saline	1	$5,237,331	1	43
Scott	-	-	-	38
Searcy	-	-	-	8
Sebastian	-	-	-	41
Sevier	-	-	2	21
Sharp	-	-	3	15
St. Francis	1	$6,009,728	4	19
Stone	-	-	2	13
Union	2	$16,284,609	3	23
Van Buren	-	-	1	20
Washington	-	-	-	33
White	-	-	-	32
Yell	-	-	3	36

Figure 3.6.10.a State-Owned /Leased Facilities in Wildfire Vulnerable Areas



3.6.11 Hazardous Materials Incidents

Table 3.6.11.a below lists the counties with facilities and/or bridges within a 1/2 mile radius of Tier II facility (See Section 3.4.11). The table provides the total number of facilities determined to be critical and the total replacement value and **Figure 3.6.11.a** shows the locations. Information is also provided for the number of state-owned bridges in these counties.

Transportation accidents do not impact state-owned facility building structures. However, it does impact state-owned roads and bridges. Roads are not typically damaged by transportation accidents. But, bridge railings and other structures can sustain damages. Data is not available to estimate future damages.

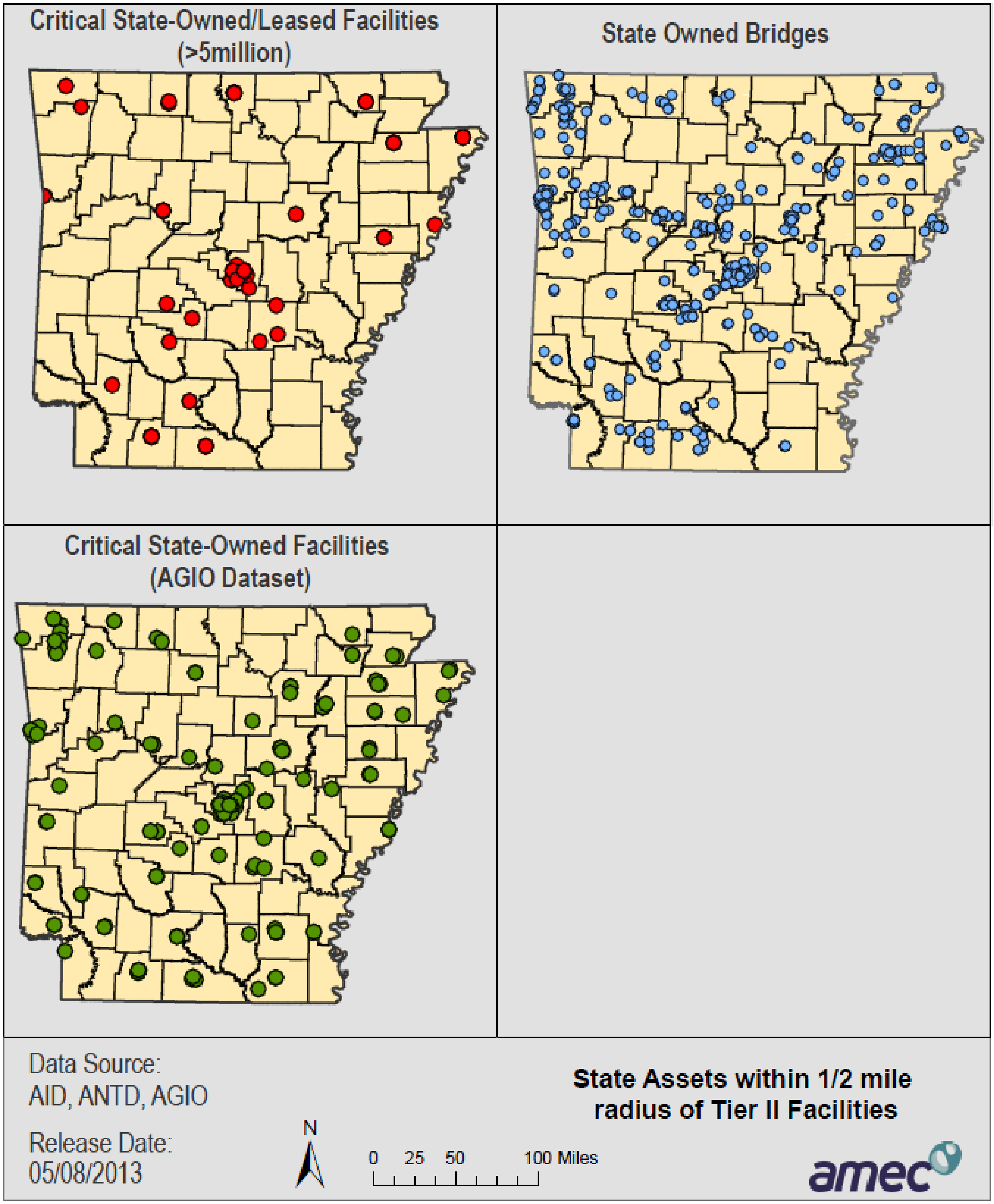
Table 3.6.11.a State-Owned /Leased Facilities in ½ Mile Radius of Tier II Facility

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Arkansas	-	-	1	-
Ashley	-	-	3	3
Baxter	6	$52,004,086	-	3
Benton	1	$9,664,855	5	31
Boone	2	$42,433,716	2	7
Bradley	-	-	1	-
Calhoun	-	-	-	1
Carroll	-	-	2	2
Chicot	-	-	-	-
Clark	1	$7,989,493	3	7
Clay	-	-	-	3
Cleburne	-	-	1	2
Cleveland	-	-	-	-
Columbia	19	$211,753,893	5	7
Conway	-	-	1	13
Craighead	6	$125,339,254	5	29
Crawford	-	-	1	21
Crittenden	1	$8,548,559	-	18
Cross	-	-	2	2
Desha	-	-	2	-
Drew	-	-	6	-
Faulkner	-	-	1	10
Franklin	-	-	-	8
Fulton	-	-	-	-
Garland	1	$8,521,270	5	21
Grant	-	-	1	2

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Greene	-	-	2	7
Hempstead	1	$7,932,152	3	4
Hot Spring	1	$7,720,312	1	10
Howard	-	-	2	6
Independence	-	-	3	3
Izard	-	-	-	-
Jackson	-	-	5	4
Jefferson	3	$49,557,016	4	14
Johnson	-	-	1	12
Jonesboro	-	-	-	-
Lafayette	-	-	-	3
Lawrence	-	-	2	3
Lee	-	-	-	-
Lincoln	-	-	-	1
Little River	-	-	2	-
Logan	-	-	1	9
Lonoke	-	-	4	5
Madison	-	-	1	1
Marion	-	-	-	-
Miller	-	-	1	12
Mississippi	5	$44,730,865	3	5
Monroe	-	-	1	1
Montgomery	-	-	-	1
Nevada	-	-	-	1
Newton	-	-	-	-
Ouachita	2	$15,239,343	2	7
Perry	-	-	-	1
Phillips	-	-	3	1
Pike	-	-	-	-
Poinsett	-	-	3	5
Polk	-	-	2	3
Pope	8	$113,967,063	3	12
Prairie	-	-	1	1
Pulaski	59	$1,621,381,084	74	126
Randolph	3	$26,176,489	1	1
Saint Francis	3	$22,272,436	3	9
Saline	-	-	2	9
Scott	-	-	1	1
Searcy	-	-	2	-

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Sebastian	1	$12,704,241	4	32
Sevier	-	-	2	3
Sharp	-	-	-	2
Stone	-	-	-	2
Union	5	$48,844,433	3	10
Van Buren	-	-	-	5
Washington	1	$7,032,389	9	22
White	1	$7,232,966	7	25
Woodruff	-	-	-	-
Yell	-	-	-	6

Figure 3.6.11.a State-Owned /Leased Facilities in ½ Mile Radius of Tier II Facility



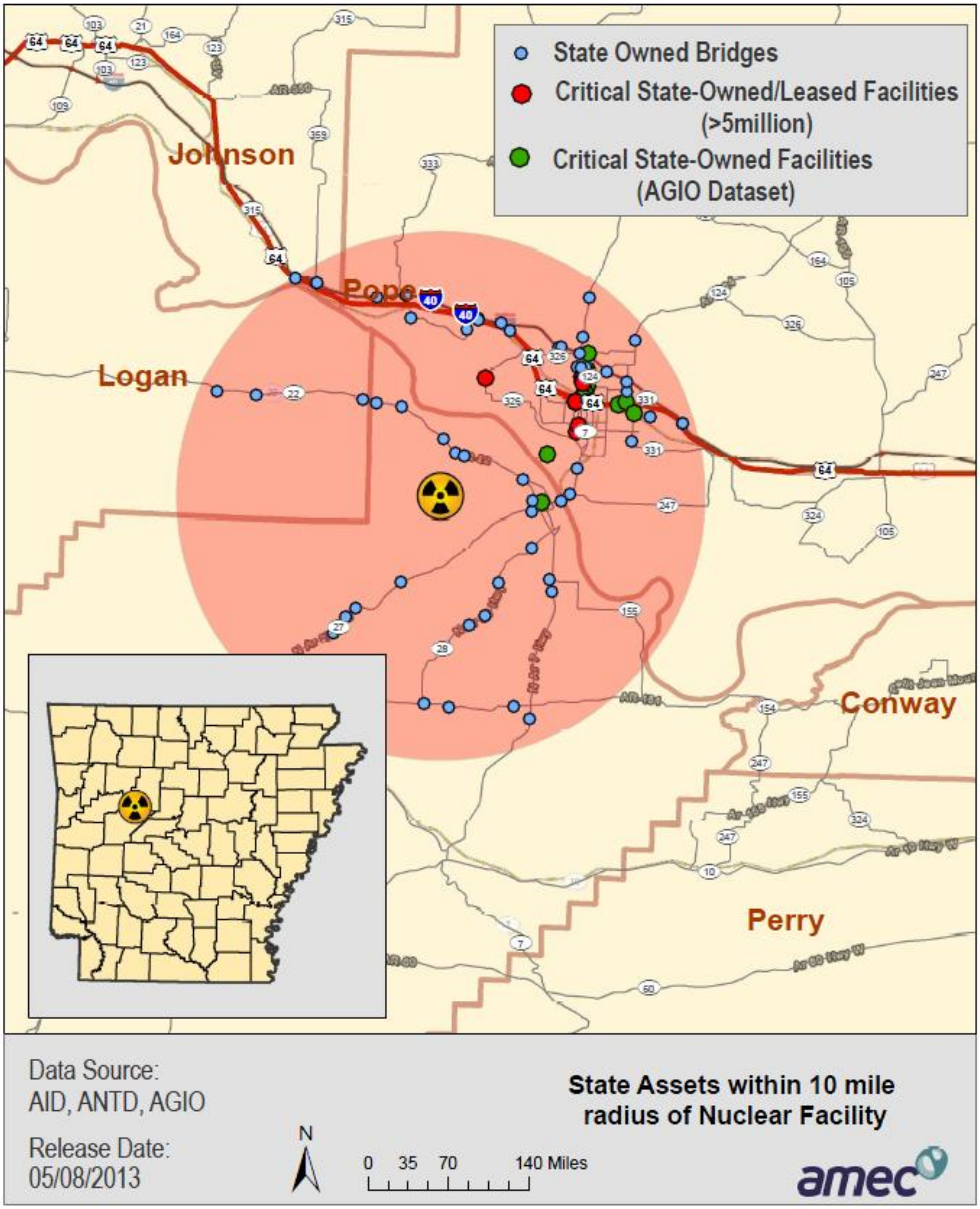
3.6.12 Nuclear Events

Table 3.6.12.a below lists the counties within the 50 mile radius of Arkansas Nuclear One, the only active nuclear reactor that remains in the State of Arkansas (See Section 3.4.12). This table provides counts and values of state-owned/leased critical facilities and state-owned bridges. **Figure 3.6.12.a** shows the locations.

Table 3.6.12.a State-Owned /Leased Facilities in 50-mile Radius of Arkansas Nuclear One

County	# of State-Owned Critical Facilities (> $5M)	Total Replacement Value	# of Critical Facilities (AGIO Data)	# of State-Owned Bridges
Johnson	-	-	-	3
Logan	-	-	-	4
Pope	21	$283,229,787	11	34
Yell	-	-	1	25

Figure 3.6.12.a State-Owned /Leased Facilities in 50-mile Radius of Arkansas Nuclear One



3.6.13 Terrorism Event

Data is not available to quantify vulnerability or estimated losses as a result of terrorism incidents that might impact state-owned facilities.

3.6.14 Major Disease Outbreak

State-owned facilities are not directly impacted by this hazard. However, the Arkansas Department of Health would be heavily involved in response to a pandemic incident.

4.0 MITIGATION STRATEGY

It is essential that state and local mitigation policy be directed to minimize the risk of future devastation and the corresponding impact on the residents and property in the State of Arkansas. This can only be accomplished by establishing workable goals and objectives that integrate the efforts of state and local governments into one cohesive mitigation strategy. Development of a sound mitigation philosophy provides a focus that helps state and local governments identify priorities and channel their limited resources toward critical mitigation projects. This process helps government at all levels make the most effective use of available resources.

The State will continue to meet its goals and objectives by taking maximum advantage of the mitigation resources available, both present and future, to reduce the impact of natural and manmade disasters on both the residents and infrastructure of Arkansas. The State will also continue to vigorously pursue methods to augment existing state and local programs by exploring and taking advantage of other opportunities, such as public-private partnerships. The State will continue to provide education and training on the benefits of a comprehensive statewide hazard mitigation program for state agencies, local governments, private enterprises, and the residents of Arkansas.

The results of the planning process, which include the risk assessment, capability assessment, goal setting, and identification of mitigation measures, as well as the hard work of the APDMAC led to the action plan that follows. This process helped the APDMAC clearly comprehend and identify the overall mitigation strategy that guides the implementation of the action plan and the day-to-day mitigation efforts of the State. Taking all of the above into consideration, the APDMAC developed this comprehensive mitigation philosophy:

- **Implement** the action plan recommendations of this plan.
- **Use** existing regulations, policies, programs, procedures, and plans already in place.
- **Monitor** multi-objective management opportunities, share and package funding opportunities, and garner broader constituent support.
- **Communicate** the hazard information collected and analyzed through this planning process so that Arkansas local governments and residents better understand where disasters occur, and what they can do to mitigate their impacts. In doing so, also publicize the success stories that have been achieved through the State’s ongoing mitigation efforts.

4.1 Hazard Mitigation Goals and Objectives

Requirement §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.

Plan Update §201.4(d): [The] plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts and changes in priorities.

The purpose of this section is to describe the goals and objectives of the state mitigation program. In order to be effective, these goals and objectives must be achievable and they must complement both state and local mitigation strategies. They also play a role in the State's overall mitigation strategy through a balanced review and prioritization of proposed mitigation projects. The results of these mitigation efforts are important to state and local governments, publicprivate partnerships, and the general public. By establishing reasonable goals and objectives, those involved in the planning process can see their efforts realized which can make a difference in other mitigation efforts.

Section 4.1.1 identifies the primary goals and objectives for the State's hazard mitigation program in prioritized order. The goals and objectives reflect the mature nature of ADEM's established statewide hazard mitigation program and have evolved over several years of state mitigation planning efforts. ADEM encourages its partners to consider these mitigation goals when developing local mitigation plans and other plans.

4.1.1 State of Arkansas Mitigation Goals and Objectives

The following goals and objectives for hazard mitigation were established from the APDMAC's discovery and deliberation process. The goals represent a vision for hazard mitigation and disaster resistance for the state government of Arkansas. Each mitigation goal and objective was reviewed and approved by the APDMAC and the Governor's Earthquake Advisory Council during a meeting held on July 18th, 2013 in Little Rock, Arkansas. The APDMAC assessed the mitigation goals and objectives from the 2010 update plan. During the 2013 update process, the APDMAC agreed that slight changes were necessary to action orient the goals and objectives, reduce redundancy, and maintain focus on hazard mitigation.

Goal 1: Reduce the vulnerability of Arkansas and its communities to all hazards.

1.1. Participate in all appropriate federal programs related to disaster planning and mitigation including FEMA, DHS, CDC, and others.
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.
1.3. Expand mitigation project opportunities throughout Arkansas.

Goal 2: Promote sustainable and disaster resilient development within Arkansas and its communities.

2.1. Promote NFIP participation and compliance for all communities throughout the State.

2.2. Promote sustainable development and “smart growth” initiatives through coordination with state agencies and non-profit organizations.

Goal 3: Support mitigation grant opportunities for local governments, their sub-jurisdictions and the general public.

3.1. Provide mitigation grant program technical assistance and funding to local jurisdictions for eligible planning and project activities.
3.2. Provide floodplain management technical assistance and resources to all communities.

Goal 4: Offer hazard mitigation training, education, and technical assistance to local jurisdictions in the development of hazard mitigation plans and implementation of projects.

4.1. Provide training, education and technical assistance to local jurisdictions in the development of local mitigation plans.
4.2. Provide training, education and technical assistance to local jurisdictions in the implementation of local mitigation plans.
4.3. Provide training, education and technical assistance to local jurisdictions in the use of FEMA’s Benefit-Cost Analysis software.
4.4. Increase awareness and knowledge of hazard mitigation principles and practices among local public officials.

Goal 5: Utilize the latest technology to improve vulnerability assessments of all identified hazards.

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.
5.2. Develop and implement a repetitive loss strategy to prevent future losses.
5.3. Develop and implement a methodology for identifying and prioritizing new mitigation projects based upon on loss reduction criteria.
5.4. Develop and monitor any mitigation data deficiencies referenced in the current state mitigation plan.

4.1.2 Process for Identifying, Reviewing, and Updating State Goals and Objectives

The APDMAC developed these goals and objectives to guide the state mitigation program and the selection of actions to mitigate potential losses from hazard events. These goals and objectives represent a long-term vision for hazard reduction and enhancement of mitigation capabilities and have evolved over years of mitigation planning in Arkansas.

During the 2013 update process, the goals and objectives from the 2010 plan were reviewed to determine if they still address current conditions and anticipated future needs. This was accomplished during the second planning meeting. The APDMAC assessed the goals and objectives based on the process outlined in Section 6.2.2 Progress Review for Mitigation Goals, Objectives, and Activities. In addition to that process, the review was based on:

- The updated statewide risk assessment, which includes changes in growth and development, recent disasters, enhanced vulnerability assessments, and analysis of local risk assessments;
- Assessment of changes and challenges in state and local capabilities since the 2010 plan;
- Analysis of the similarities and/or differences of the state mitigation plan goals with local mitigation plan goals and objectives; and
- Identification of achieved mitigation objectives from the 2010 plan.

The APDMAC recommended slight changes to action orient the goals and objectives, reduce redundancy, and maintain focus on hazard mitigation.

The key issues identified in the statewide risk assessment and the analysis of local risk assessments can be found in Chapter *3 Risk Assessment*. Information on the changes in state and local mitigation capabilities is summarized in Sections 4.2 *State Capability Assessment* and 4.3 *Local Capability Assessment*. The following section describes how the local mitigation plan goals and objectives were reviewed and considered during the 2013 update. Section 4.4 *Mitigation Actions* includes detailed and updated mitigation measures designed to meet the designated goals and objectives and progress on these objectives is evaluated in Sections 4.4 and Section 7.5 *Effective Use of Available Mitigation Funding*.

4.1.3 Review of Local Goals and Objectives

ADEM analyzed the goals and objectives of 54* Arkansas local community hazard mitigation plans to assess their consistency with state goals and objectives. The analysis involved calculating the percentage of local plans that had goals similar to a goal in the 2013 Arkasnas All-Hazarda Mitigation Plan Update.

Note: 54* includes three single-jurisdiction plans, four school districts and 52 county-level plans. Only currently approved plans were utilized in the analysis.

The results in **Table 4.1** show that most local plans have similar goals to State Goal 1 to reduce the vulnerability of Arkansas and it's communities to all hazards (89 percent).

Table 4.1. Percentage of Local Plans with Similar Goals to State Plan

Arkansas All-Hazards Mitigation Plan Goals	Local Plans with Similar Goal
Goal 1: Reduce the vulnerability of Arkansas and its communities to all hazards	89%
Goal 2: Promote sustainable and disaster resilient development within Arkansas and its communities.	6%
Goal 3: Support mitigation grant opportunities for local governments, their sub-jurisdictions and the general public.	7%
Goal 4: Offer hazard mitigation training, education, and technical assistance to local jurisdictions in the development of hazard mitigation plans and implementation of projects.	6%
Goal 5: Utilize the latest technology to improve vulnerability assessments of all identified hazards.	3%

The ADEM also analyzed the local goals that differed from state goals. Additional goals of local plans included control of construction activities in floodplains and undertake appropriate flood mitigation actions (19 percent); minimize disruption of essential services from natural disasters (17 percent); and cooperation among jurisdictions in improving communication (15 percent).

4.2 State Capability Assessment

Requirement §201.4(c)(3)(ii): [The state mitigation strategy shall include 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; [and] a discussion of State funding capabilities for hazard mitigation projects.

This section discusses the existing capabilities of Arkansas, including state agencies, programs, outreach and partnerships, plans and policies for mitigating hazards, both pre- and post-disaster. State capabilities related to development in hazard-prone areas and funding hazard mitigation projects are also discussed. During the 2013 plan update, the APDMAC evaluated capabilities by identifying the changes in capabilities since the 2010 Arkansas All-Hazards Mitigation Plan and assessed the challenges and opportunities for improving those capabilities.

4.2.1 State Agencies and Mitigation-Related Programs and Initiatives

The roles and responsibilities of the Arkansas Department of Emergency Management (ADEM) and the other agencies involved in statewide emergency preparedness, response, recovery, and mitigation activities are outlined below. While each state agency administers its own programs, ADEM is the manager and provides leadership for the overall state mitigation strategy. The agencies work together to ensure that the various mitigation programs complement each other and work toward achieving the State's overall strategy. One way that agencies work together is by participating on the APDMAC, the group responsible for the preparation and review of this plan and for state review of all mitigation initiatives.

ARKANSAS DEPARTMENT OF EMERGENCY MANAGEMENT (ADEM)

The Arkansas Department of Emergency Management (ADEM) is Arkansas' Homeland Security and Preparedness Agency. ADEM serves as the state's coordination center for all four stages of emergency management: preparedness, response, recovery and mitigation. The ADEM director is the state coordinating officer during disasters and also serves as the governor's authorized representative and liaison to FEMA; this position is counterpart to the federal coordinating officer. During disaster operations, all departments of state government are expected to cooperate fully with requests for assistance from the ADEM director. The governor's declaration of a state emergency initiates the operation of the State Emergency Operations Plan, which is continually updated by ADEM to meet changing conditions.

ADEM consists of six divisions: Director's Office, Administration, Communications, Disaster Management, Federal Surplus Property, and Preparedness.

ADEM's ***Director's Office*** is comprised of the ADEM Director, Deputy Director, Executive Officer, Public Affairs Office, and Administrative staff. The Director's Office is responsible for establishment and administration of policies and procedures governing emergency management in Arkansas. These responsibilities include the review and execution of agreements, contracts and other documents between state and federal authorities for provision of funds and services related to emergency management programs. This office serves as a liaison between the agency and the 77 local offices of emergency management. The Director's office coordinates with senior officials on a federal, state, and local government level, as well as, the private sector agencies with roles and responsibilities for emergency management.

The Public Affairs Office (PAO) serves as a point of contact for the public and media. This office works with the public and external partners in public education and community engagement. The PAO coordinates with stakeholders to ensure the community is kept informed of the agency mission. This office also coordinates speaking engagements addressing topics in emergency management and homeland security.

The Executive Officer works special projectsand is a key resource in the field during disasters. The Executive Officer also servesas an advisor to programs within ADEM.

ADEM's ***Administration Division*** includes four branches: Finance and Accounting, Human Resources, Homeland Security and Mitigation. The Administration Division's objectives include the administration of fiscal and personnel actions of the agency; preventing future loss of lives and property due to disaster by developing and implementing state and local hazard mitigation plans; encouraging implementation of mitigation measures during the immediate recovery from disasters; providing necessary equipment to first responders through grant programs; and administration of the Emergency Management Performance Grant (EMPG) program, which provides reimbursement to local jurisdictions in support of their Emergency Management Program as well as provide the support for the States program and daily operations of the States' Emergency Operations Center (EOC).

This division is responsible for Fire Services [Act 833], Emergency Medical Services, Citizen Corps, and ADEM's Safe Room/Storm Shelter Grant Program. Through the shelter program, funding is available to residents of Arkansas who choose to build safe rooms or storm shelters at their homes. This remains a popular program with citizens.

The **Homeland Security Branch** manages and administers State/FEMA Homeland Security Grant Program funds. These funds received are designed to address the Homeland Security and response capabilities in Arkansas by providing specific equipment and training to first responders throughout local jurisdictions and multiple state agencies based on the needs and vulnerabilities of the state. The **Mitigation Branch's** objectives include preventing future loss of lives and property due to disaster; overseeing development and implementing state and local hazard mitigation plans; encouraging mitigation measures to be implemented during the immediate recovery from disasters; and providing funding for previously identified mitigation measures that benefit the disaster area.

ADEM's ***Communications Division*** provides staffing and technological systems necessary for a high level of pre- and post-disaster information exchange. The Arkansas Resource Response

Coordination Center operates 24/7 to provide notification, management and documentation ofemergency and disaster situations.

ADEM's ***Disaster Management Division*** is composed of three branches, the Operations Branch, the Area Coordination Branch and the Recovery Branch. Th Division's goal is to prepare for, coordinate, respond to and help recover from any and all types of disasters whether natural or man made.

The **Operations Branch** has two broad missions: to prepare the State Emergency Operations Center (SEOC) and staff for activation and to maintain the SEOC during activation. Preparation includes developing, revising and maintaining the guidelines and procedures required to activate as well as training SEOC staff and other disaster response agencies. Operations maintains SEOC preparedness to respond to identified all hazard events. This includes severe storms, floods, tornados, winter ice storms, as well as a possible catastrophic earthquake on the New Madrid Seismic Zone and a possible flu pandemic.

The **Area Coordination Branch** is the eyes, ears and response arm of ADEM. This branch provides assistance, coordination, guidance and information to local governments on grants available from ADEM or other sources, available training opportunities and general information to help them operate their local emergency management programs.

The **Recovery Branch's** mission starts upon notification of the disaster and follows the disaster through the final recovery. The branch works with individuals as well as local governments, state agencies and private non profit organizations. This branch is responsible for generating the documents that allow state and federal involvement through the disaster declaration process.

ADEM's ***Federal Surplus Property Division*** personnel fully participate in the emergency management planning of state and offer expertise on equipment. The Division works with local unitsof government to facilitate the donation of equipment that enhance local recovery efforts.

ADEM's ***Preparedness Division-*** The Preparedness Division is dedicated to planning, training and exercising in preparation to respond to an emergency/incident in the state of Arkansas. The Preparedness Division is comprised of the Planning Branch and Training and Exercise Branch, which includes the Training Section and Exercise Section.

The **Planning Branch** ADEM staff review and revisw the Arkansas State Emergency Operations Plan (AR EOP) and the fifteen Support Annexes that enhance the AR EOP and provide more specific information for particular types of incidents. The Planning Branch also works with local emergency management coordinators to update their EOPs.

The **Training Section** is responsible for all professional and technical training that is provided to emergency services personnel through scheduled classroom instruction, seminars, workshops, independent study, conferences and distance learning opportunities. ADEM's Training Section coordinates activities to include Emergency Management Institute offerings, All Hazard Training, and Terrorism Preparedness training through Homeland Security. They also provide training courses for ADEM's Hazardous Materials Program. The Training Section also provides guidance and oversight regarding the National Incident Management System (NIMS) implementation activities in the State of Arkansas, including the annual NIMS assessment.

The **Exercise Section** is the central point for Statewide Emergency Management and Homeland Security exercise program management and coordination in the State of Arkansas. The Exercise Section coordinates closely with Federal, State, and Local jurisdictions and agencies to support a self-sustaining and robust exercise program.

ADEM's Mitigation-Related Programs and Planning

Hazard Mitigation Grant Program (Federal)
Contact: Josh Rogers, State Hazard Mitigation Officer
501.683.6700, Josh.Rogers@adem.arkansas.gov

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments 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. Unlike the Federal Emergency Management Agency's (FEMA's) more familiar disaster assistance programs that help pay for the permanent repair and restoration of existing facilities, the HMGP goes beyond simply fixing the damage. The HMGP will, within the limits of state and federal guidelines, help fund a wide range of new projects that reduce hazard vulnerability and the potential of future damage. The State of Arkansas, through ADEM, administers the Hazard Mitigation Grant Program (HMGP). 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. This Post Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Hazard Mitigation Grant Program (State)
Contact: Brenda Wilson, State Mitigation Grant Coordinator
501.683.6700, Brenda.Wilson@adem.arkansas.gov

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 of $1 million. The goal of the program is to assist county 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 counties to use. Every year County Judges are encouraged to apply for projects within their jurisdiction. Created by Amendment 1049 and 116 to Act 511, the Arkansas Mitigation program provides funding for projects in counties that have had repetitive damage situations, whether it is from floods, wind storms, earthquakes or other types of disaster. State Mitigation programs challenge counties to select priority sites where repetitive damages occur and find permanent solutions to these problems. Completed projects have saved thousands of dollars. As more projects are funded, the savings to Arkansas will continue to grow.

Pre-Disaster Mitigation Program (Federal)
Contact: Veronica Pogue, PDM-C Grant Coordinator,
501.683.6700, veronica.pogue@adem.arkansas.gov

The Pre-Disaster Mitigation Competitive (PDM-C) program provides funds on a competitive basis to states, territories, Indian tribal governments, local jurisdictions, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. There has been a decrease of the number of PDM projects approved due to congressional earmarks for 2010. All applicants and sub-applicants must be participating in the National Flood Insurance Program (NFIP) and must not be withdrawn, suspended, or on probation from the program. In addition, as of November 1, 2003, local governments, Indian tribal governments applying as sub-applicants, and universities must have a FEMA approved Hazard Mitigation Plan to be eligible to receive project grant funding under the PDM-C program. 44 CFR Part 201, Hazard Mitigation Planning, establishes requirements for state, tribal, and local hazard mitigation planning. This Pre- Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Safe Room / Shelter Rebate Program
Contact: Brenda Wilson, State Mitigation Grant Coordinator
501.683.6700, Brenda.Wilson@adem.arkansas.gov

In the spring of 1999, the Arkansas Mitigation Branch sponsored a statewide shelter rebate program for persons who had installed in-ground shelters or safe rooms since January 21, 1999. Act 646 increased the amount of State Hazard Mitigation funds from $1 million to $2.25 million. ADEM decided to put these new funds to good use, helping to save lives by providing an incentive to Arkansans for having shelters installed on their property since January 21, 1999. Homeowners who built a safe room or shelter after January 1999 are eligible to receive a rebate of up to $1,000 or 50 percent of the cost, whichever is less. Safe rooms and in-ground shelters can be designed in a number of ways. However, both types of shelters must meet requirements established in "FEMA Publication 320" and/or meet the "National Performance Criteria for Tornado Shelters.” There are no state regulations for in-ground shelters. ADEM requires, however, that it be constructed of a waterproof material, have proper ventilation and the door must meet the National Performance Criteria for Tornado Shelters. The shelters must meet city and/or county codes if there are any. To date, 13,957 shelter rebates have been funded at a cost of $13,595,163.81 with state funding. This Pre- Disaster program supports loss reduction by providing funding for mitigation initiatives.

Public Assistance Program (Federal)

Contact: Jodi Lee, Recovery Branch Manager
501.683.6700, Jodi.Lee@adem.arkansas.gov

The Arkansas Department of Emergency Management (Grantee) administers the Federal Public Assistance (PA) Grant Program. Federal assistance will be implemented 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 (PDA's) 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 jurisdictions infrastructure and recent disaster history. The PA program is available to assist with reimbursement of repairs to damaged eligible public 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 seventy-five percent of eligible expenses for emergency measures and permanent restoration. This Post Disaster program supports loss reduction by providing funding for mitigation initiatives.

Public Assistance Program (State)

Contact: Jodi Lee, Recovery Branch Manager
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The State Public Assistance Program is authorized under Arkansas Code Annotated 12-75-101 et al. The Arkansas Department of Emergency Management administers the State Public Assistance (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 for debris removal, emergency protective measures, and permanent restoration of infrastructure. The state's 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 state PA program does not offer 406 Mitigation.

Fire Protection Services Fund (Act 833)

Contact: Kendell Snyder, ADEM Fire Services Coordinator
501.683.6700, Kendell.Snyder@adem.arkansas.gov

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.
- Review and certify that departments are in accordance with Act 833 of 1991.
- Provide technical assistance and grant information and carry out administrative functions and directives from the Arkansas Fire Protection Services Board.

- Support for developing new fire departments. This Pre- Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC)
Contact: Josh Rogers, State Hazard Mitigation Officer
501.683.6700, Josh.Rogers@adem.arkansas.gov

The APDMAC provides the same services to the Pre-Disaster Mitigation Program as the Governor's Earthquake Advisory Council provides to the Earthquake Program except it addresses all hazards. The council members include all of the Governor's Earthquake Advisory Council plus additional members. It was originally formed to support the Project Impact Program in 1999. The APDMAC holds its next meeting on 7.20.2010. Topics include the current status of the Arkansas All-Hazard Mitigation Plan three-year revision, as well as the SONS10 exercise. No funding provided.

Governors Earthquake Advisory Council (GEAC)
Contact: Donald Minster, Earthquake Coordinator
501.683.6700, Donald.Minster@adem.arkansas.gov

The GEAC was appointed by then Governor Clinton in 1984. Members are representatives from state agencies, utilities, universities, hospitals, engineers, geologists, local government, and legislators. It serves as a forum for sharing ideas and information, networking of professionals, lobbying for legislative changes, search for programs and funds, and planning. Past activities include promotion of seismic safety for the state, retrofit projects in schools and hospitals, school safe rooms, promotion of disaster resistant communities, formation of a Disaster Resistant Home Coalition, and the formation of the Pre-Disaster Mitigation Advisory Council. Recent activities include consultation with the SONS07 exercise as well as a regional meeting outlining recent Arkansas All Hazard Mitigation Plan updates on 7.20.2009. No funding available.

Arkansas Earthquake Program
Contact: Donald Minster, Earthquake Coordinator
501.683.6700, Donald.Minster@adem.arkansas.gov

ADEM, under the authority granted by Act 247 of 1989, works to ensure the safety and well being of the citizens of Arkansas from the risks associated with earthquakes within the State of Arkansas, as well as from seismic events outside the state which would have a direct effect on the state. The Earthquake Program carries out this mandate in a number of program areas. The law places emphasis on earthquake mitigation, preparedness, response, and recovery related functions, requiring the full cooperation of all other state and local government agencies, departments, and personnel. The pre-disaster program is required to coordinate comparable functions of the federal government including its various departments and agencies with recent earthquake program initiatives include consultation with the SONS 07 exercise as well as the Catastrophic Earthquake Planning effort.

Hazardous Materials Program
Contact: Kenny Harmon, Hazardous Materials Program Manager
501.683.6700, kenny.harmon@adem.arkansas.gov

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 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.

Emergency Operations Planning
Contact: Danna McGinty, Planning Branch Manager
501.683.6700, danna.mcginty@adem.arkansas.gov

ADEM has developed and updated the state's Emergency Operations Plan to set the procedures for responding to a variety of hazards and to identify the various agencies and departments with functional responsibilities. This includes significant details for the various human-caused hazards such as nuclear and biological. Emergency Operations Plans are updated to meet NIMS compliancy as well as create a uniformed structure for response capabilities. This Pre-Disaster program supports loss reduction by providing planning resources to the counties.

Citizen Corps Grant Program
Contact: Brandon Morris, State Citizen Corps Coordinator
501.683.6700, community@adem.arkansas.gov

The purpose of this pre-disaster program is to supplement and assist state and local efforts by offering programs for volunteers in communities to become involved. This includes establishing Citizen Corps Councils to expand each of the five programs included in Citizen Corps to include Community Emergency Response Team (CERT), Neighborhood Watch/USA Watch, Medical Reserve Corps (MRC), Volunteers in Police Service (VIPS), and Fire Corps in the communities of Arkansas. The program supports and promotes efforts to involve a wide range of volunteer groups in activities that enhance individual, community, and family preparedness and contribute to the strengthening of homeland security.

Chemical Stockpile Emergency Preparedness Program
Contact: Sandi Hensley, CSEPP Branch Manager
501.683.6721, sandi.hensley@adem.arkansas.gov

The Pine Bluff Arsenal is one of six locations in the nation where chemical weapons are stockpiled. The United States Congress has ordered that these weapons be eliminated in the safest manner possible. The Chemical Stockpile Emergency Preparedness Program (CSEPP) was established to enhance the emergency preparedness in communities around the chemical stockpiles. The Pine Bluff Arsenal currently stores blister agents (the nerve agents GB and VX have been eliminated). The agents are stored in a high security area. The blister agents, HD and HT, are stored in thick walled ton containers within earth-covered concrete structures called "igloos." All of the agents are closely monitored. The Pine Bluff Arsenal communicates daily with Jefferson and Grant counties and the Arkansas Department of Emergency Management to inform them of activities involving the stockpile. This Pre-Disaster program supports loss reduction by providing funding for mitigation initiatives.

ADEM Training Plan
Contact: Mark Hooker, Training Branch Manager
501.683.6700, mark.hooker@adem.arkansas.gov

This plan details the overall strategic direction for ADEM in terms of training requirements for the Emergency Management/First Responder community. This plan is updated as needed on an annual basis and a copy can be found on the ADEM website.

Community Emergency Response Team
Contact: Brandon Morris, State Citizen Corps Coordinator
501.683.6700, community@adem.arkansas.gov

Initially, Pre-disaster CERT programs were developed to assist communities in taking care of themselves in the aftermath of a major disaster when first responders are overwhelmed or unable to respond because of communication or transportation difficulties. As the CERT concept has taken hold across the country, they have become much more than originally envisioned. CERTs have proven themselves to be an active and vital part of their communities' preparedness and response capabilities. For example, CERTs have been used to:

- Distribute and/or install smoke alarms and batteries to the elderly and disabled.
- Assist with evacuations and traffic control. Act as victims in training exercises.
- Promote community awareness of potential hazards and preparedness measures.
- Supplement staffing at special events, such as parades.

CERTs are an investment of local government's time and resources. To capitalize on this investment, program sponsors can view CERT members as a volunteer resource that can assist with public safety activities. Such an approach will actively involve members in serving their communities beyond disaster response and add value to the CERT program. The best source of help in an emergency or disaster is the paid or volunteer professional responder. But, if they are not available to address immediate life-saving needs or to protect property, CERT members can help. CERTs are not intended to replace a community's response capability, but rather, to serve as an important supplement to it. The agency sponsoring the CERT program is creating a volunteer resource that is part of the community's operational capability following a disaster. That agency should develop training standards for CERT personnel and protocols for their activation and use. CERT members must keep safety in mind as their first priority. CERT volunteers must know their capabilities and the limitations of their training and equipment and work within those limitations. CERTs are considered "Good Samaritans" and covered under the Volunteer Protection Act. CERT volunteers do not have any authority beyond serving as "Good Samaritan" when helping others. When deployed appropriately CERTs can complement and enhance first-response capabilities in neighborhoods and workplaces by ensuring the safety of themselves and their families until first responders arrive. CERTs can then assist first-response personnel as directed. This Pre-Disaster program supports loss reduction by providing funding for pre disaster training initiatives.

Homeland Security Grant Program
Contact: Kathy Wright, Domestic Preparedness Branch Manager
501.683.6700, kathy.wright@adem.arkansas.gov

The objective of this program is to enhance the capacity of state and local emergency responders to prevent, respond to, and recover from a weapons of mass destruction (WMD) terrorism incident involving Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) Events devices, cyber attacks, and major disasters. Funds are provided to enhance homeland security and emergency operations 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. The most recent posted Homeland Security Grant Program funding priorities include:

- AWIN communications enhancement
- Enhance local communications systems
- Enhance response capability through the purchase of specialized equipment in the areas of HAZMAT, Decon, Bomb/IED, Agriculture, Search and Rescue, EMS, and SRT/SWAT
- Support the State’s Fusion Center

This Pre Disaster program supports loss reduction by providing funding local response initiatives. Funding comes from three different venues: rental income; direct appropriations from state legislature and capital improvement bonds.

Arkansas Emergency Management Association
Contact: Jodi Lee, Recovery Branch Manager
501.683.6700, Jodi.Lee@adem.arkansas.gov

The Arkansas Emergency Management Association, AEMA, is dedicated to serving the emergency management community by offering pre-disaster opportunities for training, scholarship and fellowship. AEMA hosts an Annual Emergency Management Conference each fall to bring together Arkansas' emergency managers and responders in order to share the latest in planning, training and technology and to review disaster response and recovery.

Local Mitigation Planning
Contact: Veronica Pogue, PDM-C Grant Coordinator,
501.683.6700, veronica.pogue@adem.arkansas.gov

Arkansas's program for local hazard mitigation planning coordinates with the local governments to help meet the requirements of DMA 2000. The local hazard mitigation planning project is described in more detail in Chapter 5 *Coordination of Local Mitigation Planning*.

County Emergency Management Programs
Contact: Varies, Regional Area Coordinators

Each county in the state has a Local Coordinator responsible for the overall Emergency Management program. One of the high priorities for each of these coordinators is the development of their local mitigation plan for compliance with the DMA 2000. Part of the overall statewide mitigation strategy and plan development process is the incorporation of this local information; specifically the local loss estimates and local mitigation projects are to be integrated into this State Mitigation Plan.

Emergency Management Accreditation Program (EMAP)
Contact: Director's Office, Executive Officer

This is a standards-based voluntary assessment and accreditation process for state and local governments responsible for coordinating prevention, mitigation, preparedness, response, and recovery activities for natural and manmade disasters. Accreditation is based on compliance with collaboratively developed national standards. Becoming EMAP accredited means that the State has a comprehensive emergency management program on par with other top state emergency management programs.

Emergency Management Five-Year Strategic Plan:
Contact: Director's Office, Executive Officer

ADEM has developed a strategic plan to guide the department over the next five years 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 federal initiatives and any current high priority disaster-related issues.

Arkansas Hazardous Materials Emergency Response Commission (SERC)
Contact: David Maxwell, Director

The commission's priorities are to supervise and coordinate the activities of the Local Emergency Planning Committees (LEPC) in each of the emergency planning districts making sure: (1) That plans in each district are adequately developed, maintained and exercised to ensure an effective response to accidents and incidents involving hazardous materials; and (2) That the emergency response plans, along with the pertaining information, are accessible for review by the general public.

STATE AGENCY MITIGATION-RELATED PROGRAMS AND PLANNING

While the Arkansas Department of Emergency Management is the lead agency for emergency planning and hazard mitigation in the state, many other state agencies play an important role in supporting mitigation. Each of these state agencies was contacted individually in order to develop a complete picture of the overall capabilities of the state. All identified programs, polices and capabilities are listed below with detailed descriptions and current 2013 contact information for the program managers. The combination of the ADEM programs along with these programs from other agencies, provide a complete assessment of the mitigation-related capabilities for the State of Arkansas.

Arkansas Building Authority
ABA State Property
Contact: Anne W. Laidlaw, RPA Director
501.682.1833, alaidlaw@aba.state.ar.us

ABA is the state government's leasing agent, construction overseer, and examiner of architectural/engineering plans. ABA sets policies, guidelines, standards and procedures. Act 716 of 1975 authorizes ABA to obtain sites; to construct, equip, maintain and operate public buildings; authorize the leasing of property for and by state agencies; assist state agencies in architectural and engineering needs; and assist other state agencies in the construction and maintenance of public buildings. Funding comes from 3 different venues: rental income; direct appropriations from state legislature and capitol improvement bonds.

ABA maintains a database of state owned property and of leasing transactions that are within the purview of the Real Estate Services Section. Databases regarding on-going capital improvement projects are also maintained. This data is essential in determining exposure of state property to hazards.

Arkansas Department of Economic Development
Community Development Block Grant (CDBG) Loan and Grant Programs
Contact: J. Basil Julian, Grants Division Director
501.682.7392, bjulian@arkansasEDC.com

Several of the eight CDBG 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. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Department of Environmental Quality
Contact: Karen Bassett, ADEQ Response Planning
501.682.0959, bassett@adeq.state.ar.us

ADEQ protects and enhances the state's environment through regulatory programs, proactive programs and educational activities. Regulatory programs exist for air, water, solid waste, hazardous waste, regulated storage tanks and mining. Operating permits are issued for monitoring of compliance and are issued to businesses and farms. ADEQ 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 Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Department of Health
Preparedness & Emergency Response Program
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

The Preparedness and Emergency Response Program was established shortly after the events of September 11, 2001 to ensure the safety of Arkansas citizens from a variety of man-made or natural disasters. The CDC provides funding and technical assistance to the state for planning, drills and exercises and equipment. The Arkansas preparedness program works with internal and external partners in the area of planning, City Readiness Initiative, Strategic National Stockpile, surveillance, epidemiology, public health labs, crisis communication, the health alert network, training, exercises and drills. The program continues to grow and build upon previous efforts. The program has also responded to a number of real events in the state including the largest pre-event evacuation of NDMS patients, hurricane evacuees from LA, a major ice storm encompassing the northern one half of the state, tornadoes and the 2009 H1N1 pandemic.

Arkansas Department of Health and Arkansas Hospital Association
Hospital Preparedness
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

The Arkansas Hospital Association (AHA) is a membership organization, which for 70 years has assisted its members through collective initiatives which facilitate the integration and improvement of the delivery of healthcare services throughout Arkansas. This association is now involved in a variety of disaster preparedness initiatives especially relating to biological hazards but also related to delivering mass care during large scale natural events.

The Arkansas Department of Health Hospital Preparedness program is responsible for the coordination of the ASPR Hospital Preparedness Program. ADH partners with the Arkansas Hospital Association (AHA) and 84 acute care hospitals throughout the state to ensure that Arkansas Hospitals are prepared to meet the medical needs of their patients and communities. Several Arkansas hospitals have been involved in real world events including a direct hit by a tornado, no power or water for an extended period during an ice storm and the reception of NDMS patients evacuated prior to Hurricane Gustav. The program works closely with the hospitals on communication, drills and exercises, mass fatality plans, evacuation and alternate care sites.

Arkansas Department of Health
Bioterrorism Preparedness Program
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

After the events of September 11th, bioterrorism has become a high priority for the federal government and subsequently for the State of Arkansas. The Center of Disease Control (CDC) has assumed responsibility for the national effort for preparedness related to biological hazards, and has funded the State of Arkansas's Bioterrorism Preparedness Program with federal grant funding. This preparedness effort is focused on potential terrorism agents such as anthrax and small pox, but these efforts are also mitigating the potential effects of naturally occurring diseases such as West Nile Virus, Influenza, and now the Avian Flu. This program supports the development and funding of regional plans to purchase training, equipment, and supplies that enhance preparedness to respond to disease outbreaks involving 500 or more citizens.

Arkansas Department of Health
Strategic National Stockpile
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

In 1999 Congress charged the Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) with the establishment of the National

Pharmaceutical Stockpile (NPS). The mission was to provide a re-supply of large quantities of essential medical material to states and communities during an emergency within twelve hours of the federal decision to deploy. The Strategic National Stockpile (SNS) is a national repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items. The State of Arkansas is a full participant in this important federal program. City Readiness Program Initiative. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Department of Health
Health Alert Network
Contact: Alyce Wagner, Director of Health Alert Network
501.280.4174, alyce.wagner@arkansas.gov

The State of Arkansas is participating in the federally funded Health Alert Network (HAN). This program includes planning and funding for improving local technical capabilities for public health including high speed internet connectivity and statewide databases for nurses and other primary health care providers. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Department of Health
Arkansas Influenza Pandemic Plan

This plan has been a continuing effort since 1999 with the most recent update completed in January 2008. This plan is maintained by the Department of Health Human Services and has information about response, surveillance, vaccines, and other health issues.

Arkansas Department of Information Systems
Arkansas COOP Planning Initiative

The State of Arkansas is currently building and updating Continuity of Operations Plans (COOP Plans) for vital state locations and functions. These plans are monitored and collated by the State of Arkansas Information Technology Office. All COOP plans were referenced to provide critical facility data used in risk assessment and vulnerability assessment calculations in the current plan revision (Version 4).

Arkansas Forestry Commission
National Fire Plan; Hazard Mitigation
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

The AFC, in cooperation with the USDA Forest Service and the Southern Group of State Foresters, provides funding for interactions with and 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. Priorities will concentrate on aiding communities having a high risk or threat from wildfires. Communities are encouraged to implement "Firewise" concepts and work toward certification as Firewise Communities/USA. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Forestry Commission
FireWise Program
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

The goal of the FireWise Program is to spread FireWise information throughout Arkansas, helping Arkansans help themselves become more FireWise and fire-safe in the wild land/urban interface areas. FireWise is a cooperative effort among federal, state, and private agencies and organizations to promote fire safety in the wild land/urban interface. The primary FireWise tenet is that it is unnecessary to lose homes or other buildings to wildfires if those homes or buildings are built and maintained according to simple FireWise principles. Currently 106 communities in Arkansas participate in the FireWise program.

Arkansas Forestry Commission
Arkansas Fire Prevention Code
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

This planning process includes the current building codes for the State of Arkansas. Updated by the State Fire Marshals Office, this document references "best practices" for building disaster resistant structures. Documentation included in the Fire Prevention Code is used when establishing the overall state-wide mitigation goals and objectives.

Arkansas Forestry Commission
Rural Fire Protection
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

A Rural Fire Protection Division within the AFC was established legislatively in 1979. The purpose of this division is to encourage and assist in the establishment, development, and the operation of fire protection districts and associations in rural areas that previously had little or no fire protection available. Grants, loans, and equipment are available through AFC and other sources. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Forestry Commission
Landowner Assistance
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

AFC offers landowners a variety of free technical assistance services in forest management. This includes examinations based on the objectives of the landowner of the property, 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. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Geographic Information Office
Contact: Shelby Johnson, State Geographic Information Officer
501.682.2767, shelby.johnson@arkansas.gov

Assist state and local government agencies with GIS design and data creation standards; coordinate statewide GIS data creation standards; administer GeoStor, the on-line GIS data clearinghouse for Arkansas; serve as liaison between local and state GIS activities and federal GIS activities.

GeoStor was initiated in late 1998 as a two-year research project (Seamless Warehouse of Arkansas Geodata), GeoStor, an internet accessible data warehouse that delivers geographic data, was funded by the Governor's Telecommunications and Technology Infrastructure Fund. Under the direction of Ms. Susan Cromwell, the Department of Information Services, Office of Information Technology, administered the project and provided guidance and direction throughout the initiative. The objective of this research was to create an internet accessible database or warehouse that could deliver geographic data suitable for use in a range of geographic information systems, to the desktop machines in state agencies, local government offices, and to teachers and students in K-12 educational settings throughout the state.

Arkansas Geographic Information Office
Arkansas Centerline File (ACF) Program
Contact: Shelby Johnson, State Geographic Information Officer
501.682.2767, shelby.johnson@arkansas.gov

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 inter and intra agency coordination, training and guidance and technical support for ACF data development, and maintenance of a master statewide layer via program participant updates. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Geographic Information Office and Arkansas Assessment Coordination Department
Arkansas County Assessor Mapping Program (CAMP)
Contact: Shelby Johnson, State Geographic Information Officer
501.682.2767, shelby.johnson@arkansas.gov

Provides technical and GIS input and support for county assessors for the development of cadastral mapping with a goal of giving the public, including mitigation planners, easier access to assessment data. Free services include GIS hardware and software installation, training, technical support, and publishing a statewide master cadastral layer via GeoStor. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Geological Survey
Contact: Bekki White, Director
501.296-1880, bekki.white@arkansas.gov

Evaluates geologic hazards, collects geologic data, develops geo-hazard maps, interprets geologic damage reports for damage assessment following disasters, and provides scientific advice on what to expect for potential damage, personal safety issues, and mitigation measures concerning geo-hazards. As far as funding, no funds dispersed to cities or counties for related projects. The Arkansas Geological Survey (AGS) has installed six state-of-the-art permanent seismic monitors to establish better and more uniform earthquake detection across the State of Arkansas. These monitors were strategically placed within selected State Parks across the State. These seismic monitors of the Arkansas Seismic Network (ASN) were seamlessly integrated with seismic monitors of both the regional and national networks. The Center for Earthquake Research and Information (CERI) at the University of Memphis will provide continuous maintenance and reporting services for the network. Link to the network http//www.geology.ar.gov/geohazards/ark_seismic_network.htm.

Arkansas Highway and Transportation Department
Technology Transfer Program (T2)
Contact: Laura D. Carter, Program Manager
501.569.2380, Laura.Carter@ArkansasHighways.com

The Technology Transfer Program is responsible for assisting cities and counties in implementation of transportation related technology. The objective is a safer, more efficient, and more economical road and street program. Targeted operations include construction and maintenance, materials, administration, and computer programs.

Arkansas Livestock and Poultry Commission
AR Animal Disease Emergency Response Plan, Inspections and Veterinary Diagnostic Lab
Contact: Dr. George P. Badley, DVM, State Veterinarian
501.907.2400, pbadley@alpc.ar.gov

The Arkansas Livestock and Poultry Commission were created by Act 87 of 1963. 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. It has the duty for the development of the livestock and poultry industries in the state and for administering the provisions of laws and regulations pertaining to livestock and poultry. The Commission is authorized to enter into cooperative agreements with several federal agencies in matters relating to livestock and poultry disease control programs. Act 150 of 1985 act clarifies and expands authority.

Arkansas Natural Resources Commission
Severe Repetitive Loss (SRL) Program
Contact: Mike Borengasser, State Climatologist and NFIP State Coordinator
501.682.3969, Michael.Borengasser@arkansas.gov

The SRL program provides an opportunity for communities to identify and mitigate the most often reoccurring repetitive flood loss properties. FEMA approves eligible sub-applications based on priorities set by the Applicant or program priorities. The Arkansas Department of Emergency Management will maintain an up-to-date database containing information on all repetitive loss properties in the State. The elimination of these properties from the list will be the number one priority of all mitigation grant programs available to the State. FMA, PDMC, HMGP, SRL, and NFIP coordinators will give funding priority, based on the state ranking system, to the acquisition or relocation of properties on this list. Program coordinators will advise communities of available funding. The goal is the elimination of all NFIP repetitive loss claims in the state within 10 years as funds become available. This Pre- Disaster program supports loss reduction by providing funding for mitigation initiatives. The SRL program has allotted 70 million dollars nationwide to help reduce the number of Severe Repetitive Loss properties. Currently in 2010 the State is acquiring 3 SRL properties in one FMA acquisition project.

Arkansas Natural Resources Commission
Flood Mitigation Assistance Program
Contact: Mike Borengasser, State Climatologist and NFIP State Coordinator
501.682.3969, Michael.Borengasser@arkansas.gov

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FEMA provides FMA funds to assist states and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program. Three types of FMA grants are available to states and communities:

- Planning Grants: to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants.
- Project Grants: to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least $1,000 within any ten-year period since 1978. Currently in 2010, the State has approved the project application for 1 acquisition project that includes 6 residential properties three of which are severe repetitive loss properties.
- Technical Assistance Grants: for the state to help administer the FMA program and activities. Up to ten percent (10%) of project grants may be awarded to states for Technical Assistance Grants." This Pre- Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Natural Resources Commission
Floodplain Management Program
Contact: Mike Borengasser, State Climatologist and NFIP State Coordinator
501.682.3969, Michael.Borengasser@arkansas.gov

The purpose of the Floodplain Management Program is to promote the public health, safety, and general welfare of the state and to minimize public and private losses due to flood conditions. The authority for this program is the Act 629 of 1969 which 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. Program resources and responsibilities include State Coordinator for the NFIP; Administrator of the Community Assistance Program - State Services Support Element Grant provided by the NFIP; provider of general information and assistance apart from the NFIP. Duties of the Floodplain Management Section include: visiting communities (towns, cities and counties) participating in the NFIP to provide general and technical assistance, conducting training and educational workshops, providing information to the public regarding the NFIP and floodplain management, and providing assistance for mitigation during the recovery phase of a disaster operation. As far as funding, no funds dispersed to cities or counties for related projects.

Arkansas Natural Resources Commission
Dam Safety Program (DSP)
Contact: Nancy Gambill, Engineer Supervisor
501.682.3980, Nancy.Gambill@arkansas.gov

The purpose of the Dam Safety Program is to a) provide for the comprehensive regulation and supervision of dams for the protection of the health, safety, and welfare of the citizens of Arkansas, and b) to assure proper planning, design, construction, maintenance, monitoring, and supervision of dams, including such preventive measures necessary to provide an adequate margin of safety. Duties of the DSP include: reviewing applications for permits to assure proper safety standards are met, issuing permits to construct and operate a dam in the state, inspecting dams under state jurisdiction, providing information and education to dam owners and the public, overseeing the development and implementation of emergency action plans for high hazard dams, responding to dam emergencies, maintaining a database and files on dams in the state and collecting annual permit fees. As far as funding, no funds dispersed to cities or counties for related projects.

Arkansas Natural Resources Commission
Arkansas Wetland Mitigation Bank Program
Contact: John Turner, ANRC Program Coordinator
501.682.1608, john.turner@arkansas.gov

The Arkansas Wetland Mitigation Bank Program is a state-sponsored initiative aimed at providing off-site mitigation opportunities to Section 404 permit recipients required to provide compensatory mitigation for impacts of approved wetland projects. Arkansas statutes allow the state to acquire degraded wetlands and restore the wetland functions that previously occurred on the areas. This is accomplished by re-establishing the wetland hydrology and vegetation. As far as funding, no funds dispersed to cities or counties for related projects.

Arkansas Natural Resources Commission
Arkansas Wetland and Riparian Zones Tax Credit Program
Contact: John Turner, ANRC Program Coordinator
501.682.1608, john.turner@arkansas.gov

This program allows a credit against the tax imposed by the Arkansas Income Tax Act for any taxpayer engaged in the development or restoration of wetlands and riparian zones. The program is designed to encourage private landowners to restore and enhance existing wetlands and riparian zones, and when possible, create new wetlands and riparian zones. This program benefits the landowners through tax credits and the state by increasing wetlands and riparian zones, which provide flood control, water quality enhancement, fish and wildlife habitats, recreation and ground water recharge. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Natural Resources Commission
Conservation District Grant Program
Contact: Kathryn Stewart
501.682.3972, kathryn.stewart@arkansas.gov

The purpose of this program is to enhance the capability of conservation districts to carry out conservation within their respective districts. Projects eligible for grant funds must carry out resource enhancement, restoration or protection and must be new or in addition to those in which a district is currently involved. Projects intended to replace existing programs are not eligible for grant funding. Only conservation districts may make applications for assistance. Maximum total grant money available per district is $25,000 per year. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

Arkansas Office of the Governor
Executive Order EO-04-02

Executive order signed by Governor Mike Huckabee on August 4th, 2004 that orders that, as directed by Section 322 of the Federal Disaster Mitigation Act of 2000, all state offices, agencies, departments, and commissions integrate sound mitigation measures into all future planning initiatives and coordinate these efforts with the Arkansas Department of Emergency Management and the Arkansas All-Hazards Mitigation Plan. Also provides 3 million annually for mitigation programs.

Department of Arkansas Heritage
Historic Places and Landmarks Database
Contact: Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

The Department of Arkansas Heritage maintains a number of databases with over 20,000 historical locations throughout the state. These listings include buildings, houses, industrial sites, agricultural facilities, cemeteries and other types of structures. These databases are constantly updated and are used to develop better mitigation strategies to protect the historical foundation of Arkansas. Network is backed up once a week.

University of Arkansas
Arkansas Archeological Survey
Archeological Site Databases
Contact: Ann M. Early, State Archeologist
479.575.3556, amearly@uark.edu

Automated Management of Archeological Site Data in Arkansas (AMASDA) database now contains more than 44,000 entries for prehistoric and historic sites located throughout the state that have been identified as historical in nature. This includes pre-historic and historic mounds, campsites, cemeteries, battlefields and settlements. This database is constantly updated and is being used to develop better mitigation strategies to protect the historical foundation of Arkansas.

University of Arkansas at Little Rock
Arkansas Earthquake Center
Contact: Dr. Haydar Al-Shukri, Professor, Chair and Director
501.569.8164, hjalshukri@ualr.edu

This collaborative program between UALR and ADEM assists the State of Arkansas in hazard mitigation planning and public education. ACEETT has four distinct but overlapping tasks for its mission. These include 1) public education, 2) hazard mitigation, 3) earthquake monitoring, and 4) scientific research. ACEETT provides general information on earthquakes, the new Madrid Fault, maps and preparedness and response. Secondly, it provides on-going ACEETT research; one of the most recent is the Paleoseismology research study in eastern Arkansas to map and locate geological features such as sand blows and possible near surface faulting. Lastly, the center will initiate the Arkansas Seismic Observatory to monitor earthquake activity throughout the state. This Pre Disaster program supports loss reduction by providing funding for mitigation initiatives.

University of Arkansas for Medical Sciences
Bioterrorism Steering Committee

As the state's only academic medical center, UAMS is assisting other organizations in the state and region in their bioterrorism planning efforts. UAMS faculty and staff are active in basic and applied research involving bioterrorism and have been successful in obtaining federally funded grants for the study of the potential intentional use of Severe Acute Respiratory Syndrome (SARS), Avian Influenza, Tularemia and other agents. UAMS has also obtained grants for statewide continuing education in coordination with its Area Health Education Centers (AHECs) to provide instructions on terrorism to health and emergency response professionals throughout the state. UAMS is also retooling its undergraduate curriculum to include more teaching on bioterrorism, disaster preparedness and infectious diseases using an additional federal grant. As far as funding, no funds dispersed to cities or counties for related projects.

University of Arkansas
Center of Excellence for Poultry Science
Contact: Michael Kidd; Center Director and Department Head
479.575.3699, mkidd@uark.edu

This program is very involved with the poultry industry in the state. This program educates future workers and provides subject matter expertise to businesses and government. As far as funding, no funds dispersed to cities or counties for related projects.

STATE INDUSTRY MITIGATION-RELATED PROGRAMS AND PLANNING

Arkansas Animal Disease Emergency Response Plan

This plan was originally developed in 1998 and has been constantly maintained and was most recently updated in 2006. The AADER Committee 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, Avian Flu, Mad Cow Disease or Foot and Mouth Disease. This existing planning effort is being incorporated into the state's mitigation strategies for biological hazards.

Arkansas Manufactured Home Commission

Licensing authority for all manufacturers, dealers, installers, and salespersons engaged in the business of manufactured housing. Responsibilities include enforcing construction and safety standards for manufactured housing, dealer lot inspections and monitoring of consumer complaints. The AMHC sets, administers, and enforces standards for the proper installation of manufactured homes in the State of Arkansas. The commission is funded through special revenues from fees charged to dealers, manufactures, and installers.

Arkansas One-Call

The Arkansas One-Call Center was established in 1978, in central Arkansas, and expanded to be statewide in 1981. It was created to provide an easy way for excavators to notify multiple utilities before digging with just one free phone call. The mission of Arkansas One-Call is to protect the public and prevent damages from accidents involving underground facilities. Arkansas One Call strives to: (1) Provide the best possible notification service at the lowest cost to an underground facility operator in the State of Arkansas; (2) To aggressively promote, through advertising and all other possible means, the practice of "call before you dig" among excavators because advance notice remains the single most productive step which can be taken to prevent damage; (3) To conduct education and training programs for companies, organizations and individuals involved in the excavation business, particularly focusing on those with a record of repeated damage and/or violations of the law; (4) To promote improved communications and coordination among utilities, excavators, governmental agencies, contract locators, and all others involved in the excavation and damage prevention processes; and (5) To promote the use of technology on the One-Call Center and among its constituencies that can help implement these programs more efficiently and effectively.

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 as indicated by DOT (1162).

Arkansas State Disaster Insurance Coalition Plan

The Arkansas State Disaster Insurance Coalition is a public-private team of individuals and businesses which; through a formal, detailed disaster plan, ensure that citizens of Arkansas will always receive the best possible services when disasters occur in the state. The plan – called the Arkansas State Disaster Insurance Coalition Plan – is a comprehensive contingency plan that facilitates a timely and comprehensive response from the insurance industry in the aftermath of a disaster event impacting the state. This plan was originally developed in 2002 and was recently updated and promulgated in December of 2008. ADEM is a lead partner in this coordinated planning effort.

Central Arkansas Veterans Healthcare System – Bioterrorism Readiness Plan

As part of the APDMAC's efforts to coordinate with other agencies, the team has considered this plan. This plan contains operations information for this organization for responding to potential outbreaks.

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. Per Dr. George Badley, this committee is made up of state and federal veterinarians, who receive no grant money whatsoever. It's an unfunded committee. They have response plans that information is kept only amongst the members on the committee. They are also part of a tri-state committee in the following states: AR, OK, and MO.

The Poultry Federation

The purposes of The Poultry Federation are to promote and protect all poultry interests relating to production, distribution, merchandising and consumption of poultry and poultry products; to disseminate information relating to the various phases of the poultry industry in order to improve and expand markets; to increase efficiency in production and marketing; to encourage and support research in production and marketing of poultry; and to encourage and support youth programs in poultry work. The Poultry Federation has offices in Arkansas, Missouri and Oklahoma. Not a government agency.

FEDERAL AGENCY MITIGATION-RELATED PROGRAMS AND PLANNING

Animal and Plant Health Inspection Services (APHIS)

Protecting American agriculture" is the basic charge of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS). APHIS provides leadership in ensuring the health and care of animals and plants. 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 APHIS especially related to potential biological hazards that could impact the poultry and cattle industry of the state. Projects focus on monitoring animal health and animal health management practices primarily via specific commodity surveys represent the US population of animals and producers. Activities include survey design, questionnaire design, data collection, data analysis, data summarization and last the dissemination of results. Results are for public consumption via hard copy and postings on the web.

Center for Disease Control (CDC) Emergency Planning

As part of the federal government's bioterrorism planning efforts, the CDC has developed detailed emergency plans for smallpox and other pandemic hazards. These federal plans are implemented through state and local government public health agencies. This coordination is an important part of the state's overall strategy regarding biological hazards. 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 U.S. Earthquake Consortium (CUSEC) / USDOT - Earthquake Vulnerability of Transportation Systems in the Central United States

Transportation systems in the Central US are vulnerable to the effects of a damaging earthquake in the New Madrid seismic zone. In an effort to increase awareness of the earthquake risk in the Central US, and specifically the vulnerability of transportation systems, the U.S. Department of Transportation collaborated with the Central U.S. Earthquake Consortium (CUSEC) to prepare a monograph. Emergency transportation planning is an important element in CUSEC's long-term plan to reduce the earthquake risk in the Central US. In this regard, the Consortium has worked closely with the U.S. Department of Transportation 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 Week

Each year in late January and in February, several CUSEC States participate in joint efforts to raise the level of earthquake awareness in the central United States. Activities include things such as Press Conferences, Governor's Proclamations, Town Hall Meetings, Exhibits, Earthquake related training, and much more. In 2009, States holding Earthquake Awareness Activities include Arkansas, Kentucky, Mississippi, Missouri, and Tennessee.

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 the Central U.S. Earthquake Consortium (CUSEC) in 1998 with representation from the four federal regions, state and local governments from the seven member states in the Consortium, and the American Red Cross because of its role as lead agency for Emergency Support Function 6 (Mass Care) in the Federal Response Plan. The task of the working group was 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 potentially thousands of disaster victims displaced from their residences as a result of a major earthquake in the Central US. This plan is available on the CUSEC website.

CUSEC - New Madrid Catastrophic Planning Initiative

Launched in 2006, the mission of the New Madrid Seismic Zone Catastrophic Planning Project is to increase national readiness for a catastrophic earthquake in the New Madrid Seismic Zone (NMSZ). This multi-year, multi-agency initiative is the largest planning effort ever undertaken in United States History. Specifically, national readiness will be increased by developing a series of annexes or supplements to existing base plans for response and recovery to a series of major earthquakes in the NMSZ and integrating them into a single document with federal, regional, tribal, state, and local components. Additionally, the mission is to identify any issues that cannot be resolved based on current capabilities and to propose recommended courses of action for decision makers involved in this project. The project is expected to culminate in 2011 with a series of major command exercises, coinciding with the 200th Anniversary of the 1811-1812 earthquakes. The geology in the central U.S. is particularly vulnerable to earthquake shaking, and potential damage is more widespread than other earthquake-prone areas of the U.S. The series of earthquakes with the greatest magnitude in the area was in 1811-1812 (4 major quakes within 3 months, ranging from approximately 7.0 to 8.0 in magnitude.). Impact to national infrastructure will compound the problem - getting supplies and relief to survivors will be exceptionally challenging. CUSEC, the Mid-America Earthquake Center (MAEC), the United States Geological Survey (USGS) and FEMA have completed preliminary planning scenarios of potential impacts of an earthquake in the NMSZ. The estimated total building loss in the area from one quake alone could exceed $70 Billion. Recently, in September 2008, a comprehensive report from the MAE Center was released that details several different catastrophic earthquake scenarios for a major earthquake in the central U.S.

Department of Homeland Security - Buffer Zone Protection Program:

The Buffer Zone Protection Program provides both funding and coordination in bringing federal, state and local levels of government, law enforcement and the private sector together to create buffer zone plans to reduce vulnerabilities in areas surrounding critical infrastructure and key resources. The Buffer Zone Protection Program (BZPP) provides targeted funding through states to local jurisdictions to purchase equipment that will extend the zone of protection beyond the gates of these critical facilities. In 2009, the U.S. Department of Homeland Security announced $48 million in grant funding to protect and secure areas surrounding critical infrastructure and key resource sites such as chemical facilities, dams, and nuclear plants across the country.

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 coordination is managed by the Arkansas Livestock and Poultry Commission. Animal disease outbreaks, and especially the Avian Flu, are a major concern for Arkansas, so this coordinated effort with the USDA and the APHIS program has a high priority.

Federal Emergency Management Agency (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 strategy is intended to engender a fundamental change in the general public's perception about hazard risk and mitigation of that risk, and to demonstrate that mitigation is often the most cost-effective and environmentally sound approach to reducing losses. The overall 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. The foundation of the strategy is the development of partnerships that empower all Americans to fulfill their responsibility for ensuring safer communities. This strategy must be implemented in partnership with state and local governments and private sector constituents, including, and most especially, the general public.

FEMA/USACE - Chemical Stockpile Emergency Preparedness Program (CSEPP)

The Chemical Stockpile Emergency Preparedness Program (CSEPP) is a unique partnership between FEMA and the U.S. Army, combining FEMA's long-standing experience in preparing for and dealing with all types of emergencies, and the U.S. Army's role as custodian of the U.S. chemical stockpile. Since 1988, FEMA and the U.S. Army have assisted communities surrounding the eight chemical stockpile sites to enhance their abilities to respond in the unlikely event of a chemical agent emergency.

The success of CSEPP initiatives depend on the productive working partnerships among federal, state, and local jurisdictions involved in the program.

National Animal Health Monitoring System

The National Animal Health Monitoring System (NAHMS) was initiated in 1983 for the purpose of collecting, analyzing, and disseminating data on animal health, management, and productivity across the United States. The NAHMS unit conducts national studies on the health and health management of America's domestic livestock populations. These studies are designed to meet the information needs of the industries associated with these commodities, as identified by people within those industries.

The National Surveillance Unit (NSU), established by Veterinarian Services (VS) in 2003, is the first unit within VS to have personnel devoted solely to animal disease surveillance and surveillance enhancement. The NSU was established to coordinate activities related to US animal health surveillance, to address the recommendations regarding surveillance in the Animal Health Safeguarding Review, and to facilitate the development of a National Animal Health Surveillance System. The NSU works under the direction of the Veterinary Services National Surveillance Coordinator (Dr. Valerie Ragan) and in collaboration with the National Center for Animal Health Programs, which continues to be responsible for managing and implementing program disease surveillance.

National Fire Protection Association

The goal of the NFPA 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. NFPA membership totals more than 79 thousand individuals globally and more than 80 national trade and professional organizations. Established in 1896, NFPA serves as the world's leading advocate for fire prevention and is an authoritative source on public safety. In fact, the 300 NFPA codes and standards influence every building, process, service, design, and installation in the United States, as well as many of those used in other countries.

National Flood Insurance Program’s (NFIP) Community Rating System (CRS)

The NFIP 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: (1) Reduce flood losses; (2) Facilitate accurate insurance rating; and (3) Promote the awareness of flood insurance. Each community has prepared a flood mitigation plan and has received funding for flood mitigation projects. Details are presented in the flood hazard section.

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. The State of Arkansas is integrating all emergency management and homeland security resources to comply with this federal initiative.

National Oceanic and Atmospheric Administration StormReady Program—

The StormReady Program is a voluntary program that was developed by the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) 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. Receiving StormReady recognition does not mean that a community is storm-proof, but StormReady communities will be better prepared when severe weather strikes. 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.

As of February 2013, Arkansas had 16 counties, 5 communities, two commercial sites, two universities, and three supporters that are recognized as StormReady,

National Oceanic and Atmospheric Administration Weather Radio All Hazards

NOAA Weather Radios are tone alert radios that provide continuous weather coverage and can be programmed to sound when severe weather watches, warnings, or other critical information is broadcast by the National Weather Service. Due to the joint efforts of many electric cooperatives, private businesses, the National Weather Service, FEMA, and ADEM, every county in the State is covered by a NOAA Weather Radio transmitter providing over 95 percent coverage (hills and terrain cause blockage to a strong signal is some areas). The coverage benefits everyone by providing early warnings for severe weather events and giving people extra time to protect their families and property. This effort is a public-private partnership that uses mostly private, donated tower space for the transmitters.

National Strategy for Pandemic Influenza

In November 2005, President Bush outlined this important national strategy and 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.

Transportation Community Awareness Emergency Response (TRANSCAER)

TRANSCAER is a voluntary national outreach effort that focuses on assisting communities to prepare for and respond to a possible hazardous material transportation incident. TRANSCAER members consist of volunteer representatives from the chemical manufacturing, transportation, distribution, and emergency response industries, as well as the government. The mission for Arkansas TRANSCAER program is to promote safe transportation and handling of hazardous materials by river, rail and highway, educate our communities to safely handle hazardous materials, and help provide education and training for our emergency responders regarding the safe handling of hazardous materials.

U.S. Geological Survey - 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. The strategy envisions a society that is fully aware of landslide hazards and routinely takes action to reduce both the risks and costs associated with those hazards. The long-term mission of a comprehensive landslide hazard mitigation strategy is to provide and encourage the use of scientific information, maps, methodology, and guidance for emergency management, land-use planning and development and implementation of public and private policy to reduce losses from landslides and other ground failure hazards nationwide. The ten-year goal is to substantially reduce the risks of loss of life, injuries, economic costs and destruction of natural and cultural resources that result from landslides and other ground failure hazards.

4.2.2 Implementation Opportunities and Challenges

This section summarizes the opportunities for improving state capabilities and opportunities and challenges related to the implementation of mitigation laws, regulations, policies, and programs. It also highlights the pre- and post-disaster tools, policies, and programs that have proven to be successful in achieving the mitigation objectives of Arkansas.

Mitigation planning, especially at the local level, has greatly increased the awareness and importance of mitigation throughout the State. This has subsequently increased interest in mitigation grant programs and the number of local applications for project funding. This is both a success and a challenge due to increased workloads in processing grant applications.

The administration of the Flood Mitigation Assistance Program and Repetitive Flood Claims Programs are now the responsibility of with the Arkansas Natural Resources Commission. Both programs are important tools for moving people and property out of flood hazard areas and will be greatly served through the agency which is also responsible for the state floodplain management program.

State capabilities will be enhanced with the comprehensive update to the Arkansas State Water Planning. In 1969, the Arkansas Legislature passed Act 217 making the ANRC responsible for water planning at the state level and the development of the first Arkansas State Water Plan. The Arkansas Water Plan is a "comprehensive program for the orderly development and management of the state's water and related land resources. It is intended by the Legislature to be the state policy for the development of water and related land resources in this state. In 2011, the General Assembly appropriated money for a comprehensive update of the Plan, which was last revised in the 1980s. We expect this revision to be complete in the fall of 2014.

More information on successful mitigation programs and projects in Arkansas can be found in Section 7.5 *Effective Use of Available Mitigation Funding*.

4.3 Local Capability Assessment

Requirement §201.4(c)(3)(ii): [The State mitigation strategy shall include] a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

The local capability assessment provides a general description of local mitigation capabilities in Arkansas, including examples of successful policies and programs, followed by an analysis of the effectiveness of these capabilities. The assessment concludes with a discussion of opportunities and obstacles to implementing and strengthening local capabilities.

4.3.1 Methodology

For this 2013 Update, the APDMAC analyzed 54* FEMA-approved local hazard mitigation plans to inventory capabilities and assess their effectiveness. Information related to the following categories of capabilities was captured:

- Personnel
- Technical
- Fiscal
- Land Use Planning and Building Codes
- Coordination and Partnerships
- Education and Outreach
- Other Capabilities

Note: 54* includes three single-jurisdiction plans, four school districts and 52 county-level plans. Only currently approved plans were utilized in the analysis.

4.3.2 Local Policies, Programs, and Capabilities

A general description of local capabilities, both existing and emerging, from the analysis of local plans is summarized below for each of the categories of capabilities identified in the methodology.

Personnel

All 77 counties in Arkansas have a Local Emergency Management Program and Coordinator to plan for and respond to a wide range of natural and man-made hazards. These local programs vary based on the size, population, hazards and financial situation of the county. Each of the programs also has an Area Coordinator who acts as the liaison to ADEM with respect to state and federal initiatives and funding opportunities.

Other local personnel capabilities vary greatly across the State. Larger, wealthier counties have full-time planners and engineers; smaller, less affluent counties do have not full-time planners or engineers. Other personnel capabilities include administrators for grant funding programs.

Technical

The primary technical capability evaluated by the local governments was GIS analysis, which is valuable for mapping hazard areas and comparing hazards areas with vulnerable areas and assets in the community. Many plans identified GIS capabilities. Other technical capabilities discussed in local plans include joint communications centers and advanced warning systems.

Fiscal

The analysis of local plans indicates that most local governments do not have specific local funding sources for mitigation and rely on federal programs, such as the federal HMGP and PDM-C Programs and the state HMGP and Safe Room Programs, to fund pre- and post-disaster mitigation projects. Through tax-funded investments in infrastructure improvements, local governments are able to fund some projects that have mitigation effects, such as replacing culverts or structural improvements to critical facilities.

These funds come predominantly from property and sales tax revenues and are generally allocated directly to schools, public works, and other essential government functions. Mitigation can be accomplished with this revenue stream through projects that meet multiple objectives. For instance, money allocated for school repairs can be used to replace a school’s roof with better wind resistant materials.

Some counties and municipalities have dedicated transportation or capital improvements sales or use taxes that can be obligated to fund mitigation projects. Many counties have fully allocated their current tax collections and do not have significant additional amounts for mitigation projects. A sales tax or bond issue to help fund mitigation actions would require a vote of the citizenry and could be difficult to pass.

Land Use Planning and Building Codes

The APDMAC examined the adoption of land use plans, regulations, and building codes as they pertain to hazard mitigation. The following regulatory and planning capabilities were identified:

- Building Codes;
- Seismic Design Requirements;
- Zoning Codes;
- Comprehensive/master/general plans;
- NFIP participation;
- Stormwater Management Ordinances;
- Stream Management Ordinances;
- Zoning Management Ordinances;
- Subdivision Regulations;
- Erosion Management Ordinances; and
- Flood Damage Prevention Ordinances.

Table 4.2 displays the number of counties and cities that reported their land use and regulatory capabilities in their local plans and, of those counties and cities, the number and percent with each capability. If the percent of capability for the County or City is over 50 percent it is highlighted with red text in the table.

Table 4.2. Land Use and Regulatory Capabilities of Counties and Cities

CAPABILITY	COUNTIES			CITIES		
	Number Reporting	Number with Capability	Percent with Capability	Number Reporting	Number with Capability	Percent with Capability
Building Code	19	5	26%	187	107	57%
Seismic Design Requirement	3	0	0%	26	0	0%
Zoning Code	15	3	20%	155	79	51%
Comprehensive Plan	17	5	29%	165	73	44%
NFIP participation	39	35	90%	259	190	73%
Stormwater Management Ordinance	17	2	12%	162	20	12%
Stream Management Ordinance	16	1	6%	159	8	5%
Zoning Management Ordinance	17	3	18%	162	84	52%
Subdivision Regulations	16	4	25%	158	73	46%
Erosion Management Ordinance	16	0	0%	159	13	8%
Flood Damage Prevention Ordinance	24	21	88%	213	138	65%

Building Codes

The Arkansas Building Code is adopted by the State Fire Marshal's office. It is a part of the Fire Prevention Code. The Code applies Statewide, even in rural and unincorporated areas. Many cities adopt the AFPC by way of a local ordinance; however this action is not necessary to allow enforcement.

Arkansas is currently under the 2007 Edition of the Code. The current edition took effect on August 1, 2008. The Arkansas Fire Prevention Code is a three volume set.

- Volume I is the Fire Code based on the International Fire Code
- Volume II is the Building Code based on the International Building Code
- Volume III is the Residential Code based on the International Residential Code.

With the 2007 Arkansas Fire Prevention Code, Volume II, contains Appendix L which provides an alternative to the seismic design provisions found in the structural design chapter of Volume II. Appendix L was not adopted by the State of Arkansas but will be available for local jurisdictions to adopt by ordinance.

Arkansas reviews the International Codes and then makes changes to best suit the State. The current code is based on the 2006 editions of the International Fire, Building, and Residential Codes. This revision was managed by the Fire Code Revision Committee consisting of approximately 30 people from various disciplines. The committee consists of municipal fire marshals, building officials, architects, engineers, and officials from other state agencies. There are also representatives from the Arkansas Home Builders Association, Arkansas Oil Marketers Association, Manufactured Housing Association, and several other special interest groups. The Arkansas Fire Prevention Code is adopted in accordance with the Administrative Procedures Act of the State of Arkansas (ACA 25-15-201 through 214).

The proposed 2007 Arkansas Fire Prevention Code was "reviewed without objection" on April 3, 2008, by the Committee on Administrative Rules and Regulations of the Arkansas Legislative Council. On January 3, 2008, the Rules Committee asked the State Fire Marshal's Office to reconsider the seismic provisions found in Volume II (Building Code Volume) of the proposed 2007 Arkansas Fire Prevention Code. After several months of diligent work by many individuals and agencies, the conflict was resolved by means of an Appendix to address the seismic concerns.

Zoning, Land Use Planning, and Subdivision Regulations

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. There are no state-prepared comprehensive land use plans or provisions for land use controls at the state government level.

Zoning can keep inappropriate development out of hazard-prone areas and can designate certain areas for such things as conservation, public use, or agriculture. Zoning regulations are administered by planning commissions, established by local government ordinances and comprised of citizens appointed by the local governing bodies. Several cities, particularly the larger ones, have chosen to exercise "extra-territorial jurisdiction" within x-miles of their city limits, allowing these governments to enforce their land use regulations relative to platted subdivisions in these outlying areas. A few of the state's largest cities (notably Little Rock and Fort Smith) are enabled through state legislation to extend zoning into these extra-territorial areas.

Less than half of the counties reported having adopted comprehensive plans, zoning codes, or subdivision regulations.

Floodplain Management

The following state laws govern floodplain management,

Floodplain management within the state is governed by State Law Chapter 268 Flood *Loss Prevention* this includes:

- 14-268-101. Legislative determination;
- 14-268-102. Definitions;
- 14-268-103. Penalty;
- 14-268-104. Authority to adopt measures;
- 14-268-105. Public nuisance - Injunction or abatement;
- 14-268-106. Floodplain administrator;
- 15-24-102 Commission Powers and Duties General; and
- 15-24-109.Accreditation of floodplain administrators.

There is no state or federal grants for local governments to help support the cost of floodplain management. Though all counties and cities are expected to participate in the NFIP in order to qualify for hazard mitigation assistance, funding and staffing are entirely local responsibilities.

Among both counties and cities, floodplain management regulations required for participants in the NFIP are the most common hazard-related land use regulation. The local plans indicate that 225 local governments currently have this type of regulation. There is a noted discrepancy with NFIP participation and Flood Damage Prevention Ordinances. This is due to the data available within the local hazard mitigation plan.

Coordination and Partnerships

Some local governments have intergovernmental or interagency committees that meet regularly. For example, local emergency planning committee (LEPC) may be used to coordinate emergency management and mitigation issues. LEPCs are required by the Emergency Planning and Community Right-to-Know Act of 1986. The purpose of this act is to encourage and support emergency planning efforts at the State and local levels and provide the public and local governments with information concerning potential chemical hazards. Membership of the LEPCs includes representatives of public and private organizations as well as representatives from every facility in the jurisdiction subject to the emergency planning requirements of the act.

Each county in Arkansas also has a County Health Unit and each of the five geographic Public Health Regions of the State has a regional Health Office. These units are jointly sponsored by the local county and by the state to ensure a variety of health-related services. The County Units and Regional Offices along with the staff members that support them (full-time, part-time and volunteer) are involved in a variety of day-to-day health services as well as being responsible for local disaster planning and any related hazard mitigation activities. These units are primary responders for any biological hazards and are responsible for health care issues during natural hazard events.

Another indicator of the long-term success of local mitigation plans is their integration with other local plans and programs. Many local governments describe the coordination of their mitigation plan with their emergency operations plan.

Education and Awareness

The State reviewed local plans for reference to mitigation-related education and awareness programs. Some counties perform outreach activities for their floodplain management program or work with the media to raise awareness of certain hazards. Some of the counties indicated that they provide moderate to substantial curriculum on hazards and emergency management in elementary and secondary schools.

Other Capabilities

Fifteen communities within Arkansas currently participate in the NFIP's Community Rating System (CRS), a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.

4.3.3 Opportunities for Improving Local Capabilities

This section discusses opportunities for strengthening local capabilities that have been identified based on the analysis of local programs, policies, and capabilities. The State will use these opportunities and obstacles to strengthen local capabilities identified in this assessment and to update their mitigation strategy and enhance local planning coordination.

Local Funding

The analysis of local plans indicates that most local governments use federal funds for mitigation. Local governments have met federal mitigation program match requirements through in-kind services, their general fund, and state general revenue; however, state general revenue is no longer available for this purpose due to budget constraints.

One approach communities are using to overcome this funding obstacle is by improving the integration of mitigation plans with other local plans and programs, such as capital improvement plans. This helps to achieve mitigation through other community objectives. Another approach is taking cost-effective mitigation measures into consideration when developing capital improvement projects.

Public Education and Outreach

Public education and awareness about natural hazards risks and mitigation is an important component in most local plans. Education and outreach has led to greater household preparedness, public participation in and support for mitigation policies and programs, as well as political support to address and fund mitigation needs. Seasonal hazard awareness campaigns are one outreach tool that many local governments use to enhance public awareness.

Technical Support

GIS and other technical assistance from the State remains an important resource for smaller communities with limited capabilities. The Arkansas Geographic Information Office assists local government agencies with the on-line GIS data clearinghouse for Arkansas, GeoStor. Data available through GeoStor can assist local governments with vulnerability and risk assessments.

Local Plan Update Guidance

FEMA has produced a series of how-to guide for local plan updates. This allows the State to communicate information and encourages the strengthening and implementation of local capabilities identified in this 2013 state plan. This may include encouraging existing intergovernmental local emergency management committees to take a larger role in mitigation by prioritizing activities and in monitoring progress of the plan and encouraging better integration with community comprehensive plans, capital improvement plans, and other long-term community goals. The updated guidance can also align the monitoring and evaluation goals of the state plan with the local update process to create more effective feedback.

Land Use Planning and Regulations

Local governments are using land use planning to identify areas at risk to natural hazards and to keep those areas from developing inappropriately. Local governments are also starting to look at the negative impacts of existing and future planned subdivision developments and what measures can be implemented to reduce or eliminate them. Combinations of stormwater retention/detention projects along with locally funded buyouts are making a significant difference in this area.

Floodplain Management

Floodplain management and the NFIP remain key opportunities to strengthen local capabilities. The State has facilitated this by continuing to enhance its program that encourages and supports new participation in the NFIP and in the CRS Program. Additionally the State is helping existing participants in the NFIP and CRS promote and enforce their floodplain management programs.

4.4 Mitigation Actions

Requirement §201.4(c)(3)(iii): [State plans shall include 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. This section should be linked to local plans, where specific local actions and projects are identified.

Plan Update §201.4(d): Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts and changes in priorities.

This section introduces the mitigation actions and implementation strategy considered by the State to meet the goals and objectives of this plan. This section also describes how the mitigation actions were reviewed and updated during the 2013 planning process to reflect changes in risk, progress in statewide mitigation efforts, and changes in priorities. It further describes the progress of implementation for those mitigation actions and includes an analysis of local mitigation actions summarized from the available local mitigation plans.

4.4.1 Process for Identifying, Evaluating, Prioritizing, and Updating Mitigation Actions

The Mitigation Strategy represents the mitigation actions and initiatives ***identified*** by the APDMAC and ADEM over years of mitigation planning for the state government of Arkansas to pursue during the next three years. These mitigation actions were reviewed by the state agencies participating in the state plan, other non-participating but interested state agencies, local emergency management organizations, and others before being submitted to the Arkansas Department of Emergency Management for approval and promulgation. In addition, the mitigation actions were reviewed and integrated with the Emergency Management Accreditation Program (EMAP) and actions from the approved local hazard mitigation plans.

Mitigation actions identified in the strategy have been ***evaluated*** utilizing the STAPLEE screening tool. STAPLEE is a screening tool that FEMA has proposed for all jurisdictions to consider consisting of a common set of evaluation criteria. This set of criteria enables a jurisdiction to examine the Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) opportunities and constraints of implementing a particular mitigation measure using a consistent framework. During the 2013 update, the APDMAC measured each of the mitigation actions against the STAPLEE criteria (see **Table 4.3**).

Mitigation actions identified in the strategy have been ***prioritized*** as follows:

- **High priority** actions were those deemed both very necessary to meeting the goals and objects agreed upon(see Section 4.1 *Hazard Mitigation Goals and Objectives*), as well as those that fit well with the STAPLEE evaluation criteria.
- **Medium priority** actions were those deemed very necessary to meeting the identified goals and objectives, but not meeting all of the STAPLEE evaluation criteria, particularly technical feasibility or cost effectiveness.

- **Low priority** actions are those that are deemed important to meeting the mitigation goals, and may be of questionable economic feasibility or technically difficult to implement.

Table 4.3. STAPLEE Evaluation Criteria

Evaluation Category	Sources of Information
Social	Members of local, county and state government were members of the APDMAC and had input throughout the planning process. It must be noted that many small town political leaders are also business or professional persons. Community priorities must be evaluated within the context of social effects on communities. Existing community plans will be used wherever possible. Members of the media were contacted and invited to attend all APDMAC meetings.
Technical	The following persons/agencies were consulted regarding the technical feasibility of the various projects: Arkansas Geological Survey, University of Arkansas Extension Service, Arkansas Natural Resources Commission, Arkansas Health Departments, Arkansas Highway and Transportation Department, Arkansas Department of Environmental Quality, Arkansas Governor’s Earthquake Advisory Council, and Arkansas Forestry Service. All of these had their comments and suggestions incorporated. Technical expertise will be a requirement for any local action, and building technical expertise is also a mitigation objective.
Administrative	Staffing for proper implementation of the plan currently will rely on existing members of the various agencies involved. It is the opinion of the APDMAC that insufficient staff is available due to budget constraints, as the staff has been cut to a minimum and many agencies have staff members who are overloaded with work. Technical assistance is available from various state agencies. Some local jurisdictions have incorporated hazard mitigation efforts into their Capital Improvement Plans. Operations costs are under discussion by the relevant department heads.
Political	The governor of Arkansas has issued an Executive Order instructing all state agencies to assist ADEM in mitigation planning and implementation of mitigation goals. Political considerations will also be evaluated locally for actions.
Legal	Members of the APDMAC discussed legal issues with the county commissioners, and it was their opinion that no significant legal issues were involved in the projects that were selected by the APDMAC.
Economic	Economic issues were the predominant issues discussed by all concerned. Each entity felt that the projects selected would have a positive effect, in that the projects would attract business and recreation to the areas and help the community be better prepared for a disaster. Funding for the various projects was a major concern as local budgets were not capable of fulfilling the needs, due to the economic downturn. Reliance on outside grants will be relied on heavily for completion of projects.
Environmental	Arkansas Department of Environmental Quality, Arkansas Forestry Commission, and the Arkansas Natural Resources Commission were all consulted regarding the environmental impact of the various projects and it was felt that there would be no negative impact. Local governments are currently considering zoning of environmentally sensitive areas.

4.4.2 Integration with Emergency Management Accreditation Program (EMAP)

During the 2013 plan update, the APDMAC also considered the State's overall mitigation strategy in the context of the Emergency Management Accreditation (EMAP) Program's mitigation standards. EMAP is a voluntary assessment and accreditation process for state emergency management programs. Accreditation is granted only following a rigorous peer review of all aspects of a state's emergency management program. To ensure EMAP mitigation compliance, the APDMAC considered the following:

1. The use of applicable building construction standards;
2. Hazard avoidance through appropriate land use practices;
3. Relocation, retrofitting, or removal of structures at risk;
4. Removal or elimination of the hazard;
5. Reduction or limitation of the amount or size of the hazard;
6. Segregation of the hazard from that which is to be protected;
7. Modification of the basic characteristics of the hazard;
8. Control the rate of release of the hazard;
9. Provision of protective systems or equipment for both cyber and physical risks;
10. Establishment of hazard warning and communication procedures; and
11. Redundancy or duplication of essential personnel, critical systems, equipment, information, operations, or materials.

As previously noted, the APDMAC considered a wide range of mitigation strategies and projects to eliminate and reduce damages across the state. The first strategies to be considered related to the ability for planners and responders to affect or control the various identified hazards. However, the team understood that these are usually the least effective measures due to man's lack of power over the weather and natural phenomena. In general the APDMAC has determined that the State of Arkansas has little to no control over the hazards that may potentially affect the citizens and infrastructure. There are practically no opportunities for the emergency management community to significantly impact these events prior to their happening.

Based on EMAP considerations, the APDMAC has admitted its limited power to mitigate under these circumstances. See below for specific comments related to each identified hazard:

- **Dam and Levee Failure**
- **Drought with Soil Erosion and Dust:** In general, there are no strategies or actions that can be taken to eliminate or remove the severity of a drought in an area. However, water conservation can help in prolonging the pre-drought period. The ARNC is currently updating the State Water Plan.
- **Earthquake:** There are no strategies or actions that can be taken to eliminate or remove the severity of an earthquake in an area. The efforts the APDMAC makes are to attempt to reduce damage to structures and infrastructures when an event occurs.
- **Expansive Soil:** There are no strategies or actions that can be taken to eliminate or remove the severity of expansive soil in an area. Locations with expansive soil history

can be avoided for future development sites. The Arkansas Geological Survey is in the process of identifying expansive soil locations throughout the State.

- **Flood:** There are some strategies that can be taken to reduce or eliminate floods such as drainage projects, storm water management plans, and dam and levee development. This hazard is one of the few natural hazards that can be affected; especially flash flooding in urban environments.
- **Landslide:** In general, there are no strategies or actions that can be taken that will eliminate or reduce the severity of a landslide in the area. However, some structural projects at known at-risk locations could limit the landslide potential.
- **Severe Thunderstorms:** There are no strategies or actions that can be taken to eliminate or reduce the severity of straight-line winds in an area. The efforts the APDMAC makes are to reduce or eliminate some of the effects of an event.
- **Severe Winter Weather:** There are no strategies or actions that can be taken to eliminate or reduce the severity of a winter storm in an area. The efforts the APDMAC makes are to reduce or eliminate some of the effects of an event.
- **Tornado:** There are no strategies or actions that can be taken to eliminate or reduce the severity of a tornado. The efforts of the APDMAC are to attempt to shelter the public in the event of a tornado.
- **Wildfire:** There are a variety of strategies for controlling, reducing and eliminating wildfires, such as brush control, forest management, and minimizing the contact between people with fire and dry, at-risk locations.
- **Hazardous Materials Incidents:** There are ways to eliminate or control the overall HAZMAT hazard in the state; however this would require new laws and regulations and enforcement. The amount of hazardous materials in the state could be significantly limited and controlled but it would require a major shift in state policy and would force change on a large number of businesses and individuals.
- **Nuclear Events:** This hazard could be eliminated or controlled by shutting down the ANO plant. However, this location supplies a significant portion of the state's electricity, so it is highly unlikely that the state government would seek to curtail the operations of this vital location.
- **Terrorism Event:** The mitigation actions and strategies to eliminate or reduce the severity of terrorism are very limited for this hazard mitigation plan. However, the State of Arkansas is always working with the Department of Homeland Security to reduce or eliminate the threat of terror. The State of Arkansas does not have legislation or regulation governing the building construction standards or land-use practices for events related to terrorism. The State does support and assist in the hardening of critical or high-risk facilities.
- **Major Disease Outbreak:** To a large extent, there are no strategies or actions that can be taken to eliminate or reduce the severity of a biological event in an area. However, there are actions that can be taken to prevent diseases from entering the state. These include border inspections, and on-going surveillance.

4.4.3 Review and Integration with Local Actions

A roll-up and analysis of the mitigation actions contained in local plans was conducted to summarize the types of mitigation actions most commonly implemented, or desired to be implemented. This analysis included a summary of actions and the associated hazards, which give an indication of the priority hazards to be mitigated at the local level.

As of April 2013, 54 local hazard mitigation plans in Arkansas have been reviewed and included in this mitigation action analysis. ADEM maintains the status of local plans on their website at http://www.adem.arkansas.gov/ADEM/Divisions/Admin/Mitigation/index.aspx under "Approved Hazard Mitigation Plans". The 54 local plans included in this analysis include six single-jurisdiction plans and 48 county-level plans as follows:

Table 4.4. Local Plans Included in Mitigation Action Analysis

Single Jurisdiction and County-Level Plans		
Ashley	Drew	Mountain View City
Beebe Schools	Faulkner	Ouachita
Benton	Foreman City	Perry
Bradley	Franklin	Pike
Calhoun	Fulton	Poinsett
Chicot	Garland	Polk
Clark	Hot Spring	Pope
Clay	Howard	Prairie
Cleburne	Independence	Saint Francis
Columbia	Johnson	Saline
Conway	Lafayette	Scott
County Line School District	Lawrence	Sebastian
Craighead	Lincoln	Sevier
Crawford	Lonoke	Sharp
Crittenden	Marion	Union
Cross	Mena City	Washington
Dallas	Monroe	White County Education Cooperative
Desha	Montgomery	Woodruff

Methodology

The roll-up was conducted by reviewing and capturing key elements of the mitigation sections of each local plan into a master spreadsheet. Most local plans provided a summary table of their mitigation actions, which included a variety of information, such as action description, category of mitigation action, priority, responsible agency, potential funding sources, hazard addressed, and the action's relationship to the local plan's goals and objectives. Some local plans provided a limited amount of information that made it difficult to summarize their data.

The roll-up of the local mitigation actions focused on evaluating the types of local mitigation actions by determining the following:

- The total number of mitigation actions in each county
- The number of actions for each mitigation category (i.e., prevention, emergency services,
- property protection, natural resource protection, structural protection, and public information)
- The types of hazards addressed by each mitigation action

Most of this information was included in the mitigation action summary tables of the local plans. Additional information was obtained, where necessary, in the local plans' text. In some instances, where the mitigation categories as defined by the local plan did not meet the six FEMA-established mitigation categories included in FEMA state and local guidance, the actions were assigned to the most suitable FEMA category.

This analysis assumes that the local actions were accurately placed in the FEMA mitigation categories, to the extent possible. There were instances where the action was not in the appropriate category, but no effort was made to try to reinterpret the information in the local plans. Some actions that are oriented to life safety, such as tornado safe rooms, do not easily fit into any of the six categories. Most assigned this action to structural projects.

Results

Table 4.5 summarizes the results of the roll-up of local mitigation actions using FEMA's mitigation categories. FEMA's publication developing the Mitigation Plan emphasizes six categories of mitigation activities categories that are defined as follows:

- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event.
- **Prevention:** Administrative or regulatory actions/processes that influence the way land and buildings are developed and built.
- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigation them.
- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of hazard.

Table 4.5. Breakdown of Local Actions by Mitigation Categories

Mitigation Category	Percent
Public Information	21%
Emergency Services	18%
Prevention	14%
Property Protection	10%
Structural Projects	11%
Natural Resources	3%
Other	25%

Based on this summary, a large portion of the actions seemed to be public information and policy/regulatory in nature. This means, communities deal with influencing change on the front-end through community outreach efforts, policy changes, and developing and enforcing new regulations. Many actions were also emergency services and property protection categories showing that the full cycle of mitigation actions are needed at the local level.

4.4.4 2013 Updated Mitigation Actions

During the 2013 plan update, the APDMAC and ADEM assessed existing actions and developed new actions for consideration based on:

- Review of the updated state risk assessment and information from local risk assessments;
- Review of goals and objectives;
- Review and assessment of existing state actions, including priorities;
- Review of state and local capabilities; and
- Review of a summary of commonly used actions identified in local plans.

Ongoing, completed, new, and revised actions are summarized in **Table 4.6**. The Table displays information on and prioritization of the objectives and actions for each goal. Note, the goals and objectives were revised during the 2013 update and the numbering of mitigation actions has been updated accordingly.

The responsible agency, the projected timeline, projected resources, rationale for action, and contribution to each mitigation goal and objective were noted. The table also shows which STAPLEE guidelines were met by the action, the priorities for each action based on the STAPLEE categories and ties the categories to EMAP considerations. The APDMAC reviewed the cost effectiveness for each mitigation action listed in the mitigation plan. Some projects are pending a benefit-cost analysis before final implementation.

Table 4.6. Local Plans Included in Mitigation Action Analysis

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
1.1	**1.1.1** Continue participation with CDC and DHS in the establishment and the distribution of pharmaceuticals under the federal Strategic National Stockpile (SNS) program.	Arkansas Department of Health	On-going	CDC grant funding	The federal government has instituted the SNS and considers it a priority strategy in combating potential bioterrorism events and other types of biological hazards. This program requires state and local participation for effective storage and distribution.	Ensures that appropriate vaccines and other medications will be available in times of great distress. This stockpile will reduce the number of victims and assist with disease containment issues.	Meets all criteria	Yes	High	3, 5, 6, 9, 10, 11	The Department of Health collates information from CDC to prepare for SNS pharmaceutical distribution events. **Evaluation: 2013** Participation is vital to the state.
1.1	**1.1.2** Continue participation with Citizen Corp. and support of CERTs.	ADEM Admin. Division	On-going	Homeland Security Grant	Large scale events will require the cooperation and assistance from local personnel.	Promotes efforts to involve a wide range of volunteer groups in activities that enhance individual, community, and family preparedness and contribute to the strengthening of homeland security.	Meets all criteria	Yes	High	3, 5, 6, 9, 10, 11	ADEM has added a Citizen Corp. council to establish an RFP process for all CCP Grants **Evaluation:2013** Position is vital to the state.
1.1	**1.1.3** 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.	Arkansas Livestock and Poultry Commission	On-going	APHIS grants, Existing state resources	This federal program is extremely important for early detection of disease cases. Local participation and reporting is vital to this program.	This program is instituted at the national level in partnership with state and local government for reporting and implementation.	Meets all criteria	Yes	High	3, 5, 6, 9, 10, 11	USDA APHIS is active with many Domestic Detection and Surveillance Programs **Evaluation:2013** Domestic detection and surveillance of animals is important to the state.
1.1	**1.1.4 Perform** acquisition and/or relocation of repetitive-loss properties.	ANRC ADEM	On-going	PDM, HMGP, FMA, SRL, and RFC	Prevent repetitive loss.	Economic priority.	Cost effectiveness under consideration per property	Yes	High	3, 5, 6, 9 10, 11	Currently ADEM has active mitigation projects acquire 6 repetitive loss properties totaling $950,400.00. **Evaluation: 2013** Any program that helps communities to reduce or eliminate the threat of flooding is essential.
1.1	**1.1.5** Provide federal Flood Mitigation Assistance (FMA) planning grants to local jurisdiction when available.	ANRC	On-going	FMA	Mitigation planning is the first step in decreasing damage.	Decrease flood damage.	Meets all criteria	Yes	High	3, 5, 6, 9, 10, 11	**Evaluation: 2013** Helping jurisdictions with funding is vital for mitigation efforts.
1.1	**1.1.6** Provide federal Hazard Mitigation Grant Program (HMGP) planning grants and Pre-Disaster Mitigation (PDM) grants to local jurisdictions for hazard mitigation projects.	ADEM Admin. Division	On-going	HMGP and PDM	Local communities need help in constructing mitigation plans.	Decrease economic load on local jurisdictions.	Meets all criteria	Yes	High	3, 5, 6, 9, 10, 11	Administration Division currently manages HMGP as well as PDM grant allocation in AR. **Evaluation:2013** Helping jurisdictions with funding is vital for mitigation efforts.
1.1	**1.1.7** 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.	Department of Health	On-going	CDC Grant Funding	Preparedness and disaster planning for public health is of vital importance. These efforts will ensure better response and recovery thereby reducing the damages and effects of a major event.	Planning, response and recovery effectiveness increased.	Meets all criteria	Yes	High	3, 5, 6, 9, 10, 11	Annual CDC funding currently numbers around 7-8 million dollars for the State of Arkansas **Evaluation:2013** This is an important program to the state.
1.2	**1.2.1** Brief elected officials frequently on the benefits of hazard mitigation.	ADEM	On-going	Existing state resources	Legislative awareness is invaluable.	Provides legal underpinning for mitigation activities.	Meets all criteria	Yes	High	1, 2	ADEM director briefs governor on hazard mitigation in Arkansas. **Evaluation: 2013** Implementation includes meeting with legislators, annual Governor's Briefing and statewide conferences twice a year.
1.2	**1.2.2** Advocate inclusion of sustainable development policies and pre-disaster mitigation opportunities in public policies.	ADEM, Governor's Office	On-going	Existing state resources	Sustainability and mitigation are inseparable.	Creates institution of mitigation and sustainability.	Meets all criteria	Yes	High	1, 2	Milestones have been accomplished in this area over the past 3 years. These include policies building codes SB984 and HB2022. **Evaluation:2013** Policies are vital to the state and local governments.

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
1.2	**1.2.3** Establish procedures for assessing recovery after HAZMAT/biological events such as returning to buildings and general oversight guidance.	ADEQ	On-Going	Hazardous Materials Emergency Preparedness Training and Planning Grant, Existing state resources	Procedures are necessary for assessing the aftermath of hazardous materials releases or biological events. Also procedures for determining the safety of contaminated buildings before they are re-opened to the public.	This preparedness effort assists with the overall mitigation efforts in the state.	Meets all criteria	Yes	Medium	5, 6, 9, 11	Procedures have been completed, and are updated with coordination from the Department of Health. **Evaluation:2013** Resiliency from disaster events is important to the state.
1.2	**1.2.4** Advocate the implementation of laws and regulations related to the subject of quarantine in times of disease outbreak.	Department of Health, ADEM, Governor's Office	On-going	Existing state resources, CDC grant funding	Quarantine issues are highly charged and can have profound ramifications for the people affected. Many will not voluntarily submit to the time constraints and financial effects of quarantine without legal implications.	These new laws could significantly assist responders in containing outbreaks without wasting time and effort enacting quarantine procedures.	Meets all criteria	Yes	High	5, 6, 9, 11	Judges in Arkansas are provided guidance outlining specific laws that can be enacted in times of disaster, or an epidemic. **Evaluation: 2013** This mitigation action item is included in the Comprehensive Preparedness Plan as policy.
1.2	**1.2.5** Realign the state regions for emergency management and public health so that they all match. This will be better for regional coordination.	ADEM, Department of Health	2 years Proposed Status	DHS and CDC grant funding	The state has been divided into regions by each organization but the regions do not match. Some counties have to meet with different regions for different purposes. This realignment would benefit these counties and the state as a whole by simplifying this regional coordination.	This regional realignment will contribute to mitigation by making it easier for all counties to work together in coordinated regions as opposed to one region for emergency management and another for public health.	Meets all criteria	Yes	Medium	5, 6, 9, 11	This project has not been selected as an "action item" to this point **Evaluation: 2013** ADEM will coordinate with public health regions.
1.2	**1.2.6** Manage and fund the individual (and school) safe room program in Arkansas.	Governor's Office	On-going	HMGP, State Funds	Fund safe rooms and in-ground shelters for citizens across the state	Safe rooms save lives.	Meets all criteria	Yes	High	**1, 3, 6, 9**	**Evaluation:2013** The action items for individual and school safe rooms have been combined into one on-going action item.
1.3	**1.3.1** Continually update membership of the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC), and hold regular meetings of the Advisory Council.	ADEM Mitigation	On-going	PDM HMGP Existing state resources	Involves encouragement of participation at all public and private levels.	Communication is a must to institutionalize mitigation and sustainability.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Membership still active and currently holding meetings twice per year. **Evaluation: 2013** Considered productive and vital.
1.3	**1.3.2** Continue to assist the Governor's Earthquake Advisory Council.	ADEM	On-going	PDM, HMGP, Existing state resources	Involves on-going efforts on mitigation.	Regular meetings are a good way to communicate.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Membership still active and holding meetings twice per year. **Evaluation: 2013** Considered productive and vital.
1.3	**1.3.3** Communicate regularly with Local Emergency Planning Committees (LEPC).	ADEM Disaster Management	On-going	Existing state resources	LEPCs are all involved in local mitigation planning	Links mitigation with preparedness.	Cost effectiveness under consideration	Yes	Medium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Each local LEPC is contacted by Local ADEM Coordinator no less than once per year. The Arkansas State Emergency Response Commission currently aids in all LEPC dialogue. **Evaluation: 2013** Considered productive and vital.
1.3	**1.3.4** Formally include the public health agencies throughout the state in the mitigation planning process for expert input on biological hazards.	ADEM and Arkansas Department of Health	On-going	PDM, HMGP, Existing state resources	Biological hazard to humans, poultry and cattle is considered a high priority. Therefore subject matter expertise is required to plan and respond to these types of events.	Links mitigation to preparedness on these biological issues.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Public Health Agency officials currently serve on the Governor's Pre-Disaster Mitigation Advisory Council. **Evaluation: 2013** Biological hazard information is vital to the state.
1.3	**1.3.5** Publicize mitigation program successes through news media and on the ADEM website.	ADEM Public Relations	On-going	HMGP, Existing state resources	Mitigation successes are important for motivation.	FEMA promotes mitigation successes.	Technical feasibility under consideration	Yes	Medium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Mitigation success stories currently posted on ADEM website and news media outlets. **Evaluation: 2013** Informing the public on success stories is vital to the current programs. This is performed by the ADEM Public Information Officer (PIO).

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
1.3	**1.3.6** Develop Continuity of Operations Plans for all state departments and agencies.	Arkansas DIS	On-going	State budgetary funds	Continuity of Operations planning is a vital way to minimize any disruptions to vital government services.	This planning effort would prevent loss of important data and ensure that the state government is able to continue operating in times of distress.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	COOP project is in progress in AR. Project is in "plan maintenance" phase. **Evaluation: 2013** This is an important program to the state.
1.3	**1.3.7** Publish and disseminate the USDA APHIS information about bio-security for poultry.	Arkansas Livestock and Poultry Commission	On-going	USDA APHIS, and CDC	The USDA has produced a detailed document with the top six methods for preventing the spread of disease. This document will be re-produced and made available to commercial and private poultry farmers as a viable mitigation strategy.	These recommendations are very important to containing a disease outbreak.	Meets all criteria	Yes	Medium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Pan-Flu and other literature are produced and disseminated to the poultry industry throughout AR **Evaluation:2013** Public awareness is important to all communities in the state.
1.3	**1.3.8** Develop Mutual Aid agreements between local jurisdictions to assist in responding to hazardous material events.	ADEM Preparedness Division	On-going	Existing local resources	Many HAZMAT events that occur are beyond the capabilities of a jurisdiction to respond.	Encourages assistance and communication from neighboring jurisdictions on responding to major HAZMAT events.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	2005 Mutual Aid Act required local jurisdictions to sign Mutual Aid Agreements for HAZMAT response. **Evaluation:2013** These agreements are important in time of disaster.
1.3	**1.3.9** Monitor and update the ADEM 5-year strategic plan.	ADEM Preparedness Division	On-going	DHS grants and existing state resources	This plan is one of the primary elements of ADEM's overall strategy for disaster preparedness. This plan must be continually updated to match the changing priorities of the governor and the federal government.	This planning process ensures that the state's emergency management program is proactively addressing future goals and requirements. By developing this 5-year plan and then continually monitoring it, ADEM is initiating best-practices for the future and has a blueprint to guide future growth and program development.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Plan was last updated in 2007. Specific date can be referenced from ADEM. **Evaluation:2013** Plan will be updated as necessary and during the 5 year update.
1.3	**1.3.10** Administer funds for road and bridge improvement projects.	ADEM Mitigation Branch	On-going	State Funds	This program has been successful in the past in repairing and strengthening the road system after being damaged by disasters. As future events occur, road and bridge damage is highly likely. Therefore the continuation of support for this program is essential to the state's mitigation efforts.	This program has been successful in the past and will be necessary to repair damage from future events. This program is in an ideal position to be expanded from a recovery based operation to a pre-disaster mitigation related activity.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Current program in place. **Evaluation:2013** As funds become available.
2.1	**2.1.1** Work with Arkansas Natural Resources Commission [ANRC] to aid communities in participating in NFIP CRS Program.	ADEM, ANRC	On-going	Existing state resources	CRS and NFIP are important to the economic health of communities.	CRS provides for provisions and extra protection for communities.	Political feasibility and cost effectiveness rated per community	Yes	Medium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	In Arkansas, over 65 counties and 416 towns and cities have joined the NFIP since its creation in 1968. **Evaluation: 2013** The CRS program is promoted at all ADEM local mitigation planning workshops.
2.1	**2.1.2** Identify communities not currently participating in the NFIP and through program education, enroll communities in the NFIP.	ANRC	On-going	Existing state resources	Ability to concentrate efforts to encourage all local communities to join NFIP.	NFIP identified as important first step in mitigation planning.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	ADEM and the State Climatologist promote the basic NFIP participation. **Evaluation: 2013** Community participation in the NFIP is important to the state. The action items for identification and enrollment have been combined into one on-going action item.
2.2	**2.2.2** Identify and establish partnerships with all non-profit agencies involved in emergency response or implementing sustainable development.	ADEM	On-going	Existing state resources	All stakeholders on same page.	Smart Growth important mitigation philosophy.	Political feasibility under consideration	Yes	Low	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	American Red Cross, Salvation Army, and Feed the Children along with other VOAD non-profits are utilized at the EOC during disasters. **Evaluation: 2013** This is important in time of disaster.

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
3.1	**3.1.1** Develop and provide technical assistance to local jurisdictions in the planning process.	ADEM, FEMA	On-going	PDM, HMGP	Risk assessment important first step in prioritizing mitigation objectives.	Increase local jurisdiction's ability to assess risks.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Currently, 54 approved local hazard mitigation plans throughout the State of Arkansas. **Evaluation: 2013** ADEM Mitigation Branch provides technical assistance to local jurisdiction in various forms throughout the year. This may include workshops, conferences and/or phone calls.
3.1	**3.1.2** Work with local public health departments to improve emergency planning and response capabilities for biological events.	ADEM, Department of Health	On-going	Existing state resources, CDC grants, DHS/FEMA grants	Public health staff and resource will be vital to any response and recovery related to disease outbreaks or bioterrorism incidents.	All response will begin at the local level and this increase in communications and training and coordination will improve the capabilities of these local departments.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Currently, the ADEM Planning Branch Manager is the lead coordinator on this ongoing initiative. **Evaluation:2013** Identified in original All-Hazards Plan. This program is vital to the state.
3.1	**3.1.3** Compile all local mitigation strategies and prioritize them on a statewide basis.	ADEM Mitigation Branch	During Update to State Mitigation Plan	PDM, HMGP, existing state resources	Many local mitigation projects are very successful at decreasing large amounts of potential future damage. These projects have been identified in the various local mitigation plans and can be compiled, analyzed and prioritized.	As the state compiles all on-going and proposed mitigation projects, ADEM will be in a better position to assist the local agencies with funding opportunities to initiate these projects.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	All current FEMA approved mitigation plans have been incorporated in the Arkansas All-Hazard Mitigation Plan (Version 4). **Evaluation:2013** Identified in original All-Hazards Plan. This program is vital to the state.
3.1	**3.1.4** Fund mitigation drainage projects.	ANRC ADEM	On-going	State Funds/HMGP/FMA	Flood damage often results from blocked drainage.	Decrease flood damages.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	The State of Arkansas seeks funding through HMGP and FMA when communities are interested in drainage projects. **Evaluation:2013** Reducing flooding is vital to the state.
3.2	**3.2.1** Provide training to local floodplain administrators to increase knowledge of good floodplain management practices.	ANRC ADEM	On-going	Existing state resources	Best practices should be standardized.	Close the feedback loop.	Cost effectiveness under consideration	Yes	Medium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	AFMA holds 2 annual meetings and much training are facilitated. Floodplain administrators within the state are required to maintain a Floodplain Manager certification (CFM). **Evaluation: 2013** This program is vital to the state.
4.1	**4.1.1** Encourage the use of Digital Flood Insurance Rate Maps (DFIRMs) and DFIRM products in the development of mitigation plans and projects.	ARNC	On-going	Existing state resources	DFIRM maps are best available technology.	Planning effectiveness increased.	Cost effectiveness under consideration	Yes	Medium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Approximately 60% of the State of Arkansas is in the process of changing their NFIP maps to DFIRM maps. **Evaluation:2013** This is an important program to the state.
4.1	**4.1.2** Provide public education to include mitigation ideas in school curriculums.	ADEM AGS	On-going	Existing state resources	Schools provide access to citizens of tomorrow.	Strengthen local mitigation planning efforts.	Cost effectiveness under consideration	Yes	Medium		FEMA and ADEM provide public education to school districts in Arkansas. **Evaluation: 2013** This is an important program to the state. ADEM's Earthquake program and the Arkansas Geological Survey regularly participate with schools.
4.1	**4.1.3** Fund the full-time emergency planners to act as regional area coordinators to assist local planners with the development of viable plans and to improve response capabilities.	ADEM	On-going	Existing state resources, DHS/FEMA grants	These area coordinators can provide technical assistance to locals and act as liaisons with the various state agencies.	These coordinators contribute by assisting the locals with all of their various planning, response and mitigation activities.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Full-time hazard planners have been added to the Northeast Arkansas region in 2006. **Evaluation:2013** This program will continue as funds become available. ADEM is staffed with five regional emergency management coordinators.
4.1	**4.1.4** Conduct training for local emergency planners and responders to improve their capabilities.	ADEM	On-going	Existing state and local resources, DHS/FEMA grants, CDC, Grants, USDA/APHIS grants	Training is a major component of all disaster preparedness. Improvements to human resources will improve response and recovery and therefore limit overall damages and effects.	These training sessions are conducted by the state for the benefit of the local organizations.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	ADEM continues to facilitate training on a regular basis for first responders in the state. **Evaluation:2013** Training for disasters is important to the state.

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
4.1	**4.1.5** Provide technical assistance to local governments to assist with the development of Continuity of Operations Plans (COOP).	Arkansas DIS	On-going	DHS/FEMA grants, existing state resources	Local governments need to develop contingency plans to ensure continuity of operations. AR will provide support and assistance to local agencies.	The state can provide this support and assistance to the local government.	Meets all criteria	Yes	Medium	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	ADEM and Department of Information Systems is working to have all 75 counties to have up to date COOP plans. **Evaluation:2013** This is an important program to the state.
4.1	**4.1.6** Identify and train additional state and local resources for veterinarian expertise. These resources would focus on monitoring, testing, and disease surveillance.	Arkansas Livestock and Poultry Commission, Division of Agriculture, University of Arkansas, Fayetteville	On-going	State Funds/DHS Grants	In the case of an outbreak of animal disease, the current state resources would be quickly overwhelmed. More trained, expert, local resources and equipment are necessary for surveillance and containment response, and mass animal euthanasia.	These positions and additional training sessions are for the benefit of the state as well as for the benefit of all the affiliated local organizations.	Meets all criteria	Yes	High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Over the past fiscal year, DHS grants have funded training for AR county DECON teams, DHS grants have also provided equipment, training and exercise funding. **Evaluation:2013** Identified in original All-Hazards Plan. Training for disasters is important to the state.
4.1	**4.1.7** Assist the University of Arkansas County Extension Services to improve training for local responders for animal disease events.	ADEM, Arkansas Livestock and Poultry Commission	On-going	Existing state and local resources, DHS/FEMA grants, USAD/APHIS grants	These extension services are already in existence and are assisting local jurisdictions. Expanding these programs will help with overall preparedness and mitigation.	These extension services can act as local training programs to assist with preparedness.	Meets all criteria	Yes	Medium	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	AWR-180- Foreign Animal Disease Response Train the Trainer classes were offered at University of AR extension offices. **Evaluation:2013** Identified in original All-Hazards Plan. Training for disasters is important to the state.
4.2	**4.2.1** Assist emergency managers with table-top and full scale emergency exercises to practice response and improve operations and coordination.	ADEM	On-going	Existing state and local resources, DHS/FEMA grants, CDC, Grants, USDA/APHIS grants	Exercises are a great form of mitigation by improving the overall preparedness of a jurisdiction. Organizations determine areas of strength and areas in need of improvement.	Organizations that have practiced various forms of response are better prepared and therefore reduce the damages and effects of large scale events.	Meets all criteria	Yes	High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Each AR county works with ADEM to facilitate a table top exercise every year. **Evaluation: 2013** Training for disasters is important to the state.
4.2	**4.2.2** Continue ADEM and Arkansas Livestock and Poultry Commission partnership to conduct animal disease related exercises in the state.	Arkansas Livestock and Poultry Commission, ADEM, APHIS, Local responders	Annually	USDA/APHIS grants, DHS/FEMA grants, existing state resources	ARLPC has already conducted some emergency exercises in conjunction with federal, state and local officials. These exercises are valuable training events and more of these are required to increase the level of response.	These exercises are vital to improving the animal health response of the state.	Meets all criteria	Yes	High	2, 5, 6	ADEM Training/Exercise Branch Manager as well as the Domestic Preparedness Exercise Coordinator are in the process of developing additional animal disease related exercised for AR. **Evaluation: 2013** Training for disasters is important to the state. Exercises are held annually.
4.2	**4.2.3** Conduct nuclear event exercises with ANO and local jurisdictions.	ADEM	On-going	Existing state resources	Event at ANO will impact the facility and all of the surrounding jurisdictions.	Promotes the communication and response techniques for an event at ANO.	Meets all criteria	Yes	High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	ANO exercise performed on annual basis. **Evaluation: 2013** Exercises are an important part of being prepared for disasters.
4.3	**4.3.1 Conduct** workshop for local jurisdictions on the use of FEMA's Benefit-Cost Analysis software.	ADEM Mitigation Branch	1 Year Pending	HMGP and Existing state resources	Training on the benefit-cost software will assist local jurisdiction in the assessment of mitigation actions and projects within the community, as well as the preparation of mitigation grant project applications.	Strengthen local mitigation project efforts.	Meets all criteria	Yes	High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	FEMA and ADEM provide training to local jurisdictions. **Evaluation: 2013** New

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4.4	**4.4.1** Conduct mitigation outreach activities and education presentations for local public officials.	ADEM	On-going	HMGP and Existing state resources	Increase awareness of mitigation efficacy.	All mitigation is local.	Meets all criteria	Yes	Low	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	ADEM continues to conduct mitigation outreach programs for public officials. One example is memos sent to local jurisdictions after Federal disaster declarations. ADEM regional directors currently contact local public officials in their region to update them on new initiatives across the state. **Evaluation: 2013** Informing the public and local officials is important to the state. The actions for mitigation outreach and education presentations have been combined into a single mitigation action.
4.4	**4.4.2** Develop/ provide local planners and consultants with a uniformed methodology of listing hazard probability data in hazard mitigation plans.	ADEM	1 year	Existing state resources	As local planning efforts are completed, the state can collate the local probability data with a uniformed methodology for better consistency and accuracy for consolidating probability in the state hazard mitigation plan.	All mitigation is local.	Meets all criteria	Yes	Medium	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	ADEM will set a standard methodology for reporting probability data for local hazard mitigation plans. **Evaluation: 2013** Uniformed methodology will assist the local communities in plan development.
5.1	**5.1.1** Develop and update databases of all livestock and poultry locations including major small flock distribution points in the state. Also include emergency resources for response and recovery for animal diseases - including a GIS spatial component.	Arkansas Livestock and Poultry Commission Division of Agriculture, University of Arkansas, Fayetteville	On-going	USDA/APHIS grants, existing state resources, private industry	This database and the associated locations are very helpful for preparedness, response and reducing the resulting damages. Sources of small quantities of feed and birds will be documented statewide.	Use of database and GIS technology to assist response and recovery. The objective of the work would be to provide educators with an effective means of communicating bio-security information to small flock owners. Much of the documentation will be obtained through site visits.	Meets all criteria	Yes	Medium	2, 5, 6	Continues to collect data when available. **Evaluation: 2013** GIS data is essential to the state's mapping needs.
5.1	**5.1.2** Support maintenance of statewide spatial database and facilitate local access to data.	ADEM, Arkansas Building Authority, Arkansas Geographic Information Office	On-going	Existing state resources	Shared data is best way to ensure standardization.	Incorporation of multiple data sources.	Cost effectiveness under consideration	Pending	Medium	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Arkansas Geographic Office works with all state agencies to standardize GIS data formats. **Evaluation: 2013** GIS data is essential to the state's mapping needs.
5.1	**5.1.3** Expand the use and capabilities of the National Alert Warning System.	Department of Health, ADEM	On-going	Existing state resources	This is an established nationally used system that is beneficial to the state.	Existing technology that is already in use but requires constant resources to maintain and expand.	Meets all criteria	Yes	High	10	NAWS continues to expand in Arkansas. Not all local jurisdictions are using the system, but all counties currently are. **Evaluation: 2013** Communicating disaster information is important to the state.
5.1	**5.1.4** Incorporate state of the art bio-security equipment and procedures at the Conway Livestock Auction location and other primary congregation points in the state.	Arkansas Livestock and Poultry Commission	On-going	USDA APHIS grants, existing state resources	These preparedness efforts will drastically reduce the potential for widespread disease transmission.	Using new technology and updated methodology to improve bio-security at these locations will meet this mitigation objective.	Cost effectiveness, social and political issues are under consideration	yes	Medium	4, 5, 6, 9	USDA APHIS is always updating equipment as funds become available. **Evaluation: 2013** Updating equipment is important to the state.
5.1	**5.1.5** Upgrade the current laboratory capabilities for animal disease surveillance and coordination including portable equipment for the establishment of mobile labs in the affected area.	Arkansas Livestock and Poultry Commission	On-going	USDA APHIS grants, existing state resources	Additional equipment and capabilities for emergency coordination and lab testing will be vital during any pandemic event. The current state resources need improving.	These improvements of new technology and additional equipment would be used during an outbreak.	Cost effectiveness is being considered	Pending	High	4, 5, 6, 9	Updating continues as funds become available. **Evaluation: 2013** This is an important program to the state.

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
5.1	**5.1.6** Develop for deployment, as necessary, a mobile facility for poultry carcass disinfection and processing.	Arkansas Livestock and Poultry Commission, Department of Health, Division of Agriculture, U of A, Fayetteville	Proposed	USDA APHIS grants, existing state resources, educational research grants	The ability to quickly contain a poultry disease outbreak will determine the eventual size and impact. The proposed mobile technology would be used to quickly clean an infected area thereby halting the disease.	New technology for processing and disinfecting poultry carcasses can be incorporated into mobile facilities to move throughout a regional area to work at multiple locations. This should drastically limit possible new infections due to the handling of contaminated materials.	Cost effectiveness is being considered	Pending	High	4, 5, 6, 9	No action has been completed since no events have occurred to warrant action. **Evaluation: 2013** Reducing a risk for disasters is important to the state.
5.1	**5.1.7** Incorporate the use of Arkansas Wireless Information Network (AWIN) radios across jurisdictions.	Arkansas DIS	On-going	ODP	Compatible communication capabilities across one spectrum throughout the state will be critical in a multi-jurisdictional event.	AWIN radios distributed throughout communities in Arkansas would ensure a statewide communication capability.	Meets all criteria	Yes	High	10	AWIN radios are now in every county across the State of Arkansas. **Evaluation: 2013** Communications during disasters is important to the state. Updated responsible agency.
5.1	**5.1.8** Test radiation leakage from ANO using Thermoluminescent Dosimeters (TLD's).	Arkansas DEQ	On-going	Arkansas Department of Health	TLD's placed around a nuclear facility can give early warnings to leaks or radiation exposures in the environment.	Awareness of a radiation leak or contamination in the early stages can reduce loss of life and damage to surrounding areas.	Meets all criteria	Yes	High	3, 4, 6, 9	Daily tests are performed for radiation leakage from ANO. **Evaluation: 2013** Radiation testing is important to the state.
5.1	**5.1.9** Provide local residents with an Emergency Instruction Booklet (EIB), an evacuation and response information booklet regarding ANO.	Arkansas Department of Health	On-going	Department of Health	Local residents need information about what to do during an event at ANO.	Provides information to residents about ANO and actions to be taken during a nuclear event.	Meets all criteria	Yes	High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	EIB has been completed and distributed. This booklet is updated based on AAR from annual exercise. **Evaluation:2013** Will be continued as needed.
5.1	**5.1.10** Conduct annual pipeline event training classes for local first responders.	ADEM	On-going	Private sector pipeline companies	Up to date response techniques and pipeline information reduces risk of injury when responding to a pipeline event.	Trains local first responders on how to respond to a pipeline event.	Meets all criteria	Yes	High	3, 4, 6, 9	Pipeline training events are active and are continued through the "Arkansas 1 Call" initiative. **Evaluation: 2013** Training exercises are an important part of being prepared for disasters.
5.1	**5.1.11** Conduct weekly test of ANO warning sirens.	Arkansas Department of Health	On-going	Arkansas Department of Health	Siren notification is a timely and effective mode of communication for notifying residents of an event at ANO.	Ensures the operation of warning sirens to protect the general public.	Meets all criteria	Yes	High	10	Weekly tests are completed and on-going to date. **Evaluation: 2013** Exercises are an important part of being prepared for disasters.
5.2	**5.2.1** Update State Mitigation Policy (Administrative Plan)	ADEM Mitigation Branch	Annually	HMGP/PDM, Existing state resources	Continue to update estimated loss data from local mitigation plans into the overall state mitigation policy.	Allows state to target high-loss hazards with funding concentration.	Meets all criteria	Yes	High	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	State will update the mitigation policies as needed. **Evaluation: 2013** The Administrative Plan will be updated annually and following each new presidential disaster declaration.
5.2	**5.2.2** Develop and implement a repetitive loss strategy to prevent future losses.	ADEM Mitigation Branch, ARNC	1 Year, Proposed	HMGP/PDM, FMA, RFC, SRL Existing state resources	Continue to update repetitive loss data from local jurisdictions into the overall state mitigation policy.	Allows state to target high-loss structures with funding concentration.	Meets all criteria	Yes	High	2, 3, 6	State will incorporate draft Repetitive Loss Strategy into the All-Hazards Mitigation Plan and implement in coming years as funding is available. **Evaluation: 2013** The Repetitive Loss Strategy will be updated annually and following each new presidential disaster declaration. New.
5.3	**5.3.1** Develop and implement a methodology for identifying and prioritizing new mitigation projects based upon on loss reduction criteria.	ADEM Mitigation Branch	3 Year Proposed	Existing state resources	Continue to update estimated loss data from local mitigation plans into the overall state mitigation policy.	Allows state to target high-loss hazards with funding concentration.	Meets all criteria	Yes	High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11	State will implement the mitigation prioritization policies outlined in the Administrative Plan. **Evaluation: 2013** The Administrative Plan will be updated annually and following each new presidential disaster declaration.

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
5.4	**5.4.1** Research and develop expansive soil historical database throughout the state. Collate data on a regional and local level.	Arkansas Geological Survey	5 year Proposed	PDM, HMGP, existing state resources	Expansive soil data limitation cited in current state mitigation plan (Version 4)	By collecting advanced expansive soil data, the APDMAC will formulate loss estimations for the hazard. These loss estimations will then be compared with other natural hazard loss estimations.	Cost effectiveness under consideration	Pending	Low	2, 5, 6	Time and funding has not been available for this project. **Evaluation: 2013** When time and funding becomes available. AGS has initiated development but the development of a full database is an extensive project that will take long term effort.
5.4	**5.4.2** Research and develop landslide hazard historical database throughout the state. Collate data on a regional and local level	Arkansas Geological Survey	5 year, Proposed	PDM, HMGP, existing state resources	Landslide data limitation cited in current state mitigation plan (Version 4)	By collecting advanced landslide data, the APDMAC will formulate loss estimations for the hazard. These loss estimations will then be compared with the other natural hazard loss estimations.	Cost effectiveness, social and political issues are under consideration	Pending	Low	2, 5, 6	This mitigation action is a low priority and has not been completed at this time. Time and funding has not been available for this project. **Evaluation: 2013** When time and funding becomes available. AGS has initiated development but the development of a full database is an extensive project that will take long term effort.
5.4	**5.4.3** Research and develop drought hazard historical database throughout the state. Collate data on a regional and local level	ANRC, Arkansas Geological Survey, Arkansas Forestry Commission	3 year, Proposed	PDM, HMGP, existing state resources	Drought historical data limitation cited in current state mitigation plan (Version 4)	By collecting advanced drought data, the APDMAC will formulate loss estimations for the hazard. These loss estimations will then be compared with the other natural hazard loss estimations to allocate resources with better accuracy.	Cost effectiveness, social and political issues are under consideration	Pending	Low	2, 5, 6	This mitigation action is a low priority and has not been completed at this time. Time and funding has not been available for this project. **Evaluation: 2013** When time and funding becomes available. The update to the State Water Plan is the current focus of effort.
COMPLETED MITIGATION ACTIONS											
1.1	Place FEMA and ADEM under the DHS umbrella to streamline operations.	DOD DHS	Completed	PDM HMGP Existing state resources	Streamline operations and de-duplicate goals and objectives for each agency.	Funding for mitigation projects is streamlined through ADEM administrators	Meets all criteria	Yes	High		New Data **Evaluation: 2013** Mitigation Action has been completed.
1.3	Establish a full-time position for coordination between ADEM and the Department of Health.	ADEM and Arkansas Department of Health	Completed	CDC grant funding including bioterrorism preparedness and Health Resources and Services Administration (HRSA) funds.	ADEM requires subject matter expertise on public health matters for biological events, and for mass care issues. Therefore this position has been created and will be maintained in the future as a planning liaison between the two departments.	Facilitates inter-agency coordination between ADEM and the Department of Health. Assists Department of Health with emergency planning and response priorities.	Meets all criteria	Yes	High		Position is currently filled and funded. Applications for funding will continue as needed. **Evaluation: 2013** Mitigation Action has been completed.
1.3	The Department of Health has established a set of full-time positions for regional area response coordinators to assist communities with public health bioterrorism preparedness.	Arkansas Department of Health	Completed	CDC grant funding	Many local public health agencies do not have subject matter expertise in disaster planning. These positions provide points of contact for local agencies in their coordinated effort with the State Department.	Assists with meetings and communications between the local health departments and staff and the State Department of Health.	Meets all criteria	Yes	High		Position is currently filled and funded. Applications for funding will continue as needed. **Evaluation: 2013** Mitigation Action has been completed.
1.2	Re-organize the Department of Health to become a division within the Department of Health and Human Service.	Governor's Office, State Legislature, Department of Health	Completed	Existing state resources	The Department of Health will be able to function with better coordination in conjunction with the staff of the Department of Human Services. This organization is able to meet strategic priorities with a larger budget and larger staff.	This develops a larger organization that is better able to plan for and respond to biological hazards and mass care events.	Meets all criteria	Yes	Low		This re-organization was completed, and reversed in 2007. The Arkansas Department of Health will exist as a stand-alone entity **Evaluation: 2013** Mitigation Action has been completed.

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
1.2	Create state drought plan and appointment of state climatologist.	ANRC	Completed	PDM	State needs a drought strategy and an officer to administer it.	Furthers hazard mitigation and sustainability.	Technical feasibility under consideration	Yes	Medium		Arkansas now has a state climatologist. Will apply for funding as needed. **Evaluation: 2013** Mitigation Action has been completed.
1.3	Distribute NOAA All-Hazard radios.	ADEM	Completed	HMGP	Part of preparedness is severe weather notification.	Important part of sustainability.	Meets all criteria	Yes	High		All-Hazard radios are available to CSEPP residents outside of siren range free of charge. **Evaluation: 2013** Mitigation Action has been completed.
1.3	Identify and update identified structures in the Buffer Zone Protection Program.	ADEM Admin. Division	Completed	DHS grant	High priority structures are provided with funding to set protection barriers around the facility.	The barrier program provides additional security measures to high priority identified structures.	Meets all criteria	Yes	High		Buffer Zone protection funding is active in AR. In 2006, 13 sites were outfitted with barriers. **Evaluation: 2013** Mitigation Action has been completed.
5.1	Provide a training workshop to educate local jurisdictions to operate Pre-disaster Mitigation (PDM) Grants E-Grant system.	ADEM, FEMA	Completed	PDM	E-grant system required by FEMA for PDM applications.	Easier to obtain grants from FEMA.	Meets all criteria	Yes	High		ADEM assists local communities with the FEMA E-Grants System. **Evaluation: 2013** Mitigation Action has been completed.
5.1	Incorporate a progressive geographic information system (GIS) as the primary tool for spatial data management for hazard mitigation throughout the state.	ADEM	Completed	FMA, USGS and Existing state resources	GIS is best practice for interpretation of spatial data.	GIS is best technology.	Meets all criteria	Yes	Medium		Each state-owned or operated critical facility with a complete address was manually verified and exported into GIS database format. **Evaluation: 2013** Mitigation Action has been completed.
5.1	Update a structured process whereby strategic state assets such as buildings can be accurately mapped and maintained within electronic databases (latitude-longitude) to assist in assessing vulnerability of state facilities.	ADEM, Arkansas Building Authority, Arkansas Geographic Information Office, and the Arkansas Insurance Department	Completed	PDM	Will allow assessment of vulnerability and potential losses of state facilities to be completed.	Incorporation of multiple data sources.	Meets all criteria	Yes	High		Changes are being updated on a continual basis. The database has not been linked with hazard information to show vulnerability to state facilities **Evaluation:2013** GIS data is essential to the state's mapping needs. Mitigation action is similar to 4.2.2.
5.1	Expand the capabilities of the State Department of Health Emergency Communications Center and the existing laboratory facilities.	Department of Health	Completed	Existing state resources, CDC grants, DHS/FEMA grants	Improving these facilities and expanding their capabilities will greatly enhance the state's ability to respond during disease outbreaks thereby limiting damages and residual effects.	Use of technology and equipment to be more prepared for any type of disaster involving a public health response.	Meets all criteria	Yes	High		Equipment upgrades such as satellite phones have been installed in EOC's using CDC Grants. **Evaluation: 2013** Mitigation Action has been completed.
5.4	Research and develop wildfire historical database throughout the state. Collate data on a regional and local level	ADEM, Arkansas Forestry Commission, State Fire Marshall	Completed	PDM, HMGP, existing state resources	Wildfire data limitation cited in current state mitigation plan (Version 3)	By collecting advanced wildfire data, the APDMAC will formulate loss estimations for the hazard. These loss estimations will then be compared with the other natural hazard loss estimations.	Meets all criteria	Yes	Low		ADEM receives a report from the Forestry Commission. **Evaluation: 2013** Mitigation Action has been completed.
REMOVED MITIGATION ACTIONS											

New Goal / Obj.	Actions	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action	Contribution to Mitigation Objective	STAPLEE	Project Cost-Effective?	Priority	EMAP	2013 Comments and Evaluation
2.1	Fund the position of NFIP program manager that holds a Certified Floodplain Manager [CFM] certificate.	ANRC	Removed	Existing state resources	Floodplain managers must understand NFIP regulations.	Floodplain management important effort in sustainability.	Political feasibility under consideration	Pending	N/A	N/A	Arkansas currently has a CFM-rated NFIP administrator. **Evaluation: 2013** The APDMAC removed this action item. The State NFIP Coordinator is a full time position at ARNC.
4.1	Provide hazard mitigation technical assistance for local mitigation planning.	ADEM, FEMA	Removed	HMGP and Existing state resources	Local officials seldom have access to technical expertise.	Improve local mitigation planning efforts.	Meets all criteria	Yes	N/A	N/A	Hazard mitigation technical assistance is available from the ADEM Mitigation branch. **Evaluation: 2013** The APDMAC removed this action item. This is an ongoing role of the ADEM Mitigation Branch.
4.1	Collate local mitigation plan vulnerabilities assessments and estimated loss data into overall State of Arkansas mitigation strategy.	ADEM	Removed	HMGP	Local plans are required by DMA 2000 and they help the local jurisdictions and the state to improve overall mitigation strategy.	This will improve the local mitigation planning efforts.	Meets all criteria	Yes	N/A	N/A	ADEM mitigation branch works with local jurisdictions to complete hazard mitigation plans. 62 plans have been FEMA approved to date. **Evaluation: 2013** The APDMAC removed this action item. This is a regular activity with the state All-Hazards Mitigation Plan update.
4.1	Compile all local loss estimation information into the collated state plan's vulnerability analysis.	ADEM, Local emergency management organizations	Removed	PDM, HMGP, existing state resources	As local planning efforts are completed, the state can collate the local loss estimates into the overall statewide risk assessment and further refine the analysis. This more detailed information will assist the state in identifying vulnerabilities.	As the state refines the overall State Risk Assessment, ADEM will be in a better position to assist local agencies with their individual risk assessments and vulnerability analysis.	Meets all criteria	Yes	N/A	N/A	All current local FEMA approved Vulnerability Analysis data has been incorporated into the State of Arkansas All-Hazard Mitigation Plan (Version 4) **Evaluation: Evaluation: 2013** The APDMAC removed this action item. This is a regular activity with the state All-Hazards Mitigation Plan update.
5.1	Mandate the use of GIS data as a recognized essential tool in decision making.	ADEM	Removed	FMA, USGS, and Existing state resources	GIS best practice for interpretation of spatial data.	GIS best technology.	Meets all criteria	Yes	N/A	N/A	Geostor is a GIS data warehouse server open to ADEM and other agencies. **Evaluation: 2013** GIS technology will be encouraged, but not mandated. This is noted at Goal #5.
5.3	Expand the functionality of the on-line survey tool at www.arkansasmitigation.com to allow for data collection related to new activities.	ADEM	Removed	PDM, HMGP, existing state resources	This web-based tool is already developed and can easily be modified to collect additional data from the mitigation community at large.	Data from this tool can be used by ADEM to identify and prioritize projects submitted by a variety of organizations and individuals.	Meets all criteria	Yes	N/A	N/A	No action has been taken but is still proposed for future. **Evaluation: 2013** ADEM does require the use of proprietary software in the development of local hazard mitigation plans.

4.4.5 Challenges in Implementation

In general, the State has been very successful in implementing mitigation projects. This is demonstrated in Section 7.2 *Project Implementation Capability*. Funding, or lack thereof, has been a major challenge in implementing mitigation projects in Arkansas. Arkansas experiences Presidential disasters frequently and as a result obtains significant Hazard Mitigation Grant Program funds. The fact that Arkansas regularly experiences disasters presents its own special challenge, as ADEM mitigation staff are often involved in response and recovery operations in addition to mitigation program administration. Solutions to this challenge include the recent move of the FMA, RFC, and SRL grant administration to the Arkansas Natural Resource Commission. This move not only assigns new dedicated staff to the grant administration, but also aligns the flood specific grant programs with the statewide Floodplain Management Program.

4.4.6 Mitigation Success

Mitigation successes are discussed in detail in Section 7.5 *Effective Use of Available Mitigation Funding*.

4.5 Funding Sources

Requirement §201.4(c)(3)(iv): [The State mitigation strategy shall include an] identification of current and potential sources of federal, state, local, or private funding to implement mitigation activities.

Arkansas uses a variety of sources to fund state and local mitigation activities. As discussed in Section 4.2 *State Capability Assessment*, the primary sources for funding for hazard mitigation projects have been the federally funded programs available through FEMA, the State Mitigation Program, and the State Saferoom/Shelter Program. Local governments have used a variety of other sources to fund hazard mitigation projects, including local revenues, Community Development Block Grants, and a variety of transportation and public health grant programs. Few examples of private funding for mitigation actions were found, as most disaster-related private funds are for relief immediately following a disaster to meet immediate human needs. It is likely that corporations (e.g., Wal-Mart, Home Depot) could provide funding and in-kind services for various mitigation projects that meet corporate community service goals, generally at the local government or community level. Large private foundation funding for mitigation projects in Arkansas should also be explored. For example, the Walton Family Foundation, Inc. includes three foundation focus areas, two of which (the Northwest Region of Arkansas and the Delta Region of Arkansas and Mississippi) can be explored for mitigation funding – particularly as it pertains to the Foundation Focus Goal of "implementing economic/community-based strategies for sustainable development" in the Delta region of Arkansas (Phillips and St. Francis Counties).

4.5.1 Primary Hazard Mitigation Funding Sources

Pre-Disaster Mitigation Program (Federal)
Contact: Veronica Pogue, PDM-C Grant Coordinator,
501.683.6700, veronica.pogue@adem.arkansas.gov

The Pre-Disaster Mitigation (PDM) program is a FEMA grant program. In 2009, Congress amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act to reauthorize the pre-disaster mitigation program of FEMA. In addition, there is the Legislative Pre-Disaster Mitigation (L-PDM) program funded through the National Legislative Pre-Disaster Mitigation Fund. The purpose of PDM and L-PDM programs are to provide funds to states, territories, Indian tribal governments, and communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.

Project grants are available for voluntary acquisition of real property (i.e., structures and land, where necessary) for open space conversion; relocation of public or private structures; elevation of existing public or private structures to avoid flooding; structural and nonstructural retrofitting of existing public or private structure to meet/exceed applicable building codes; construction of safe rooms for public and private structures; vegetation management (e.g., for wildfire);protective measures for utilities, water and sanitary sewer systems, and infrastructure; stormwater management projects; and localized flood control projects that are designed specifically to protect critical facilities and that do not constitute a section of a larger flood control system.

Planning grants are available for new plan development, plan upgrades, and comprehensive plan reviews and updates.

- **Amount**: Up to $800,000 Federal share may be requested in a sub-application for a planning grant to develop a new hazard mitigation plan. Up to $300,000 Federal share may be requested in a sub-application for a planning grant to update a hazard mitigation plan. Up to $3 million Federal share may be requested in a sub-application to implement a mitigation project. The cumulative Federal award for sub-applications awarded during a single application cycle to any one Applicant shall not exceed 15 percent of the total appropriated PDM Program funds for that application cycle.
- **Eligibility**: In Arkansas, ADEM serves as the applicant for all PDM and L-PDM grants. State level agencies, including state institutions (e.g., state hospital or university); federally recognized Indian tribal governments; local governments (including state recognized Indian tribes and authorized Indian tribal organizations); public colleges and universities; and Indian Tribal colleges and universities are eligible to apply to ADEM for assistance as sub-applicants. Private nonprofit organizations and private colleges and universities are not eligible to apply to the State, but an eligible, relevant state agency or local government may apply on their behalf. ADEM reviews and prioritizes sub-applications and submits the grant application with sub-applications to FEMA for review and approval.
- All sub-applicants that have been identified through the NFIP as having a Special Flood Hazard Area and that have a Flood Hazard Boundary Map or a Flood Insurance Rate Map must be participating and in good standing in the NFIP. There is no NFIP participation requirement for PDM and HMGP project sub-applications for projects located outside of the SFHA. Also there are no NFIP participation requirements for PDM and HMGP hazard mitigation planning sub-applications. The latest Hazard Mitigation Assistance Unified Guidance can also provide the latest information.
- For project grants, sub-applicants must have a FEMA-approved local mitigation plan. All activities submitted for consideration must be consistent with the local mitigation plan as well as the Arkansas All-Hazards Mitigation Plan.
- **Cost-Share Requirements**: PDM and L-PDM grants are provided on a 75 percent federal/25 percent nonfederal cost share basis. Small and impoverished communities may be eligible for up -to a 90 percent federal cost-share (see Section 5.3.3 *Small and Impoverished Communities*).
- **Requirements**: Recipients of PDM and L-PDM planning grants must produce FEMA-approved hazard mitigation plans.

- ***More Information:*** Pre-Disaster Mitigation Program - www.fema.gov/government/grant/pdm/index.shtm and Hazard Mitigation Assistance (HMA) Unified Guidance http://www.fema.gov/library/

Flood Mitigation Assistance Program
Contact: Mike Borengasser, State Climatologist and NFIP State Coordinator
501.682.3969, Michael.Borengasser@arkansas.gov

The Flood Mitigation Assistance Program (FMA) is a program under FEMA's NFIP. Its purpose is to implement cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the NFIP. The FMA provides planning grants for communities to assess their flood risk and identify actions to reduce it. Planning grants may be used to develop a new or update an existing flood mitigation plan (this also applies to the flood hazard portion of multi-hazard mitigation plans).

Project grants are available for acquisition, structure demolition, or structure relocation with the property deed restricted for open space uses in perpetuity; elevation of structures; dry floodproofing of nonresidential structures; and minor structural flood control activities. Planning grants are available for flood mitigation planning activities.

- **Amount**: The FMA program is authorized by Section 1366 of the National Flood Insurance Act of 1968, as amended (NFIA), 42 U.S.C. 4104c, with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). The National Flood Insurance Fund (NFIF) provides the funding for the FMA program. The FMA program is subject to the availability of appropriation funding, as well as any program-specific directive or restriction made with respect to such funds. Individual planning grants using FMA funds shall not exceed $50,000 to any Applicant or $25,000 to any sub-applicant. FMA funds can only be used for the flood hazard component of a hazard mitigation plan that meets the planning criteria outlined in 44 CFR Part 201.
- **Eligibility**: In Arkansas, the Arkansas Natural Resources Commission (ANRC) serves as the applicant for all FMA grants. State-level agencies, federally recognized Indian tribal governments, and local governments (including recognized Indian tribes and authorized Indian tribal organizations) are eligible to apply to ANRC for assistance as sub-applicants. Individuals and private nonprofit organizations are not eligible to apply to the State, but a relevant state agency or local community may apply on their behalf. ANRC reviews and prioritizes sub-applications by the applications that include mitigating repetitive loss properties. ANRC then submits the grant application with sub-applications to FEMA for review and approval.
- All sub-applicants must be participating and in good standing in the NFIP. Also properties included in a project sub-application must be NFIP-insured at the time of the application submittal.
- For project grants, sub-applicants must have a FEMA-approved flood mitigation plan or multihazard mitigation plan that meets FMA planning requirements. All activities

submitted for consideration must be consistent with the local mitigation plan as well as the Arkansas All-Hazards Mitigation Plan.

- **Cost-Share Requirements**: FMA funds are provided on a 75 percent federal/25 percent nonfederal cost share basis. The recipient must provide the 25 percent match, only half of which may be in-kind contributions. For severe repetitive loss properties, FEMA will contribute up to 90 percent of the total eligible costs if the State has taken actions to reduce the number of severe repetitive loss properties and has an approved state mitigation plan that specifies how it intends to reduce the number of severe repetitive loss properties.
- **Requirements**: Recipients of FMA planning grants must produce FEMA-approved flood mitigation plans.
- ***More Information:*** Flood Mitigation Assistance (FMA) Program www.fema.gov/government/grant/fma/index.shtm and Hazard Mitigation Assistance (HMA) Unified Guidance http://www.fema.gov/library/

Hazard Mitigation Grant Program (Federal)

Contact: Josh Rogers, State Hazard Mitigation Officer
501.683.6700, Josh.Rogers@adem.arkansas.gov

The Hazard Mitigation Grant Program (HMGP) is a FEMA program to provide funds to states, territories, Indian tribal governments, and communities to significantly reduce or permanently eliminate future risk to lives and property from natural hazards. HMGP funds projects in accordance with priorities identified in state, tribal, or local hazard mitigation plans, and enables mitigation measures to be implemented during the recovery from a disaster. HMGP funds can be used for projects to protect either public or private property, as long as the project fits within state and local government mitigation strategies to address areas of risk and complies with program guidelines. Examples of projects include acquiring and relocating structures from hazard-prone areas; retrofitting structures to protect them from floods, high winds, earthquakes, or other natural hazards; constructing certain types of minor and localized flood control projects; and constructing safe rooms inside schools or other buildings in tornado prone areas.

The State may set aside up to 7 percent of the HMGP funds received following a presidential disaster declaration to develop FEMA-approved mitigation plans. The State may also set aside up to 5 percent of the HMGP monies to fund the State 5% Initiative Projects.

- **Amount**: Federal funding under the HMGP is available following a major disaster declaration if requested by the governor. The amount of an HMGP grant will depend on the costs associated with each individual disaster. Since the Arkansas All-Hazards Mitigation Plan is currently a standard hazard mitigation plan, the State is eligible for up to 15 percent 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 and not more than $35.3 billion.
- **Eligibility**: HMGP funds are administered by ADEM. Local governments, eligible private nonprofit organizations or institutions, and Indian tribes or authorized tribal

organizations are eligible to apply to ADEM for assistance as sub-applicants. Individuals and businesses are not eligible to apply to the State, but eligible local governments or private non-profit organizations may apply on their behalf. ADEM reviews the submitted HMGP sub-applications documents. Priority is given to flood mitigation, tornado/ severe wind, ice storm and earthquake mitigation projects located in the declared counties. If all available funds are not expended on these mitigation projects, consideration will be given to other types of mitigation projects in the declared counties prior to requesting proposals statewide. The sub-applications are sent to FEMA for review and approval.

- For project grants, sub-applicants must have a FEMA-approved local mitigation plan. All activities submitted for consideration must be consistent with the local mitigation plan as well as the Arkansas All-Hazards Mitigation Plan.
- **Cost-Share Requirements**: HMGP funds are provided on a 75 percent federal/25 percent nonfederal cost share basis. The nonfederal match does not does not need to be cash; in-kind services and/or materials may be used.
- ***More Information:*** Hazard Mitigation Grant Program www.fema.gov/government/grant/hmgp/index.shtm and Hazard Mitigation Assistance (HMA) Unified Guidance http://www.fema.gov/library/

Repetitive Flood Claims Program

Contact: Mike Borengasser, State Climatologist and NFIP State Coordinator
501.682.3969, Michael.Borengasser@arkansas.gov

The Repetitive Flood Claims (RFC) Program is a FEMA program designed to reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP that have had one or more claim payment(s) for flood damage.

Project grants are available for voluntary property acquisition, structure demolition, structure elevation, dry floodproofing of structures, and minor localized flood reduction projects. If the structure is removed, the property is deeded to the community and restricted only to open-space use. The property can never be developed again.

Planning grants and non-flood hazard mitigation activities are not available.

- **Amount**: Historically, Congress appropriated $10 million for the RFC program for each fiscal year 2006-2010. RFC grants are awarded nationally without reference to state allocations, quotas, or other formula-based allocation(s) of funds.
- **Eligibility**: RFC funds can only be used mitigate structures that are located within a state or community that cannot meet the requirements of the FMA for either cost share or capacity to manage the activities.
- In Arkansas, the Arkansas Natural Resources Commission (ANRC) serves as the applicant for all RFC grants. State-level agencies, federally recognized Indian tribal governments, and local governments (including state-recognized Indian tribes and authorized Indian tribal organizations) are eligible to apply to ANRC for assistance as sub-applicants. Individuals and private nonprofit organizations are not eligible to apply to

the State, but a relevant state agency or local community may apply on their behalf. ANRC reviews and prioritizes sub-applications and submits the grant application with sub-applications to FEMA for review and approval.

- All sub-applicants must be participating and in good standing in the NFIP.
- **Cost-Share Requirements**: All RFC grants are eligible for up to 100 percent federal assistance.
- ***More Information:*** Repetitive Flood Claims Program www.fema.gov/government/grant/rfc/index.shtm and Hazard Mitigation Assistance (HMA)Unified Guidance http://www.fema.gov/library/

Severe Repetitive Loss (SRL) Program

Contact: Mike Borengasser, State Climatologist and NFIP State Coordinator
501.682.3969, Michael.Borengasser@arkansas.gov

The Severe Repetitive Loss (SRL) program is a FEMA program with a purpose to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential properties and the associated drain on the National Flood Insurance Fund (NFIF) from such properties. FEMA defines SRL properties as residential properties that have at least four NFIP claim payments over $5,000 each, at least two of which occurred within any ten-year period, and the cumulative amount of such claims payments exceeds $20,000; or that have at least two separate claims payments (building payments only) where the total of the payments exceeds the value of the property, when two such claims have occurred within any ten-year period.

Project grants are available for flood mitigation activities such as acquisition, structure demolition, or structure relocation with the property deed restricted for open-space uses in perpetuity; elevation of structures; floodproofing of structures; minor physical localized flood control projects; and mitigation reconstruction. ADEM gives the highest priority to the sub-applicant projects that demonstrate the greatest savings to the NFIP based on a benefit cost ratio.

Planning grants are not available.

- **Amount**: The SRL program was authorized for up to $40 million for fiscal years 2006 and 2007. Then up to $80 million in fiscal years 2008 and 2009 and $70 million in fiscal year 2010. The SRL program is subject to the availability of appropriation funding, as well as any directive or restriction made with respect to such funds.
- **Eligibility**: In Arkansas, the Arkansas Natural Resources Commission (ANRC) serves as the applicant for all SRL grants. State-level agencies, federally recognized Indian tribal governments, and local governments (including recognized Indian tribes and authorized Indian tribal organizations) are eligible to apply to ANRC for assistance as sub-applicants. Individuals and private nonprofit organizations are not eligible to apply to the State, but a relevant state agency or local community may apply on their behalf. ANRC reviews and prioritizes sub-applications and submits the grant application with sub-applications to FEMA for review and approval.

- All sub-applicants must be participating and in good standing in the NFIP and an approved local mitigation plan is required.
- **Cost-Share Requirements**: SRL grants are provided on a 75 percent federal/25 percent nonfederal cost share basis. Up to 90 percent federal cost-share funding may be available for projects approved in states, territories, and federally recognized Indian Tribes with FEMA approved standard or enhanced mitigation plans or Indian tribal plans that include a repetitive loss strategy for mitigating existing and future SRL properties.
- ***More Information:*** Severe Repetitive Loss Program www.fema.gov/government/grant/srl/index.shtm and Hazard Mitigation Assistance (HMA)Unified Guidance http://www.fema.gov/library/

Public Assistance Program (Federal)
Contact: Jodi Lee, Recovery Branch Manager
501.683.6700, Jodi.Lee@adem.arkansas.gov

Section 406 (Public Assistance) of the Stafford Act establishes the program for the repair, restoration, and replacement of facilities damaged as a result of a presidentially declared disaster. These funds can also be used for hazard mitigation measures a state or local government determines to be necessary to meet a need for governmental services and functions in the area affected by the major disaster. Section 406 mitigation funds can only be used in the declared disaster areas (usually counties) and only in conjunction with identified, eligible disaster projects that will strengthen existing infrastructure and facilities to more effectively withstand the next disaster. One example would be replacing a blown out culvert with one designed to convey higher flows, instead of one that will be easily damaged in a flood again.

Eligibility: State-level agencies, federally recognized Indian tribal governments, and local governments (including state-recognized Indian tribes and authorized Indian tribal organizations) are eligible to apply to ADEM for assistance.

Cost-Share Requirements: Public Assistance grants are provided at not less than 75 percent federal/25 percent nonfederal cost share basis for emergency measures and permanent restoration. All projects approved under State disaster assistance grants will be subject to the cost sharing provisions established in the FEMA-State Agreement and the Stafford Act.

More Information: FEMA's Public Assistance Program
http://www.fema.gov/plan/ehp/noma/projects2.shtm

4.5.2 ADEM Funding Sources

The Arkansas Department of Emergency Management is the lead agency for emergency planning and hazard mitigation in the state. While assessing the overall funding sources and contacting the various agencies, the APDMAC determined that ADEM required separate treatment due to the number of individual programs and the overall focus on disaster planning, response and recovery. Based on this decision, the various funding programs managed by ADEM were extracted from the complete state agency listing. These ADEM-managed programs are listed separately in this section and are prioritized over the remaining agency programs due to their primary focus on disaster planning and hazard mitigation. The various ADEM-managed funding programs are listed below along with detailed program descriptions.

Emergency Management Performance Grant (EMPG)
Contact**:** Mike Carraway, Administration Division Director

- **Award Range:** The amount awarded to each county is a fixed base amount with additional amounts based on population. Requires a fifty percent, non-federal match. Match must be provided by the receiving entity.
- **Description:** EMPG reimburses certain eligible expenses, under program guidelines, to support state and local emergency management costs. Eligibility of all counties, cities of Little Rock & North Little Rock. Deadlines and restrictions begin from October 1, thru September 30 each year.

State Homeland Security Grant Program
Contact: Kathy Wright, Domestic Preparedness Branch Manager

- **Award Range:** Based upon assessment of needs and vulnerabilities and population of each county, along with other program priorities/ authorizations.
- **Description:** This grant is specifically designed to address the homeland security and response capabilities in Arkansas by providing specific equipment and training to first responders and state agencies based on the needs and vulnerabilities and population of each county, along with other program priorities and authorizations. Eligibility includes all counties participating in the needs assessment. The deadlines are based on each grant timeframe. Counties receiving funding must participate within the strict guidelines of the grant program, including providing mutual aid to surrounding counties, completing a terrorism annex to their EOP and holding an annual terrorism exercise. Equipment purchased through the grant will be tracked by the local jurisdiction and reported to ADEM for three years after the close of the grant.

Citizen Corps (Now part of the Homeland Security Grant Program)
Contact: Brandon Morris, State Citizen Corps Coordinator

- **Award Range:** State funding determined by formula through DHS. Amount of funding to local jurisdictions dependent upon programs offered and amount provided to the state.

- **Description:** The Citizen Corps Program is part of the overall Homeland Security efforts in Arkansas and the nation. The program allows for the establishment of local Citizen Corps Councils and the accomplishment of Community Emergency Response Team (CERT) training. Training is designed to give individuals and families the basic skills to help themselves and their neighbors during disasters as well as work with local emergency management to develop and promote awareness of disasters and safety practices. Other programs include Neighborhood Watch (NW), Volunteers in Police Service (VIPS), and Medical Reserve Corp (MRC). For eligibility all counties participating in the needs assessment will either have a current Citizen Corp Council or are in the process of developing one. Deadlines are based on each grant timeframe as provided by DHS. Counties receiving funding must participate within the strict guidelines of the grant program.

Citizen Corps / CERT Supplemental Grant
Contact: Brandon Morris, State Citizen Corps Coordinator

- **Award Range:** First round grants were for a maximum of $5,100.00 ($1,000 for Citizen Corps Local Council development and $4,100.00 for Community Emergency Response Team (CERT) team development). Eligible jurisdictions may request additional funding to train additional CERT teams.
- **Description:** Citizen Corps program is part of the overall Homeland Security efforts in Arkansas and the nation. The program allows for the establishment of local Citizen Corps Councils and the accomplishment of Community Emergency Response Team (CERT) training. The training is designed to give individuals and families the basic skills to help themselves and their neighbors during disasters as well as work with local emergency management to develop and promote awareness of disasters and safety practices. Eligibility includes all counties and cities of Little Rock and North Little Rock. Funds granted through request for proposal system. Citizen Corps strives to bring together government and community leaders in all-hazards emergency preparedness. FEMA's Comprehensive Planning Guide 101 emphasizes that the most realistic and complete plans are prepared by a "team that includes representatives of the departments and agencies, as well as private sector and NGOs."

Act 833 Fire Grant Program
Contact: Kendell Snyder, ADEM Fire Services Coordinator

- **Award Range:** Act 833 of 1991 provides one half of 1% of all turn back funds from fire insurance premiums to be divided among the seventy-five counties in Arkansas according to population. The funds in each county are divided according to population unless the county Intergovernmental Cooperation Council notifies the Quorum Court of needs of the fire departments, in which case the Quorum Court apportions the money according to those needs.
- **Description:** Act 833 funds are to be used for training, fire fighting equipment, and initial capital construction or improvements of fire departments.

Hazardous Materials Emergency Preparedness Training and Planning Grants
Contact: Kenny Harmon, Hazardous Materials Program Manager

- **Award Range:** $0 – $159,000
- **Description:** The Hazardous Materials Emergency Preparedness (HMEP) grant program is intended to provide financial and technical assistance as well as national direction and guidance to enhance state, territorial, tribal, and local hazardous materials emergency planning and training. The HMEP Grant Program distributes fees collected from shippers and carriers of hazardous materials for HAZMAT training and HAZMAT planning. In order to become eligible, the state manages grants to provide training to local jurisdictions. There are no stipulations or deadlines for local jurisdictions. Jurisdictions should request hazardous materials training from ADEM.

Chemical Stockpile Emergency Preparedness Program (CSEPP)
Contact: Sandi Hensley, CSEPP State Coordinator

- **Award Range:** Varies according to specific needs.
- **Description:** Funding identified and provided to jurisdictions/support agencies for "off-post" preparedness. Eligibility includes designated agencies, and county jurisdictions that participate or support the CSEP Program to provide emergency preparedness and response to the communities surrounding the Pine Bluff Arsenal. Those counties are: Arkansas, Cleveland, Dallas, Grant, Jefferson, Lincoln, Lonoke, Prairie, Pulaski and Saline. (100% administered by FEMA, ADEM is the grantee). Full participation is required to receive funding to meet deadlines. Multiple administrative and financial benchmarks required.

4.5.3 Other Sources of Federal and State Funding and Technical Assistance

While the Arkansas Department of Emergency Management 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 in order to develop a complete picture of the overall funding sources available throughout the state. All identified funding sources are listed below with detailed descriptions and current 2010 contact information for the program managers. 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.

Arkansas Department of Economic Development
Community Development Block Grant Program
Contact: J. Basil Julian, Grants Division Director
501.682.7392, bjulian@arkansasEDC.com

- **Award Range:** Varies depending on program type.
- **Description:** HUD funded program administered by the Arkansas Department of Economic Development to make grants to communities and loans to businesses for community and economic development. Project types are senior centers, water, wastewater, public health facilities, fire protection, community/multi-purpose centers, child care, and economic development projects. Eligible communities must be 51% low and moderate income. Only non-entitlement communities are eligible to apply. In order to manage the program effectively, ADED relies on several agencies working in partnership. The Arkansas Recovery Office is distributing $5.1 million to Arkansas communities. The 13 grants are part of the American Recovery and Reinvestment Act (ARRA). The projects have been approved and are funded by the U.S. Department of Housing and Urban Development (HUD) through the Community Development Block Grant (CDBG) program.

Arkansas Department of Finance & Administration
Protection Program – Act 833
Contact: Richard Drilling, Fiscal Account Manager
501-324-9062, richard.drilling@dfa.state.ar.us

- **Description:** Since January 1992, an extra 1/2 of 1% premium tax has been collected for the Fire Protection Program - Act 833. Disbursements are made to fire departments with the funds being used for training, equipment, and construction. Funding has helped fire departments become certified or obtain a better certification rating. Each county decides on the distribution of its funds based on the fire department's needs. The Arkansas Department of Emergency Management handles the administrative portion of the program.

Arkansas Department of Health
Applied Research Grant Program
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

- **Award Range:** Average project grant $48,700
- **Description:** Arkansas colleges and universities in conjunction with private industry use this grant. The matching grant program is used to support company-defined applied research in science and engineering.

Arkansas Department of Health
Basic Research Grant Program
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

- **Award Range:** Average project grant $40,000
- **Description:** Arkansas colleges and universities use this grant. The competitive grant program is used to support building basic research capacity in college and university science and engineering departments. The purpose of the Basic Research Grant Program is to promote and support the growth and development of Arkansas scientists and to enhance the status of science and engineering in Arkansas colleges and universities. The Arkansas Science & Technology Authority's Basic Research Grant Program is a competitive, (60 percent state: 40 percent institution) matching grant effort to support basic research in science and engineering. Three avenues: CDC, HHS/ASPR (Hospital Preparedness) and Pandemic Influenza planning.

Arkansas Department of Health
EMS Revolving Fund Grant
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

- **Award Range:** Up to $10,000
- **Description:** Matching equipment grant. Total amount available to communities: $275,000

Arkansas Department of Health
Local Grant Trust Fund
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

- **Award Range:** $3,982
- **Description:** This fund is used for the renovation of the State Health Building and for the construction and renovation of approved local health unit facilities in the state. The Individual and Family Grant Program repair placement of personal property; repair and

replacement of the primary residence; funeral and medical expenses and essential transportation. Three avenues: CDC, HHS/ASPR (Hospital Preparedness) and Pandemic Influenza planning.

Arkansas Department of Health
Bioterrorism Preparedness Program
Contact: William Mason, MD, MPH, Branch Chief
501.661.2482, pande.contactus@arkansas.gov

- **Award Range:** Up to $260k
- **Description:** This program manages the state's public health planning for potential bioterrorism events. Responsibilities include working directly with local agencies on planning and response capabilities and managing the various federal health-related grants mainly from the CDC.

  The CDC awards nearly 85 percent of its budget through grants and contracts to help accomplish its mission to promote health and quality of life by preventing and controlling disease, injury, and disability. Contracts procure goods and services used directly by the agency, and grants assist other health-related and research organizations that contribute to CDC′s mission through health information dissemination, preparedness, prevention, research, and surveillance.

US Department of Justice
Office of Community Oriented Policing Services (COPS)
Contact: Ramesa Pitts, Grant Program Specialist
202.616.9775, ask.COPS@usdoj.gov

- **Award Range:** Maximum grant amount is 15 million
- **Description:** The COPS Methamphetamine Initiative received $40,385,000 for agencies specified in the Consolidated Appropriations Act, 2010 (P.L. 111-117). COPS Meth grants provide funding that supports enforcement, training, and prevention activities nationwide, but is concentrated in areas with the greatest need for assistance in combating meth production, distribution, and use. The COPS Office encourages agencies to focus on community policing approaches to meth reduction. COPS also works directly with state and local law enforcement agencies to craft innovative strategies, track and evaluate their implementation, and disseminate results to other jurisdictions confronting similar challenges. COPS award millions of dollars every year to help the community policing program keep America safe by distributing funding through a wide range of programs, both as grants and cooperative agreements. From 1995 to the current date, $117,758,890 in COPS grants were awarded to law enforcement agencies in the State of Arkansas Grants were made available for COPS Hiring Recovery Program (CHRP), Tribal Resources Grant Program and Secure Our Schools Program in 2009.

Arkansas Department of Parks & Tourism
50/50 Matching Grant
Contact: Richard Davies, Executive Director
501.682.2535, richard.davies@arkansas.gov

- **Award Range:** Maximum grant amount is $250,000
- **Description:** Arkansas City and county governments may apply for annual competitive grants that may be used to acquire parkland and/or develop public outdoor recreation facilities. Application deadline is the last Friday each August.
- **Funding:** 50/50 Matching Grant for park development and land acquisition $250,000 and (2) Trails for life non-matching grants to develop standard health and fitness trials 1/4 mile $35,000 and custom health & fitness projects $70,000. The fun park has changed to $40,000.

Arkansas Department of Parks & Tourism
Fun Park Grant
Contact: Richard Davies, Executive Director
501.682.2535, richard.davies@arkansas.gov

- **Award Range:** Up to $45,000
- **Description:** Arkansas cities with a population of 2500 persons or fewer (unincorporated rural areas must apply through the county) may apply for $45,000 to develop a localities first park with basic recreation facilities. No match is required but, the applicant must provide land for development by ownership or 25 year lease. Grant funds must be used to develop an all-inclusive park limited to only basketball courts, baseball or softball fields, play ground equipment, picnic sites, pavilion, and support facilities. 50/50 Matching Grant for park development and land acquisition. Only unincorporated rural communities in each of the 75 counties and incorporated cities with a population of less than 2,500, as established by the 2000 census, are eligible for grant funding.

Arkansas Department of Rural Services
County Fair Building Grant
Contact: Shana Fryar, Grants Analyst
501-682-6011, shana.fryar@arkansas.gov

- **Award Range:** $4,000 maximum
- **Description:** County Fair Associations located in counties of fewer than 55,000 in population are eligible for up to $4,000 and are eligible for construction or renovation of buildings on the county fair grounds and other general improvement projects. Match ratio is 50/50. Contact Grants Coordinator for specifics and eligible projects.

Arkansas Department of Rural Services
Rural Community Development Grant
Contact: Shana Fryar, Grants Analyst

501-682-6011, shana.fryar@arkansas.gov

- **Award Range:** $15,000 maximum
- **Description:** Applicants from incorporated towns of less than 3,000 in population and unincorporated rural areas are eligible for up to $15,000 in matching funds under this program. The match ratio on the program is 50/50. Communities wishing to apply for projects under the program must provide one half of the cost of the project as match. Match may be comprised of in-kind labor, in-kind materials or cash and must be available at the time of application. Applications for this program are accepted August through March of each year. Communities in the past have received funding for baseball/softball fields, community centers, walking tracks, park and playground equipment, pavilions, picnic tables, and library shelving. 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 Fire Protection Grant
Contact: Shana Fryar, Grants Analyst
501-682-6011, shana.fryar@arkansas.gov

- **Award Range:** $15,000 maximum
- **Description:** Applicants from incorporated towns of less than 3,000 in population and unincorporated rural areas are eligible for up to $15,000 in matching funds under this program. The match ratio on the program is 50/50. Communities wishing to apply for projects under the program must provide one half of the cost of the project as match. Match may be comprised of in-kind labor, in-kind materials or cash and must be available at the time of application. Applications for this program are accepted August through March of each year. Communities in the past have received funding for baseball/softball fields, community centers, walking tracks, park and playground equipment, pavilions, picnic tables, and library shelving. 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 Services Block Grant
Contact: Lauren Gabriel, Grants Coordinator
501-682-6011, lauren.gabriel@gmail.com

- **Award Range:** $30,000 or up to $50,000 with written request
- **Description:** CDBG rural set-aside and made possible through partnership with the Arkansas Department of Economic Development. Eligibility to rural incorporated cities and unincorporated communities of fewer than 3,000 in population with at least 51% of project service area falling in 51% low-to-moderate income range. Annual grant- Match ratio 9:1 or match 10% of total project cost. Eligible projects include renovation or new

construction of community centers, fire station buildings, or multi-purpose centers, or the purchase of fire trucks (pumper, tanker, brush or service trucks). Program rules and regulations are being revised.

Arkansas Forestry Commission
Community Forestry Grants
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

- **Award Range:** $327,975 new funds
- **Description:** 50/50 matching grants to communities for community forestry planning, tree planting, and tree maintenance. The community match is "in-kind." Four hundred ninety seven landowners applied for $8,000,000 to reduce wildfire hazards in their forests. Only $1,300,000 is available. On Dec. 15, 2009, AFC conducted a random drawing of the applications at the Ozark Folk Center in Mountain View to determine ranking for consideration of funding.

Arkansas Forestry Commission
Volunteer Fire Assistance
Contact: Joe Fox, State Forester
501.296.1941, joe.fox@arkansas.gov

- **Award Range:** up to $215,260
- **Description:** 50/50 matching grants to volunteer fire departments, with funds used to buy tools, small equipment, and safety gear. Volunteer Fire assistance grants are usually available in May or June every year to fire departments that serve 10,000 or fewer people. Eligible departments must match the grant on a 50-50 basis with non-federal funds.

Arkansas Highway & Transportation Department
Bridge Replacement and Rehabilitation Program
Contact: David Mayo, State Aid Division Head
501-569-2346, david.mayo@arkansashighways.com

- **Award Range:** Up to $1 million in federal aid and $350k for signal/intersection projects
- **Description:** 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. Replacement structures must comply with current structural standards for the type and volume of traffic the facility will carry over its design life. Bridge rehabilitation consists of work necessary to restore structural integrity or correct major safety concerns. To qualify, a bridge must have a sufficiency rating of 80.0 or less and be classified as functionally obsolete or structurally deficient. The Department of Transportation is providing more than $24 million in grants to eight states in the Delta region. In addition

to Arkansas, states receiving grants are Alabama, Illinois, Kentucky, Louisiana, Mississippi, Missouri and Tennessee.

Arkansas Highway & Transportation Department
Recreational Trails Program
Contact: Bill Bastress, Recreational Trails Coordinator
501-569-2209; bill.bastress@arkansashighways.com

- **Award Range:** Based on available federal aid
- **Description:** Provides funds for construction and maintenance of motorized, non-motorized, and multiple-use recreational trails. Projects are solicited through an annual application process. Local, state, and federal government agencies, as well as private, non-profit organizations are eligible to submit project applications.

Arkansas Highway & Transportation Department
Safety Program
Contact: David Mayo, State Aid Division Head
501-569-2346, david.mayo@arkansashighways.com

- **Award Range:** Federal aid for these projects ranges from ninety to one hundred percent.
- **Description:** Provides funds for safety projects anywhere within the state. Eligible projects under this program for local roads and streets include railroad crossings protection and railroad grade separations and relocations.

Arkansas Highway & Transportation Department
State Aid Program for County Roads and Bridges
Contact: David Mayo, State Aid Division Head
501-569-2346, david.mayo@arkansashighways.com

- **Award Range:** Governed by Act 445 of 1973, funding normally 90%
- **Description:** Program consists of projects on major and minor collector routes not on the State Highway System that connect with local trade areas or state highways. Funds are used to construct, improve, widen, straighten, surface or reconstruct state aid roads.

Arkansas Highway & Transportation Department
Surface Transportation Program (STP)
Contact: David Mayo, State Aid Division Head
501-569-2346, david.mayo@arkansashighways.com

- **Award Range:** Up to $1 million in federal aid, $350k for signal/intersection projects
- **Description:** Provides funds for projects in unincorporated areas and cities with fewer than 200,000 in population. Roadway projects, such as new construction, restoration, reconstruction, rehabilitation, resurfacing, operational improvements, bridge projects,

safety projects and other transportation enhancements may be undertaken on any public road functionally classified other than a rural minor collector or local road.

Arkansas Highway & Transportation Department
Transportation Enhancement Program
Contact: Bethany Swindell, Disaster Liaison
501-569-2930, bethany.swindell@arkansashighways.com

- **Award Range:** Up to $400,000 in federal aid
- **Description:** Provides funds for transportation enhancement activities, i.e., educational activities and facilities for pedestrians and bicyclists; acquisition of scenic easements and scenic historical sites; landscaping and other scenic beautification; and rehabilitation and operation of historic transportation buildings, structures, or facilities. Cities and counties must apply for enhancement project funding and are notified when applications are being accepted.

Arkansas Highway & Transportation Department
Safe Route to Schools Program
Contact: Kimberly Sanders, Safe Routes to School Coordinator
501-569-2020, kim.sanders@arkansashighways.com

- **Award Range:** Up to $1 million in federal grants
- **Description:** Funds for education infrastructure to make it safer. Assist with kids from kindergarten through eighth grade to walk, bicycle to and from school.

Arkansas Livestock and Poultry Commission
Fair Construction Funds
Contact: Dr. George Badley, DVM, State Veterinarian
501-907-2400, pbadley@alpc.ar.gov

- **Award Range:** $0 - $847,200.
- **Description:** Used by various fair associations for construction, repairing and improving the facilities and paying existing indebtedness incurred for such purposes. To safeguard human and animal health, assure food safety and quality, and promote Arkansas livestock and poultry industries for the benefit of our citizens. No new grants awarded.

Arkansas Livestock and Poultry Commission
Livestock Inspection and Disease Control Program
Contact: Dr. George Badley, DVM, State Veterinarian
501-907-2400, pbadley@alpc.ar.gov

- **Award Range:** Varies depending on the jurisdiction and the proposed projects.
- **Description:** Suppression and eradication of animal diseases. The Commission works closely with USDA, Veterinary Services in controlling the movements of livestock on an

intra and interstate basis to ensure compliance with state disease control laws and regulations. This encompasses the inspection of virtually all herds of cattle and swine in the state, as well as surveillance of auction barns, livestock dealers and garbage feeding establishments. The Commission, through this program, strives to protect livestock and poultry industries from dreaded and costly diseases that would affect production and marketability.

Arkansas Natural Resources Commission
Beaver Project Funding
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** $5.00 per beaver
- **Description:** This grant is used to help control Arkansas' beaver population. The grant reimburses conservation districts $5.00 per beaver for payments districts make to beaver harvesters.

Arkansas Natural Resources Commission
Clean Water Revolving Loan Fund
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** Low interest loans.
- **Description:** New collection systems; rehabilitation of existing collection systems; new treatment systems; rehabilitation of existing treatment systems. Eligible entities: cities, towns, counties, public facilities boards, improvement districts, regional wastewater treatment districts.

Arkansas Natural Resources Commission
Drinking Water State Revolving Fund
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** Low interest loans
- **Description:** All projects funded through this program must be on the DWSRF priority list. The priority list is prepared by the Arkansas Department of Health and Human Services. Types of Projects: compliance, public health, water supply, treatment, distribution storage, planning and design, consolidation, restructuring. Eligible entities: cities, towns, counties, public facilities boards, public water authorities, improvement districts, regional water distribution districts, regional development authorities.

Arkansas Natural Resources Commission
Grants to Districts
Contact: Mark Bennett, ANRC Water Resources Development Director

501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** $0-$25,000
- **Description:** This grant is used by conservation districts to fund additional positions and programs. This money is primarily used to fund extra hours for district secretaries and to hire technicians. Only soil and water conservation districts are eligible for this grant.

Arkansas Natural Resources Commission
Non-Point Source Pollution Management Grant
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** $0 - $1,000,000
- **Description:** The ANRC accepts grant applications for non-point source pollution (NPS) management projects. The main purpose of the grant is to fund NPS reduction and/or abatement, demonstration, and educational projects within prioritized watersheds. Any non-federal government agency, educational institution, or nonprofit corporation is eligible for funding under this program. This program is funded by US EPA, thus federal agencies and "for profit" groups are not eligible for assistance. SPECIAL REQUIREMENTS: The ANRC requires that section 319(h) grant recipients provide non-federal match in the amount of 43% of the entire project costs. Funds and services used as match shall not be utilized as match for any other federal grant program and shall not in any way be paid by federal funds.

Arkansas Natural Resources Commission
Water Development Fund
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** Loans (5% interest) deferred loans, grants and joint ventures
- **Description:** On water projects, conditions of assistance are determined by comparison of proposed water rates to median household income. Allowances are made for greater than state average incidence of low income, unemployed or elderly persons. Types of projects: public water supply, irrigation, flood control and/or drainage, erosion and sediment control, stream bank stabilization, recreation and/or fish & wildlife, hydroelectric power, navigation. Eligible entities: cities, towns, counties, public facilities boards, public water authorities, conservation districts, water associations (with co-sponsor), improvement districts, regional water distribution districts, levee and drainage authorities.

Arkansas Natural Resources Commission
Water Resources Cost Share Revolving Fund
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** Loans (5% interest) deferred loans, grants and joint ventures
- **Description:** This program is typically used to provide local cost-share of large federal projects. Types of projects: 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. Eligible entities: cities, towns, counties, improvement districts, public facilities boards, public water authorities, regional irrigation water distribution districts, regional development authorities, conservation districts.

Arkansas Natural Resources Commission
Water, Sewer, and Solid Waste Fund
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** Loans (5% interest) deferred loans, grants and joint ventures
- **Description:** On water and sewer projects, conditions of assistance are determined by comparison of proposed water or sewer rates to median household income. Allowances are made for greater than state average incidence of low income, unemployed or elderly persons. Types of projects: public water supply, sewer systems, solid waste collection/disposal. Eligible entities: cities, towns, counties, water associations, improvement districts, public facilities boards, public water authorities, rural development authorities, regional water distribution districts, regional solid waste authorities, regional wastewater treatment districts

Arkansas Natural Resources Commission
Water, Waste Disposal and Pollution Abatement Facilities General Obligation
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** Bonds up to 30 years or life of project, whichever is less. Current market tax-exempt interest rate of the state's G.O. Bond Issue
- **Description:** Types of projects: water (supply, storage, distribution and irrigation), solid waste landfills, solid waste recycling facilities, wastewater collection systems, wastewater treatment facilities, non-point source reduction. Eligible entities: cities, towns, counties, improvement districts, rural development authorities, regional solid

waste authorities, regional water distribution, districts, regional wastewater treatment districts, public facilities boards, public water authorities.

Arkansas Natural Resources Commission
Tax Credit Incentive Program
Contact: Mark Bennett, ANRC Water Resources Development Director
501-682-3978, mark.bennett@arkansas.gov

- **Award Range:** This is a tax credit program, not a direct grant program.
- **Description:** The purpose of this program is to encourage water users to invest in (1) the construction of impoundments to use available surface water, thereby reducing their dependence on groundwater; (2) the conversion from ground water use to surface water use; and (3) land leveling to reduce agricultural irrigation water use. Tax credits may pass through partnerships, corporations, etc.

Arkansas State Police
State and Community Highway Safety Program
Contact: Bridget White
501-618-8136, bridget.white@asp.arkansas.gov

- **Award Range:** Varies based on project activities and scope of work
- **Description:** Funded primarily by Title 23, U.S.C., Section 402, these grant funds are administered by the State Highway Safety Office to fund highway safety projects by state, local and non-profit agencies that are most effective in reducing traffic fatalities, crashes and injuries. These projects focus primarily on alcohol and other drug countermeasures, occupant protection, police traffic services, speed control, traffic records, emergency medical services, motorcycle safety, pedestrian and bicycle safety, and roadway safety.

Department of Arkansas Heritage-Arkansas Historic Preservation Program
Certified Local Government Grant
Contact: Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

- **Award Range:** No minimum or maximum
- **Description:** Grant to communities participating in or pursuing membership in the Certified Local Government program using federal pass through funds from AHPP's annual federal grant. Funds can be used for surveying historic districts, staff training, conference registration, and building restoration. Fourteen Arkansas cities currently participate in the Certified Local Government program: Conway, El Dorado, Eureka Springs, Fort Smith, Helena-West Helena, Hot Springs, Little Rock, Morrilton, North Little Rock, Osceola, Pine Bluff, Rogers, Texarkana, and Van Buren.

Department of Arkansas Heritage - Arkansas Historic Preservation Program

Courthouse Restoration Grant
Contact: Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

- **Award Range:** No minimum or maximum
- **Description:** Sub grant, funded by a grant from the Arkansas Natural and Cultural Resources Council, using Real Estate Transfer Tax, for restoration of county courthouses and annexes listed on the National Register of Historic Places. Conservation easement is required. Commercial based organization that has money going to different projects.

Department of Arkansas Heritage - Arkansas Historic Preservation Program
Historic Preservation Restoration Grant
Contact: Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

- **Award Range:** Minimum $10,000
- **Description:** Matching grant (2:1), funded by the Real Estate Transfer Tax, for restoration of properties listed on the National Register of Historic Places. Applicant must be a local government (city, county, school district) or 501[c]3, and must give a conservation easement on the property prior to receiving funds.

Department of Arkansas Heritage - Arkansas Historic Preservation Program
Main Street Model Business Grant
Contact Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

- **Award Range:** Minimum $10,000
- **Description:** Grant to participating local Main Street organizations to fund facade improvements, retail design improvements, and business consultation for a local business, which then serves as a model for downtown redevelopment. Funded using Real Estate Transfer Tax.

Department of Arkansas Heritage - Arkansas Historic Preservation Program
Main Street Downtown Revitalization Grant
Contact: Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

- **Award Range:** $5000 to $10,000
- **Description:** Grant to participating local Main Street organizations to fund facade and streetscape improvements in the downtown business district. Awards distributed by formula to all participating Main Street organizations. This was funded using Real Estate Transfer Tax. The Main Street area revitalization efforts seek to rejuvenate older, downtown business districts while retaining the area's traditional and historic character.

Department of Arkansas Heritage - Arkansas Historic Preservation Program
General Improvement Fund
Contact: Joia Burton, Grants Administrator
501-324-9880, joia@arkansasheritage.org

- **Award Range:** $6000 to $25,000
- **Description:** Loose grant funded project by Legislature and Supreme Court votes. Department of Finance Administration is one of the key sources when funding these projects. The state General Improvement Fund is a pot of money that's divided every year into capital improvement projects, such as new buildings for state colleges and universities.

4.5.4 Local Funding

Local governments receive most of their funding for mitigation projects from the federal programs discussed in the previous section. Sources of local funding include tax-funded investments (predominantly from property and sales tax) in infrastructure improvements and dedicated transportation/capital improvements sales or use taxes, all of which can also serve to mitigate hazards. A sales tax or bond issue to fund mitigation would require a vote of residents and could be difficult to pass. More information about local funding can be found in Section 4.3.2 *Local Policies, Programs, and Capabilities* and Section 7.5 *Effective Use of Available Mitigation Funding*.

4.6 Arkansas Repetitive Flood Loss Strategy

Requirement §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... that also identified 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.

Requirement 44 C.F.R. §201.4(c)(3)(v): 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.

4.6.1 Background on the NFIP and Repetitive Loss

Flooding is the most common natural hazard in the United States. More than 20,000 communities experience floods and this hazard accounts for more than 70 percent of all Presidential Disaster Declarations. Over 8 million residential and commercial structures in the US are currently built in areas subject to flooding. The costs of these disasters are spread among local, state and federal governments and the individual victims themselves.

The National Flood Insurance Program (NFIP) is continually faced with the challenge of balancing the financial soundness of the program with competing expectation of keeping flood insurance premiums affordable. One of the largest obstacles to achieving financial soundness of the NFIP is repetitive-loss properties (RLP).

Since the inception of the NFIP, almost 9 billion have been paid out to RL properties, about one-fourth of all NFIP payments. Since 1978 (the year that detailed record keeping started for RLPs), approximately 160,000 RLPs have been identified in the United States. While many communities have practiced sound floodplain management principals, and many of these structures are no longer insured, RLPs continue to be a drain on the National Flood Insurance Fund. Currently RLPs only represent 1.3% of all NFIP policies, but are expected to account for between 15 to 20 percent of all future losses. This is why the Federal Emergency Management Agency (FEMA) has recently placed greater emphasis on addressing this problem. To focus more resources on these high risk properties, Congress defined a subset called “Severe Repetitive Loss Properties” when it passed the National Flood Insurance Reform Act of 2004.

Another obstacle to achieving financial soundness of the NFIP is that FEMA has not historically been allowed to eliminate coverage for any policy holder including high-risk properties. FEMA has only been authorized by Congress to make incremental adjustments to increase premium rates and reduce overall coverage. Since repetitive flood claims must be paid, FEMA has had no choice but to spread these costs among all policy holders.

In addition to these two obstacles, recent major disaster declarations more specifically Hurricane Katrina depleted the Flood Insurance Fund and required FEMA and the NFIP to borrow significantly from the Treasury Department to meet claim obligations. Because of these recent disasters, the NFIP (as of September 30, 2011) has accrued substantial debt of $17.75 billion dollars according to a June 12, 2012 report from the Congressional Research Service (CRS).

The CRS June 2012 report went on to indicate that due to analysis of major flood events in 1993, 2005, 2008, 2010 and 2011, many people who live in high-risk areas and suffered flood damage had either not purchased flood insurance or they let their flood insurance policies lapse due to nonpayment. As a result, these uninsured losses created increased emergency disaster assistance spending on flood victims.

Increased costs associated with flood events is evidenced in **Table 4.7** which lists the top 15 floods in terms of NFIP payouts. The 2005 Hurricanes led many to surmise that there may be a trend in the frequency and costs associated with future flood events.

Table 4.7 Top 15 Significant Flood Events Covered by the National Flood Insurance Program (1978 to March 31, 2012; $ nominal)

Rank	Event	Date	Number of Paid Losses	Amount Paid	Average Paid Loss
1	Hurricane Katrina	Aug. 2005	167,216	$16,172,136,626	$96,714
2	Hurricane Ike	Sept. 2008	46,219	2,629,409,589	56,890
3	Hurricane Ivan	Sept. 2004	27,637	1,582,348,735	57,255
4	Tropical Storm Allison	June 2001	30,6632	1,103,877,235	36,000
5	Louisiana Flood	May 1995	31,343	585,071,593	18,667
6	Hurricane Isabel	Sept. 2003	19,860	492,830,017	24,815
7	Hurricane Rita	Sept. 2005	9,504	470,413,959	49,496
8	Hurricane Floyd	Sept. 1999	20,438	462,268,248	22,618
9	Hurricane Opal	Oct. 1995	10,343	405,527,543	39,208
10	Hurricane Hugo	Sept. 1989	12,840	376,433,739	29,317
11	Hurricane Wilma	Oct. 2005	9,609	363,798,528	37,860
12	Nor'easter	Dec. 1992	25,142	346,150,356	13,768
13	Midwest Flood	June 1993	10,472	272,819,515	26,052
14	PA, NJ, NY Floods	June 2006	6,410	227,475,398	35,488
15	Nor'easter	Apr. 2007	8,639	225,623,333	26,117

Source: U.S. Department of Homeland Security, Federal Emergency Management Agency.

Based on these trends and to make the NFIP more financially stable and long lasting, Congress passed the National Flood Insurance Reform Act of 2012 (Biggert-Waters Flood Insurance Reform Act of 2012) which calls on FEMA and other agencies to make significant changes to the way the NFIP is run. Key provisions of the legislation will require the NFIP to raise rates to reflect the true flood risk, make the program more substantially sound and change how Flood Insurance Rate Map (FIRM) updates impact policy holders. It is important that not every policy holder will be affected by this legislation. Owners of subsidized policies, which generally include pre-FIRM structures, will see the most dramatic increase in rates. Individuals who have secondary homes in high-risk areas will also see increases in flood insurance rates.

Table 4.8 indicates that presently, the NFIP has nearly 5.6 million policies in force covering almost $1.2 trillion in property in around 20,000 participating communities. These 5.6 million policies generated $3.35 billion in premiums in 2011. Six times in the 44 year history of the NFIP, payouts of $1 billion or more have been made to policy holders. The first of which was in 1995. The other years where payouts exceeded $1 billion were in 2001, 2004, 2005, 2008 and 2011. Five of those times were in a 10-year period from 2001 to 2011.

Table 4.8 NFIP Program Statistics
(As of December 31, 2011; $ nominal)

Calendar Year	Number of Policies in Force	Total Written Premium	Total Face Value of Coverage	Total Number of Claims Paid	Total Payments Made to Policyholders
1972-1977	NA	NA	NA	4,441	$18,035,658
1978	1,446,354	$111,250,585	$50,500,956,000	29,122	$147,719,253
1979	1,843,441	$141,535,832	$74,375,240,000	70,613	$483,281,219
1980	2,103,851	$159,009,583	$99,259,942,000	41,918	$230,414,295
1981	1,915,065	$256,798,488	$102,059,859,000	23,261	$127,118,031
1982	1,900,544	$354,842,356	$107,296,802,000	32,831	$198,295,820
1983	1,981,122	$384,225,425	$117,834,255,000	51,584	$439,454,937
1984	1,926,388	$420,530,032	$124,421,281,000	27,688	$254,642,874
1985	2,016,785	$452,466,332	$139,948,260,000	38,676	$368,238,794
1986	2,119,039	$518,226,957	$155,717,168,000	13,789	$126,384,695
1987	2,115,183	$566,391,536	$165,053,402,000	13,400	$105,432,378
1988	2,149,153	$589,453,163	$175,764,175,000	7,758	$51,022,523
1989	2,292,947	$632,204,396	$265,218,590,000	36,245	$661,658,285
1990	2,477,861	$672,791,834	$213,588,265,000	14,766	$167,896,816
1991	2,532,713	$737,078,033	$223,098,548,000	28,549	$353,681,702
1992	2,623,406	$800,973,357	$236,844,980,000	44,650	$710,225,154
1993	2,828,558	$890,425,274	$267,870,761,000	36,044	$659,059,461
1994	3,040,198	$1,003,850,875	$295,935,328,000	21,583	$411,075,128
1995	3,476,829	$1,140,808,119	$349,137,768,000	62,441	$1,295,578,117
1996	3,693,076	$1,275,176,752	$400,681,650,000	52,677	$828,036,508
1997	4,102,416	$1,509,787,517	$462,606,433,000	30,338	$519,537,378
1998	4,235,138	$1,668,246,681	$497,621,083,000	57,348	$886,327,133
1999	4,329,985	$1,719,652,696	$534,117,781,000	47,247	$754,970,800
2000	4,369,087	$1,723,824,570	$567,568,653,000	16,362	$251,720,536
2001	4,458,470	$1,740,331,079	$611,918,920,000	43,589	$1,277,002,489
2002	4,519,799	$1,802,277,937	$653,776,126,000	25,312	$433,644,094
2003	4,565,491	$1,897,687,479	$691,786,140,000	36,838	$780,492,440

Calendar Year	Number of Policies in Force	Total Written Premium	Total Face Value of Coverage	Total Number of Claims Paid	Total Payments Made to Policyholders
2004	4,667,446	$2,040,828,486	$765,205,681,000	55,825	$2,232,042,331
2005	4,962,011	$2,241,264,140	$876,679,658,000	212,778	$17,713,105,660
2006	5,514,895	$2,604,844,133	$1,054,087,148,000	24,592	$640,623,771
2007	5,655,919	$2,843,422,049	$1,141,242,230,000	23,129	$612,351,594
2008	5,684,275	$3,066,729,200	$1,197,659,846,000	74,266	$3,450,249,017
2009	5,704,198	$3,202,267,224	$1,233,005,263,000	30,821	$772,390,723
2010	5,559,313	$3,348,222,091	$1,227,932,424,400	27,165	$708,992,043
2011	5,585,797	$3,477,338,993	$1,264,043,634,800	65,315	$1,847,881,892

Source: U.S. Department of Homeland Security, FEMA's Office of Legislative Affairs.

The NFIP has had to borrow from the United States Treasury in order to pay out claims to policy holders. **Table 4.9** indicates that the NFIP from 1986 to 2005 was self-supporting (covering all administrative expenses, claim payments out of premium income and fees) After Hurricane Katrina in August of 2005, FEMA had to borrow 19.64 billion, which includes amounts to pay for Hurricane Ike and the 2008 Midwest floods. It is not likely that the $17.75 billion in debt to the US Treasury, as of September 30, 2011, can be repaid based on the nearly $1 billion in annual interest on that debt and the $3.5 billion in revenue generated each year. The CRS June 2012 Report indicates that experts agree that even if FEMA increased flood insurance rates annually to the maximum allowed by law (10%), the NFIP would not have sufficient funds to cover obligations from policyholder claims, operating expenses and interest on the debt.

Table 4.9. History of US Borrowing Under the National Flood Insurance Program
(As of September 30, 2011; nominal $)

Fiscal Year	Amount Borrowed	Amount Repaid	Cumulative Debt
Prior to 1981[a]	$917,406,008	$0	$917,406,008
1981	$164,614,526	$624,970,099	$457,050,435
1982	$13,915,000	$470,965,435	$0
1983	$50,000,000	$0	$50,000,000
1984[b]	$200,000,000	$36,879,123	$213,120,877
1985	$0	$213,120,877	$0
1986-1993	$0	$0	$0
1994[c]	$100,000,000	$100,000,000	$0
1995	$265,000,000	$0	$265,000,000
1996	$423,600,000	$62,000,000	$626,600,000
1997	$530,000,000	$239,600,000	$917,000,000
1998	$0	$395,000,000	$522,000,000
1999	$400,000,000	$381,000,000	$541,000,000
2000	$345,000,000	$541,000,000	$345,000,000
2001	$600,000,000	$345,000,000	$600,000,000
2002	$50,000,000	$640,000,000	$10,000,000
October 2002	$0	$10,000,000	$0

Fiscal Year	Amount Borrowed	Amount Repaid	Cumulative Debt
2003 (Nov-Sep)	$0	$0	$0
2004	$0	$0	$0
2005[d]	$300,000,000	$75,000,000	$225,000,000
2006	$16,660,000,000	$0	$16,885,000,000
2007	$650,000,000	$0	$17,535,000,000
2008	$50,000,000	$225,000,000	$17,360,000,000
2009	$1,987,988,421	$347,988,421	$19,000,000,000
2010	$0	$500,000,000	$18,500,000,000
2011	$0	$750,000,000	$17,750,000,000
Total	**$23,707,523,955**	**$5,957,523,955**	**$17,750,000,000**

Source: U.S. Department of Homeland Security, Federal Emergency Management Agency's Office of Legislative Affairs.

Flood hazards in the United States whether from hurricanes and coastal storm surge to inland flooding on rivers, streams and lakes was largely deemed uninsurable from the private insurance industry. Hurricane Betsy in September of 1965, a Category 3 storm, was the first natural disaster in the US to generate over a billion dollars in damage without an insurance program to help property owners recover from and rebuild. In response, largely on the basis of the "general welfare" and "interstate commerce" clauses of the US Constitution, Congress created the NFIP in 1968. The NFIP would regulate the nation's floodplains (Special Flood Hazard Areas – SFHA) with land use controls and building requirements that communities in the SFHA must adopt and enforce in order for property owners to be eligible for insurance.

Terminology

Repetitive loss*:* Any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. Two of the claims paid must be more than 10 days apart but, within 10 years of each other. A repetitive loss property may or may not be currently insured by the NFIP.

Severe repetitive loss*:* As defined by the Flood Insurance Reform Act of 2004, SRLs are 1-4 family residences that have had four or more claims of more than $5,000 or at least two claims that cumulatively exceed the building's value. The Act creates new funding mechanisms to help mitigate flood damage for these properties.

Properties that experience repetitive flood losses – RLPs and Severe Repetitive Loss Properties (SRLP) account for a disproportionate share of all flood insurance claims filed under the NFIP. About one in 10 homes that suffer repetitive flood damages have cumulative flood claims that exceed the value of the structure. It is estimated by FEMA that almost 90% of RLPs were built prior to December 31, 1974 or before the adoption of a FIRM and subject to premium discounts. The June 2012 CRS Report also indicates that new RLPs are outpacing FEMA mitigation efforts by 10 to 1. FEMA along with other agencies placed a greater emphasis on mitigation after the 1993 Midwest floods where hundreds of millions were spent to remove frequently flooded structures from the floodplain.

Table 4.10 indicates that between 1978 and December 31, 2011, 166,368 total RLPs have had 496,178 losses which is equal to 2.9 claims per RLP. These 166,368 RLP's account for more than 12 billion in total claims payments.

Table 4.10. Total Repetitive Flood Loss Properties in the NFIP: 1978-2011
(As of December 31, 2011: $ nominal)

Building Payments	$9,332,087,006
Contents Payments	$2,768,293,788
Total payments	$12,100,980,774
Average payment	$24,388
Number of Losses	496,178
Number of Properties	166,368

Source: U.S. Department of Homeland Security, Federal Emergency Management Agency.

FEMA has taken steps to try to address these RLPs. The first of these strategies took place in 1999 to gather a national inventory of RLPs and to focus on substantially damaged structures (damaged by 50% or more of the market value) at which time they were reconstructed, elevated, or floodproofed to prevent future flood damage. A primary flaw at the local level has been a reluctance or inconsistency to uniformly enforce the substantial damage provision from the flood damage prevention ordinance.

4.6.2 Federal Requirement for Repetitive Loss Strategy

To be eligible to receive an increased Federal cost share of up to 90 percent for project grants related to reducing losses to severe repetitive loss properties, mitigation plans must specifically address such. States may address the repetitive loss strategy through an amendment to their existing FEMA-approved State Mitigation Plans, or they may accomplish this as part of a cyclical update.

In order to be eligible for an increased Federal cost share of up to 90 percent under the SRL program, the FEMA- approved State or Tribal Standard Mitigation Plan must also meet all of the requirements described below:

> a) **Repetitive Loss Strategy** - *44 CFR 201.4(c)(3)(v): A State may request the reduced cost share authorized under Sec. 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. This requirement supplements the risk assessment and mitigation strategy portions of the plan required under 201.4(c)(2) and (3) by specifically identifying goals, capabilities, and actions that will reduce the number of repetitive loss properties, including severe repetitive loss properties.*
>
> *The mitigation strategy is based on the State's Risk Assessment as required under 201.4(c)(3)(ii). Therefore, the State must address repetitive*

loss structures in its risk assessment, where applicable. For example, in its overview of Estimating Potential Losses by Jurisdiction under 201.4(c)(2)(iii), the State may analyze potential losses to identified repetitive loss properties based on estimates provided in local risk assessments. The Plan should refer generally to geographic areas where concentrations of repetitive loss properties are located for the purpose of identifying and prioritizing areas for mitigation projects, or the plan may list the number of repetitive loss properties with aggregate repetitive loss data.

The State Hazard Mitigation Goals under 201.4(c)(3)(i) must support the selection of activities to mitigate and reduce potential losses to structures susceptible to flood damage, including repetitive loss properties. In addition, the State and Local Capability Assessments required under 201.4(c)(3)(ii) must include an evaluation of policies, programs, and capabilities that allow the mitigation of repetitive losses from flood damage.

The State must describe specific actions that it has implemented to mitigate repetitive loss properties, and specifically actions taken to reduce the number of severe repetitive loss properties as a subset of all repetitive loss properties in the State. If the State cannot show that any action has ever been taken to reduce the number of such properties, this criteria cannot be met.

Based on the findings of the risk assessment, the State must identify actions in the statewide mitigation strategy that specifically address repetitive loss properties, including those that are severe repetitive loss properties. This supplements the mitigation actions requirement under 201.4(c)(3)(iii). Mitigation actions should be tied to goals and objectives and provide the means to achieve them. Actions should have been identified in the planning process, and local plans should be consistent with state-wide actions. As part of the mitigation strategy, the plan must also describe the current funding sources as well as potential sources that will be pursued to fund proposed mitigation actions for repetitive loss properties. This supplements the identification of funding requirement under 201.4(c)(3)(iv)

b) **Coordination With Repetitive Loss Jurisdictions** - *44 CFR 201.4(c)(3)(v) 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.*

The State is required to identify strategies that encourage local communities to mitigate severe repetitive loss properties, including the development of local mitigation plans. This supplements the Coordination of Local Mitigation Planning portion of the plan under 201.4(c)(4). At a minimum, the State must include severe repetitive loss in the description of its process for providing funding and technical assistance to prepare *mitigation plans 201.4(c)(4)(i)), and in its criteria for prioritizing communities that have such properties for planning and project grant assistance 201.4(c)(4)(iii)). Other strategies for encouraging local communities to mitigate severe repetitive loss properties should be demonstrated through specific actions identified in the Mitigation Strategy.*

4.6.3 National Flood Insurance Reform Act of 2004

The Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 was signed into law by President George W. Bush on June 30 of the same year. The Act (Public Law 108-264) revised the existing Flood Mitigation Assistance (FMA) Program by creating a Pilot Program at $40 million per year to mitigate severe repetitive loss properties. The Severe Repetitive Loss (SRL) Pilot Program provides funds for local administration. It also reduces the non-federal match from 25% to 10% with an approved mitigation plan that specifies the state's strategy to reduce the number of severe repetitive loss properties. Arkansas has constructed this SRL strategy in part to receive this share reduction.

The Federal Insurance Administration database shows claims paid that reflect either repetitive flood loss or severe repetitive properties. Residential severe repetitive flood loss properties receive priority for mitigation under the NFIP Reform Act of 2004 (Public Law 108-264). The primary goal of the Program is to reduce excessive flood claim payments and reliance on the National Flood Insurance Fund for flood relief when mitigation is an option.

4.6.4 Status of Repetitive Loss in Arkansas

The State of Arkansas as of December 30, 2011 had 808 total RLPs accounting for 2,229 losses with total (contents and structure) payments of $47,364,257.33, according to FEMA as published in the June 2012 CRS Report. Based on this data, the average claims payment in Arkansas is $21,249.11 which is slightly less than the overall average for all 50 states of $24,388.39. Arkansas ranks 27th out of the 50 states in the total number of RLPs.

Louisiana has the highest number of RLPs with 29,472 which accounts for 79,417 total losses followed by Texas with 20,395 RLPs and 65,108 total losses. The other states which are adjacent to Arkansas, have a higher number of repetitive loss properties which can be due to the number of storms, properties affected, claims submitted, percentage of insured properties, etc. They include, Mississippi with 6,139 RLP's followed by Missouri with 5,124, Tennessee with 1,077 and Oklahoma with 958.

Repetitive loss data provided to the state by FEMA (as of November 30, 2012) indicates that Arkansas has 814 RLPs (mitigated and non-mitigated). This is an increase of 6 RLP's from the number identified in the CRS Report of June 2012. 102 of these RLPs have been mitigated and are not currently counted as subject to repetitive flooding. 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. However, the State of Arkansas still has 712 active non-mitigated RLPs spread over 56 counties. A non-mitigated repetitive loss property means the building is still subject to flood damage and may or may not be presently insured. **Table 4.11** shows the number of non-mitigated repetitive loss properties by community as of November 30, 2012.

Table 4.11 Repetitive Loss Properties in Arkansas as of November 30, 2012

Community	Number RLP's	Number Insured	Total Building Payments	Total Contents Payments	Total Claims Paid
Arkansas County	4	3	346,530.28	9,353.87	355,884.15
Stuttgart	1	1	4,400	4,400	4,400
Ashley County	4	2	101,899.79	10,749.16	112,648.95
Crossett	1	0	9,057.94	421.00	9,478.94
Hamburg	1	1	92,861.03	0.00	92,861.03
Norfolk	13	13	1,028,914.21	140,199.68	1,169,113.89
Benton County	3	3	46,767.68	9,881.43	56,649.11
Bentonville	1	1	5,046.72	0.00	5,046.72
Decatur	2	0	105,219.74	241,397.70	346,617.44
Rogers	2	1	54,898.97	0.00	54,898.97
Siloam Springs	2	0	121,532.42	38,368.10	159,891.52
Boone County	N/A				
Harrison	1	0	13,474.89	0.00	13,474.89
Bradley County	7	3	216,190.54	63,826.77	280,017.31
Warren	4	2	140,221.23	1,887.71	142,108.94
Chicot County	10	4	678,028.36	138,534.08	816,562.44
Dermott	1	0	8,842.76	0.00	8,842.76
Lake Village	3	2	31,964.42	1,891.35	33,855.77
Clark County	1	1	55,949.09	0.00	55,949.09
Arkadelphia	1	1	14,117.30	0.00	14,117.30
Gurdon	2	2	23,167.17	51,763.59	74,930.76
Clay County	10	8	615,493.25	1,473.32	616,966.57
Corning	1	1	34,936.80	0.00	34,936.80
Piggott	1	1	13,739.47	0.00	13,739.47
Success	1	0	69,771.66	0.00	69.771.66
Cleburne County	1	1	69,835.26	0.00	69,835.26
Conway County	N/A				
Morrilton	2	1	75,858.42	4,633.74	80,492.16
Craighead County	N/A				
Bono	8	3	184,972.46	26,783.52	211,755.98
Caraway	1	0	8,302.73	0.00	8,302.73
Jonesboro	23	13	1,086,646.98	665,525.15	1,752,172.13
Crittenden County	2	2	107,867.73	6,999.15	114,866.88
Earle	3	1	131,525.27	0.00	131,525.27
Marion	4	3	62,498.41	2,295.02	64,784.43
West Memphis	48	32	3,339,952.51	264,381.98	3,604,34.49

Community	Number RLP's	Number Insured	Total Building Payments	Total Contents Payments	Total Claims Paid
Cross County	2	1	161,824.23	6,896.95	168,721.18
Wynne	5	2	92,730.88	36,949.02	129,676.90
Desha County	2	1	62,131.15	0.00	62,131.15
Dumas	3	0	33,854.28	10,049.28	43,903.56
McGehee	11	4	226,773.56	26,325.71	253,099.27
Drew County	1	1	190,221.14	0.00	190,221.14
Faulkner County	8	5	496,452.18	83,229.62	571,681.80
Conway	3	2	53,041.69	65,697.92	118,759.41
Greenbrier	1	1	89,759.42	7,863.77	97,623.19
Mayflower	6	5	257,201.32	55,067.39	312,268.71
Vilonia	1	1	53,001.97	14,239.62	67,241.69
Franklin	2	2	53,583.68	34,376.94	87,980.42
Charleston	1	1	16,679.16	0.00	16,679.16
Ozark	1	0	294,267.12	40,033.53	335,000.65
Fulton	5	4	204,376.72	51,026.78	255,403.50
Mammoth Spring	1	1	86,528.07	31,468.65	118,014.72
Garland County	6	3	231,920.72	4,785.68	236,706.40
Hot Springs	12	6	466,493.64	629,155.53	1,095,649.17
Grant County	2	1	32,074.92	0.00	32,074.92
Sheridan	1	1	16,550.39	0.00	16,550.39
Green County	N/A				
Paragould	5	3	120,556.48	0.00	120,556.48
Howard County	N/A				
Nashville	1	0	26,439.86	8,828.77	35,268.63
Independence County	8	4	277,381.33	10,719.69	288,101.02
Batesville	15	4	471,656.54	49,809.84	521,466.38
Oil Trough	2	2	74,885.82	33,490.07	108,375.89
Izard County	7	4	240,139.62	38,682.68	278,882.30
Calico Rock	4	0	184,966.25	0.00	184,966.25
Jackson County	8	3	536,634.82	46,938.50	583,573.32
Grubbs	1	1	31,591.25	0.00	31,591.25
Newport	3	0	61,782.11	9.795.16	71,577.27
Jefferson County	10	5	492,423.16	33,979.81	526,402.97
Altheimer	1	0	25,144.44	19,700.00	44,844.44
Pine Bluff	23	7	832,395.97	280,273.43	1,112,669.40
Sherrill	1	1	47,214.88	14,361.38	61,576.26
Lawrence	2	1	96,631.18	3,663.26	100,294.44
Black Rock	1	1	38,000.00	0.00	38,000.00
Hoxie	1	0	57,715.87	5,966.03	63,681.90
Lee County	3	1	70,964.89	16,277.30	87,242.19
Lincoln County	N/A				
Gould	4	2	66,610.84	20,764.87	87,375.71

Community	Number RLP's	Number Insured	Total Building Payments	Total Contents Payments	Total Claims Paid
Little River County	N/A				
Ashdown	1	0	66,114.67	15,389.25	81,503.92
Lonoke County	7	2	310,376.96	49,625.02	360,001.98
Cabot	3	2	111,559.88	17,662.67	129,228.55
Miller County	1	0	6,356.72	0.00	6,356.72
Texarkana	4	2	41,258.35	30,290.59	71,548.94
Mississippi County	N/A				
Gosnell	2	1	57,796.40	15,948.00	73,744.40
Monroe County	14	9	974,577.01	47,408.92	1,021,985.93
Clarendon	3	1	12,057.79	9,065.38	21,123.17
Holly Grove	1	1	69,774.27	0.00	69,774.27
Montgomery County	12	4	622,774.47	207,307.54	830,082.01
Newton County	N/A				
Jasper	2	1	101,360.88	0.00	101,360.88
Ouachita County	4	3	127,414.18	42,429.58	169,843.76
Camden	3	1	43,417.88	0.00	43,417.88
Phillips County	5	3	372,971.94	149,799.11	522,771.05
Helena- West Helena	33	6	560,504.48	448,594.56	1,009,099.04
West Helena	5	1	272,710.46	141,874.86	414,585.32
Poinsett County	2	2	66,865.14	23,580.65	90,445.79
Harrisburg	1	0	10,898.56	4,986.68	15,885.24
Marked Tree	1	1	6,685.39	5,242.05	11,927.44
Polk County	N/A				
Mena	1	1	35,422.88	0.00	35,422.88
Pope County	N/A				
Russellville	4	2	269,401.80	141,229.06	410,630.86
Prairie County	6	2	290,648.35	0.00	290,648.35
De Valls Bluff			85,103.70	1,300.00	86,403.70
Pulaski County	28	18	2,088,750.65	381,028.76	2,469,779.41
Jacksonville	10	8	354,114.48	85,019.00	439,133.48
Little Rock	55	30	3,055,922.65	2,104,110.58	5,160,033.23
North Little Rock	2	1	25,383.68	34,166.18	59,549.86
Sherwood	23	18	985,125.77	37,250.30	1,022,376.07
Randolph County	13	9	908,808.15	150,737.54	1,059,545.69
Pocahontas	3	2	91,298.98	0.00	91,298.98
Saline County	5	2	602,080.87	831,042.34	1,433,123.21
Benton	5	3	490,933.09	113,377.09	604,310.18
Bryant	2	1	76,232.29	13,114.47	90,046.76
Shannon Hills	14	4	325,784.63	94,816.21	420,600.84
Scott County	N/A				
Waldron	1	0	144,588.01	56,974.50	201,532.51
Sebastian County	N/A				

Community	Number RLP's	Number Insured	Total Building Payments	Total Contents Payments	Total Claims Paid
Fort Smith	23	14	1,814,486.83	215,070.11	2,029,556.94
Greenwood	3	3	94,756.14	17,182.19	111,938.33
Sevier County	1	0	11,771.84	9,391.07	21,162.91
Sharp County	3	2	159,723.00	14,636.15	174,359.15
Cherokee Village	1	0	25,415.20	12,551.64	37,966.84
Hardy	9	7	525,572.87	124,686.80	650,259.67
Williford	1	0	42,506.36	65,986.61	108,942.97
Union County	1	0	29,505.18	13,076.12	42,581.20
Calion	4	3	210,915.26	41,231.05	252,146.31
El Dorado	2	1	82,255.85	442.53	82,698.38
Felsenthal	1	0	13,441.04	0.00	13,441.04
Van Buren County	1	1	18,875.26	950.95	19,826.21
Washington County	3	2	139,138.96	8,657.81	147,796.77
Elkins	3	2	304,464.35	0.00	304,464.35
Farmington	5	5	508,092.46	466.80	508,599.26
Fayetteville	5	3	366,911.04	17,3700.42	376,476.76
Goshen	1	1	81,770.37	10,161.10	91.93747
Greenland	1	1	101,356.61	0.00	101,356.61
White County	6	2	609,541.33	9,251.33	618,792.56
Bald Knob	1	0	37,577.70	0.00	37,577.70
Beebe	1	0	70,226.22	0.00	70,226.22
Judsonia	1	1	80,462.82	8,300.00	88,762.82
Woodruff County	4	1	186,165.88	33,679.34	219,845.22
Ola	1	0	7,128.97	878.00	7,998.97
Total	712	373	35,254,418.95	9,294,665.35	44,549,084.30

The State of Arkansas has 712 non-mitigated RLPs spread over 56 counties, as of November 30, 2012. A non-mitigated repetitive loss property means it may or may not be presently insured. Only 373 out of the 712 identified RLP's in Arkansas or approximately 52 percent are currently insured by the NFIP. This means that 339 properties are currently not insured.

The City of Little Rock has the highest number of unmitigated RLP's with 55 followed by the City of West Memphis with 48. Unincorporated Pulaski County has the highest number of unmitigated RLP's with 28. The State of Arkansas also has 81 Severe Repetitive Loss Properties (SRLP's).

Twenty one out of the 75 total counties in Arkansas have mitigated at least one RLP as of November 30, 2012. Crittenden County has 37 mitigated RLPs, more than any other county with mitigated properties. The next highest number of mitigated RLPs belongs to Pulaski County with 17. The remaining 19 counties each have less than 10 mitigated RLPs.

Figures 4.1 and 4.2 indicate the total number of mitigated RLP’s by county and the total number of non-mitigated RLP’s by county as of November 30, 2012, respectively.

Figure 4.1. Number of Mitigated Repetitive Loss Properties by County
(Data as of November 30, 2012)

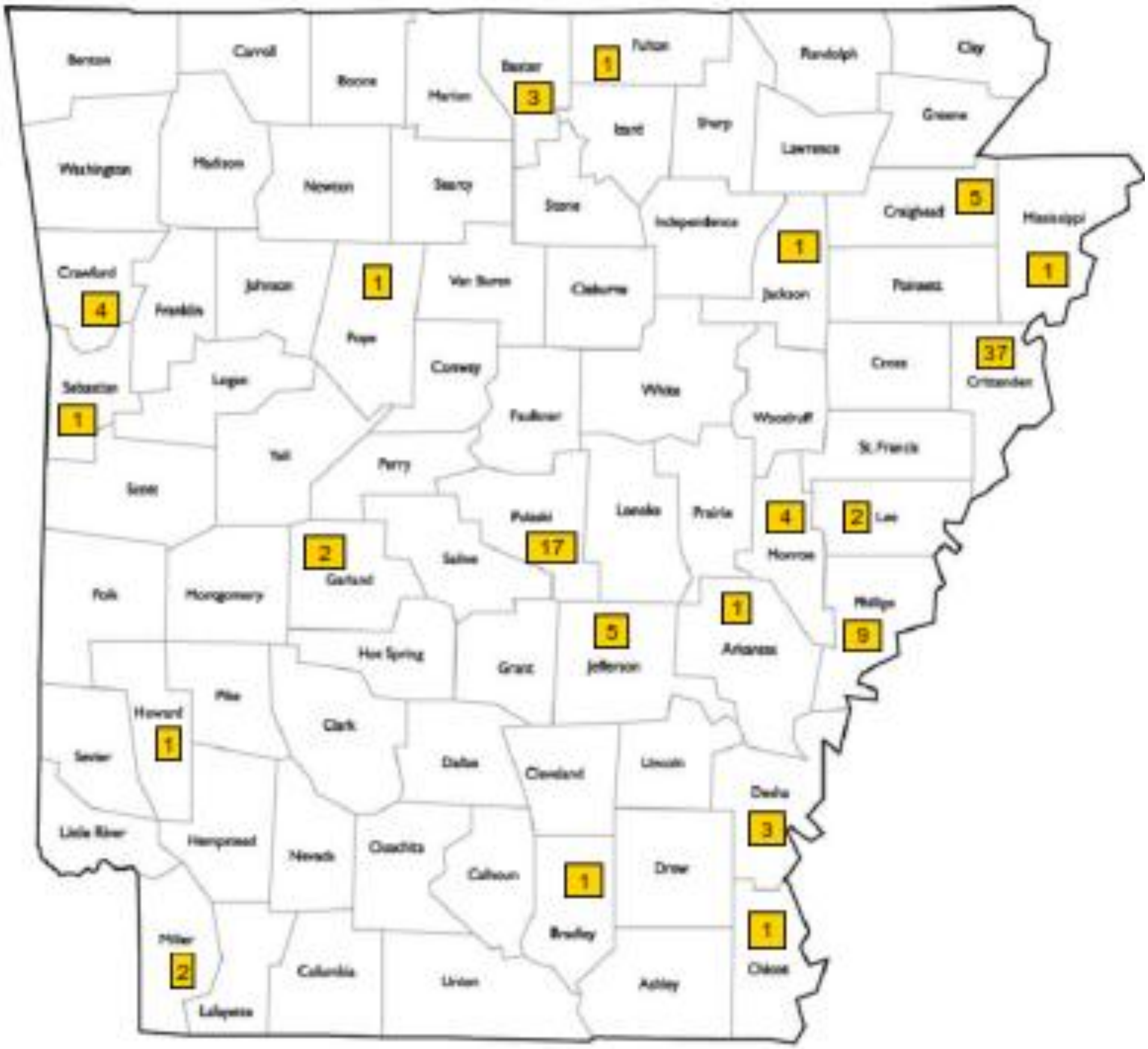
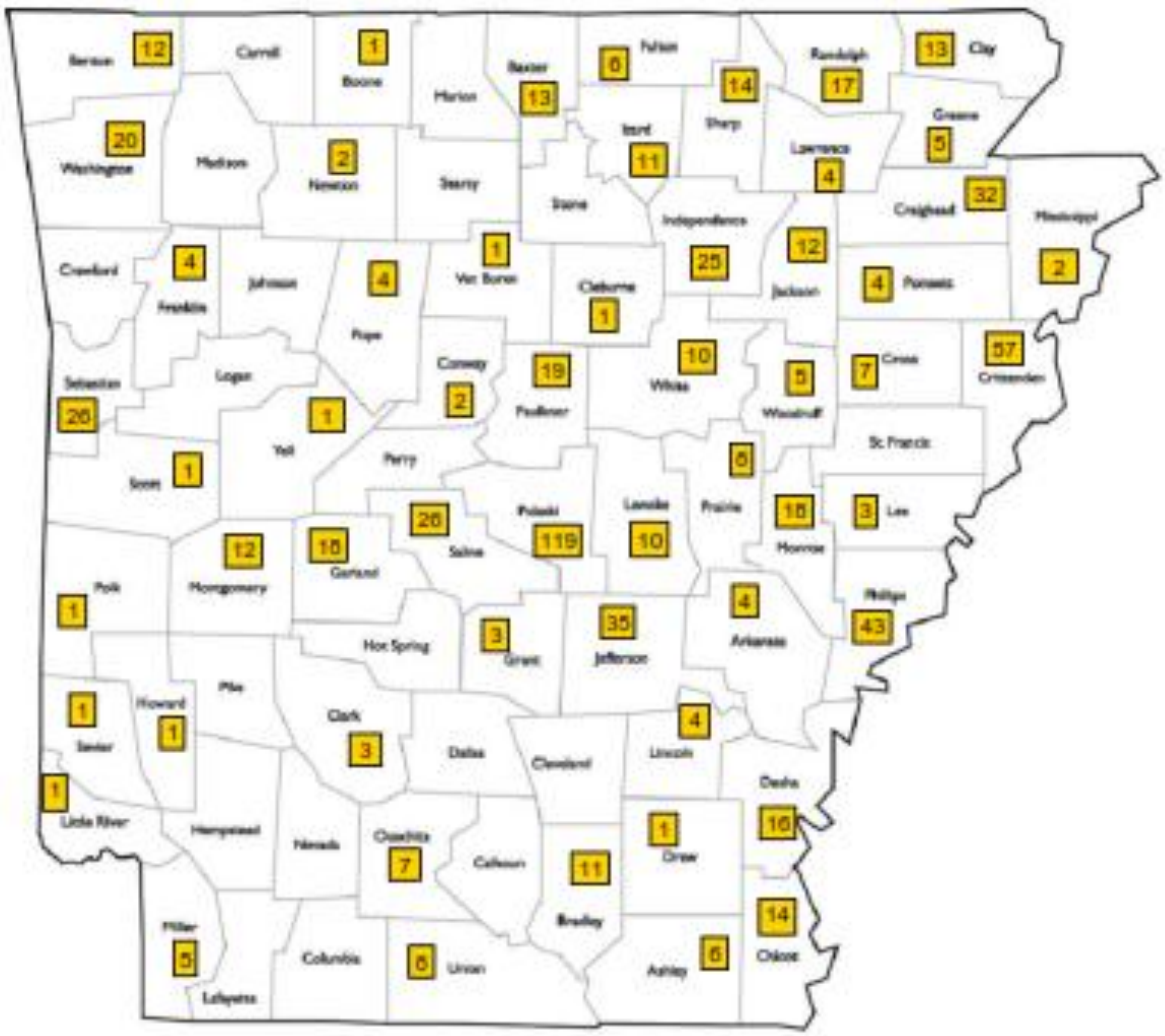


Figure 4.2 Number of Non-Mitigated Repetitive Loss Properties by County
(Data as of November 30, 2012)



4.6.5 Actions the State has Taken to Reduce the Number of Repetitive Loss Properties

Table 4.12 shows the commitment that the State of Arkansas has in reducing the number of RLP's and SRLP's. This data is complete as of November 30, 2012.

Table 4.12. Repetitive Loss Reduction Activities

Community	Com. Num.	Type of Mitigation			
		Acquisition	Flood Protection	Not Known	Severe RLP
STUTTGART, CITY OF	050002	X			
NORFORK, CITY OF	050267	X			
NORFORK, CITY OF	050267	X			
NORFORK, CITY OF	050267		X		
BRADLEY COUNTY*	050420	X			
LAKE VILLAGE, CITY OF	050028			X	
BONO, CITY OF	050046	X			
BONO, CITY OF	050046	X			
BONO, CITY OF	050046	X			
BONO, CITY OF	050046	X			
JONESBORO, CITY OF	050048	X			
CRAWFORD COUNTY *	050428		X		X
VAN BUREN, CITY OF	050053	X			
VAN BUREN, CITY OF	050053		X		
VAN BUREN, CITY OF	050053		X		
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			X
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			X
WEST MEMPHIS, CITY OF	050055	X			X
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			

Community	Com. Num.	Type of Mitigation			
		Acquisition	Flood Protection	Not Known	Severe RLP
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			
WEST MEMPHIS, CITY OF	050055	X			X
WEST MEMPHIS, CITY OF	050055	X			X
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
WEST MEMPHIS, CITY OF	050055		X		
DESHA COUNTY *	050065	X			
DESHA COUNTY *	050065	X			
WATSON, CITY OF	050072	X			
FULTON COUNTY*	050081		X		
HOT SPRINGS, CITY OF	050084	X			
HOT SPRINGS, CITY OF	050084	X			
NASHVILLE, CITY OF	050089	X			
JACKSONPORT, TOWN OF	050102	X			
JEFFERSON COUNTY *	050440	X			
JEFFERSON COUNTY *	050440	X			X
JEFFERSON COUNTY *	050440	X			X
JEFFERSON COUNTY *	050440	X			X
PINE BLUFF, CITY OF	050109	X			X
LEE COUNTY*	050444	X			
MARIANNA, CITY OF	050124	X			
TEXARKANA, CITY OF	050137		X		
TEXARKANA, CITY OF	050137		X		
MISSISSIPPI COUNTY *	050452			X	
BRINKLEY, CITY OF	050155		X		
MONROE COUNTY*	050154		X		
MONROE COUNTY*	050154		X		
MONROE COUNTY*	050154		X		

Community	Com. Num.	Type of Mitigation			
		Acquisition	Flood Protection	Not Known	Severe RLP
HELENA-WEST HELENA, CITY OF	050168	X			
HELENA-WEST HELENA, CITY OF	050168	X			
HELENA-WEST HELENA, CITY OF	050168	X			
HELENA-WEST HELENA, CITY OF	050168	X			
HELENA-WEST HELENA, CITY OF	050168	X			
HELENA-WEST HELENA, CITY OF	050168	X			
PHILLIPS COUNTY*	050166	X			
WEST HELENA, CITY OF	050171	X			
WEST HELENA, CITY OF	050171	X			
RUSSELLVILLE, CITY OF	050178	X			
JACKSONVILLE, CITY OF	050180		X		
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181	X			
LITTLE ROCK, CITY OF	050181		X		
LITTLE ROCK, CITY OF	050181		X		
LITTLE ROCK, CITY OF	050181		X		
NORTH LITTLE ROCK, CITY OF	050182	X			
NORTH LITTLE ROCK, CITY OF	050182		X		
NORTH LITTLE ROCK, CITY OF	050182		X		
NORTH LITTLE ROCK, CITY OF	050182		X		
PULASKI COUNTY *	050179	X			
SHERWOOD, CITY OF	050235		X		
FORT SMITH, CITY OF	055013	X			

4.6.6 Repetitive Loss Strategy Approach

The State of Arkansas and Natural Resources Commission will take the lead and promote the following steps to ensure repetitive loss and severe repetitive loss properties are addressed and the total numbers are further reduced.

Goal: Reduce the total number of repetitive loss and severe repetitive loss properties

1. Continue the commitment to maintain high levels of competence in grant management and responsive customer service to local governments through the Severe Repetitive Loss

Program (SRL), Repetitive Flood Claims Program (RFC) and Flood Mitigation Assistance Program (FMA).

2. Enhance education efforts that increase the public's and home or business owners' knowledge and awareness of mitigation grants by conducting various outreach activities, with focus on severe residential flood loss properties.

3. Prioritize the most cost-effective repetitive loss and severe repetitive loss properties by utilizing FEMA's Benefit-Cost Analysis (BCA) software to target likely candidates for acquisition and/or elevation.

4. Deliver training and technical assistance to those communities with the highest number of RLP's and SRLP's. This will enhance the opportunity to find adjoining properties which can help them qualify for the RFC and SRL grant programs.

5. Work with communities across the state to ensure a comprehensive repetitive loss analysis is incorporated into each applicable local hazard mitigation plan update.

6. Enhance the Department of Natural Resources' website to focus more direct attention and assistance to the areas of repetitive loss and the appropriate grant funding processes.

7. Work through the Arkansas Floodplain Management Association to provide training on FEMA's BCA software, the HMA grant application process and more focuses attention on effective mitigation of RLP's and SRLP's.

8. Work with communities who participate in the FEMA's NFIP Community Rating System Program as bonus credits are available for communities who address RLP's and SRLP's.

4.6.7 Repetitive Loss Outreach Strategy

Education and awareness provided through outreach is the key to achieving the goal of increasing the number of mitigated structures in Arkansas and reducing reliance on the National Flood Insurance Fund.

Goal: The State of Arkansas will continue to develop outreach activities and provide services beyond conventional limits, and segments of a community in addressing repetitive loss and severe repetitive loss properties.

The purpose of outreach is to focus on those properties on the highest end of the flood damage spectrum -- severe repetitive flood loss properties that have experienced four or more separate flood losses with each loss resulting in a claim payment exceeding $5,000, and the cumulative amount of the total claims paid exceeding $20,000; or, when at least two separate claim payments have been paid with the cumulative amount of the claims exceeding the value of the property.

As such Arkansas will devote time and energy to educating those properties owners on the benefits of mitigation and the assists with the FEMA's grant application process to bring help acquire and or flood protect repetitive loss properties throughout the state. Beyond individual and larger group application workshops, the Department of Natural Resources will hold sessions at upcoming Arkansas Floodplain Manager's Association conferences working with FEMA Region VI in promoting repetitive loss, grants, application process and demonstrating the BCA software program.

The Department of Natural Resources in conjunction with the Arkansas Floodplain Manager's Association will hold Community Rating System (CRS) workshops which focus on floodplain management planning, repetitive loss area analysis', and the bonus credits available for addressing RLP's and SRL's as part of the CRS Program.

5.0 COORDINATION OF LOCAL MITIGATION PLANNING

5.1 Local Funding and Technical Assistance

Requirement §201.4(c)(4)(i): [The section on the coordination of local mitigation planning must include a] description of the State process to support, through funding and technical assistance, the development of local mitigation plans.

5.1.1 Background

Per DMA 2000, all local governments must have a hazard mitigation plan approved by FEMA to receive project grants from the HMGP, Pre-Disaster Mitigation Program, and Severe Repetitive Loss Program. An approved flood mitigation plan (which may be part of an approved multi-hazard plan) is required for the Flood Mitigation Assistance Program. The Repetitive Flood Claims Program does not currently require a local hazard mitigation plan. It is the role of the State to provide assistance to local governments for plan development and to ultimately use the local plans to improve the statewide All-Hazards Mitigation Plan.

5.1.2 Funding

There are two primary sources of funds available to help local jurisdictions develop and update hazard mitigation plans. These sources are FEMA's HMGP and PDM planning grants. Detailed information about these programs is available in Section 4.5 Funding Sources.

Hazard Mitigation Grant Program

Planning Applicability:

Up to 7 percent of the HMGP funds set aside following a Presidential Disaster Declaration may be used to develop FEMA-approved mitigation plans.

ADEM Fund Administrator:

State Hazard Mitigation Officer; ADEM Grant Coordinator; ADEM Grant Coordinator-HMGP, and ADEM Budget Specialist

Arkansas Local Hazard Mitigation Grant Program Planning Distributions:

Table 5.1 shows the HMGP funds used to fund the local mitigation planning from Presidential disasters in 2008 - 2011.

Table 5.1 HMGP Funds Used for Local Planning 2008-2011

Year of Federal Declaration	Declaration Number	Jurisdictional Plan	Federal Share (75%)
2008	DR-1751	• Beebe Plan • State Hazard Mitigation Plan • Polk County Plan • Sebastian County Plan	$205,429
	DR-1754	No planning grants	N/A
	DR-1758	• White County Schools Plan • U of A, Morrilton Plan	$90,443
	DR-1793	No planning grants	N/A
	DR-1804	No planning grants	N/A
2009	DR-1819	• Mississippi County Plan Revision • Marion County Plan • Baxter County Plan • Yell County Plan • Pulaski County Plan Revision • Clay County Plan Revision • Izard County Plan	$218,625
	DR-1834	• Van Buren County Plan	$37,500
	DR-1845	No planning grants	N/A
	DR-1861	• ASU-Beebe Disaster Resistant University Plan	$34,125
2010	DR-1872	No planning grants	N/A
2011	DR-1975	• City of Eureka Plan • Conway County Plan • Little River Plan • Logan County Plan • Nevada County Plan	$152,773

It is anticipated that additional funds from presidential disaster declarations DR 4000, DR 4100, and DR 4124, which occurred in 2011 and 2013, may also be used in the development of local mitigation plans, but the funding levels have not yet been determined.

Pre-Disaster Mitigation Program

Planning Applicability:

PDM grants can be used for mitigation plan development, upgrades, comprehensive reviews and updates. Recipients of PDM planning grants must produce FEMA-approved hazard mitigation plans.

ADEM Fund Administrator:

State Hazard Mitigation Officer; ADEM Grant Coordinator; ADEM Emergency Planner-PDMC, and ADEM Budget Specialist

Arkansas Local Pre-Disaster Mitigation Program Planning Distributions:

In 2003/2004, the Arkansas Department of Emergency Management received two Pre-Disaster Mitigation-Competitive (PDM-C) grants in the amount of $650,000 from FEMA to provide funding and technical support for 62 of the 77 emergency management jurisdictions statewide. One PDM-C grant was awarded in September of 2003 to support 21 jurisdictions and the second was awarded in April of 2004 to support 41 jurisdictions. Each jurisdiction was provided $10,000 to assist in the mitigation planning process.

In 2005, two additional county planning grants were awarded through PDM-C bringing the total number of jurisdictions with local hazard mitigation plans to 64 of the 77 counties.

Most recently, PDM grants used recently for the development of local mitigation plans is presented in **Table 5.2**:

Table 5.2 PDM Funds Used for Local Planning 2007-2010

Year of PDM Funding	Federal Share (75%)
2007	• PDMC-PJ-06-AR-2007-002 – Greenwood SD, Wells / East Hills • PDMC-PJ-06-AR-2007-003 – Greenwood SD, High School / North Main • PDMC-PJ-06-AR-2007-001 – Fort Smith SD, Howard Elementary • PDMC-PJ-06-AR-2007-004 – Magazine SD, Elementary
2008	• PDMC-PJ-06-AR-2008-005 – Van Buren SD, Butterfrield Jr. High
2009	• PDMC-PJ-06-AR-2009-005 – Van Buren SD, King Elementary
2010	• Russellville XD, Russellville Jr. High School

5.1.3 Technical Assistance

Most jurisdictions require some form of assistance to develop and update their local hazard mitigation plans (FEMA requires that local plans be updated every five years, but plans may be updated more frequently if needed—e.g., after a major disaster). Since funding for planning purposes is generally minimal, and ADEM is unable to provide planning funds to every jurisdiction that requires a local hazard mitigation plan, technical assistance is the primary method that ADEM uses to provide planning assistance to local jurisdictions.

Technical assistance for local mitigation planning in Arkansas is supported by ADEM provides technical assistance through planning workshops, calls, and site visits. ADEM has been proactive on assisting communities and contractors when they are preparing to submit planning and project grant applications. ADEM meets with each applicant before they submit an application to the state and FEMA. This is to help ensure that the correct information and format is used and each applicant understands the required guidelines for the grant program they are requesting funding from. ADEM has found that this effort at the beginning has reduced the amount of problems when applications are submitted and has gained a higher success rating when applications are sent to FEMA for approval to be funded. The state intends on continuing this practice in assisting applicants in the future. ADEM has also been actively supporting the local governments, communities, and contractors by providing various forms of training on a regular basis. Technical assistance over the past three years has included the following:

- G-318 Mitigation Planning Workshops for Local Governments - July 7, 8, and 9, 2009
- Application Development Courses - March 22-23, 2010
- Hazard Mitigation Plan Training/Overview – June 14, 2011 and June 17, 2011
- BCA Courses - October 20 and 21, 2011
- Annual FEMA-State Mitigation Planning Meeting
  - Region VI SHMO Meeting - September 11-12, 2012
  - Region VI Mitigation Conference - April 30 – May 3, 2012
- NEMA Conferences: SHMO Meeting and Mitigation Committee
  - October 4-6, 2012 Seattle, Washington
  - March 24-27, 2012 Alexandria, VA
  - March 21-23, 2011 Alexandria, VA
  - October 16-21, 2010 Little Rock, AR
- Mitigation Planning Workshops hosted by ADEM with FEMA Region VI planning personnel in attendance to provide opportunities for locals to work on their planning issues:
  - May 22, 2013- Jonesboro, AR (NE area)
  - May 23, 2013- Van Buren, Crawford Co (NW area)
  - June 11-12, 2013 - Hope, AR (SW area)
  - June 13, 2013- Star City, AR (SE area)
  - June 18, 2013- Perryville, AR (Central area)

5.1.4 Local Plan Development Status

As of April 2013, 59 jurisdictions had FEMA-approved hazard mitigation plans that met the requirements of both the DMA 2000 and the Flood Mitigation Assistance Program. The 59 local plans include three single-jurisdiction plans, four school districts and 52 county-level plans. Additional plan status includes:

- 9 Under Development – 7 Counties; 1 Single Jurisdiction; 1 University
- 6 Plan Updates Under Development – 5 Counties; 1 Dual Jurisdiction

- 1 Expired Plan – 1 County
- 1 Approved Pending Adoption – 1 County
- 8 No Known Plan – 8 Counties

With many county-level plans available, ADEM can effectively coordinate its efforts with local jurisdictions and assess how to most efficiently distribute project funding and technical assistance. Section 5.1.3 describes the process the State uses to provide planning support to local jurisdictions and the types of funding and technical assistance they make available for initial and future planning efforts.

Figure 5.1 Local Mitigation Plan Status by County, June 2013

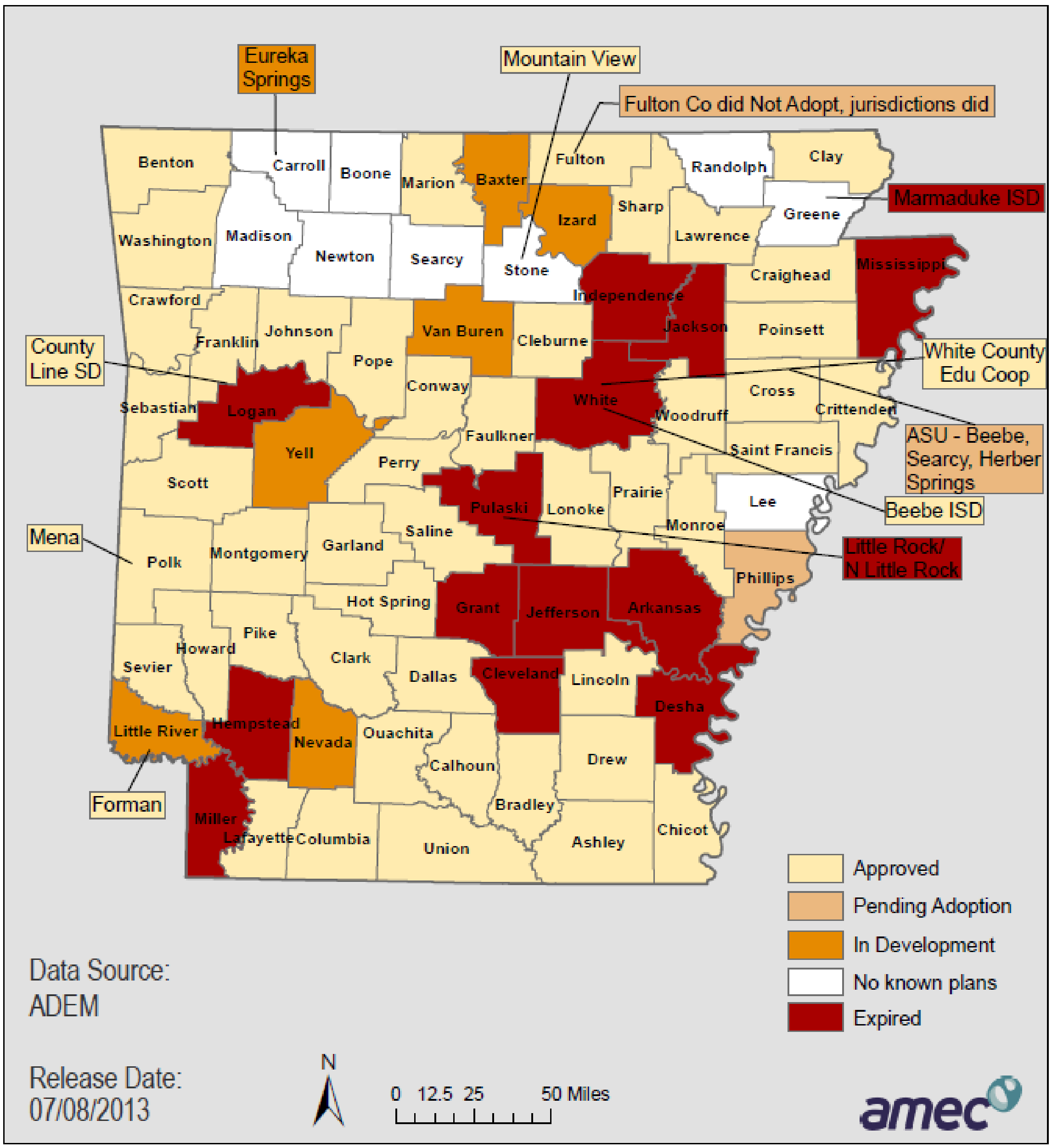


Table 5.3 Local Mitigation Plan Status by County, April 2013

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
APPROVED PLANS						
Ashley County	Ashley	Approved	FY03 PDMC	Multi	10	Ashley County, Crossett, Fountain Hill, Hamburg, Montrose, Parkdale, Portland, Wilmot, Hamburg School District, Crossett School District
Beebe School District	White	Approved	HMGP	Local	1	Beebe School District
Benton County	Benton	Approved	FY03 PDMC	Multi	28	Benton County, Bentonville, Garfield, Gateway, Pea Ridge, Lowell, Avoca, Highfill, Cave Springs, Siloam Springs, Gravette, Decatur, Bella Vista, Sulfur Springs, Bethel Heights, Rogers, Gentry, Centerton, Little Flock, Springtown, Bentonville SD, Decatur SD, Gentry SD, Gravette SD, Pea Ridge SD, Rogers SD, Siloam Springs SD, North West Arkansas Community College.
Bradley County	Bradley	Approved	FY03 PDM Plan	Multi	6	Bradley County, Warren, Hermitage, Banks, Warren School District, Hermitage School District
Calhoun County	Calhoun	Approved	FY03 PDMC	Multi	6	Calhoun County, Hampton, Harrell, Thornton, Tinsman, Hampton School District
Chicot County	Chicot	Approved	FY03 PDM Plan	Multi	7	Chicot County, Lake Village, Dermott, Eudora, Lakeside School District, Dermott School District, Eudora School District
Clark County	Clark	Approved	FY03 PDM Plan	Multi	14	Clark County, Amity, Arkadelphia, Caddo Valley, Gum Springs, Gurdon, Okolona, Whelen Spring, Arkadelphia School District, Gurdon School District, Henderson School District, Ouachita Baptist University
Clay County	Clay	Approved	N/A	Multi	16	Clay County, Corning, Datto, Greenway, Knobel, McDougal, Nimmons, Peach Orchard, Piggott, Pollard, Rector, St. Francis, Success, Corning School District, Piggott School District, Rector School District
Cleburne County	Cleburne	Approved	FY03 PDMC	Multi	4	Cleburne County, Heber Springs, Quitman, Quitman School District
Cleveland County	Cleveland	Approved	FY03 PDMC	Multi	5	Cleveland County, Rison, Kingsland, Cleveland County School District, Woodlawn School District
Columbia County	Columbia	Approved	FY03 PDMC	Multi	5	Columbia County, Emerson, Magnolia, McNeil, Taylor, Waldo
Conway County	Conway	Approved	FY03 PDM Plan	Multi	8	Conway County, Menifee, Morrilton, Oppelo, Plumerville, Nemo Vista School District, Woodview School District, South Conway County School District

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
County Line School District	Franklin	Approved	HMGP	Local	1	County Line School District
Craighead County	Craighead	Approved	FY03 PDM Plan	Multi	23	Craighead County, Bay, Black Oak, Bono, Brookland, Caraway, Cash, Lake City, Egypt, Jonesboro, Monette, Bay Schools, Blessed Sacrement Schools, Brookland Schools, Buffalo Island Central Schools, Concordia Christian Schools, East Side Baptist Schools, Jonesboro Schools, Nettleton Schools, Ridgefield Schools, Riverside Schools, Valley View Schools, Westside Consolidated Schools
Crittenden County	Crittenden	Approved	FY03 PDM Plan	Multi	7	Crittenden County, Earle, Horseshoe Lake, Marion, Turrell, West Memphis, Marion School District, West Memphis School District, Mid-South Community College
Crawford County	Crawford	Update - Approved	FY03 PDM Plan	Multi	15	Crawford County, Alma, Cedarville, Chester, Dyer, Kibler, Mountainburg, Mulberry, Ruby, Van Buren, Alma School District, Cedarville School District, Mountainburg School District, Mulberry School District, Van Buren School District
Cross County	Cross	Approved	FY03 PDMC	Multi	3	Cross County, Cherry Valley, Cross County School District (including Cherry Valley and Vanndale)
Dallas County	Dallas	Approved	FY03 PDMC	Multi	5	Dallas County, Fordyce, Carthage, Sparkman, Fordyce School District
Desha County	Desha	Approved	FY03 PDMC	Multi	10	Desha County, Arkansas City, Dumas, McGehee, Mitchellville, Reed, Tillar, Watson, Dumas School District, McGhee School District
Drew County	Drew	Approved	FY03 PDM Plan	Multi	9	Drew County, Jerome, Monticello, Tillar, Wilmar, Winchester, Drew Central School District, Monticello School District, University of Arkansas at Monticello
Faulkner County	Faulkner	Approved	FY03 PDM Plan	Multi	20	Faulkner County, Conway, Damascus, Enola, Greenbrier, Guy, Holland, Mayflower, Mt. Vernon, Twin Groves, Vilonia, Wooster, Conway School District, Guy-Perkins School District, Greenbrier School District, Mayflower School District, Vilonia School District, University of Central Arkansas, Central Baptist College, Hendrix University
Foreman (city)	Little River	Approved	FY03 PDMC	Multi	2	Foreman, Foreman School District
Franklin County	Franklin	Approved	FY03 PDMC	Multi	9	Franklin County, Atlus, Branch. Charleston, Denning, Ozark, Wiederkehr Village, Charleston School District, Ozark School District
Fulton County	Fulton	Approved	FY03 PDMC	Multi	5	Fulton County, Mammoth Spring, Salem, Viola, Viola School District

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
Garland County	Garland	Approved	FY02 FMA	Multi	12	Garland County, Lonsdale, Mountain Pine, Fountain Lake, Hot Springs, Jessieville School District, Lakeside School District, Fountain Lake School District, Mountain Pine School District, Lake Hamilton School District, Hot Springs School District, Cutter Morning Star School District
Grant County	Grant	Approved	FY03 PDMC	Multi	8	Grant County, Leola, Poyen, Prattsville, Sheridan, Tull, Poyen School District, Sheridan School District
Hempstead County	Hempstead	Approved	FY03 PDM Plan	Multi	11	Hempstead County, Blevins, Fulton, Hope, McNab, Patmos, Washington, Blevins School District, Hope School District, Saratoga School District, Spring Hill School District
Hot Spring County	Hot Spring	Approved	FY03 PDM Plan	Multi	12	Hot Spring County, Donaldson, Friendship, Malvern, Magnet Cove, Midway, Perla, Rockport, School District of Bismark, School District of Glen Rose, School District of Magnet Cove, School District of Malvern, School District of Ouachita
Howard County	Howard	Approved	FY03 PDMC	Multi	8	Howard County, Dierks, Mineral Springs, Tollette, Nashville, Nashville School District, Dierks School District, Mineral Springs School District
Independence County	Independence	Approved	FY03 PDM Plan	Multi	10	Independence County, Batesville, Magness, Pleasant Plains, Oil Trough, Sulpher Rock, Newark, Cushman, Batesville School District, Cedar Ridge School District
Jackson County	Jackson	Approved	FY03 PDM Plan	Multi	14	Jackson County, Amagon, Beedville, Campbell Station, Diaz, Grubbs, Jackson Port, Newport, Swifton, Tuckerman, Tupelo, Weldon, Jackson School District, Newport School District
Johnson County	Johnson	Approved	FY05 PDM	Multi	11	Johnson County, Clarksville, Coal Hill, Hartman, Knoxville, Lamar, Clarksville School District, Jasper School District, Lamar School District, Westside School District, University of Ozarks
Lafayette County	Lafayette	Approved	FY03 PDMC	Multi	7	Lafayette County, Bradley, Buckner, Lewisville, Stamps, Bradley School District, Lafayette School District
Lawrence County	Lawrence	Approved	FY03 PDMC	Multi	13	Lawrence County, Alicia, Black Rock, College City, Hoxie, Imboden, Ravenden, Smithville, Strawberry, Walnut Ridge, Hoxie School District, Lawrence County School District, Sloan-Hendrix School District
Lincoln County	Lincoln	Approved	FY03 PDM Plan	Multi	2	Lincoln County, Star City
Lonoke County	Lonoke	Approved	FY03 PDM Plan	Multi	15	Lonoke County, Allport, Austin, Cabot, Carlisle, Coy, England, Humnoke, Keo, Lonoke, Ward, Cabot School District, Carlisle School District, England School District, Lonoke School District
Marion County	Marion	Approved	N/A	Multi	10	Marion County, Bull Shoals, Everton, Flippin, Oakland, Peel, Pyatt, Rea Valley, Summit, Yellville
Marmaduke School-ISD	Greene	Approved	HMGP	Local	1	Marmaduke School District

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
Mena (city)	Polk	Approved	FY03 PDMC	Multi	2	Mena, Mena School District
Monroe County	Monroe	Approved	FY03 PDM Plan	Multi	8	Monroe County, Brinkley, Clarendon, Fargo, Holly Grove, Roe, Brinkley School District, Clarendon School District
Montgomery County	Montgomery	Approved	FY03 PDMC	Multi	8	Montgomery County, Black Springs, Mount Ida, Norman, Oden, Caddo Hills School District, Mount Ida School District, Ouachita River School District
Mountain View (city)	Stone	Approved	FY03 PDMC	Multi	3	Mountain View, Stone County, Mountain View School District
Ouachita County	Ouachita	Approved	Deobligated FY03 PDMC	Multi	12	Ouachita County, Bearden, Camden, Chidester, East Camden, Louann, Reader, Stephens, Bearden School District, Camden Fairview School District, Harmony Grove School District, Stephens School District
Perry County	Perry	Approved	FY03 PDMC	Multi	11	Perry County, Adona, Bigelow, Casa, Houston, Perry, Perryville, East End School District, Two Rivers School District, Perryville School District, Perry County Day Service Center
Pike County	Pike	Approved	FY03 PDMC	Multi	10	Pike County, Antoine, Daisy, Delight, Glenwood, Murfreesboro, Delight School District, Centerpoint School District, Kirby School District, Murfreesboro School District
Poinsett County	Poinsett	Approved	Deobligated FY03 PDMC	Multi	14	Poinsett County, Fisher, Harrisburg, Lepanto, Marked Tree, Trumann, Tyronza, Waldenburg, Weiner, East Poinsett County School District, Harrisburg School District, Marked Tree School District, Trumann School District, Weiner School District
Pope County	Pope	Approved	FY05 PDM	Multi	13	Pope County, Atkins, Dover, Hector, London, Pottsville, Russellville, Atkins School District, Dover School District, Hector School District, London School District, Pottsville School District, Russellville School District
Prairie County	Prairie	Approved	FY03 PDM Plan	Multi	9	Prairie County, Biscoe, Des Arc, DeValls Bluff, Hazen, Ulm, Des Arc School District, DeValls Bluff School District, Hazen School District
Saline County	Saline	Approved	FY03 PDMC	Multi	12	Saline County, Alenxander, Bauxite, Benton, Bryant, Haskell, Shannon Hills, Traskwood, Bauxite School District, Benton School District, Bryant School District, Harmony Grove School District
Scott County	Scott	Approved	FY03 PDMC	Multi	3	Scott County, Walden, Walden School District
Sebastian County	Sebastian	Update - Approved	FY03 PDM Plan	Multi	18	Sebastian County, Barling, Bonanza, Central City, Fort Smith, Greenwood, Hackett, Hartford, Huntington, Manfield, Midland, Lavaca, Fort Smith School District, Greenwood School District, Hackett School District, Hartford School District, Mansfield School District, Lavaca School District

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
Sevier County	Sevier	Approved	FY03 PDMC		9	Sevier County, Ben Lomond, DeQueen, Gillham, Horatio, Lockesburg, Horatio School District, DeQueen-Lockesburg School District, Cossatot Community College
Sharp County	Sharp	Approved	FY03 PDMC	Multi	9	Sharp County, Hardy, Ash Flat, Cave City, Cherokee Village, Highland, Evening Shade, Sidney, Williford
St. Francis County	St. Francis	Approved	FY03 PDMC	Multi	13	Saint Francis County, Caldwell, Colt, Forrest City, Hughes, Madison, Paelstine, Wheatley, Widener, Forrest City School District, Hughes School District, Palestine-Wheatley School District, Crowley's Ridge Technical Institute
Union County	Union	Approved	FY03 PDMC	Multi	11	Union County, Calion, El Dorado, Felsenthal, Huttig, Junction City, Smackover, Junction City School District, Norphlet School District, Smackover School District, Parkers Chapel School District
Washington County	Washington	Approved	FY03 PDMC	Multi	23	Washington County, Elkins, Elm Springs, Farmington, Fayetteville, Goshen, Greenland, Johnson, Lincoln, Prairie Grove, Springdale, Tontitown, West Fork, Winslow, Elkins School District, Farmington School District, Fayetteville School District, Greenland School District, Lincoln School District, Prairie Grove School District, Springdale School District, West Fork School District
White County	White	Approved	FY03 PDMC	Local	1	White County
White County Edu Cooperative	White	Approved	HMGP	Multi	5	White County Central School District, River School District, Pangburn School District, Bald Knob School District, Bradford School District
Woodruff County	Woodruff	Approved	FY03 PDMC	Multi	7	Woodruff County, Augusta, Cotton Plant, Hunter, McCrory, Paterson, Augusta School District
APPROVED PLANS – PENDING ADOPTION						
Phillips County	Phillips	Pending Adoption	FY03 PDMC	Multi	9	Phillips County, Helena-West Helena, Lexa, Elaine, Elaine Schools (Marvell Schools merged), Lake View, Marvell, Barton-Lexa Schools, Helena-West Helena Schools
NEW PLANS and PLAN UPDATES - UNDER DEVELOPMENT						
ASU-Beebe-Heber Springs-Searcy	Arkansas State University	Under Development	N/A	Multi	3	ASU Campuses: Beebe, Heber Springs, and Searcy
Baxter County	Baxter	Under Development	N/A	Multi	18	Baxter County, Big Flat, Briarcliff, Clarkridge, Cotter, East Cotter, Gamaliel, Gassville, Harriet, Hendersdon, Lake View, Lakeview, Midway, Monkey Run, Mountain Home, Norfork, Salesville, Whiteville

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
Eureka Springs, City of	Carroll	Under Development	N/A	Local	1	City of Eureka Springs
Izard County	Izard	Under Development	N/A	Multi	20	Izard County, Boswell, Brockwell, Calico Rock, Dolph, Franklin, Forty Four, Guion, Horseshoe Bend, Jordan, LaCrosse, Melbourne, Mount Pleasant, Oxford, Pineville, Sage, Violet Hill, Wideman, Wiseman, Zion
Little River County	Little River	Under Development	N/A	Multi	6	Little River County, Ashdown, Alleene, Ogden, Wilton, Winthrop
Nevada County	Nevada	Under Development	N/A	Multi	8	Nevada County, Bluff City, Bodcaw, Cale, Emmet, Laneburg, Rosston, Willisville
Polk County	Polk	Under Development	HMGP	Multi	5	Polk County, Wickes, Ouachita School District, Van Cove School District, Wickes School District
Van Buren County	Van Buren	Under Development	N/A	Multi	21	Van Buren County, Alread, Bee Branch, Botkinburg, Choctaw, Clinton, Crabtree, Culpeper, Dennard, Eglantine, Fairfield Bay, Formosa, Koch Ridge, Lexington, Plant, Rex, Rupert, Rushing, Scotland, Shirley, Walnut Grove
Yell County	Yell	Under Development		Multi	13	Yell County, Belleville, Bluffton, Briggsville, Centerville, Corinth, Danville, Dardanelle, Gravelly, Ola, Plainview, Rover, Waveland
Arkansas County	Arkansas	Update - Under Development	N/A	Multi	10	Arkansas County, Almyra, DeWitt, Gillett, Humphrey, St. Charles, Stuttgart, Stuttgart Schools, DeWitt Schools, Phillips Community College
Jefferson County	Jefferson	Update - Under Development	N/A	Multi	9	Jefferson County, Altheimer, Humphrey, Pine Bluff, Redfield, Sherrill, Wabbaseka, White Hall, Pine Bluff School District
Little Rock / North Little Rock(city)	Pulaski	Update - Under Development	FY03 PDMC	Multi	2	Little Rock, North Little Rock
Logan County	Logan	Update - Under Development	N/A	Multi	15	Logan County, Blue Mountain, Booneville, Caulksville, Magazine, Paris, Morrison Bluff, Ratcliff, Scranton, Subiaco, Booneville School District, County Line School District, Magazine School District, Paris School District, Scranton School District
Mississippi County	Mississippi	Update - Under Development	N/A	Multi	16	Mississippi County, Blytheville, Dell, Dyess, Etowah, Gosnell, Keiser, Leachville, Luxora, Manila, Marie, Osceola, Wilson, Gosnell School District, Manila School District, South Mississippi County School District
Pulaski County	Pulaski	Update - Under Development	N/A	Multi	9	Pulaski County, Alexander, Cammack Village, Jacksonville, Little Rock, North Little Rock, Maumelle, Sherwood, Wrightsville

Jurisdiction	County	Status	Funding Source	Plan Type	Included Jurisdictions	
					No.	Names
EXPIRED PLANS						
Miller County	Miller	Expired		Multi	7	Miller County, Fouke, Garland, Texarkana, Fouke School District, Genoa Central School District, Texarkana School District
DEOBLIGATED						
Ashdown (city)	Little River	Deobligated	FY03 PDMC			
Madison County	Madison	Deobligated	FY03 PDMC			
Mountain Home (city)	Baxter	Deobligated	FY03 PDMC			
Norfolk (city)	Baxter	Deobligated	FY03 PDMC			
NO KNOWN PLAN						
Boone County	Boone	No Known Plan				Boone County, Alpena, Bellefonte, Bergman, Bruno, Carrollton, Diamond City, Everton, Harrison, Lead Hill, Omaha, South Lead Hill, Valley Springs, Zinc
Carroll County	Carroll	No Known Plan				Carroll County, Beaver, Berryville, Blue Eye, Busch , Elk Ranch, Eureka, Eureka Springs, Grandview, Green Forest, Holiday Island, Metalton, Oak Grove, Osage, Rudd, Rule, Urbanette
Greene County	Greene	No Known Plan				Greene County, Beech Grove, Delaplaine, Lafe, Light, Marmaduke, Oak Grove, Heights, Paragould, Walcott
Lee County	Lee	No Known Plan				Lee County, Aubrey, Brickeys, Haynes, LaGrange, Marianna, Moro, Rondo
Madison County	Madison	No Known Plan				Madison County, Combs, Hindsville, Huntsville, Kingston, Pettigrew, St. Paul, St. Paull, Wesley, Witter
Newton County	Newton	No Known Plan				Newton County, Bass, Compton, Deer, Dogpatch, Erbie, Hasty, Jasper, Limestone, Low Gap, Marble Falls, Mossville, Mount Hersey, Mount Judea, Mount Sherman, Nail, Parthenon, Pelsor, Piercetown, Ponca, Pruitt, Vendor, Wayton, Western Grove, Yardelle
Randolph County	Randolph	No Known Plan				Randolph County, Biggers, Dalton, Maynard, O'Kean, Pocahontas, Ravendale Springs, Reyno, Warm Springs
Searcy County	Searcy	No Known Plan				Searcy County, Canaan, Chimes, Cozahome, Dongola, Flag, Gilbert, Harriet, Landis, Leslie, Marshall, Oxley, Pindall, Rumley, St. Joe, Witts Springs

N/A – data not available

5.2 Local Plan Integration

Requirement §201.4(c)(4)(ii): [The section on the coordination of local mitigation planning must include a] description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the state mitigation plan.

Plan Update §201.4(d): Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities.

5.2.1 Review and Approval of Local Plans

The DMA 2000 (Section 322(b)) calls for each local plan to ―describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan and establish a strategy to implement those actions. FEMA expanded on these basic criteria and established specific requirements for local mitigation plans in *Local Multi-Hazard Mitigation Planning Guidance*, July 2008; *Local Mitigation Plan Review Guide*, October 2011; and most recently *Local Mitigation Planning Handbook*, March 2013. ADEM's hazard mitigation plan guidance dictates that local hazard mitigation plans be developed to meet all federal requirements, address the specific hazard mitigation needs of the applicable jurisdictions, and complement the Arkansas All-Hazards Mitigation Plan. The state plan is used as a reference for locals to refer to in plan development.

Local hazard mitigation plans undergo a continuous review during development that involves state and local officials and concerned members of the applicable communities. This helps to ensure that plans develop smoothly and that the final plan is acceptable to the jurisdiction, its citizens, and the State. The current process used to review and approve both new and updated plans is outlined below:

Table 5.4 Local Mitigation Plan Review Process and Timeframe

Local Mitigation Plan Review Step	Timeframe
The submitting jurisdiction submits the plan to ADEM	8 months after funding approval
The ADEM Grant Coordinator-HMGP works with the submitting jurisdiction to resolve any concerns, as necessary, and completes a formal review of the plan using the FEMA Crosswalk Tool.	30 days after submittal
After successful integration of the required plan elements the plan is approved by ADEM	
ADEM sends the Draft to FEMA Region VI for conditional approval	
FEMA notifies ADEM of conditional approval	Approximately 45 days after submittal
ADEM notifies the submitting jurisdiction of conditional approval	30 days after FEMA Approval
The participating jurisdictions adopt the plan	
The submitting jurisdiction sends the adopted plan with resolutions to ADEM	
ADEM sends an electronic copy of the adopted plan with resolutions to FEMA Region VI	

Local Mitigation Plan Review Step	Timeframe
FEMA grants final approval (this determines the date of approval)	Approximately 45 days after submittal
ADEM notifies the submitting jurisdiction of final approval with a letter	Immediately upon receiving FEMA Approval
ADEM keeps all hazard mitigation plans on file at the ADEM office	Ongoing

Local mitigation projects and initiatives are based on the goals and objectives of local plans. However, it is understood that funding, situations, and priorities change. ADEM and FEMA allow jurisdictions the flexibility to add/subtract mitigation projects as priorities, due to funding and other changing circumstances. Changes may be made to the plan review process, if needed, to comply with FEMA's guidance for local plan updates.

5.2.2 Integrating the Local Plans with the State Plan

The process of integrating state and local mitigation planning began with state staff involvement and guidance in the local planning process. It is understood by all levels of government that the success of the Arkansas mitigation program depends on the degree to which everyone works together toward the common goal of reducing future disasters in Arkansas. This is accomplished by involving as many interested groups and individuals as possible in the planning process.

It is also widely acknowledged that the local plans can benefit from data in the state plan, and the state plan can benefit from data in local plans. For this 2013 plan update, the APDMAC reviewed and summarized information from the local plans. This information included:

- Hazard identification and risk assessment,
- Goals and objectives,
- Local capabilities, and
- Mitigation initiatives.

The process in 2013 involved reviewing all of the local community plans and capturing the information related to the four categories above in spreadsheets for further review and comparison purposes. (For more details on this process, and how the information was collected and incorporated, see Section 3.6 *Assessing Vulnerability and Estimating Losses by Jurisdiction: Integration of Local Plans*, Section 4.1 *Hazard Mitigation Goals and Objectives*, Section 4.3 *Local Capability Assessment*, and Section 4.4 *Mitigation Actions*.) This information was used to reassess state hazard and capabilities priorities and the progress in statewide mitigation efforts.

As of April 2013, this state plan update is integrated with 54 local hazard mitigation plans. New and updated plans will be incorporated into the state plan during the next three-year update cycle due in 2016. By 2016, the state plan should be linked to all the county mitigation plans and will represent near 100 percent coverage. The incorporation of local plans by 2016 also means that the majority of the state population will be covered by an approved local hazard mitigation plan.

5.3 Prioritizing Local Assistance

Requirement §201.4(c)(4)(iii): [The section on the coordination of local mitigation planning must include] 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.
Plan Update §201.4(d): Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities.

This section describes the criteria Arkansas uses to prioritize distribution of planning and project grants to communities and local jurisdictions. The criteria and process remain the same as was outlined in the previous versions of the Arkansas All-Hazard Mitigation Plan.

5.3.1 Planning Grants

Federal and state funding for mitigation planning is limited and in some instances not available. The Hazard Mitigation Grant Program and Pre-Disaster Mitigation program are the primary sources of funding for mitigation planning. Funding to meet the nonfederal match requirement of these grants comes primarily from local sources (cash and in-kind).

There are always more requests for financial assistance for mitigation planning funds than there are funds available. Funding for mitigation planning is based primarily on the availability of funds and whether the requesting jurisdiction has demonstrated the desire and ability to complete their plan as well as to follow through with the initiatives developed in the plan (which should not be dependent on the availability of state or federal funds). The expiration date of any current plan is also taken into consideration when evaluating the possibility of a plan update project.

In evaluating mitigation planning applications, ADEM uses the following factors for prioritization:

Table 5.5 Mitigation Planning Application Ranking Criteria

Mitigation Planning Ranking Criteria	Scoring (Points)
Existing Plan Revision	10
New Plan	10
Multi-Jurisdiction	10
Single Jurisdiction	5

Mitigation Planning Ranking Criteria	Scoring (Points)
School/University	5
Private Non-Profit	5
NFIP Participation	5
CRS Participation	5

5.3.2 Project Grants

Federal and state funding for mitigation projects is also limited and therefore requires the State to prioritize proposed local mitigation projects. The Flood Mitigation Assistance Program, Hazard Mitigation Grant Program, and Pre-Disaster Mitigation program are the primary sources of funding for mitigation projects. The State intends to increase the utilization of the Repetitive Loss Flood Claims and Severe Repetitive Loss programs for repetitive-loss mitigation. Funding to meet the non-federal match requirement of these grants comes mostly from U.S. Department of Housing and Urban Development (HUD) Community Development Block Grants (CDBG) and Arkansas' general revenue. As state general revenue is no longer available, future matching funds will have to come primarily from local sources. Ideally, all communities will participate in some form of mitigation; however, due to differences in local capabilities and priorities, including the status of local mitigation plans, the degree of participation varies greatly from community to community.

In evaluating mitigation projects that have been submitted for review and possible approval, ADEM first considers the following factors for eligibility:

- **Benefit/Cost** - a benefit/cost review is required for all projects with the exceptions of safe rooms, which are categorically and programmatically excluded. Benefit/Cost ratios in excess of 1:1 are required for funding consideration;
- **NFIP Participation** - Communities must participate in the National Flood Insurance Program; and
- **Approved Local Mitigation Plan -** Communities must have a FEMA approved Hazard Mitigation Plan to be considered for mitigation funding.

Next, ADEM considers the following factors for scoring and ranking the mitigation project grant proposals:

Table 5.6 Mitigation Project Ranking Criteria

Mitigation Project Ranking Criteria	Scoring (Points)	
	Yes	No
Is the project the highest priority in the local mitigation plan?	5	0
Does the project mitigate a repetitive loss structure?	5	0

Mitigation Project Ranking Criteria	Scoring (Points)	
	Yes	No
What is the date of the project notice of intent?	Latest = 0 Points Earliest = 5 Points	
Is the project located within the floodplain?	5	0
What is the Benefit/Cost Ratio?	1.0-1.25 = 1 Point 1.26-1.5 = 2 Points 1.51-1.75 = 3 Points 1.76-2.0 = 4 Points Over 2.0 = 5 Points	
Is the applicant community located within a high risk area for the hazard being mitigated (as indicated in the risk assessment)?	5	0
Does the applicant community is exhibit intense development pressure (as indicated in demographic section or using other data)?	5	0
Is the applicant community located within a FEMA-Declared County?	5	0
Does the applicant community participate in the Community Rating System (CRS)?	1	0
Is the applicant community a Fire Wise Community / USA?	1	0
Is the applicant community a National Weather Service StormReady Community?	2	0
Is the applicant community a FEMA CTP (Cooperating Technical Partner)?	1	0
Has the applicant community received previous mitigation grant awards?	0 Awards = 5 Points 1 Award = 4 Point 2 Awards = 3 Point 3 Awards = 2 Point 4 Award s= 1 Point	

Acquisition and relocation projects are further prioritized per the State Administrative Plan as follows:

a. Structures in the floodway with >50% damage;
b. Structures in the floodplain with >50% damage;
c. Structures in the floodway with <50% damage;
d. Structures in the floodplain with <50% damage;
e. Vacant lots in the floodway;
f. Vacant lots in the floodplain;
g. Priority of structures will be as follows:

(1) Primary Residence
(2) Secondary/Rental Property
(3) Commercial Property

Arkansas's highest project priorities consider the hazards (both natural and man-made), vulnerabilities, and capabilities. Flood buyout projects (especially for repetitive and severe repetitive loss properties), and other flood mitigation and structural projects to protect essential infrastructure are the first priority. Projects to protect individuals from tornadoes and high wind rank second, followed by projects to reduce losses from earthquakes. A list of funding priorities for mitigation projects across the state is presented in the table below.

Table 5.7 Mitigation Project Funding Priorities, 2013

1. Acquisition/relocation of severe repetitive loss structures.
2. Acquisition/relocation of repetitive loss structures.
3. Acquisition/Relocation Projects will be further prioritized as follows: a. Two repetitive losses totaling at least $20,000; b. Structures in the floodway with >50% damage; c. Structures in the floodplain with >50% damage; d. Structures in the floodway with <50% damage; e. Structures in the floodplain with <50% damage; f. Vacant lots in the floodway; g. Vacant lots in the floodplain; h. Priority of structures will be as follows: i. *Primary Residence* ii. *Secondary/Rental Property* iii. *Commercial Property*
4. Structural flood control measures.
5. Structural retrofit of public critical facilities to resist high wind and seismic effects.
6. Community safe rooms.
7. Retrofitting, such as wet and dry flood proofing.
8. Non-structural retrofit for seismic effects.
9. Window film, Gas Shutoff valves, and NOAA weather radios.
10. Wild land fire suppression measures.
11. Legislation to include mitigation actions in all new construction.
12. GIS/spatial data related activities to support mitigation.

13. Mapping projects to assist in planning.
14. Mitigation planning activities.
15. Support Mitigation in Public Education activities.
16. Support all activities related to NFIP.

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.

Additional information about the process ADEM uses to evaluate and prioritize mitigation actions and determine cost-effectiveness is available in Section 7.2.1 *Process Used to Evaluate and Prioritize Mitigation Actions*, Section 7.2.2 *Eligibility Criteria for Multi-Hazard Mitigation Projects*, Section 7.2.3 *Eligibility Criteria by Mitigation Project Type*, and Section 7.2.4 *Pre-Project Determination of Cost-Effectiveness of Mitigation Measures*.

5.3.3 Small and Impoverished Communities

44 CFR §201.2 defines small and impoverished communities as follows:

"Small and impoverished communities means a community of 3,000 or fewer individuals that is identified by the State as a rural community, and 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, based on best available data; the local unemployment rate exceeds by one percentage point or more, the most recently reported, average yearly national unemployment rate; and any other factors identified in the State Plan in which the community is located."

Hazard Mitigation Grant Program

In regard to the plan requirement for HMGP project funds, the FEMA regional administrators may waive this requirement for small and impoverished communities. In these cases, a plan must be completed within 12 months of the award of the project grant. This process is to be used judiciously and should not be viewed as the normal sequence of the planning process.

Pre-Disaster Mitigation Grant Program

Small and impoverished communities that receive grants from the PDM program may receive a federal cost share of up to 90 percent of the total amount approved under the grant award (as opposed to the typical 75 percent federal cost share). Documentation must be submitted with the sub-application to support the eligibility for the higher cost share.

6.0 PLAN MAINTENANCE PROCESS

6.1 Monitoring, Evaluating, and Updating the Plan

Requirement §201.4(c)(5)(i): The standard state plan maintenance process must include an established method and schedule for monitoring, evaluating, and updating the plan.

As described in detail in Chapter 2, this update to the Arkansas All-Hazards Mitigation Plan is the result of the combined efforts of members of the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC) which is composed of state, federal, local, and voluntary agency representatives. For a detailed listing of agencies represented on the APDMAC, see Section 2.1.2.

Hazard mitigation planning is a continuous and ongoing process. Policies and procedures established in this plan reflect the current emergency management and hazard mitigation philosophy at both the state and national level. Changes in hazard mitigation programs and/or priorities, including changes in legislation and available funding, may necessitate modifications to this plan. A major disaster could also prompt modifications to this plan.

6.1.1 Plan Maintenance Process

The Mitigation Branch of ADEM is the lead group responsible for monitoring, evaluating, and updating the Arkansas All Hazard Mitigation Plan. Meetings of the APDMAC are scheduled by the Mitigation Branch as needed monitor this plan. These meetings are to be conducted at a minimum:

- In the event of a major disaster and/or upon receiving a Presidential Disaster Declaration, if needed/warranted;
- As part of the State's hazard mitigation plan review/update every three years or as required; and
- When required/needed due to changes in federal/state regulations and/or legislation that impact the hazard mitigation program.

In addition to the update requirements mentioned above, annually ADEM conducts an in-house review and evaluation in order to assess the plan on a more regular basis. This review, done in conjunction with the development of ADEM's annual hazard analysis, continues to allow the State to direct its priorities in the appropriate manner before disasters occur.

The ADEM State Hazard Mitigation Officer will coordinate the annual review and evaluation of the plan. Meeting invitations and emails will be sent to the following ADEM branches and other state agencies and departments to participate in the evaluation and update of the state plan:

- ADEM Mitigation Branch;

- ADEM Planning Branch;
- ADEM Information Technology Branch;
- Members of the APDMAC; and
- Other ADEM branches and/or state agencies and departments that may be asked to assist in the review of this plan based on legislative changes, FEMA policy changes, or State priorities affecting the state hazard mitigation program.

Representatives from the various agencies and departments on the APDMAC are responsible for reviewing the plan, providing input and suggesting changes to the plan based on the mitigation initiatives being undertaken by their respective organizations.

During evaluation, state agencies:

- Review the risk assessment and revise if necessary;
- Review the vulnerability assessment and loss estimates and revise if necessary;
- Review goals and objectives and revise if necessary;
- Review hazard mitigation projects and initiatives to ensure there are no potential conflicts with ongoing agency initiatives;
- Review hazard mitigation projects and initiatives to ensure they complement the statewide mitigation strategy; and
- Review existing state/federal programs to ensure that the state is taking full advantage of possible funding sources in its implementation of the State hazard mitigation program.

A review of plan goals and objectives is emphasized as part of the regular plan review and evaluation process. The review is in conjunction with the review and approval process of local hazard mitigation plans. This helps to ensure that the state and local hazard mitigation plans complement each other and that both state and local governments are working together to accomplish Arkansas's mitigation goals. Additionally, proposed mitigation projects are reviewed to determine how they help state and local governments meet their established goals and objectives.

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized. Evaluation of progress can further be achieved by monitoring changes in vulnerabilities identified in the plan.

Public involvement in the hazard mitigation process is accomplished through open public meetings as part of the development and review of local hazard mitigation plans. State and local representatives participate in these meetings and public input is sought and taken into consideration in developing mitigation priorities.

2013 Plan Update

For this update to the Arkansas All Hazards Mitigation Plan, the previously approved plan maintenance process was followed and evaluated. The APDMAC determined that the elements and processes originally proposed to monitor, evaluate, and update the plan were effective.

Future Plan Update

The Arkansas All Hazards Mitigation Plan will be updated every three years and re-submitted to FEMA for re-approval. This three year cycle will begin in mid-September 2013, based upon the anticipated FEMA re-approval date.

- **Year 1**
    - **January 2014 – APDMAC Meeting**; ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. APDMAC members will be notified this is the beginning of the evaluation period and will be responsible for reviewing the plan, providing input and suggesting changes to the plan based on the mitigation initiatives being undertaken by their respective organizations. The evaluation tasks, as previously noted, will be undertaken.
    - **July 2014 – APDMAC Meeting;** ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. All evaluation comments received by ADEM will be presented to the APDMAC and updates, if necessary, incorporated into the All Hazards Mitigation Plan. FEMA Region VI will be notified of any updates to the plan.
- **Year 2**
    - **January 2015 – APDMAC Meeting**; ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. Similar to Year 1, APDMAC members will be notified this is the beginning of the evaluation period and will be responsible for reviewing the plan, providing input and suggesting changes to the plan based on the mitigation initiatives being undertaken by their respective organizations. The evaluation tasks, as previously noted, will be undertaken.
    - **July 2015 – APDMAC Meeting;** ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. All evaluation comments received by ADEM will be presented to the APDMAC and updates, if necessary, incorporated into the All Hazards Mitigation Plan. FEMA Region VI will be notified of any updates to the plan.
- **Year 3**
    - **January 2016 – APDMAC Meeting**; ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. For Year 3, this will serve as the formal kick-off meeting for the update to the All Hazards Mitigation Plan. The evaluation period will be expedited during this third year to accommodate the formal update to the plan.

- **March 2016 – APDMAC Meeting,** ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. Results of the risk assessment will be presented to the APDMAC and a review and update of the mitigation strategy will be performed. The APDMAC will be provided with updated text for all chapters of the All Hazards Mitigation Plan during the planning process for review and comment.
- **July 2016 – APDMAC Meeting;** ADEM State Hazard Mitigation Officer will coordinate and oversee the meeting. The APDMAC will be provided with the final draft version of the All Hazards Mitigation Plan Update. Formal submittal to FEMA for re-approval will follow.

6.2 Monitoring Progress of Mitigation Activities

Requirement §201.4(c)(5)(ii) and (iii): [The standard state plan maintenance process must include a] system for monitoring implementation of mitigation measures and project closeouts. [The standard state plan maintenance process must include a] system for reviewing progress on achieving goals as well as activities and projects in the mitigation strategy.

6.2.1 Monitoring Implementation of Mitigation Measures and Project Closeouts

The State of Arkansas ensures all Hazard Mitigation Assistance (HMA) grants are implemented in accordance with current FEMA guidance. The most current FEMA guidance is the June 1, 2010 Hazard Mitigation Assistance Unified Guidance: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program, Repetitive Flood Claims Program, Severe Repetitive Loss Program. The State has established a database for tracking the implementation and closeout of mitigation actions.

The most current Arkansas Hazard Mitigation Administrative Plan, March 2012, provides details on how the State monitors implementation of mitigation measures and conducts project closeouts for the Hazard Mitigation Grant Program (HMGP). Although not all Hazard Mitigation Assistance Grants require a detailed State Administrative Plan, the State applies the basic monitoring and closeout procedures set out in the HMGP Administrative Plan consistently in the other applicable HMA programs where the State serves as grantee. The following paragraphs detail how the State tracks the implementation of mitigation actions and project closeouts.

Project Management

Upon notification from FEMA that a project has been approved and is eligible for funding, the SHMO will notify the subgrantee and will arrange a meeting to provide the subgrantee with appropriate information on regulatory program requirements, State policy and grant management in accordance with 44 CFR 13. Based upon the approved application and work schedule of the project(s), a record keeping and financial system will be implemented for the duration of the project.

The Arkansas Department of Emergency Management (ADEM) is the grantee for project management and accountability of funds in accordance with 44 CFR 13. Approved applicants are considered subgrantees and are accountable to the grantee for funds awarded them.

Technical Assistance and Project Monitoring

ADEM (as grantee) recognizes their regulatory responsibilities for all HMA grants: The State, serving as grantee, has primary responsibility for project management and accountability of funds as indicated in 44 CFR 13. The State is responsible for ensuring that subgrantees meet all program and administrative requirements.

ADEM is committed to monitoring and providing technical assistance to all eligible and funded subgrantees. 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 applicant. ADEM also directs local governments to locate FEMA's ―How-To‖ Guidebooks for mitigation planning.

To track mitigation projects from initiation to closeout, a project tracking spreadsheet is used that includes the following information:

- Applicant/Subgrantee name;
- Contractor, if applicable;
- Total Cost Estimate;
- Federal Share;
- Local Share;
- NEMIS;
- Date Submitted to FEMA.

Quarterly Reports

Quarterly Progress Reports based upon the work schedule will be submitted to the SHMO, beginning the first full quarter after receipt of the funding. The SHMO will submit quarterly reports to FEMA. The final report will be a complete assessment of project accomplishment.

Any problems or circumstances affecting completion dates, scope of work, or project costs which would cause non-compliance with FEMA approved grant conditions shall be described in a letter to FEMA requesting an extension, change in scope of work, etc.

Cost Overruns

Immediately upon recognition that an original scope of work approved and funded cannot be accomplished with the grant funds allocated, the subgrantee must submit a request for additional funds with appropriate justification. The Governor's Authorized Representative (GAR) shall evaluate each cost overrun and shall submit a request with a recommendation to the FEMA Regional Administrator for a determination. The applicant's justification for additional costs and other pertinent material shall accompany the request. The FEMA Regional Administrator shall notify the GAR in writing of the determination and process a supplement, if necessary. All requests that are not justified shall be denied by the GAR. In no case will the total amount obligated to the State exceed funding limits set forth in 44 CFR §206.432 (b). Any such problems or circumstances affecting project costs shall be identified through the quarterly progress reports.

Project Closeout

Upon completion of a HMA grant project, the program manager and/or hazard mitigation grant auditor conducts a closeout site visit to review all files (or a representative sample) and all documents pertaining to the use of HMA grant and state general revenue funds. In addition, all procurement files and contracts to third parties are reviewed.

Closeout reports will be submitted for each subgrantee upon expiration of the grant. The following documents are required upon project completion:

- Summary of Documentation;
- Certification Letter on subgrantee letterhead;
- Pictures of completed project;
- Materials, labor and equipment forms, if required;
- Hazard Mitigation Grant Close-Out Certification; and
- Closeout in NEMIS.

Closeout reports will generally be submitted 90 days after notification by a quarterly report that the project has been completed. Note: delays could occur due to extenuating circumstances, such as another disaster declaration.

Audit Requirements

44 CFR 14, Administration of Grants: Audits of State and Local Governments, OMB A-133, and the Single Audit Act of 1984, as amended in 1996 all require subgrantees expending $500,000 or more in Federal assistance must have an audit conducted in accordance with the Single Audit Act. Copies of such reports, if applicable, will be requested. All general audit requirements in 44 CFR Part 14 and in accordance with implementing program regulations will be adhered to by ADEM as well as subgrantees spending FEMA hazard mitigation grant awards.

Appeals

All subgrantee appeals to FEMA decisions are administered in accordance with implementing program regulations.

A subgrantee may appeal any decision regarding projects submitted for HMA funding. The appeal must be submitted in writing and contain sufficient documentation to support the subgrantee's position. The appeal must specify the monetary figure in dispute and the provisions in Federal law, regulation, or policy with which the appellant believes the initial action is inconsistent. The appeal must reach the Grantee within 60 days from the date the subgrantee was notified of denial of funding.

On behalf of the subgrantee, the State may appeal any FEMA denial for Federal assistance. Within 60 days of the date of the receipt of the appeal from the subgrantee, the State will review the material submitted, make additions if necessary, and forward the appeal with a written recommendation to the FEMA Region VI Administrator.

2013 Plan Update

As part of the update to the Arkansas All-Hazards Mitigation Plan, the previously approved plan's monitoring system for implementation of mitigation measures and project closeout was evaluated. It was determined that the monitoring system described herein to track the initiation, status, and closeout of mitigation activities was taken largely from the former effective Administrative Plan. Therefore, the changes to this section involved incorporating changes that were integrated into the Administrative Plan approved in March of 2012. The SHMO continues to have primary responsibility for continued management and maintenance of the monitoring system. Future reviews will be conducted in accordance with the process and schedules established for the plan maintenance process.

The review of mitigation actions implemented since the last plan update revealed that the mitigation actions were implemented as planned. A description of mitigation actions implemented since the 2010 All-Hazards Mitigation Plan development is in Section 4.4.5 *Review and Progress of Mitigation Actions*. Table 4.10 in that section provides a summary of mitigation actions implemented. This table demonstrates that the actions implemented fall within the overall State priorities for mitigation.

6.2.2 Progress Review for Mitigation Goals, Objectives, and Activities

A review and update of the State's system for conducting a progress review of mitigation goals, objectives, and actions is also conducted as part of the plan maintenance process. This section includes a description of the State's process for monitoring the progress of mitigation goals, objectives, and actions and any modifications to the system identified during the 2010 plan update.

Mitigation Progress Review System

In order for any program to remain effective, the goals and objectives of that program must be reviewed periodically. That review should answer, at a minimum, the following questions:

- Are the established goals and objectives realistic? (Take into consideration available funding, staffing, state/local capabilities, and the overall state mitigation strategy.)
- Has the State clearly explained the overall mitigation strategy to local governments?
- Are proposed mitigation projects evaluated based on how they help the State and/or local government meet their overall mitigation goals and objectives?
- How have approved mitigation projects complemented existing state and/or local government mitigation goals and objectives?
- Have completed mitigation projects generated the anticipated cost avoidance or other disaster reduction result?

A thorough and realistic evaluation of the benefits of a mitigation project may be delayed until the area of the project is impacted by another disaster. The lack of realized benefits from a completed mitigation project may result in the disapproval or modification of similar projects in the future. At the same time, mitigation projects that have proven their worth may be repeated in other areas of the State.

Based on the results of the review/evaluation of mitigation progress described above, the State may need to adjust its goals and objectives to meet the current and future mitigation needs of the State and local governments

2013 Plan Update

For this update to the Arkansas All-Hazards Mitigation Plan, the system for reviewing progress on achieving goals as well as progress of mitigation activities was evaluated. It was determined that the process stated herein to monitor progress was effective. A few additions and clarifications to this process have been made where warranted. The following paragraphs include additions and modifications to the process initially identified in the 2007 plan updated and implemented during the 2010 plan update.

As part of the 2013 plan update process, the goals and objectives outlined in the 2010 plan were reviewed to determine if they still address current and anticipated future conditions. This was accomplished during a planning meeting and during focused meetings with ADEM mitigation staff. The APDMAC evaluated the goals and objectives based on the process outlined above. In addition, the review was based on:

- The updated statewide risk assessment, including changes in development, recent disasters, and analysis of local risk assessments;
- Assessment of changes and challenges in state and local capabilities since the 2010 plan;

- Analysis of the similarities and differences of the state mitigation plan goals with local mitigation plan goals and objectives; and
- Identification of achieved mitigation objectives from the 2010 plan.

This review of the 2010 goals and objectives and modifications to the review process are described in more detail in Section 4.1.2 *Process for Identifying, Reviewing, and Updating State Goals and Objectives*. These additional review criteria have been added to the process for reviewing progress on achieving plan goals and objectives.

The status of mitigation actions were also evaluated to ensure that the State is making progress with its overall mitigation strategy. Conducting a comprehensive review of state goals and objectives in conjunction with identified mitigation actions helps ensure consistency with the overall mitigation goals of Arkansas.

Progress of identified mitigation actions is measured based on the following variables:

- The number of projects implemented over time;
- The successful disbursement of mitigation grant funds over time;
- The disaster losses avoided over time (given a post-disaster event); and
- Plans, partnerships, and outreach developed over time.

This evaluation process is described in more detail in Section 4.3 *Local Capability Assessment*, Section 4.4 *Mitigation Actions*, and Section 7.4.2 *Post-disaster Progress Assessment/Review of Mitigation Goals, Objectives, and Measures*. These review criteria have also been added to this process for evaluating the progress of mitigation actions.

6.2.3 Staffing

In addition to the duties of the APDMAC, ADEM implements and updates the All-Hazards Mitigation Plan and administers the HMA grant programs using the following positions:

State Hazard Mitigation Officer (SHMO)

Pursuant to 44 CFR 206.437(b)(2), the Governor's Authorized Representative (GAR) identifies the SHMO. At ADEM, the SHMO is designated to coordinate activities of the State Hazard Mitigation Team and to serve as the responsible individual for project management and administration of funds. The SHMO is responsible for all matters related to the HMGP and will be assisted by two ADEM Grant Coordinators, and two ADEM Emergency Planners.

Responsibilities of the SHMO include:

- Conduct applicant briefings and distribute application packets;
- Determine applicant eligibility, project approval and project priority;
- Establish deadlines for applicants to submit projects for consideration;
- Provide applicants with detailed information on application preparation;

- Establish deadlines for applicants to complete projects and request time extensions;
- Provide applicants with guidance on documentation required for the administration of funded projects;
- Monitor and evaluate the progress and completion of selected projects;
- Forward claims for reimbursement to SMARTLINK;
- Process requests for reimbursement of funds based on documentation supplied by applicant;
- Maintain financial records to include availability, obligation, expenditures, and complete quarterly reports;
- Responsible for management of the Hazard Mitigation Grant Program (Section 404) under the direct supervision of the Division Manager;
- Responsible for management of the Flood Mitigation Assistance Program, Severe Repetitive Loss Program, and the Repetitive Loss Claims Program under the direct supervision of the Division Manager;
- Responsible for the management of the Pre-Disaster Mitigation Competitive Grant Program under the direct supervision of the Division Manager;
- Ensures the applicant understands and complies with state and federal grant rules and regulations, for all mitigation grant programs;
- Maintain the Hazard Mitigation Administrative Plan and the State Hazard Mitigation Plan as described in the Stafford Act and Section 322 of P.L. 106-390;
- Responsible for training activities associated with mitigation; and
- Perform disaster duties as required.

ADEM Grant Coordinator (HMGP)

The ADEM Grant Coordinator HMGP is designated to coordinate the financial activities of all HMGP projects, and shall act as liaison between FEMA and the subgrantees. Responsibilities of the ADEM Grant Coordinator include:

- Assist the SHMO with the administration of all Federal programs;
- Assist local governments and the District Planning and Development agencies in the formulation of grant applications, and review the final applications for completeness, accuracy, and compliance with Federal regulations;
- Advise subgrantee of the period of performance in initial award letter. Monitor subgrantee period of performance compliance through site visits and quarterly reports. If needed, request an extension of 60 days prior to the end of the performance period.
- Contact all subgrantees one month prior to the deadline for their Quarterly Reports.
- Maintain NEMIS input and coordination;
- Provide technical assistance for locals through state level training in grant administration and documentation;
- Coordinate with the State Department of Finance and Administration for the timely award of grant monies;

- Review and provide guidance for local mitigation plans; and
- Perform disaster duties as required.

ADEM Emergency Planner (PDM)

The ADEM Emergency Planner PDM is designated to administer all PDM grant functions to include:

- Assist local governments and the District Planning and Development agencies in the formulation of grant applications, and review the final applications for completeness, accuracy, and compliance with Federal regulations;
- Maintain financial records on all grant awards, expenditures and administrative funds;
- Maintain electronic grants (eGrants) input and coordination;
- Maintain statewide vulnerability assessment in a database and the State Hazard Mitigation Plan;
- Assist in the conduct of state level training for locals in the PDM-C program;
- Coordinate with the State Department of Finance and Administration for the timely award of grant monies to the subgrantee;
- Prepare and submit all required quarterly reports;
- Assist the SHMO in review of local plans and maintaining the State Mitigation Plan;
- Perform administrative functions as require by the SHMO;
- Maintain Mitigation Division portion of the ADEM webpage; and
- Perform disaster duties as required.

Grant functions for the Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and Severe Repetitive Loss (SRL) programs are administered by the Arkansas Natural Resource Commission, NFIP State Coordinator. The responsibilities for administration of these grant funds include:

- Maintain financial records on all grant awards, expenditures and administrative funds;
- Maintain electronic grants (eGrants) input and coordination;
- Prepare and submit all required quarterly reports; and
- Perform disaster duties as required.

Other Staff Involvement

ADEM Budget Specialist

The ADEM Budget Specialist is designated to administer grant functions for all Federal Mitigation programs to include:

- Make general ledger accounting entries (i.e. deposits, closing entries, adjusting entries, error correction entries, refund to expenditure entries, revenue receipt correction entries) in AASIS;
- Monitor accounts payable, payroll costs, fund cash balances and request grant funds as necessary;
- Provide information on grant expenditures and projected costs;
- Reconcile funds, prepare and submit closing reports to FEMA and DHS;
- Prepare and submit Management Costs Reimbursement reports to FEMA;
- Prepare and submit quarterly grant reports to FEMA and DHS; and
- Perform disaster duties as required.

State Hazard Mitigation Team

The State Hazard Mitigation Team members will be designated by the appropriate Directors of the state agencies having hazard mitigation expertise and responsibilities. A Proclamation by the Governor or a Memorandum of Understanding may be used as needed to define authority and responsibility of team members. The State Hazard Mitigation Team will:

- Provide engineering and administrative expertise for the program;
- Review project applications for engineering feasibility and mitigation objective accomplishment;
- Be members of the Mitigation Selection Panel and assist in prioritization and funding recommendations for eligible projects;
- Provide assistance with the development of the State Hazard Mitigation Plan;
- Recommend methods to improve mitigation, preparedness, response, and recovery activities of state agencies, local governments, federal governments, and private industry;
- Develop means to communicate the capabilities of each state agency to address hazards to persons, agencies, or governments, who might utilize that information;
- Coordinate activities of State agencies to reduce the impact of hazard potentials within the state;
- Determine what the capabilities are of each state agency to address various hazards, including what legal authority each agency has and what programs and funding sources are available to address mitigation preparedness, response and recovery activities;
- Assist in conducting applicant’s briefings;
- Represent the State on the inspection team; and
- Attend the inspector’s briefing to establish operational considerations for completion of hazard mitigation proposals.

APPENDIX A
PLANNING PROCESS DOCUMENTATION

Arkansas Pre-Disaster Mitigation Advisory Council

- APDMAC Members and Contact Information
- January 20, 2010 – Meeting Minutes
- July 22, 2010 – Meeting Minutes
- January 20, 2011 – Meeting Minutes
- July 20, 2011 – Meeting Minutes
- January 1, 2012 – Meeting Minutes
- July 26, 2012 – Meeting Minutes
- December 20, 2012 – ADEM Coordination for All-Hazards Mitigation Plan Update
- January 24, 2013 – Meeting Minutes, Kickoff All-Hazards Mitigation Plan Update
- March 26, 2013 – Meeting Minutes, Review Risk Assessment and Mitigation Strategy
- July 18, 2013 – Meeting Minutes – *to be added*

Executive Orders

- Executive Order for 2013 Adoption – September 11, 2013

Table A.1. Arkansas Pre-Disaster Mitigation Advisory Council Representatives

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
AR Dept. of Emergency Management	State Hazard Mitigation Officer	Josh Rogers	Josh.Rogers@adem.arkansas.gov	Project Manager for State Mitigation Plan Update
AR Dept. of Emergency Management	Federal Grants Mitigation Coordinator	Veronica Villalobos-Pogue	veronica.pogue@adem.arkansas.gov	Invited/Attended all APDMAC meetings; Provided local mitigation plan data; schedule; outreach and education efforts by ADEM; PDM and HMGP grant information
AR Dept. of Emergency Management	HazMat Reporting	Kenny Harmon	Kenny.Harmon@adem.arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on man-made hazards Provided Tier II reporting information and HazMat summary documents
AR Dept. of Emergency Management	HazMat Reporting	Danita Kelley	danita.kelley@adem.arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on man-made hazards
ADEM-Jonesboro Office	EQ Program Manager	Donald Minster	Donald.Minster@adem.arkansas.gov	Invited/Attended all APDMAC meetings; Coordinator for GEAC; Review/input on earthquake hazard and mitigation strategy
AR Dept. of Environmental Quality	Geologist Supervisor, RST Division	Gerald Delavan, P.G.	gld@adeq.state.ar.us	Invited/Attended all APDMAC meetings; Review/input on natural hazards risk assessment and mitigation strategy
AR Geological Survey	Earthquake Geologist	David Johnston	david.johnston@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on earthquake hazard
AR Geological Survey	Geologist Supervisor	William Prior	Bill.prior@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on earthquake hazard and mitigation strategy
AR Geographic Information Office	Geographic Information Officer	Shelby Johnson	shelby.johnson@arkansas.gov	AGIO provided data sets for critical facilities throughout the State.
AR Department of Information Systems	ACOOP Manager	Amber Emberson	amber.styles-emberson@arkansas.gov	Invited/Attended all APDMAC meetings; Provided input on COOP Planning and mitigation strategy

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
AR Building Authority	Director	Anne Laidlaw	alaidlaw@aba.state.ar.us	Invited/Attended all APDMAC meetings; Provided State Leased Facility data
AR Insurance Department	Asst. Director	Mark Guinee	mark.guinee@arkansas.gov	Invited/Attended all APDMAC meetings; Provided State Master Property database for state-owned facilities
USDA Natural Resources Conservation Service	Geologist	Chris King	chris.king@ar.usda.gov	Invited/Attended all APDMAC meetings; Review/input on expansive soils and landslide hazards; and provided input on mitigation strategy
USDA Natural Resources Conservation Service	Asst. State Conservation Engineer	Lane Johnson	Lane.Johnson@ar.usda.gov	Invited/Attended all APDMAC meetings; Review/input on expansive soils and landslide hazards; Provide GIS/mapping data for expansive soils and landslide hazards; and provided input on mitigation strategy
Central U.S. Earthquake Consortium	Executive Director	James M. Wilkinson, Jr.	jwilkinson@cusec.org	Invited/Attended all APDMAC meetings; CUSEC reports utilized for earthquake hazard
AR Highway & Transportation	Staff Maintenance Engineer	Brooks Booher	Brooks.Booher@arkansashighways.com	Invited/Attended all APDMAC meetings; Provided GIS/mapping data for state owned bridges
AR - Natural Resources Commission	AR Dam Safety Program Coordinator	Nancy Gambill	nancy.gambill@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on drought and dam/levee hazards; and provided input on mitigation strategy
AR - Natural Resources Commission	State Climatologist State NFIP Coordinator	Michael Borengasser	michael.borengasser@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on drought and flood hazards; Provided RepLoss Data and review/input on RepLoss Strategy; Provided update of Map Modernization for State; and provided input on mitigation strategy
National Weather Service - Little Rock	Warning Coordination Meterologist	John Robinson	John.robinson@noaa.gov	Invited/Attended all APDMAC meetings; Review/input on natural hazards risk assessment and mitigation strategy

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
Louisiana Governor's Office of Homeland Security & Emergency Preparedness	SHMO	Jeffrey Giering	jeffrey.giering@la.gov	SHMO for neighboring States invited to participate/comment on State Mitigation Plan and Process
Mississippi Emergency Mgnt Agency	SHMO	Jana Henderson	jhenderson@mema.ms.gov	SHMO for neighboring States invited to participate/comment on State Mitigation Plan and Process
Missouri Emergency Management Agency	SHMO	Sheila Huddleston	Sheila.Huddleston@sema.dps.mo.gov	SHMO for neighboring States invited to participate/comment on State Mitigation Plan and Process
Oklahoma Emergency Management Agency	SHMO	Bill Penka	odcem.state.ok.us	SHMO for neighboring States invited to participate/comment on State Mitigation Plan and Process
Tennessee Emergency Management Agency	SHMO	Doug Worden	dworden@tnema.org	SHMO for neighboring States invited to participate/comment on State Mitigation Plan and Process
AETN	Deputy Director	Tony Brooks	tbrooks@aetn.org	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
American Red Cross	Executive Assistant	Janet Davidson	jldavidson_2000@yahoo.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
American Red Cross	AR State Disaster Director	Roger Elliot	elliotr@arkansasredcross.org	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR - Natural Resources Conservation Service	State Conservationist	Mike Sullivan	michael.sullivan@ar.usda.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Department of Human Services	Director Of Emergency Operations	Edwin Lyons	edwin.lyons@arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Dept. of Emergency Management	N/E Area Coordinator	Anthony Coy	Anthony.coy@adem.arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Dept. of Emergency Management	Preparedness Division Director	Sheila Annable	sheila.annable@adem.arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
AR Dept. of Environmental Quality	Chief Deputy Director	Karen Bassett	bassett@adeq.state.ar.us	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Electric Cooperative	Principal Engineer Fuels & Civil	Steve Sharp	ssharp@aecc.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Electric Cooperative	Principal Engineer Fuels & Civil	Steve Sharp	ssharp@aecc.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Geological Survey	Education Specialist	Erica Doerr	erica.doerr@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on earthquake hazard
AR Geological Survey	Director & State Geologist	Bekki White	bekki.white@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on earthquake hazard
AR Geological Survey	Geohazards & Environmental Geology Supervisor	Scott M. Ausbrooks	scott.ausbrooks@arkansas.gov	Invited/Attended all APDMAC meetings; Review/input on earthquake hazard
AR Insurance Department	Property & Casualty Compliance Officer	Becky Harrington	becky.harrington@arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Wing Civil Air Patrol	Assist. Homeland Security Coordinator	Thommie Herndon	tdherndon@sbcglobal.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
AR Wing, Civil Air Patrol	Homeland Security Coordinator	James "Herb" Williams	arwingdoh@sbcglobal.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Arkansas Archeological Survey, Blytheville	Archeological Assistant	Marion Haynes	mhaynes3@sbcglobal.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Arkansas Department of Information Systems	Director	Claire Bailey	claire.bailey@arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Arkansas Dept.of Education	Assistant Director, Engineer P.E.	Chuck D. Stein	charles.stein@arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
Arkansas State Police	Lieutenant, Arkansas State Fire Marshal	Lindsey Williams	lindsey.williams@asp.arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Arkansas State University	Assistant Professor, College of Engineering	Ashraf S. Elsayed	aelsayed@astate.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Arkansas State University	Director Environmental Health and Safety	Starr J. Fenner	sfenner@astate.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Arkansas State University-Jonesboro	Safety Supervisor, Environmental Health & Safety	D.A. Davis	ddavis@astate.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
ASP/Fire Marshal's office	Architect	Andy Branton	andy.branton@asp.arkansas.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
ASU-Searcy	Workforce Training	Todd Hunter	thunter@searcy.asub.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Bold Planning Solutions	Certified Business Continuity Professional	Fulton Wold	fulton@boldplanning.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
City of Little Rock	Little Rock Emergency Management Administrator	Matt Burks	mburks@littlerock.org	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Civil Air Patrol	EQ Planning Coordinator	Robert Penton	pilotrlp@aol.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Clay Co. Government	Clay County Judge	Gary Howell	ccjudge@centurytel.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Clay Co. Government	Grants Coordinator	Sally Howell	ccjudge@centurytel.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Clay Co.OEM	Clay Co Coord	Travis Boyd	clayoem@centurytel.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
Clay County	911 Coordinator/Deputy OEM	Darlene Tanner	clay911@centurytel.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Code Camey and Associates, Inc.	Emergency Operations Manager	Gary McElligott	gmc@codecamey.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Craighead County	Craighead County LEPC/CERT	Lou Anne Clements	equakelady@suddenlink.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Craighead County OEM	OEM Coordinator Craighead County	David Moore	dmoore@craigheadcounty.org	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Crittenden County OEM	Crittenden County Coordinator	Ronny Rogers	oemronny@crittco.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Defense Coordinating Element VI, Joint and	State Emergency Preparedness Liaison Officer for	John I. Kaminar	john.i.kaminar@us.army.mil	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Engineering Consultants, Inc.	Vice President/Structural Engineer	Frank Allison	fallison@ecilr.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Hospital Association	V.P. for Government Relations	Jodiane Tritt	jtritt@arkhospitals.org	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
IEM, Inc.	Response & Recovery A-Team, Senior Planner	Susan Love	susan.love@iem.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Mississippi Co. Government	Emergency Management Coordinator	Joseph Richmond	mcoem@sbcglobal.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Mississippi County	911/Floodplain Management	David Lendennie	missco911@sbcglobal.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
NEPLO -Arkansas	Emergency Preparedness Liaison Officer	Steve Gentry	NEPLO_AR@yahoo.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
Poinsett Co OEM	Poinsett Co. Coordinator	Frank Kraft	poinsett.4oem@pcsii.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Poinsett Co. (Retired)	Private Citizen	Merle Williams	merler@rittermail.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Poinsett County	Poinsett Co. Judge	Charles Nix	poinsettcountyjudge@pcsii.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Pulaski Co. OEM	Pulaski County Coordinator	Andy Traffanstedt	atraffanstedt@co.pulaski.ar.us	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Pulaski County	Director of Pulaski Co. Sanitation/Animal Services	Kathy Botsford	kbotsford@co.pulaski.ar.us	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
State Farm Fire & Casualty Ins. Co.	Claim Section Manager	Bob G. Lorimer	bob.lorimer.anli@statefarm.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
State Farm Insurance	Government & Community Affairs Liaison	Gary Stephenson	gary.stephenson.a9ef@statefarm.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
State Farm Insurance	State Farm Catastrophe Coordinator	Joe Green	Joe.green.g9e5@statefarm.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
State Farm Insurance	Catastrophe Coordinator	Vernon Frank	vernon.frank.lods@statefarm.com	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
U.S Air Force	AR CAP-USAF State Director	Robert W. Betzold	caploar@sbcglobal.net	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
UALR, AR. Small Bus. Devel. Center	Director	Janet Roderick	jmroderick@ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
UALR, AR. Small Bus. Devel. Center	Training Specialist	Timothy Lee	tmlee1@ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update

Agency	Title	Name	Email	Participation/Contribution to All-Hazards Mitigation Plan 2013 Update
UALR, Dept. of Earth Sciences	Professor	Jeffrey Connelly	jbconnelly@ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
UALR, Earth Science Dept.	Instructor	Jay Sims	wjsims@ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
UALR, GIT	Seismologist	Hanan Mahdi	hhmahdi@ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Univ. of AR in Little Rock	Director, ACEETT	Haydar Al-Shukri	alshukri@seismo.ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
Univ. of Arkansas Little Rock	Geologist/Faculty	Wendi J.W. Williams	wjwilliams@ualr.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
University of Arkansas Fayetteville	Assistant Professor, Department of Civil Engineering	Brady Cox	brcox@uark.edu	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
US Representative Berry's Office	Regional Representative	Joe Dillard	Joe.Dillard@mail.house.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update
VA Medical Center	Area Emergency Manager	Rex Oxner	j.oxner@va.gov	Invited/Attended all APDMAC meetings; provided with opportunity to review/comment on HMP Update

Arkansas Governor's Earthquake Advisory Council
&
Arkansas Pre-Disaster Mitigation Advisory Council

Meeting Minutes
January 20, 2010

Andy Traffanstedt officially welcomed everyone to Pulaski County.

Scott Ausbrooks, AR GEAC Chairman, thanked everyone for attending. He expressed appreciation to Arkansas Electric Cooperative Corporation for the use of their facility and Steve Sharp for helping make the arrangements. He called for introductions, approval of the minutes and Chairman's Reports. The membership voted unanimously to keep current officers. New nominees for membership: Becky Harrington, Arkansas Insurance Department; Capt. Steve Gentry, U.S. Navy; and David Johnston, AGS Earthquake Geologist. All were accepted unanimously.

Jay Winters, Deputy Director of ADEM, discussed planning for the National Level Exercise in 2011. He reviewed exercises leading up to NLE 2011as well as the State's plan to participate. He spoke about NEHRP funds received by Arkansas and goal areas established for their use.

Wendy Phillips, FEMA, Hurricane/Earthquake Program Specialist, being new to the group introduced herself. She expressed her appreciation for council members' activities. She spoke of events in Haiti and relief efforts. The importance of building codes in mitigating loss of life and property was emphasized.

Jim Wilkinson, CUSEC Executive Director, talked about how the earthquake in Haiti has renewed interest in the New Madrid Seismic Zone. He also gave an update on NEHRP, Bicentennial planned activities, and continued planning for NLE 2011. There was a moment of remembrance for Dr. Norman Hester and all of his accomplishments

Brian Blake, CUSEC Earthquake Program Manager, gave a recap of the National EQ Program Managers Meeting held in Boston in November, 2009. He provided an overview of workshops and training CUSEC had co-sponsored and also town hall meetings that had been held. He informed the group the GIS Working Group Meeting would be held the last week in February.

Scott Ausbrooks, AR Geological Survey, provided an update on the recent education, information and outreach activities they had been involved in. He recapped the 2009 earthquake activity in Arkansas. Reports of earthquakes felt have increased. Scott emphasized how new monitoring stations enhance the state capabilities in monitoring activity. David Johnston, AR Geological Survey, gave a brief presentation on the permanent seismometer stations.

Dr. Haydar Al-Shukri, UALR ACEETT, presented a report on research being done in Marianna. Indications are the fault zone is larger than initial work revealed. Additionally, the reason for the concentration of damage in Haiti was also discussed. He reported on work being coordinated with Arkansas Geological Survey on the location of more seismic stations.

Dr. Steve Horton, CERI Research Scientist, presented an update on the Arkansas Seismic Network. Increased monitoring in Arkansas beyond the northeast area has provided the ability to lower the magnitude detection threshold as well as better location of the event.

Lt. Lindsey Williams, AR State Police, State Fire Marshal, spoke on state building codes, recent revisions of statutes, and further updating needed.

Dr. Steve Horton, reviewed earthquake related products and tools available on the USGS website.

Veronica Villalobos-Pogue, ADEM Earthquake Program Manager, highlighted key activities over the last six months (handout was provided).

Adjourn for Lunch

APDMAC
Meeting Minutes
July 22, 2010

Honorable Gary Howell, Clay County Judge, brought the APDMAC meeting to order.

Amanda Merrill, ADEM Pre-Disaster Mitigation Program Manager, discussed PDM Grant funding. She confirmed the only Arkansas project this year is in Russellville. She displayed a map showing the status of hazard mitigation plans for each county.

Fulton Wold, Bold Planning Solutions, gave an update on state hazard mitigation planning. He presented an estimated timeline outlining deliverables and actions proposed to achieve those deliverables.

Open Discussion

It was the decided to form the following working groups:

- Building Codes
- Legislation
- Awareness/Preparedness
- Education and Outreach

Veronica Villalobos-Pogue offered examples of useful products these groups could provide.

Adjourned

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Arkansas Governor's Earthquake Advisory Council
&
Arkansas Pre-Disaster Mitigation Advisory Council

Meeting Minutes
July 22, 2010

Mark Hogan representing Judge Dale Haas officially welcomed everyone to Craighead County.

Scott Ausbrooks, AR GEAC Chairman, thanked everyone for attending. He called for introductions, approval of the minutes and Chairman's Reports. New nominees for membership: Brad Montgomery, Steve Gates, Amber Styles Emberson, and Jay Henson. All were accepted unanimously.

Jim Wilkinson, Central United States Earthquake Consortium (CUSEC) Executive Director, discussed issues covered at the Earthquake Program Managers meeting in May including the Great Central US ShakeOut and state earthquake work plans submitted to and waiting approval of FEMA. He covered progress of various working groups and also updated plans for NLE 11. A detailed list of activities planned for the 1811/12 Bicentennial Observance was presented.

Brian Blake, CUSEC Earthquake Program Manager, provided information on the Great Central U.S. Shakeout to be held April 28, 2011 at 10:15 a.m. Based on a California model, those interested can register online where they will also find more information and related resources. The goal is to register one million. While there are not set requirements, participants are asked to take three to five minutes to drop, cover and hold. Those participating are encouraged to send pictures and comments afterward. A discussion of public service announcements included funding, development, and the possibility of canned PSAs being available by February 2011. CUSEC should be contacted for more information.

David Maxwell, director of the Arkansas Department of Emergency Management (ADEM) informed the group:

- of personnel changes within the Earthquake Program at ADEM. Veronica Pogue was promoted to the Mitigation Division and replaced as Earthquake Program Manager by Myra Jane Biggers whose office is located in Jonesboro. Katy Wilson will be assisting with the earthquake program in the central Arkansas area from her office at Camp Robinson.
- ADEM is now accredited through the Emergency Management Accreditation Program.
- Legislation was passed last year to ensure the continuity of government at the local level. Counties are required to name a line of succession for judges and sheriffs in the event normal procedures cannot take place.
- ADEM is continuing catastrophic planning by refining and adding detail to plans. Partnering with FEMA Region VI, the focus has been on Air Transportation, Logistics, Health and Medical, Search and Rescue, and Mass Care Annexes.
- The importance of NLE 11 is the opportunity to test plans to gain insight into areas needing improvement.
- Governor Beebe continues to demonstrate his support in planning for the next catastrophic earthquake and expects all agencies to work together.

Scott Ausbrooks, Arkansas Geological Survey, provided an update of their involvement in recent education, information and outreach activities. He emphasized GEAC should take this opportunity to work with the bicentennial. He requested those interested in serving on committees (building codes, outreach, and bi-centennial activities) let him know. An update on the Arkansas Seismic Network and recent earthquakes was presented. Scott concluded by showing work done on a 3-D model of North-Central Arkansas intraplate earthquake swarms.

Katy Wilson, ADEM Natural Hazards Planner, presented a program on Guatemalan disasters and emergency management. MSG Greg White, Operations NCO for Directorate of Military Support, followed Katy's presentation with a program on the National Guard State Partnership Program (SSP). He gave a brief history of the program and explained how partnerships are formed. The partnership between Arkansas and Guatemala was established in 2002 and continues to be active. He included photos from the April 2009 SSP event in Guatemala.

Tony Evans, Emergency Management Liaison Officer from the Arkansas Highway and Transportation Department (AHTD) reviewed his agency's plans for preparation, response, and recovery. The primary mission of the Department is to reopen priority routes as quickly as possible by providing the necessary personnel, equipment, and materials so relief efforts may have access to the affected areas. While the bridge connecting Lake Village, Arkansas with Greenville, Mississippi opening the end of July 2010 is designed for a 7.4 earthquake, other Arkansas bridges are a major concern. AHTD represents Arkansas on the CUSEC State Transportation Task Force. Some issues considered by the task force are emergency routes, post earthquake bridge initial inspections, and the need for improved contact and coordination of other transportation groups such as air, rail, and water.

Myra Jane Biggers, ADEM Earthquake Program Manager, highlighted key activities over the last six months (handout was provided).

Adjourn for Lunch

Arkansas Pre-Disaster Mitigation Advisory Council Meeting Minutes
July 22, 2010

Terry Gray, Mitigation Branch Manager, brought the APDMAC meeting to order. New GEAC members were accepted as APDMA members.

Terry discussed Pre-disaster Mitigation Grant funding, explained mitigation goals, and talked about the State Mitigation Program. The application by Russellville School District for a saferoom has been approved. Although there are no other applications, ADEM is working with several interested schools. A map detailing the status of county mitigation plans was shown.

Fulton Wold, Bold Planning Solutions, gave an update on state hazard mitigation planning. He presented an estimated timeline outlining deliverables and actions proposed to achieve those deliverables.

Adjourned

Arkansas Governor's Earthquake Advisory Council
&
Arkansas Pre-Disaster Mitigation Advisory Council

Meeting Minutes
January 20, 2011

Andy Traffanstedt, Director, Pulaski County Office of Emergency Management officially welcomed everyone to Pulaski County.

Scott Ausbrooks, AR GEAC Chairman, thanked everyone for attending. He called for introductions, approval of the minutes and Chairman's Reports. New nominees for membership: Mike Dawson, Robin Gifford, Ginger Bailey, Robert Loeber, Josh Rogers, Sammy Hugen, Shelia Maxwell, Kathy Flannigan, and Katy Wilson. All were accepted unanimously.

David Maxwell, director of the Arkansas Department of Emergency Management (ADEM) briefed the group on:

- Terry Gray's retirement and honored him listing his many accomplishments while at ADEM.
- Resource Allocation Workshop – Federal level ESF's met with all of the CUSEC states to try to get commitments for resources. Pleasantly surprised at the level of Search and Rescue resources committed to AR. Biggest concern is the ESF 10 (Oil and Hazardous Materials Response) lack of commitment. It was a start with 30-40 % solution being better than what we had before.
- Earthquake Awareness Week will be the week of February 7th. It begins with an Earthquake Outreach Tour in Jonesboro. Also planned is Earthquake Mitigation for Hospitals Workshop in Jonesboro on February 17th.

- NLE11 – Overview
    - 62 Counties
    - All State ESF's
    - 11 Private Industry
    - State is committed to 24 hours a day for the first 72 hours
    - State objectives: Communication, critical resources, logistics, mass care, medical surge

Jim Wilkinson, Central United States Earthquake Consortium (CUSEC) Executive Director, discussed:

- Earthquake awareness activities planned for the Bicentennial. The Earthquake Outreach Tour will be conducted in five states: Arkansas, Kentucky, Illinois, Missouri and Tennessee, during the week of Feb.7-11, 2011. The tour will conclude at the "Earthquakes: Mean Business" event on February 11 in St. Louis, which marks the official kickoff of the New Madrid Bicentennial
- The Federal Emergency Management Agency will host three one-hour webinars for schools interested in learning how to reduce earthquake risks and take actions to ensure school safety and continued operations.
- The 2011 ShakeOut drill on April 28 will be the largest earthquake preparedness event in central U.S. history. With 325,000 already registered he asked members to encourage others to sign up to reach the goal of at least one million participants.

Scott Ausbrooks, Arkansas Geological Survey (AGS), provided an update of recent earthquake activity in Arkansas as compared to last year. Similarities and differences between the Guy Swarm and Enola Swarm were described. Of interest to members was the still unanswered question of relationship between gas exploration and the ongoing earthquakes in the Guy/Greenbrier area. AGS continues to monitor and plot earthquakes and current well activity but have yet to prove a cause/effect.

Steve Sharp, Arkansas Electric Cooperative Corporation, presented an overview of the ATC 20 class. He explained who the class would be of interest to and various topics that are covered. One of the goals is to form emergency response teams of trained building inspectors.

Kelly Amoroso, Planning Manager with Kenyon International Emergency Services, announced Arkansas signed a contract with Kenyon June 1, 2010, for services needed in the event of a mass fatality incident. Just two weeks later they responded to the Albert Pike flooding incident. A draft of a statewide mass fatality plan should be finished by the end of February. Response by Kenyon is based on State request. It will vary by needs of particular event and can include humanitarian assistance, data management, mortuary/fatality operations, etc.

Myra Jane Biggers, ADEM Earthquake Program Manager, highlighted key activities over the last six months (handout was provided).

Adjourn for Lunch

Arkansas Pre-Disaster Mitigation Advisory Council Meeting Minutes
January 20, 2011

Judge Gary Howell brought the APDMAC meeting to order. New GEAC members were accepted as APDMA members.

Veronica Villalobos-Pogue, ADEM Federal Mitigation Grant Coordinator, described the pre-disaster mitigation program and rules for grants. To date there are 56 counties with FEMA approved mitigation plans.

Josh Rogers, ADEM Federal Mitigation Grant Coordinator, updated members on the hazard mitigation grant program. There are currently 130 safe rooms under construction.

Adjourned

Arkansas Governor's Earthquake Advisory Council

&

Arkansas Pre-Disaster Mitigation Advisory Council

Meeting Minutes

July 20, 2011

Veronica Villalobos-Pogue of ADEM welcomed West Memphis Mayor William Johnson.

West Memphis Mayor William Johnson officially welcomed everyone to the city. He told everyone about the County Judge's accident and asked for everyone to pray for him.

Scott Ausbrooks, AR GEAC Chairman thanked the Mayor for attending and thanked Mid South Community college for allowing the use of the campus for the meeting. He thanked the speakers and the guests and covered housekeeping items; food, restrooms, and no smoking policy.

Scott called the meeting to order, reviewed the minutes from the January 2011 meeting and made the motion to approve the minutes. Motion was approved. Scott gave the Chairman's report:

GEAC will be moving in a new direction, closer to its original intentions. Members should be looking for emails concerning committees. Members are challenged to come up with something special for the January meeting and try to get publicity for it. Members are encouraged to put forth ideas. Members need to check their contact information to make sure it is correct. If not, fill out a change of information form and give it to Katy Wilson.

Scott gave the Arkansas Geological Survey Update: The Survey has been busy because of earthquake activity in central Arkansas. The survey participated in the National Level Exercise 2011 and has been attending many meetings and presentations. AGS has been installing monitoring stations in Faulkner County. Other activities and information mentioned:

- SSA Annual Meeting in Memphis, TN
- Geohazards meetings and talks
- 662 earthquakes as of July 20, 2011; 130 were felt, 6 were in the NMSZ
- The M4.7 earthquake on Feb 27, 2011 is the largest earthquake to strike in Arkansas in 37 years. There has been a definite drop off in activity since that event; the moratorium on injection wells is still in place and they are lobbying for a permanent moratorium on the injection wells and to have the four existing wells shut down and plugged
- USGS has new products including new maps of AR earthquakes from 1699-2010, Arkansas Earthquake Swarm of October, 2010, and 2010-2011 Earthquake Swarm
- AGS has the seismogram of the March Japan earthquake

- In answer to a question posed from ADEQ, Scott explained the mapping of earthquakes to the drilling and injection wells and the differences between injection wells and fracking
- Col. Kaminar posed a question concerning the size of the 6 NMSZ earthquakes; Scott replied the earthquakes were small in size

Danna McGinty, Planning Branch Manager at ADEM gave the Arkansas Department of Emergency Management Update: NLE 11 was the first national level exercise to use a catastrophic NMSZ event as a scenario. ADEM participated and learned many lessons.

Edwin Lyons of the Arkansas Department of Human Services presented on Functional Needs Populations in a Disaster; Lessons from NLE: DHS didn't learn new lessons from NLE 2011, old lessons were reinforced. His presentation covered:

- What is FNSS and who needs it
- Key Non-discrimination concepts
- Planning coordination
- Designating shelters – all shelters must meet ADA requirements
- Evaluating shelters
- Equipping and supplying shelters
- Minimum provisions
- Coordinating services
- Lessons from NLE – there is a lack of understanding of FNSS at all levels, identification and use of local resources/expectations of timely assistance, ESF #6 long term staffing/resources needs, limited capabilities and overwhelming need.

Brian Blake asked: What are you doing about the things you learned? Edwin answered: looking into soft sided shelter, working on sheltering issues and waiting for funding for more surveys. Ft. Chaffee is no longer on the list of shelters. Agreements are being developed through the Department of Higher Education to use facilities on college campuses. DHS is looking into offering Shelter operations training courses. ESF #6 continues to work on mutual aid with other states

D.A. Davis asked: Where can we get follow-up information from NLE 2011. Edwin deferred to Danna McGinty who stated the AAR is still going on so no paper has come out for the general public yet. 60 days was given for the AAR and that deadline is coming up so something will come out as soon as the information can be put together.

Anthony Coy asked: Are soft sided shelters ADA compliant? Edwin is looking into that.

Col. Greg Bacon of the Arkansas National Guard spoke on the Arkansas National Guard's participation and the lessons learned from NLE 2011: The AR-NG scaled back for this exercise. It is important to note that about 40% of the AR-NG is deployed at any given time and Arkansas is very short on aviation sources. There is a rule requiring Guardsmen to report to their duty stations if all communication goes down. This is how the AR-NG plans to alert members of an event if there is no communication. To develop situational awareness the AR-NG plans to use the Business Emergency Operations Center in Springdale, AR to establish communications with truck drivers, use HSIN for COP at the national level; Joint Information EE is used as well as flyovers with live feed on helicopters to show damage. The AR-NG needs a target list to be developed for this to take place. The AR-NG will prioritize this list in conjunction with Civil Air Patrol. The AR-NG refined the county resource team concept and created County Recon Teams composed of 5-8 people (instead of 50 people). The AR-NG needs priorities for planning purposes. The next Biannual GUARD EMAC meeting will be in November.

Prince Aryee of FEMA Region VI gave the FEMA update: FEMA just received funds for FY 11 but not the guidance for applications; September 30th is the deadline for awards. A Youth Summit will be held in LA the last week of September.

Jim Wilkinson of CUSEC gave the CUSEC update:

- NLE-2011 was affected by real world events but they were not detrimental in their impact. Overall, the NLE was productive:
    - Exercised virtual USA for the first time
    - Will hold a second RAW focused on local and state interaction
    - New EQ alert services was tested which links the at-risk population and economic vulnerability to the event to generate a red, yellow, or green alert
    - First time many state surveys were in SEOCs; learned this was a very good thing
- Ongoing Activities:
    - Power Grid and Communications Workshop will be held August 3-4 in D.C.
    - One-day recovery seminar was held on July 19
    - After Action conference July 20-21
    - Long-Term Recovery Table Top will be September 20-22
    - The CUSEC board of Directors does not look at NLE as over; still working on response planning, corrective actions, and updates
    - The Board has set a cycle for exercises; the next one should be in 2014
- 1811-12 Bicentennial Observance
    - Indiana is purchasing a Quake Cottage which will be on tour
    - New publications are coming out including the National Earthquake Prediction Evaluation Council Report
    - The New Madrid Earthquake Scenario (NMES) will be complete. It is more probable than the worst case scenario NLE was based on.
    - The next ShakeOut will be in February
    - CUSEC is working with St. Jude on the Dream Home project
- The National Earthquake Conference will be in Memphis in 2012
- As part of the 2011 Earthquake Awareness Blitz there will be a New Madrid Proposed briefing to the US Congressional Hazards Caucus sponsored by the Geological Society of America. There was an Earthquake Outreach Tour in February, 2011 and the ShakeOut occurred on April 28, 2011.

Brian Blake briefed on CUSEC Outreach: The outreach tour started with a town hall meeting in Jonesboro on Feb. 7, 2011. There was a larger turnout than expected. CUSEC, FEMA, IBHS & States are partnering for QuakeSmart, ShakeOut, and earthquake mitigation. Specific outreach centered around the ShakeOut included traditional outreach campaigns and social media campaigns. Feb. 7, 2012 will be the next ShakeOut. Registration will begin in September.

Jim Wilkinson briefed on the National Mitigation Alliance and the Association of State Flood Plain Managers and National Emergency Management Association serve as tri-chairs for an alliance which produced the Mitigation White Paper: Recommendations for an Effective National Mitigation Effort. There is an educational Briefing on Capitol Hill planned.

Lt. Lindsey Williams, Arkansas State Fire Marshall, briefed on the work currently under way concerning fire and building codes: Starting the revision of fire prevention codes which include building codes. Currently, building codes are based on international codes they will be based on 2012 codes. There will be a reduction in the seismic forces considered in the codes. There were issues a few days before last time with the seismic codes. People thought they were too stringent and would damage economic development activities; bad information was given out. Lindsey has researched the issues and documented reasons companies went to other states and found out why. Clear opposition to the proposed standards meant there had to be an alternative means of compliance and lowered standards. So an appendix was created that contained alternative seismic standards that applied to certain categories of buildings but we don't know what the impact on economics would be if it was not adopted. Cities are rated by insurance and can be penalized by reduced building codes. In order to keep this from happening all over the state the reduced codes had to be adopted by local ordinance. Lt. Williams is unsure of the current climate concerning this matter. Hopefully, the code will be adopted in 10-12 months.

Lt. Williams also discussed fire and building codes as they concern shelters: The Louisiana State Fire Marshal brought up that shelters should be safe as far as codes; fire alarms, exits, etc. Lt. Williams wants to work with ESF #6 as they develop their shelter list to ensure such safety is considered. Veronica Villalobos-Pogue pointed out most structures were put in place with life safety codes; people can be evacuated, but buildings are not meant for re-entry and reuse. Lt. Williams pointed out because we are planning to use places meant to function as classrooms as places for people to sleep, the safety of the building changes.

Dr. Ashraf Elsayed of Arkansas State University pointed out that Shelby County, TN has the same appendix as Arkansas. Memphis is the center of a study about the effect of seismic codes on seismic safety. The report will be out in the middle of 2012.

Karen Bassett asked about lessons learned from Greenbrier. Lt. Williams deferred to Scott Ausbrooks: the magnitude 4.7 was not expected to cause damage but there was some damage reported locally at the epicenter. There are some questions about whether or not the damage was actually earthquake related. It was a wake-up call that other areas outside of major faults do have the potential to cause damage.

Scott Ausbrooks asked whether or not Lt. Williams knew of any communities that adopted the appendix: Official notice was not given but some counties in north east Arkansas adopted it. The question was raised of whether or not county adoption forces city adoption. The consensus was that adoption applies to the entire county. Engineers have reservations about designing to a reduced standard so many times they build to higher one.

Scott Ausbrooks recommended committees and drafting a letter of support for building codes to be sent to the Governor.

Nominations for new members were taken: Ed Hill, Jan Biggers, and Col. Greg Bacon. All members were approved unanimously.

Tony Evans from the Arkansas Highway Department mentioned that from NLE they learned they need more people for the SEOC and they are training extra staff.

Katy Wilson, Natural Hazards Planner for ADEM, gave the Arkansas Earthquake Program Update. She discussed the work plan which was submitted to FEMA for the FY 2011 grant.

Adjourn for lunch

Arkansas Pre-Disaster Mitigation Advisory Council Meeting Minutes

July 20, 2011

Hon. Gary Howell, Clay County Judge called the meeting to order and asked for approval of minutes.

Brian Blake was nominated as a new member. Scott Ausbrooks moved to have him added to GEAC as well. This was approved. New GEAC members were approved as members of PDMAC.

Josh Rogers, Mitigation Branch Manager, ADEM, gave the State Mitigation Plan Update: Version 4 was approved September 21, 2010. April's disasters will be applied to the plan. The Plan is on the ADEM website under "Mitigation Homepage". The 3 year life cycle of the plan expires on September 21, 2013. Version 5 must be approved by then. They are looking for Enhanced Plan Status.

Josh Rogers gave the Hazard Mitigation Grant Program Update. He discussed mitigation goals, the program requirements and process including HMGP funding, and the state disaster history. Currently there are more than 80 open projects over 10 disasters.

Jim Wilkinson asked whether or not any projects for this program are seismic: Josh answered, no. Jim asked if any local plans that say earthquakes are a high risk but are not doing projects. Veronica answered, yes. Most north east counties list earthquakes but none are doing projects.

Lt. Lindsey Williams asked if there is any information out of Joplin concerning safe rooms. Josh answered, no.

Wendi Williams pointed out there is a community with safe rooms with automatic locks that will not unlock until sirens go off. She asked if this will be addressed in Arkansas. Josh answered it is up to the jurisdiction to decide.

Question was posed: When do you use property acquisition? Answer: in frequent major flooding areas where it will cost less to buy the property than it will to continue paying for the flood damage.

Veronica Villalobos-Pogue gave a handout concerning the Arkansas PDM program update which included information on the accomplishments of the program, closings, additional projects, and the Fiscal Year 2012 Hazard Mitigation Assistance Application Period.

Brian Blake asked: What was the amount of PDM at its height? Answer: 2003-2004 had about 10 million.

Meeting Adjourned

Arkansas Governor's Earthquake Advisory Council and Pre-Disaster Mitigation Council Meeting Minutes

January 19, 2012

Jonesboro, AR

- Scott Ausbrooks welcomed everyone and introduced Craighead County Judge, Ed Hill.
- Judge Ed Hill, on behalf of the Mayor of Jonesboro, thanked everyone for coming and welcomed everyone to Jonesboro.
- Scott Ausbrooks introduced Arkansas Department of Emergency Management Director, David Maxwell.
- Director Maxwell gave the Arkansas Department of Emergency Management Update: The National Level Exercise which took place in May, 20 11 will drive what ADEM does for the next couple of years. In the course of the exercise issues and problems were discovered and ADEM will work to correct them. ADEM will not drop NLE '11 just because it is over. The Central United States Earthquake Consortium states will repeat the exercise in 2014. We have to continue the planning effort. It has made some tremendous strides in the amount of preparedness at the state and local level – which is the key to everything. Problems must be corrected. The Arkansas Department of Emergency Management is focused and committed to helping the counties correct their gaps and will do that over the next few years. It has been decided that the 2014 exercise will use the same scenario as NLE '11 in order to compare apples to apples. I am extremely proud of ADEM and their efforts. We are going into a legislative session which may be difficult for budget reasons. We'll see what comes from the legislature. Medicare, the Department of Corrections, and the Department of Education are 90% of the state budget. The rest of the agencies fight over the 10% left. ADEM was given an hour and a half with the House and Senate to talk about our agency; we were very fortunate in this. We were able to give a presentation to advocate for ADEM. We hope to not have many disasters but have been warned that it may be a repeat of 2008. We hope they are wrong. What the council does is very important to ADEM, and me and the Governor.
- Scott Ausbrooks gave the Chairman's report: Thank you to ASU and Jonesboro, and Dr. Elsayed, DA Davis for securing our facility. We always feel welcome. Thank you to the staff at ADEM who put in a lot of time. Today is a little different from normal. It will be abbreviated. Today is an observance of the 1811-1812 bicentennial. I think the presentations will be great and informative. I encourage you to hang on and see all of them. Now to some business to take care of this morning. Look in your packet we will approve Minutes.
    - Motion to approve – accepted.
    - Nominations: Retain Chair and Vice Chair as before – Approved

  The Great Central United States ShakeOut won an award; that is why no one from CUSEC is here today; they are accepting their award. We are having the ShakeOut in February 2012. Please sign up. It is a great way to practice Earthquake preparedness.

Thank you Judge Hill and thank you judge Howell for coming today. Thank you to our speakers; some of them came a long way. Conevery came from Boston. Thank you to her. We have the earthquake booth set up if you would like to see it. Please tell the locals that we are having the Town Hall meeting tonight.

  - New Nomination: Theresa Lear; Approved.

- Scott Ausbrooks gave the Arkansas Geological Survey Update: 2011 was very busy. Lots of meetings. By the time of our meeting in July things were dying down. I did testify before the oil and gas commission and we got the moratorium on the injection wells.

  Total earthquakes in Arkansas in 2011was 788, Non-New Madrid Seismic Zone earthquakes were 771, Guy Swarm 724; Total felt 153: a lot of the Guy/Greenbrier earthquakes were felt. If it was around a 2.5 it was felt. We have attended a lot of meetings since July.

  (Scott showed a map of the Guy-Greenbrier Swarm and the moratorium area) In October there was a burst of activity in Quitman. This activity was most likely an extension of the fault where the remaining pressure from the well traveled up the fault. Things have died down since then. Compared to what it was the activity has subsided. Something of concern: there is a gap that has formed; last time this happened it was filled in by a 4.7 magnitude quake. We can't say whether or not something will happen we will need to watch. Three of our stations have gone to VA. We are comfortable saying there was a connection between these earthquakes and the injection wells here. Rocky Mountain Arsenal had activity for up to 7 years after the shutdown of the well there. So the activity is to be expected to continue for some time although in reduced frequency.

  There was a M5.8 in Virginia. There were over 141 thousand responses on *Did You Feel It*. Max MMI was 8. We picked up this earthquake on our stations.

  There was a M5.6 in OK; MMI 7. No damage pictures but lots of reports from NW AR from people who felt it. We picked up data from the 6.8 in Alaska. We have data from Japan. For about an hour the earth rang like a bell. Japan moved 13 feet - the whole island.

  Asked for Question: none asked

- Scott introduced the first speaker, Conevery Valencius.
- Conevery: *Historical Lessons from the New Madrid Earthquakes.*
- Scott opened up new member nominations again: nomination MSG Foster: Accepted.
- Break
- Scott introduced Gary Patterson of CERI
- Gary Patterson discussed the upcoming New Madrid Bicentennial: We need to provide a message that we are providing planning and preparedness for the hazards of the New Madrid. Because of the National Earthquake Conference in April, national attention will be brought to our area. Every major network in Tennessee will show public service announcements for earthquake safety next week. All we have to go on is a factual statistic for probability.

We don't know everything we need to know about when the next earthquake is going to happen. We help the government plan for the worst case scenario. We have to look at all theories regarding NMSZ; both that it is a large threat and that it is going away (3 out of 100's of scientists say the fault is shutting down). It is important to keep pushing this [earthquake] science. The biggest Bicentennial event is Brian winning the presidential award. Congratulations Brian.
We have 200 earthquakes a year in the New Madrid Seismic Zone. This is nothing compared to the number in California but it makes us the most seismically active area in the Central United States. Paleoseimology would have to be reconciled with new theories that the earthquake threat is going away; we must recognize that we had 3 series in the same area. With a 7.7 magnitude there is not an epicenter it will be the whole fault that rings. Small earthquakes will have an epicenter therefore it will matter where that occurs.
The PSA's will be made available to state governments to be used. (on Vimeo). There will also be a documentary about the history of the New Madrid Fault and how it shaped the western frontier of the United States.
April 11 there will be a joint seismic council meeting in Memphis. National Earthquake Conference is April 10-13.
Questions:
    - How long is the NMSZ? **125 miles in a zigzag fashion (approx. This is the best guess on 30 years of science).**
    - Anybody remote measuring stress along the new Madrid: **no**
    - **The fault has too much overburden to express itself at the surface** – *response to question from Frank Allison*
- Scott introduced Katy Wilson, Earthquake Program Manager for the Arkansas Department of Emergency Management
- Katy gave the Arkansas Earthquake Program update:
    - Activities:
        - ATC 20 classes: July 29, 2011 – Little Rock; December 2, 2011; Fayetteville, AR
        - September: Ran earthquake awareness commercial in Jonesboro as part of Preparedness Month with funds from State Farm. The video was made from our 2011 Video Contest winner video
        - September – November 2011: Earthquake Preparedness Presentations given to 15 separate school counselor cooperative groups around the state. 607 people attended in total
        - October, 2011 - Supported the 83rd annual Meeting of the Eastern Section of the Seismological Society of America
        - November, 2011 – attended the CUSEC Earthquake Program Manager's Meeting in Biloxi, MS
        - December 3, 2011 – part of the Radio Disney Festival of Giving; part of our agreement with Radio Disney – ADEM was partnered with a charitable organization at the Chenal Promenade in Little Rock. Children made graham cracker houses and were taught about earthquake safety. The ADEM Earthquake House was present (funded by State Farm)

        - December 31, 2011 – Radio Disney Noon Year's Eve
    - Moving Forward – Upcoming Projects
        - Non-Structural Mitigation Survey of Higher Education Institution
        - CERT Training for Higher Education Institutions
        - County Meetings
        - Structural Engineer Credentialing
        - Earthquake Awareness Week and ShakeOut
        - Earthquake Curriculum

Scott Ausbrooks made a motion to adjourn the meeting: Approved

July 26, 2012 ARGEAC Meeting Minutes

Scott Ausbrooks welcomed everyone to the meeting and introduced Steve Sharp to welcome everyone to the facility.

Steve Sharp – thanked Scott and welcomed everyone to the Arkansas Electric Cooperative Building. Steve pointed out that AECC has supported this effort for a long time. He offered his services if anything was needed during the meeting and explained where food, emergency exits, and restrooms are located. He then gave the podium back to Scott Ausbrooks.

Scott Ausbrooks – Thanked Steve Sharp and AECC for the use of the facility. Thanked ADEM for putting the meeting together. Scott asked for the minutes from the last meeting to be approved. Steve Sharp makes the motion; Col. Kaminar seconds; minutes are approved.

Scott Ausbrooks asked for new member nominations. Sheila Annable nominated Joe Roddy, Scott Ausbrooks nominated James Wiley. Nominations were accepted, seconded, and passed. New members were welcomed.

Scott Ausbrooks explained David Johnston would present state earthquake activity. Scott would talk about what is going on outside our borders in relation to AR.

- April/may CERI came out with a paper about the activity going on in Guy/Greenbrier are of Arkansas about the factors that led to the swarm; a copy can be obtained from the Arkansas Geological Survey (AGS)
- Scott spoke at a nation-wide NRC meeting about induced seismicity potential in new technologies and also about injection wells. A report can be obtained from National Academy of Sciences website;
- The USGS spoke at congressional hearing on hydraulic fracturing; said the Guy/Greenbrier swarm is the best example of induced seismicity since the Rocky Mountain Arsenal. National Public Radio has a link to this testimony.
- Since the wells have been shut down and seismicity has been reduced. AGS is refocusing on New Madrid. Because of the drought this year the Arkansas River is very low. This could be the best opportunity to find where the New Madrid fault crosses the Mississippi River. AGS is planning to work with Ken Moran from CERI to attempt to find this spot during the first week in August.

David Johnston gave the AGS update:

- 2011 total earthquakes reported 788; non NMSZ- 771; Guy/Greenbrier 725; felt 153 (mostly in Guy)
- 2012 total earthquakes reported= 54; non NMSZ – 46; guy/ greenbrier – 2; felt 7
- Multiple meetings and trainings through 2012 so far
- April 27, met with St. Joseph Elementary School from Conway, AR at wooly hollow – gave tour of seismic station (showed pictures)
- Showed map of earthquakes from March 20, 2012 to November 20, 2011 which showed the Guy/Greenbrier Swarm and compared this to a map of earthquakes from November 20, 2011 until July 25, 2012 when only 2 events occurred in the same area.

- Showed Helicorder display from Wooly hollow 2/24/2011 and a year later – shows significant decrease in activity.
- 2.5 event SW of Rose bud may 9th Ozark folk center ; 2.7 NW of Quitman largest of the year
- Showed map of temporary seismic monitoring station locations
- A temp. station is located near where an injection well in pope county
- Largest since January may 17 in eastern TX; 4.8 some responses out of AR
- Preparing an MMI map for M4.7 earthquake in Arkansas. USGS and AGS received well over 100 felt reports for the event.
- Showed the M5.4 from Italy; M6.0 Argentina on June 2nd; and M9.0 Japan March 11, 2011 as seen on Wooly Hollow instruments.

Question Posed: *OK is having this same type of activity. Has Arkansas felt anything from that? Has AGS looked at their data to see if it is related to injection wells there?* – David Johnston replied: **Some activity has been felt in Western AR.** Scott Ausbrooks: **The M5.6 from OK was felt in Arkansas and knocked pictures off the wall at the police headquarters in Fort Smith. That event was felt over the western part of the state. Since then OK has had some clusters of earthquakes. Scientists from OK presented at SSA meeting in San Diego in April where they stated some instruments recorded the aftershocks which appear to point to an injection well, however this is not yet conclusive.**

Question posed by Karen Basset: *Was the one in TX close to injection wells?* Scott Ausbrooks answered: **Yes. They are looking into the possibility. But just because you have an injection well you can't automatically say that is the cause. You have to collect data before you can conclude. Geological Surveys from Louisiana and Texas are doing research. Not all injection wells are going to cause earthquakes. The vast majority don't. However, given the right geologic settings, injection wells can trigger seismic activity. Earthquake swarms are fairly common in the central U.S. Oklahoma has been researching such swarms and has determined that some hydraulic fracturing was linked to some of the earthquakes. Arkansas has not seen a correlation between hydraulic fracturing and earthquakes but has seen a correlation between the injection wells and earthquake swarms.**

Question posed by Dr. Elsayed: *What is the largest magnitude earthquake to happen in AR that is related to the injection wells?* Scott Ausbrooks answered: **the M4.7 in February 2011. We will see activity up in that area for years to come. As an example, with the Rocky Mountain Arsenal event they had earthquakes for seven years. The magnitudes were smaller but I won't be surprised to have little earthquakes here and there.**

Statement by Wendi Williams: *New Madrid is still Arkansas' greatest threat. Please remind us of that.* Scott Ausbrooks replied: **I totally agree. New Madrid is our biggest concern. It is our focus. A M7.7 for the worst case is a good number. A M6.7 is good for moderate but is not the "big one." A M 5.7 is a good size earthquake. A M 4.7 from Guy had some localized damage and was felt all over the state. Sue Huff has put out a paper which states that the largest earthquake in New Madrid (1811-1812) was a M7.0. Some buzz was created in the press about whether or not we are over preparing. But her work has not been vetted and collaborated with other scientists. Realistically a magnitude of mid 7 is a good estimate of the historic earthquakes. In the end it doesn't matter the magnitude – what matters is if you had that earthquake today with what is there now it would be a major disaster. Soon David Johnston will be working on displays for parks interpreters to teach to groups.**

Question posed by Sheila Annable: *Has the injection well in Pope County started injecting fluids yet? From a planning perspective I'm concerned with Nuclear One.* Scott Ausbrooks: **The gas commission maintains that there have been wells around that area for a long time but they are traditional wells**

which is different from current methods. As of right now, it is my understanding that it has been permitted but is not in the ground yet.

Statement by Dr. Wendi Williams: *I think regulations have been put in place in the last six months that deal with that.* Scott Ausbrooks: **Entergy has a website that talks about seismic preparedness and faults concerning Nuclear One. They are aware and sensitive to seismic hazards. We are monitoring the situation and will keep you updated. As of right now nothing has happened at the site; the well is permitted for 6 months.**

Scott Ausbrooks introduced Tina Owens

Tina Owens gave the Arkansas Department of Emergency Management Update. Tina welcomed everyone on Director Maxwell's behalf and explained his absence was due to the Yell County fire. There were approximately 1400 acres burned. Director Maxwell was with Governor Beebe surveying damage at the time of the meeting. Director Maxwell wished to thank the Arkansas Electric Cooperative for the use of the Facility.

ADEM is continuing to work on catastrophic earthquake plans. ADEM has looked at what was in place for NLE 2011 and seen that we had a long way to go. There are definite areas the state needs to address and ADEM is working on a daily basis. ADEM receives an EQ grant from FEMA. This year it requires a cash match. Director Maxwell allowed for the match so the grant will be around another year. In 2013 ADEM will participate with the Arkansas National Guard in the Vigilant Guard exercise as a way to take NLE and move forward. Also ADEM will participate in Capstone 14 which will also look at lessons learned from NLE.

Tina welcomed Joe Roddy and stated she is excited about his joining as another part of the process; a very vital piece. As the committee grows it brings a welcome change to move the program forward.

Tina announced that Katy is leaving ADEM and wished her well. She challenged the committee to look forward and to look outside the box; to continue to look down the road, continue to ask what if. Continue to move this committee down the road.

Question posed by Col Thommie Herndon: Did *we have a problem with communications in the exercise in 2011?* Tina Owens: **In 2011 ADEM tested communications. In the AAR there were some issues that developed that need to be addressed. For example towers are land based – we have looked at putting in a redundant system (satellite radios). There are issues with cell phones which been have tested – cell towers are land base. ADEM recognizes communication is a key area. It is an area which is included in all exercises.**

Col Herndon continued: *In hurricane Katrina our cells were useless. With all the planning it seemed you went back to the basics and hoped for the best. It needs to be exercised.* Tina Owens: **Grants given to our local emergency managers require plans be exercised and communications has to be part of those exercises. We are trying to put in the best redundancy we have available now.**

Break

Brian Blake gave the Central United States Earthquake Consortium (CUSEC) Update. Brian explained that Jim Wilkinson gives his regards. Brian then explained what CUSEC is. Brian stated CUSEC just got done with the New Madrid Bicentennial. Planning for bicentennial events started 2008 and 2009.

CUSEC had a major coordinating roll in NLE 2011, coordinated the ShakeOut in 2011 and 2012, and coordinated and helped lead the National Earthquake Conference in Memphis in 2012. CUSEC lost some staff this year due to the end of projects and the end of funding for those projects.

NEHRP State Assistance program comes through FEMA. States are now required to have a match but not all states are making the match. Some states will have no money for their earthquake program because they cannot make a match. FEMA is still working on options for assistance for those who cannot make a match – CUSEC is working to help with that.

Capstone 14 is a multistate planning initiative looking at private sector integration and resources following an event – how will multiple states and jurisdictions get supplies when there are few; communications, ground transportation, mutual aid. CUSEC is holding several workshops that will lead up to an exercise in June 2014. This is state lead not federal. FEMA's support is desirable but ultimately the state EMA's are driving this initiative. It will be very similar to NLE 2011 – looking at lessons learned and new challenges including short and long term recovery which was not looked at in NLE 2011.

Brian presented: *Engaging the Public in Disaster Preparedness*. CUSEC has been focused on getting prepared for disasters. The questions presented are, "how do you get the average citizen engaged in earthquake preparedness? What are the challenges?" A typical day in the life of a citizen involves a large amount of information and multitudes of campaigns. We have to figure out a way to engage the public in disaster preparedness. Studies say 15-20% of the population is relatively prepared for disasters. Craig Fugate and the CEO for Red Cross pointed out that we have not improved this statistic. We have told people what we want them to do but have not gotten them to do it. Current campaigns center on getting a kit, making a plan, and being informed. Such campaigns do not tug at the values that will get people involved. We need to move towards "why" they should do it. We need to sell disaster preparedness like Walt Disney world sells "where dreams come true." We are in the sales business, we are selling disaster preparedness and ultimately trying to save lives and prevent property damage. We need to go from just telling people what they should do and start to look at the value of why they should do it. Studies have been done which show why people prepare: They see and hear consistent information about what to do, they learn potential consequences and how to avoid them, they see others like themselves getting prepared, and they talk about preparedness with people they know. Talking about it is what moves them to action. Part of this has been done with the ShakeOut. The ShakeOut is now international. CUSEC is the lead coordinator for the Central U.S. version and the South East shakeout (GA, SC, NC, MD, and DC). The EQ in that area last year did 50-100 million in damages. The ShakeOut in Central US will be Feb 7, 2013 at 10:15 a.m. The ShakeOut's goals are to gain the participation of whole community, to shift the culture about earthquake preparedness, and to obtain a significant increase in earthquake and disaster readiness. Why should people participate? To increase chances for survival, to protect your family, and to build a resilient community. 2.4 million people participated in 2012, 120K in Arkansas. To help promote and organize the event there exists for public use a centralized website where you can get resources including drill manuals, broadcasts, scenarios, graphics and posters. " What we do now before the next earthquake, will determine what our lives are like after." A majority of participants in the ShakeOut are students; which is good because the preparedness will come from them in the future.

In conclusion: Speak to the values that will engage the community, leverage ADEM, CUSEC, FEMA and other existing resources, community preparedness starts with you.

<u>Scott Ausbrooks</u> thanked Brian and CUSEC for their work and introduced Lindsey Williams

<u>Lindsey Williams</u> gave the Building Codes Update

We have been meeting for several months and have formed a committee with 3 subcommittees. The building code group has met a number of times and things seem to be progressing well. Hope to go before legislative rules committee before the end of the year. So far he's not uncovered any organized opposition to the seismic revisions in the building code. Legislators from NE AR have not indicated they will oppose the code. Lindsey will present the code as it comes from the international code (without the appendix which will allow for a reduced standard). Lindsey stated he is unaware if that appendix was taken advantage of although it was adopted by some counties. ADEM supports moving forward without the alternative standard. The State Economic Development Commission and Chamber of Commerce have not given support or non-support comments. A potential good selling point for moving in this direction – Lindsey has garnered from talking to a few engineers- is that the provisions in the 2012 international building code are a little bit more attractive than our current code. This time it seems to be clearer that they are more attractive.

Question posed by Dr. Elsayed: *are we going on the 2009 edition of international code?* Lt. Lindsey Williams: **No. We will go from the 2012. The international codes are updated every 3 years but our code is updated every 6 years b/c that is more practical.**

Question posed by Brian Blake: *When are they up for adoption?* Lt. Lindsey Williams: **We are going through the revision process right now. Once that is complete we have to have a public comment period and then we move to an appearance before the Legislative Rules Committees, and if they agree it gets shipped for printing and we will establish an effective date. We can't establish the effective date before we go before the committee. We need to appear before the rules committee before January since they won't meet during the legislative session.**

Question posed by Col. Thommie Herndon: *Once in the 90's we talked about getting the rules in the building codes some of the communities with flat roof schools looked into getting columns for their schools – was that done?* Lt. Lindsey Williams: **Honestly, I don't know. When you go in and start talking about an existing building it gets complicated. With existing buildings it is not always an easy answer. So I don't really know. Thanks for all you do to support the fire marshal's office and building codes.**

Scott Ausbrooks Thanked Lt. Williams for his work as the Fire Marshal and his work on the building codes. Scott pointed out that there are still some states behind us on those building codes and there is pressure to remedy that which may help with our efforts. Seismic safety seems to be on the forefront thanks to Japan. We are ahead of the game as far as codes. This goes back to where is the council going to be in the future? Do we need to publish a white paper?

Scott introduced Hanan Mahdi

<u>Hanan Mahdi</u> gave an update on the AR Earthquake Center Active Research Projects. She presented information about two seismology research projects – Paleoearthquake in Eastern Arkansas and the Arkansas Seismic Observatory. Paleoearthquake has been going on since 1999. In 2003 the center decided there is a new source region outside of new Madrid Seismic Zone near Marianna. In 2006 the center found evidence of deep seeded fault. Hanan showed the group a map of different earthquakes and gave ranges for time of occurrence. In the Marianna area there is the biggest sand blow found in

the NMSZ area. The center has used to satellite photos to create a map showing the location of sand blows line along a NW/SE linear pattern – might be the surface evidence of a deep seated fault. Next the center will try to investigate the possibility of more faults crossing that linear area. USGS is funding 3-D GPR surveys, Geology and Soil Analysis, Trenching, and dating.

Statement from Dr. Wendi Williams: *I just want to point out to those who are not geologists that age dates coming back with the carbon dating maybe in the thousands these dates are still important and might trigger actions concerning site placement.* Dr. Hanan Mahdi: **This is exactly why we are doing this research – we are discovering more seismic zones active before the NMSZ became active. If this is true then the seismicity is shifting from one place to another. But we need to see if these faults are still active. The data should have an impact on the seismic hazard map of the region.**

The Arkansas Seismic Observatory was started in 2009. It has 6 broadband permanent stations, adopted from the IRIS transportable array, integrated with the national monitoring system, one 6-channels strong motion station in the New Madrid Zone. Motion station in Osceola was installed last year. Dr. Mahdi showed the USArray Transportable array installation plan for Arkansas. Stations are supposed to work for two years and then they have to stop working. The center Chose 6 stations to take over. Data will be online. IRIS is currently replacing the seismometers with new STS-2s and the digitizers with new 6 channels for future expansion to both weak and strong motion monitoring.

Question posed by Brian Blake: *The sand blow (you spoke of) is one of the largest in what area?* Dr. Mahdi: **In the New Madrid seismic area.**

Question posed: *What were the ages of the sad blows*? Dr. Mahdi: **They differ from one region to another but 5,000-10,000 possibly older, possibly younger.**

Scott Ausbrooks: UALR and individuals in Memphis (CERI) are looking at sand blows around the state to see if the seismicity moves throughout the state. This research will tell us if there are other areas of concern besides New Madrid.

Scott introduced Katy Wilson

Katy Wilson gave the Arkansas Earthquake Program Update. In an effort to catch us back up on time I will say that everything I had to report has already been said by others. There is a handout in your material with all the information that I will let you read. Also, FEMA was unable to attend today and Prince sent me some information. That information is printed on the back of the information from the Earthquake Program.

One of my projects I have worked on is the GEAC website. It is up in the form of a blog. You can see it at www.argeac.org. It has been up as a work in progress since January. There is a place to see meeting announcements and the minutes. The new secretary will need input from you members on what other information you want on the webpage.

We have made three short videos for the Earthquake Program. Katy showed one of the videos which is on YouTube. The other two videos will be put on YouTube later and were made available for viewing in the back of the room. Katy gave the podium back to Scott

Scott Ausbrooks led the open discussion concerning the council's future.

Brian Blake: I have seen several states' seismic council makeup – I don't think there is anything particularly better or worse than any others. Maybe there should be an executive board of the council –

6 or 7 people to advice the chairman and then get buy in from other members. Working groups are a good idea-they have this in Missouri – the board of directors could be responsible for each one of the working groups. Everyone should be advising the powers that be of your support for these building codes (example) in Japan the reason they had as few deaths from the earthquake is the building codes. We all need to throw our support behind the adoption of this code.

Sheila Annable: I do know director Maxwell would like to hear from the council any input on the direction we should go with earthquakes. He considers this the group of experts. If anyone feels that a different direction should be taken by ADEM he is open to input. We are fortunate that the Governor does not have to appoint people. If you know someone who should be on the council you should bring them and nominate them and explain their benefit. I think the updates we get are important but feedback is something we want to as well.

Brian Blake: Sheila brings up a good point about input from emergency management – subsections could be emergency management, scientific, mitigation, outreach…a balanced approach of the whole program. I think the original intent of the council was to advise the earthquake program in general.

Scott Ausbrooks asked for any opinions from tenured members of the council.

Frank Kraft: Originally our push was building codes because it was not required. We have a long history of backing up Lindsey and his team.

Scott Ausbrooks: We piggybacked on Ivan Browning and there was a letdown when it didn't come through but it put some things in motion. We learned our lessons. We build on what we have done. In a moment I will take a survey I want to see how many different people here are from different agencies.

Col. Thommie Herndon: I think you are on track as far as the overall council. I think as time goes on you hit your peaks and valleys. But I think the brochures are good. I would say Awareness, Preparedness, and Exercises are the way to go. How do we publicize things? Work with the media. Things like that are effective but you don't realize it. I think we are on track.

Dr. Wendi Williams: I want to reinforce the comments about education. I think it will make things easier when we go up the chain. I really think we should have a working group that is education based. There has been a big push for the earth science literacy capabilities. We need to communicate broadly. Work with the Core education, science, applied science – we are at a good point to work on what CUSEC and other groups are doing outside of the council. I am willing to roll up my sleeves.

Scott Ausbrooks: Look at your agenda and you will see there are questions. This will be put together in an email. We want to get your input. Start with these questions and reply and add any comments you are thinking about. If you want to volunteer for a working group, let us know. I realize we are all busy and I appreciate your time.

Meeting adjourned.

Arkansas State All-Hazards Mitigation Plan Update
Initial Project Coordination Meeting Minutes

Date: Thursday, December 20, 2012, 2pm (CST)
Location: ADEM Office

Attendees:
Arkansas Department of Emergency Management (ADEM)
AMEC Environment & Infrastructure, Inc. (AMEC)

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1. *Attendees*
ADEM – Josh Rogers, State Hazard Mitigation Officer
AMEC – Cindy Popplewell, Project Manager

2. *ADEM Project Expectations and Scope of Work*
In addition to developing a FEMA approved State Hazard Mitigation Plan, ADEM is seeking to:
- Add an enhanced planning element;
- Scale back on the bulk of the document to a more manageable and useful plan;
- Address EMAP requirements, specifically noting comments from the 2010 review and mitigation strategies for terrorism; and
- Develop a repetitive loss strategy.

3. *Review Mitigation Plan Methodology and Scope of Work*
The methodology and scope proposed by AMEC was adjusted as follows:
- Kickoff Meeting to coincide with the Advisory Council Meeting on January 24th. AMEC will schedule on-site interviews with key staff the days prior to the Council Meeting.
- The Risk Assessment and Mitigation Strategy meetings will be combined into one meeting date, tentatively scheduled for late March. AMEC will coordinate with ADEM on key staff to invite.
- Draft documents will provided prior to the final document as proposed by AMEC.

4. *Project Deliverables*
AMEC will prepare and deliver the following items:
- Weekly progress reports, posted to the AMEC developed on-line sharepoint site
- Meeting invitation and minutes to the Risk Assessment/Mitigation Strategy Meeting
- First Draft document for ADEM and key staff
- Second Draft document for ADEM and general public
- Final plan document for FEMA submittal
- Project supporting data, to be provided at project close-out

5. Project Schedule
The following dates were identified as project milestones:
- January 4th – Sharepoint Site is completed and ready for use
- January 21-23 – AMEC will conduct on-site interviews/data gathering with key staff
- January 24th – Advisory Council/Kick-off Mitigation Meeting
- March 28th (tentative) – Risk Assessment/Mitigation Strategy Meeting
- May 6th – 1st Draft submittal to ADEM
- May 17th – Review comments from 1st draft due to AMEC

- June 3rd – 2nd Draft submittal to ADEM
- June 14th – Review comments from 2nd draft due to AMEC
- July 1st – Final plan submittal to ADEM
- July 18th – Final meeting with Advisory Council

5. *Preparations for Project Kickoff Meeting*
The Governor's Earthquake Advisory Council / Arkansas Pre-Disaster Mitigation Advisory Council Meeting scheduled for January 24th will serve as the Kick-off meeting for the All-Hazards Mitigation Plan Update. AMEC will prepare a short summary presentation for the Council regarding the planning process and current status.

6. *Project Contacts and Reporting*

- AMEC will provide weekly progress reports, posted to the AMEC developed on-line sharepoint site.
- Monthly invoices will be prepared by AMEC and addressed to Josh Rogers at ADEM.

7. *Data Requests*
The following data items were requested initially by AMEC:

- Copy of Signed Contract
- Existing State Mitigation Plan (*provided*)
- FEMA Crosswalk review of 2010 Mitigation Plan (*provided*)
- EMAP review comments from 2010
- Local Hazard Mitigation Plans, approximately 60 local plans within the state
- GIS Data, AMEC will provide comprehensive list of GIS data needs
- NFIP claims data and repetitive loss data, AMEC will provide comprehensive list of NFIP data needs
- Additional data requests will be provided to Josh Rogers as needed during the planning process.

January 24, 2013 ARGEAC Meeting Minutes
ASU Convo Center Jonesboro, AR

0850 - David Maxwell ADEM Director Welcomed everyone to the meeting. Outlined Capstone 14 exercise and the similarity to NLE11 to include CUSEC involvement. Exercise is slated to take place June 2014 and FEMA has been invited. He emphasized FEMA Administrator Craig Fugate fully supporting the exercise to include naming it. Clarification for disaster declaration according to legislative guidance and proposed increase to TIER II fees was addressed. Fees have not changed since 1994 introduction. New legislation to include ADEM director or executive representative to the Emergency Management Telecommunications Board to assist with Next Generation 911 funding. State is working with Law Enforcement Training Center and Criminal Justice Training Institute to develop school based active shooter training and exercises. Introduced Jeff Connelly and thanked ASUs Starr Fenner for assisting with the ARGEAC and PDMAC meeting arrangements.

0902 – Jeff Connelly UALR Welcomed everyone to the meeting.

Approval of past minutes: **Moved** – Donald Minster
Second – Steve Sharp

New member nominations: **Moved** – W. Jay Sims
Second – Gary Stephenson

New Member		Sponsor	
Andrea	Allen	Sheila	Annable
Joe	Berry	Fulton	Wold
Cpt. Steve	Hartman	Col. John	Kaminar
Shirley	Fetherolf	Col. John	Kaminar
Michele	Snyder	Col. John	Kaminar

0906 – David Johnston AGS Thanked everyone for attending and apologized on Scott Ausbrooks behalf. Mr. Ausbrooks was invited to guest present at a geological injection conference out of state. Total of 97 earthquakes reported in 2012. Of those: 83 were Non-NMSZ; 8 related to Guy-Greenbrier Swarm, and 15 were “felt.” As of January 23, 2013, 1 earthquake was reported and was not “felt.” AGS attended and spoke at a total of 10 meetings during 2012 to include ANG Vigilant Guard planning conference and the NW AR Emergency Preparedness Fair where approx. 4,000 in attendance. October 29, 2012 Parkin, AR experienced a 3.9 magnitude earthquake with resulted in 1024 “Did You Feel It” responses to USGS over a 146 Zip Code span. Max Mercalli reported was a VI.

0918 – Jim Wilkinson CUSEC Capstone 14 multi-state planning priorities include but are not limited to: regional communications, regional situations awareness, regional transportation, national resource allocation, DOD/NG mobilization. Private sector workshop with kickoff August 2012 in Chicago, IL and a private sector advisory group will be formed. An upcoming CUSEC board meeting February 12, 2013 immediately followed by Capstone 14 Concepts and Objectives meeting the 13th. NEHRP funding match required of third year programs. Arkansas has committed to partial match and is partially funded. Mike Calvert was hired as a result of new NEHRP funding. USGS will be closing the Memphis, TN office and moving operations to Golden, CO. Robert Williams will remain the central US earthquake representative.

0940 – Mike Calvert CUSEC Introduced the FEMA Drop, Cover, and Hold-On laminated poster he, Brian Blake of CUSEC and Donald Minster of ADEM have been working on. The poster now carries specific contact information for AGS, CUSEC, ADEM, and Ready.ar and is laminated for prolonged classroom use.

<u>0945 – Brigette Williams Arkansas Red Cross</u> Thanked the council for inviting Red Cross and outlined current and future planning efforts with state and local entities for earthquake response and sheltering. She provided a working explanation of the Red Cross Earthquake Smartphone Application.

<u>1000 – Break</u>

<u>1015 – Donald Minster ADEM</u> Welcomed everyone to the meeting and provided a brief introduction as the new earthquake program coordinator. Updated the council on training as of the July meetings, to include: ATC-20, FEMA-154, FEMA 395 and FEMA E-74 webinars. ADEM in conjunction with FEMA Region VI and IEM Air conducted a thorough site assessment for Walnut Ridge Regional Airport. Attended CUSEC Program Manager's Meeting where development of EMAC Mission Ready Packaging was exhausted. Further EMAC MRP will be conducted in March 2013. MRP relates to engineers deploying post disaster for building assessments. Shakeout Drop, Cover, and Hold-On drill currently has 53,819 registrations as of January 8, 2013. With 2013, we will see the introduction of a national Shakeout drill on October 17th. The state will be participating in two drills this year and eliminate the February drill in 2014. For the February 7th Shakeout, ADEM partnered with CUSEC and Illinois Department of Emergency Management to broadcast a radio spot. The spot will air between January 18th, 2013 and terminate at the time of the exercise on February 7th, 2013. Using Cumulus radio to broadcast, the spot will air on 48 stations across the state and reach 470,000 listeners each week. Arkansas is hosting E-74 Non-Structural Mitigation training on February 8th and has invited FEMA and CUSEC to attend. Future projects include identifying non-structural mitigations projections throughout the state, Capstone 14 planning, and earthquake curriculum for schools.

<u>1030 – Bob Lorimer State Farm Insurance</u> Thanked the council for the opportunity to present about earthquake specific insurance. Mr. Lorimer began his presentation with information about the insurance coalition which includes ARGEAC member Becky Harrington. Various agencies throughout the state and the insurance community work together to ensure Arkansans receive timely response following a disaster. Outlined the 1999 Arkansas Earthquake Authority Act and how it applies to Arkansans and the insurance industry. Described how the earthquake policy rider works and exclusions.

<u>1050 – Jeff Connelly</u> Thanked the presenters and attendees and adjourned the meeting.

January 24, 2013 PDMAC Meeting Minutes

<u>1050 – Hon. Gary Howell Clay Co. Judge</u> Welcomed everyone to the meeting. Led the approval of past minutes and added all newly voted ARGEAC members to the PDMAC.

<u>1100 – Cindy Popplewell AMEC</u> Introduced AMEC and FTN planning team for the State Hazard Mitigation Plan Update: Susan Belt and Beth Breed. Described the changes being made to move the plan forward from a Standard State Mitigation Plan to that of an Enhanced plan along with other changes in formatting and content. Outlined the mitigation planning process: risk assessment, mitigation strategy, coordination of local mitigation planning, and maintenance process. Project Schedule: planning process through July 2013; Risk Assessment Through April 2013; Mitigation Strategy through May 2013; Coordination through April 2013; and drafts submitted through Jun 2013. Meetings with ADEM began on 1/23 to discuss and gather data on mitigation program and capabilities.

1115 – Josh Rogers ADEM Welcomed everyone to the meeting. Began with reporting on how the HMPG grant program funding works (post disaster funds) and that there are currently no funds available. Outlined how HMGP staff is working projects in all phases from application to closeouts. He informed the group of the federal disaster declaration request that was made due to the Winter Storms on December 25-26, 2012 and the potential for HMGP funds to become available. Provided a status update on the Shelter Rebate Program.: ADEM is still not accepting applications at this time. Once the Legislature appropriates funds for the upcoming 2014 fiscal year ADEM will notify the State of how and when we will start receiving applications.

1125 – Veronica Villalobos-Pogue ADEM

Accomplishments:

- FY 2010 total funding $1,086,154.50
    - Russellville School District Safe Room
- FY 2011 total funding $2,124,956.00
    - Conway Simon Intermediate Safe Room
    - Conway Ruth Doyle Intermediate Safe Room
- FY 2012 total funding $1,100,000.00
    - Vilonia Primary School Safe Room
- FY 2010 FMA total funding $1,123,744.59
    - City of Benton Flood Acquisition
- LPDM total funding $2,175,920.21
    - Drew County, AR Early Warning System
    - ASU-Beebe Warning System
    - First Congressional District Emergency Generators

Grants Closed:

- FY 2008 PDM total funding $ 1,652,067.75
- FY 2009 total funding $ 1,184,180.49

Additional Projects:

- Assist HMGP by providing Technical Assistance and planning guidance in the current development or updating of Hazard Mitigation Plans along with working with local jurisdictions and contractors. Emphasized the number of plans that will be expiring in Arkansas over the next two years: 20 plans expiring within the year and 31 plans expiring by 2014. Lack of a current FEMA Approved Hazard Mitigation Plan makes jurisdictions ineligible to apply for many if not most Hazard Mitigation Assistance grants provided by FEMA.

Fiscal Year 2012 Hazard Mitigation Assistance Application Period:
There is no open application period at this time. Per FEMA, the application period will be opened if Congress appropriates funds for the program. Please check our webpage for updates on the program.

1140 Hon. Gary Howell Clay Co. Judge Adjourned the meeting.

1145 Donald Minster ADEM Led the working lunch by showing University of Memphis CERI video, New Madrid: The Earthquakes of 1811 - 1812

1300 Conclusion

2013 State Hazard Mitigation Plan Update

January 24, 2013

Overview

- Introduction to Planning Team Consultant
  - AMEC Environment & Infrastructure, Inc.
  - FTN Associates, Ltd.
- State Mitigation Planning
  - Review of Purpose and Process
  - Moving Forward from 2010 to 2013
- Project Schedule
- Current Project Status
  - Project Needs / Committee Participation

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Mitigation Planning ***Purpose***

- Qualify Arkansas for disaster assistance funding
  - Up to 15% of the first $2B of the estimated amount of disaster assistance
  - Up to 10% for amounts between $2B to $10B
  - 7.5% on amounts between $10B to ~$35B
- Legislature
  - DMA 2000 amended the Stafford Act with new mitigation planning section (322)
  - Interim Final Rule (44 CFR Part 201)
- Update Requirements
  - Every <u>three years</u>, review State mitigation activities, plans, and programs to ensure that mitigation commitments are fulfilled
  - Reflect changes in development, progress in statewide mitigation efforts, and changes in priorities

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Mitigation Planning ***Process***

- Prerequisite
  - Adoption by the State
- Planning Process
  - Documentation of Process
  - Coordination Among Agencies
  - Program Integration
- Risk Assessment
  - Identify Hazards
  - Profile Hazards
  - Assess Vulnerability
  - Estimate Potential Losses
- Mitigation Strategy
  - Goals
  - Capability Assessment
  - Mitigation Actions
  - Funding Sources
- Coordination of Local Mitigation Planning
  - Local Funding and Technical Assistance
  - Local Plan Integration
  - Prioritizing Local Assistance
- Maintenance Process

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2010 Mitigation Plan - *Standard*

- Prerequisite *(Ch.1)*
  - Adoption by the State
- Planning Process *(Ch.1)*
  - Documentation of Process
  - Coordination Among Agencies
  - Program Integration
- Risk Assessment *(Ch.2)*
  - Identify Hazards
  - Profile Hazards
  - Assess Vulnerability *(Ch.3)*
  - Estimate Potential Losses *(Ch.4)*
- Mitigation Strategy *(Ch.5)*
  - Goals
  - Capability Assessment
  - Mitigation Actions
  - Funding Sources
- Coordination of Local Mitigation Planning *(Ch.5)*
  - Local Funding and Technical Assistance
  - Local Plan Integration
  - Prioritizing Local Assistance
- Maintenance Process *(Ch.5)*

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2013 Mitigation Plan - *Enhanced*

- Address all FEMA review comments and recommendations from 2010
- Update plan based on new hazard events, status of mitigation actions, state capabilities, etc.
- Arrange Risk Assessment
  - Identify Hazards
    - Profile Hazards
    - Assess Vulnerability
    - Estimate Potential Losses
- Mitigation Strategy
  - Add Repetitive Loss Strategy – increase federal cost share (90/10) for mitigation of severe repetitive loss mitigation projects
- Enhanced Mitigation Plan
  - Increase, up to 20%, of eligible disaster assistance funds

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2013 Mitigation Plan - *Enhanced*

- Prerequisite
- Planning Process
- Risk Assessment
  - Identify Hazards
    - **Profile Hazards**
    - **Assess Vulnerability**
    - **Estimate Potential Losses**
- Mitigation Strategy
  - Goals
  - Capability Assessment
  - Mitigation Actions
  - Funding Sources
  - **Repetitive Loss Strategy**
- Coordination of Local Mitigation Planning
- Maintenance Process
- **Enhanced Mitigation Plan**
  - **Integration Planning Initiatives**
  - **Project Implementation Capability**
  - **Program Management Capability**
  - **Assessment of Mitigation Actions**
  - **Effective Use of Available Mitigation Funding**
  - **Commitment to a Comprehensive Mitigation Program**

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Project Schedule

	2012	2013											
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planning Process		Mtg #1						Mtg #3					
Risk Assessment				Mtg #2									
Mitigation Strategy				Mtg #2									
Coordination of Local Mitigation Planning													
Enhanced Planning Requirements													
DMA and EMAP Requirements													
Submittals – Draft and Final Plan Documents						#1	#2	Final					

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Current Project Status

- Planning Process *– initial project coordination meeting (Dec 2012) and Advisory Committee Meeting (today)*
- Risk Assessment
  - Identify Hazards
  - Profile Hazards *– update is underway*
  - Assess Vulnerability and Estimate Potential Losses *– FEMA annualized loss data; GIS Data requests from AGIO and others*
- Mitigation Strategy
  - Goals
  - Capability Assessment and Mitigation Actions *– AMEC will coordinate individual interviews /questionnaires for state departments and/or committee members –* ***please anticipate contact***
  - Funding Sources
  - Repetitive Loss Strategy *– met with NFIP coordinator on 01/22, in development*

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Current Project Status

- Coordination of Local Mitigation Planning
  - *ADEM is providing a copy of all local plans – to roll up for summary*
- Maintenance Process
- Enhanced Mitigation Plan
  - Integration with Other Planning
  - Project Implementation and Program Mgmt Capability
  - Assessment of Mitigation Actions
  - Effective Use of Mitigation Funding
  - Commitment to Comprehensive Program
    - *AMEC met with ADEM staff on 01/23 to discuss and gather data on mitigation program and capabilities*
- Review of Draft Document
  - ***Late March Mtg – Review risk assessment/mitigation strategy***
  - ***May and June – Draft documents for review and comment***

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Questions?

- Josh Rogers
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  - (501) 683-6724
- Cindy Popplewell
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Arkansas State All-Hazards Mitigation Plan Update Risk Assessment and Mitigation Strategy Review Meeting Minutes

Date: Tuesday, March 26, 2013, 9am – 12pm (CST)
Location: ADEM Office

Attendees:
Arkansas Department of Emergency Management (ADEM)
Arkansas Department of Environmental Quality (ADEQ)
Arkansas Department of Information Services (DIS)
Arkansas Geological Survey (AGS)
Arkansas Natural Resources Commission (ARNC)
Arkansas State Highway and Transportation Department (AHTD)
National Weather Service (NWS)
USDA, Natural Resources Conservation Service (NRCS)
AMEC Environment & Infrastructure, Inc. (AMEC)

Attachments:
Sign-In Sheet
PowerPoint Presentation
Meeting Invitation

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1. *Introductions*

Josh Rogers, State Hazard Mitigation Officer, organized the meeting and invited members of the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC). Attendees introduced themselves and the organization they represented. AMEC Environment & Infrastructure, hired to update the State All-Hazards Mitigation Plan, facilitated the remainder of the meeting. The meeting invitation and presentation are included as attachments.

2. *State Mitigation Planning*

a. AMEC reviewed the planning process and format of plan document.
b. AMEC presented overall project schedule and highlighted upcoming deadlines.
   - **April 15th** – Draft 1a - Draft Chapters 1, 2, and 3 will be submitted to APDMAC for review and comment.

3. *Risk Assessment*

The natural and man-made hazards indentified in the current 2010 mitigation plan for Arkansas were reviewed and meeting attendees were asked to comment on past hazard events, where additional information might be found, and the preliminary results of the 2013 updated vulnerability assessments and loss estimations.

Hazards were identified as follows:

Natural

- Drought
- Earthquake
- Expansive Soils
- Flood
  - Dam and Levee Failure – will be presented as a separate hazard in the 2013 update
- Landslide
- Severe Storm
  - Hail – vulnerability and loss estimation will be presented as a separately in the 2013 update
  - Lightning – vulnerability and loss estimation will be presented as a separately in the 2013 update
  - Straight-line Wind – vulnerability and loss estimation will be presented as a separately in the 2013 update
- Severe Winter Storm
- Tornado
- Wildfire

Man-Made

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

Review Comments from the APDMAC meeting attendees are highlighted below:

- Expansive Soils – NRCS responds to isolated incidents, home investigations, etc. Noted areas include SW Little Rock, Benton County, and Lafayette County, and Cabot. Several incidents along I-30. NRCS Soil Survey can provide additional information.
- Flood – NRCS Emergency Watershed Protection Plans may provide additional information.
- Dam Failure – does the function of the dam (water supply) factor into rankings?
- Levee Failure – previous events within St. Francis County, Benton, Little River County, overtopping within Cross County, Pocahontas. Include crop loss information within levee failures.
- Landslide – Arkansas Geological Survey can provide additional information, soil layers. Previous occurrences north of Arkansas River, Hot Springs, Ouachita Mountains. In many cases where buildings are involved, the problem is based on the type of structure, the slope and the soil type.
- Tornado – are numbers increasing? Professor at University of Arkansas (Patsy Smith) may have additional information based on her Master's Thesis work was involved in Tornado Activity in Arkansas; NWS performs damage surveys following tornadoes – this may fall to local EMAs in future, check the 1983 date on tornado fatalities as there is concern the data may go back as far as 1952.

- Pine Bluff Arsenal – still using phosphorus, some areas of contamination still exist. Charlie Neel at PBA may be able to provide additional information.
- Tier II facilities – how to address facilities that are currently at low capacity and not reporting, but will again in the future.

4. *Mitigation Strategy*

The goals and objectives of the current hazard mitigation plan were reviewed by the APDMAC attendees. AMEC presented recommendations and slight changes to action orient the goals and objectives, reduce redundancy, and maintain focus on hazard mitigation. The recommendations to the goals and objectives are presented Tables 1 – 5 on the following pages.

5. *Next Steps*

- AMEC to complete risk assessments and submit draft chapters 1, 2, and 3 to the APDMAC for review and comment by April 15th.
- APDMAC to review recommended changes to the goals and objectives and provide feedback.

  Please return comments by Friday, April 19th to:
  cindy.popplewell@amec.com with copy to Josh.Rogers@adem.arkansas.gov

Table 1. Hazard Mitigation Goals – Current and Recommendations

STATUS	GOAL	COMMENTS
Current	Goal #1 - The reduction of vulnerability in Arkansas to all hazards and the promotion of sustainable infrastructure and environment.	
Recommendation	Goal #1 – Reduce the vulnerability of Arkansas and its communities to all hazards. Goal #2 – Promote sustainable and disaster resilient development within Arkansas and its communities.	• Refine goal to be action oriented • Additional goal to focus on development
Current	Goal #2 - Identify mitigation grant opportunities for state and local governments, their sub-jurisdictions and the general public, and provide effective technical support.	
Recommendation	Goal #3 – Support mitigation grant opportunities for local governments, their sub-jurisdictions and the general public.	• Refine goal to focus on grant opportunities. Remove technical support, this is covered in next goal
Current	Goal #3 - Offer training, education, and technical assistance to local jurisdictions as they develop local hazard mitigation plans and mitigation projects.	
Recommendation	Goal #4 – Offer hazard mitigation training, education, and technical assistance to local jurisdictions in the development of hazard mitigation plans and implementation of projects.	• Refine goal to focus on hazard mitigation and implementation of mitigation projects
Current	Goal #4 - Formulate objectives using state of the art knowledge to reduce vulnerability to all identified hazards.	
Recommendation	Goal #5 – Utilize the latest technology to improve vulnerability assessments of all identified hazards.	• Refine goal to focus on technology and vulnerability assessments.

Table 2. Hazard Mitigation Goal #1 Objectives – Current and Recommendations

STATUS	OBJECTIVE	COMMENTS
Goal #1 – Reduce the vulnerability of Arkansas and its communities to all hazards.		
Current	1.1: Research and participate in all appropriate federal programs related to disaster planning and mitigation including FEMA, DHS, CDC, and others.	
Recommendation	1.1: Participate in all appropriate federal programs related to disaster planning and mitigation including FEMA, DHS, CDC, and others.	• Refine objective to focus on participation.
Current	1.2: Hold regular meetings to communicate mitigation goals, objectives and actions with state, county and local jurisdictions and stakeholders from the private sector.	
Recommendation	N/A	• Remove this objective, this is an action item
Current	1.3: Institutionalize hazard mitigation by educating and assisting The Governor's Office and The Arkansas General Assembly in developing policies and state legislation that will further hazard mitigation and sustainability.	
Recommendation	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.	• Refine goal to positively focus on education and assistance. • Remove sustainability; next goal.
Current	**1.4:** Expand mitigation opportunities throughout Arkansas.	
Recommendation	**1.3:** Expand mitigation project opportunities throughout Arkansas.	• Refine goal to focus on mitigation projects.

Table 3. Hazard Mitigation Goal #2 Objectives – Current and Recommendations

STATUS	OBJECTIVE	COMMENTS
Goal #2 – Promote sustainable and disaster resilient development within Arkansas and its communities.		
Current	**1.5:** Promote NFIP compliance as the major starting point for any community serious about hazard mitigation.	
Recommendation	**2.1:** Promote NFIP participation and compliance for all communities throughout the State.	• Refine objective to include participation within the NFIP.
Current	**1.6:** Coordinate with non-profit organizations that engage in emergency response or planning activities or are responsible for promoting and or implementing sustainable development or "smart growth" initiatives.	
Recommendation	**2.2:** Promote sustainable development and "smart growth" initiatives through coordination with state agencies and non-profit organizations.	• Refine objective to include state agencies.

Table 4. Hazard Mitigation Goal #3 Objectives – Current and Recommendations

STATUS	OBJECTIVE	COMMENTS
Goal #3 – Support mitigation grant opportunities for local governments, their sub-jurisdictions and the general public.		
Current	2.1: Provide direct technical assistance to local public officials and help local jurisdictions to obtain funding for mitigation planning and project activities.	
Recommendation	3.1: Provide mitigation grant program technical assistance and funding to local jurisdictions for eligible planning and project activities.	• Refine objective to note eligible planning and project activities
Current	2.2: Provide floodplain management resources.	
Recommendation	3.2: Provide floodplain management technical assistance and resources to all communities.	• Refine objective to focus on technical assistance and local communities.
Current	**2.3:** Allocate federal and state grant funding to local jurisdictions for the purpose of implementing local mitigation plans and eligible hazard mitigation projects.	
Recommendation	N/A	• Remove objective, this is covered in current 2.1 (recommended 3.1).

Table 5. Hazard Mitigation Goal #4 Objectives – Current and Recommendations

STATUS	OBJECTIVE	COMMENTS
Goal #4 – Offer hazard mitigation training, education, and technical assistance to local jurisdictions in the development of hazard mitigation plans and implementation of projects.		
Current	3.1: The state will work with local jurisdictions to improve the local hazard mitigation planning process including technical assistance in developing, adopting, and implementing building codes, fire codes, and land-use ordinances.	
Recommendation	4.1: Provide training, education and technical assistance to local jurisdictions in the development of local mitigation plans. 4.2: Provide training, education and technical assistance to local jurisdictions in the implementation of local mitigation plans.	• Expand original objective to two objectives focusing on planning and implementation of plans. Remove reference to preventative mitigation measures only.
Current	N/A	
Recommendation	4.3: Provide training, education and technical assistance to local jurisdictions in the use of FEMA's Benefit-Cost Analysis software.	• Add objective to focus on benefit cost and FEMA's determination of eligible projects.
Current	4.4: Increase awareness and knowledge of hazard mitigation principles and practices among local public officials.	
Recommendation	N/A	• No recommended changes.

Table 6. Hazard Mitigation Goal #5 Objectives – Current and Recommendations

STATUS	OBJECTIVE	COMMENTS
Goal #5 – Utilize the latest technology to improve vulnerability assessments of all identified hazards.		
Current	**4.1:** Maximize the utilization of best-available technology.	
Recommendation	N/A	• Remove objective, same as the goal.
Current	4.2: Cooperate and coordinate with partners at all government levels in planning and use of best technology.	
Recommendation	**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.	• Refine objective to focus on hazard mitigation planning and projects.
Current	4.3: Identify and track repetitive losses from all hazards and analyze this data to prevent future losses.	
Recommendation	**5.2:** Develop and implement a repetitive loss strategy to prevent future losses.	• Refine objective to reflect repetitive loss strategy and remove reference to all hazards.
Current	4.4: Develop a methodology for identifying, prioritizing and implementing new mitigation activities based largely on loss reduction criteria.	
Recommendation	**5.3:** Develop and implement a methodology for identifying and prioritizing new mitigation projects based upon on loss reduction criteria.	• Refine objective to include implementation and focus on mitigation projects.
Current	4.5: Develop and monitor any mitigation data deficiencies referenced in the current state mitigation plan.	
Recommendation	N/A	• No recommended changes.

NAME	AGENCY	PHONE NUMBER	EMAIL ADDRESS
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2013 State Hazard Mitigation Plan Update

March 26, 2013

Overview

- Introductions
- State Mitigation Planning
  - Review of Planning Process
  - Project Schedule
- Risk Assessment
  - Review and Address Data Needs
- Mitigation Strategy
  - Review and Address Status of Action Items

Mitigation Planning Process

- Prerequisite
  - Adoption by the State
- Planning Process
  - Documentation of Process
  - Coordination Among Agencies
  - Program Integration
- Risk Assessment
  - Identify Hazards
  - Profile Hazards
  - Assess Vulnerability
  - Estimate Potential Losses
- Mitigation Strategy
  - Goals
  - Capability Assessment
  - Mitigation Actions
  - Funding Sources
- Coordination of Local Mitigation Planning
  - Local Funding and Technical Assistance
  - Local Plan Integration
  - Prioritizing Local Assistance
- Maintenance Process
- Enhanced Mitigation Plan

Project Schedule

	2012	2013											
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planning Process		Mtg #1						Mtg #3					
Risk Assessment				Mtg #2									
Mitigation Strategy				Mtg #2									
Coordination of Local Mitigation Planning													
Enhanced Planning Requirements													
DMA and EMAP Requirements													
Submittals – Draft and Final Plan Documents					#1a	#1b	#2	Final					

Project Schedule

- **April 15th** – Draft 1a - Draft Chapters 1, 2, and 3
- **April 29th** – Review Comments Due
- **May 6th** – Draft 1b – Draft Chapters 4,5,6, and 7
- **May 17th** – Review Comments Due
- **June 3rd** – Full Document with comments incorporated for Final Review
- **June 14th** – Final Review Comments Due

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Mitigation Planning Process

- Prerequisite
  - Adoption by the State
- Planning Process
  - Documentation of Process
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  - Program Integration
- Risk Assessment
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  - Profile Hazards
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- Coordination of Local Mitigation Planning
  - Local Funding and Technical Assistance
  - Local Plan Integration
  - Prioritizing Local Assistance
- Maintenance Process

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Risk Assessment – 2010

Natural Hazards

2010 HAZARDS	PROBABILITY
Drought	Possible
Earthquake	Likely
Expansive Soils	Unlikely
Flood	Highly Likely
Landslide	Possible
Severe Storm	Highly Likely
Severe Winter Storm	Highly Likely
Straight-line Wind	Highly Likely
Tornado	Highly Likely
Wildfire	Highly Likely

PROBABILITY	
Highly Likely	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring (1/1=100%). History of events is greater than 33% likely per year.
Likely	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring (1/3=33%). History of events is greater than 20% but less than or equal to 33% likely per year.
Possible	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring (1/5=20%). History of events is greater than 10% but less than or equal to 20% likely per year.
Unlikely	Event is possible within the next 10 years. Event has up to 1 in 10 years chance of occurring (1/10=10%). History of events is less than or equal to 10% likely per year.

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Risk Assessment – 2013

Natural Hazards

2010 HAZARDS	PROBABILITY	2013 HAZARDS	PROBABILITY	SEVERITY	PRIORITIZATION
Drought	Possible	Drought	Possible		
Earthquake	Likely	Earthquake	Likely		
Expansive Soils	Unlikely	Expansive Soils	Unlikely		
Flood	Highly Likely	Flood	Highly Likely		
		Dam and Levee Failure			
Landslide	Possible	Landslide	Possible		
Severe Storm	Highly Likely	Severe Storm	Highly Likely		
		Hail			
		Lightning			
Straight-line Wind	Highly Likely	Straight-line Wind	Highly Likely		
Severe Winter Storm	Highly Likely	Severe Winter Storm	Highly Likely		
Tornado	Highly Likely	Tornado	Highly Likely		
Wildfire	Highly Likely	Wildfire	Highly Likely		

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Risk Assessment – 2013
Prioritization

PROBABILITY	
Highly Likely	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring (1/1=100%). History of events is greater than 33% likely per year.
Likely	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring (1/3=33%). History of events is greater than 20% but less than or equal to 33% likely per year.
Possible	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring (1/5=20%). History of events is greater than 10% but less than or equal to 20% likely per year.
Unlikely	Event is possible within the next 10 years. Event has up to 1 in 10 years chance of occurring (1/10=10%). History of events is less than or equal to 10% likely per year.

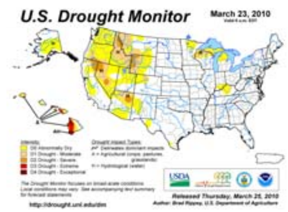
SEVERITY	
Catastrophic	Multiple deaths More than 50% of property is severely damaged
Critical	Injuries and/or illnesses is expected 25–50% of property is severely damaged
Limited	Injuries and/or illnesses is expected 10–25% of property is severely damaged
Negligible	Injuries and/or illnesses is possible Minor quality of life lost Less than 10% of property is severely damaged

		PROBABILITY			
		Unlikely	Possible	Likely	Highly Likely
SEVERITY	Negligible	Low	Low	Low	Low
	Limited	Low	Moderate	Moderate	Moderate
	Critical	Low	Moderate	**High**	**High**
	Catastrophic	Low	Moderate	**High**	**High**

Drought

P: Possible
S: Critical
Moderate

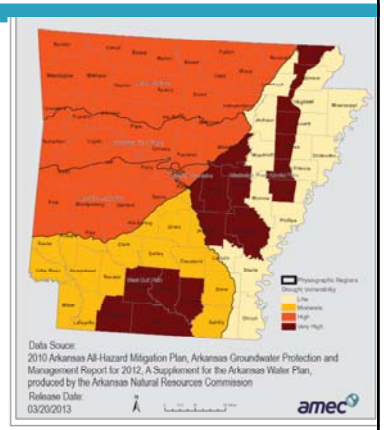
- 2010 Summary
  - National Climatic Data Center
    - Noted damage tables incomplete
  - Dustbowl Drought
  - Droughts of 1953 and 1954
  - Summers of 1980, 2000
  - Drought of 2005 and 2006
  - At 2010 plan – AR not experiencing long-term drought conditions



- 2013 Summary
  - Drought Impact Reporter shows <u>328 impacts</u> that affected Arkansas betw. Jan 2003 & 2012.
  - Most drought impacts were <u>agriculture related</u>.
  - USDA designated 69 of 75 counties as disaster areas in July 2012.
  - USDA Insured Crops Paid totaled <u>$79M</u> from 2003-2012 (10 year period).

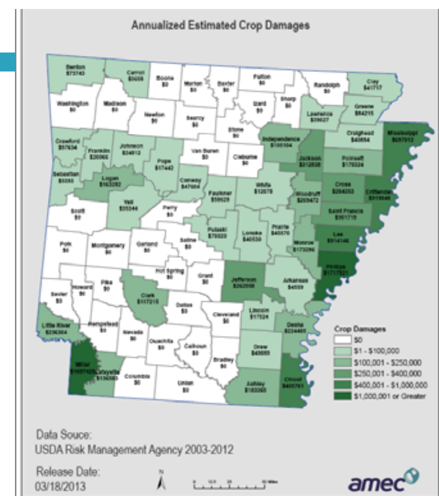
Drought

- Vulnerability
  - Based on physiographic regions of Arkansas.
  - <u>Low Vulnerability Area</u> – Mississippi River Alluvial Plain with the Mississippi River Valley alluvial aquifer for water.
  - <u>Moderate Vulnerability Area</u> – Gulf Coast Plain Plain with several significant aquifers under lying.
  - <u>High Vulnerability Area</u> – Ozark Plateaus, Arkansas River Valley and Ouachita Mountains physiographic provinces. Limited aquifers lie underneath.
  - <u>Very High</u> – State designated critical groundwater areas.



Drought

- Loss Estimation
  - USDA Risk Management Agency's insured crop insurance payments for drought-related damages.



Earthquake

P: Likely
S: Critical/Catastrophic
High

- 2010 Summary
  - Modified Mercalli Intensity Scale
  - Seismic Zones
    - New Madrid Seismic Zone
    - Historic Events
  - 27 counties were identified as being most vulnerable to earthquakes

- 2013 Summary
  - Coordination with the Arkansas Geological Survey / CUSEC
  - Update on earthquake occurrences since 2010 plan
  - *Impact of Earthquakes on the Central USA - New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, 2008*
    - *HAZUS model of* deterministic, magnitude 7.7 (M_w7.7) earthquake caused by a rupture over the entire length of the segment. (USGS)

Earthquake

P: Likely
S: Critical/Catastrophic
High

- Vulnerability
  - *Impact of Earthquakes on the Central USA - New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, 2008*

Table 15: NMSZ Event Building Damage by Occupancy Type for the State of Arkansas

General Occupancy Type Damage			
General Occupancy Type	Total No. Buildings	Moderate to Severe Damage	Complete Damage
Single Family	936,609	38,644	35,742
Other Residential	195,818	21,792	13,626
Commercial	8,078	796	555
Industrial	1,461	155	174
Other	1,169	102	62
Total	1,143,135	61,489	50,159

- Loss Estimate
  - *Impact of Earthquakes on the Central USA - New Madrid Seismic Zone Catastrophic Earthquake Response Planning Project, 2008*

Table 69: NMSZ Event Total Direct Economic Losses for the State of Arkansas

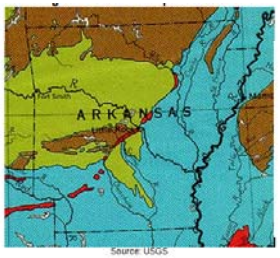
Total Direct Economic Losses		
System	Inventory Value	Total Direct Economic Loss
Buildings	$157,602,000,000	$12,597,230,000
Transportation	$67,940,310,000	$2,154,660,000
Utility	$47,658,900,000	$4,126,730,000
Total	**$273,201,210,000**	**$18,878,620,000**

Expansive Soils

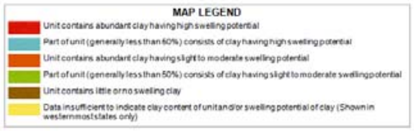
P: Unlikely
S: Limited
Low

- 2010 Summary
  - Developed in the original 2004 plan
  - Arkansas Geological Commission geologists have investigated but not formally documented moderate to severe expansive soil occurrences in southwest Little Rock (Pulaski County), Cabot (Lonoke County) and other locations in Lonoke County.
  - The HMP Sub-Committee has decided to add the collection of expansive soil data as a mitigation "action item" to be considered by the state as funding becomes available.
- 2013 Summary
  - Profile language was updated and Arkansas Geological Survey information was added.
  - No reported occurrences of expansive soils in the past three years.
  - *The HMP Sub-Committee does not consider this a high priority hazard and feels that any impact will be minor in nature.*

Expansive Soils



Source: USGS



Expansive Soils

- Vulnerability
  - Expansive soil overlain with total exposure # data from HAZUS by census block.
- Loss Estimation
  - Expansive soil overlain with total exposure $ data from HAZUS by census block.

Flood

P: Highly Likely
S: Critical/Catastrophic
High

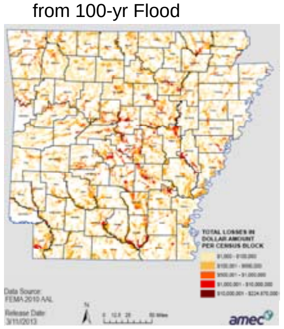
- 2010 Summary
  - Exposure of properties from HAZUS MH2 appears to be total for county, not just floodplain; does not include loss data
  - Utilized FEMA Q3 Data

Arkansas 2011 Flooding

- 2013 Summary
  - Updated Previous Occurrences
    - NCDC
    - Presidential Declarations
    - Online articles for 2011
  - Included USDA, Risk Management Agency Crop Insurance Payments—10 yrs
  - FEMA HAZUS Analysis
    - 1-Percent Annual Chance Flood
    - Average Annualized Loss (10, 50, 100, & 500 yr frequencies)
  - Updated Flood Insurance Policy & Loss Statistics by County
  - Updated Repetitive Loss & Severe Repetitive Loss Analysis by County
  - Included Information on CRS Program and Communities.

Flood

- Vulnerability
  - HAZUS 1-Percent Annual Chance Flood Scenario
  - Nearly $4.5 Billion in Losses from 100-yr Flood



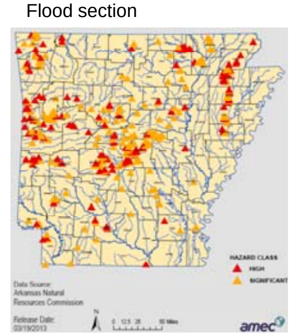
- Loss Estimation
  - Flash Flooding Property Loss Estimate $14.3 M/yr (NCDC)
  - Crop Loss Estimate $38.4 M/yr (USDA)
  - Riverine Flooding Loss Estimates $353.3 M/yr (HAZUS AAL)
    - Top 10 $ losses below

County	Total
Pulaski County	$65,873,000
Benton County	$17,766,000
Phillips County	$15,709,000
Garland County	$15,429,000
Washington County	$13,315,000
Jefferson County	$12,277,000
Crawford County	$10,164,000
Saline County	$9,735,000
Johnson County	$8,908,000
Lincoln County	$8,197,000

Dam Failure

P: Possible
S: Catastrophic
Moderate

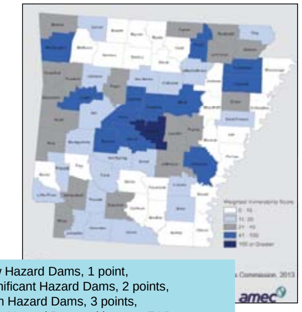
- 2010 Summary
  - Not included as separate hazard
  - Abbreviated Info. on dams was in Flood section



- 2013 Summary-Dam Failure
  - Arkansas Natural Resources Commission Provided Current Dam Inventory
  - Plan Update Includes Summary Data by County and Hazard Potential (High, Significant, Low)
    - State-regulated Dams
    - Federal Dams—# of Federal dams by agency
  - Incidents from Stanford University National Performance of Dams Program—other sources?

Dam Failure

- Vulnerability
  - Weighted Vulnerability Analysis Score



•Low Hazard Dams, 1 point,
•Significant Hazard Dams, 2 points,
•High Hazard Dams, 3 points,
•High Hazard Dams without an EAP, an additional 2 points.

- Loss Estimation
  - Based on ANRC Hazard Class Definitions
    - $500,000 X # of High Hazard Dams,
    - $250,000 X # of Significant Hazard Dams, and
    - $50,000 X # of Low Hazard Dams.
  - Top 10 Counties – Dam Failure Loss Estimates

County	Loss Estimates
Pulaski	$17,750,000
Craighead	$7,800,000
Saline	$7,750,000
Sharp	$7,350,000
Garland	$7,300,000
Poinsett	$6,300,000
Logan	$5,400,000
Washington	$4,850,000
Conway	$4,800,000
Sebastian	$4,800,000

Levee Failure

P: Possible
S: Catastrophic
Moderate

- 2010 Summary
  - Not included as separate hazard

Pocahontas, AR levee breach April 28, 2011

- 2013 Summary-Levee Failure
  - USACE Levee Safety Program Levees—inventory of 66 levees w/ inspection rating
  - Data from FEMA Mid-term Levee Inventory Status Report—will be integrated with USACE levees in 2013
  - FEMA Accredited Levees—summary for 16 counties w/ prelim/effective DFIRM
    - Estimated population, building & contents values in Zone X, Protected by Levee
    - HAZUS estimated losses from 500-year (0.2-percent annual chance) flood
  - Other data sources for previous levee failures?

Levee Failure

- Vulnerability
  - Exposure—Population, Building and Contents Value in Zone X, Protected by Levee Areas (Effective/Prelim.* DFIRM counties only)
  - Top 10 Building Value Below
  - Notice highest population behind levees in Desha, Chinot, and Poinsett

County	Population Exposure in "Zone X Protected by Levee" Areas	Total Building Exposure Value in "Zone X, Protected by Levee" Areas
Pulaski County*	4,275	$2,035,415,836
Desha County	11,231	$1,127,499,767
Poinsett County	9,056	$891,071,125
Chinot County	10,668	$875,516,220
Jefferson County	8,632	$865,982,519
Independence County	4	$158,569,188
Lincoln County	3,550	$155,258,908
Ashley County	2,025	$145,304,566

- Loss Estimation
  - Based on FEMA's 2010 Average Annualized Loss (AAL) Study
    - Loss Estimates as a result of a 500-year (0.2 Percent Annual Chance Flood)
    - Top 10 Loss Estimates Below

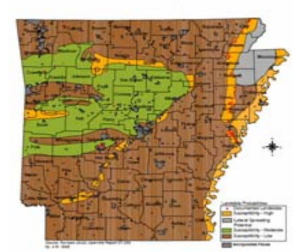
County	Total Estimated Losses
Pulaski	$362,334,477
Jefferson	$135,041,932
Lincoln	$39,893,191
Desha	$23,804,147
Crawford	$22,365,965
Poinsett	$12,198,504
Chicot	$11,421,544
Ashley	$7,331,394
Conway	$2,350,690
Independence	$2,300,663

Landslide

P: Possible
S: Negligible
Low

- 2010 Summary
  - Landslides occur in all counties; often triggered by heavy rainfall, earthquake or construction activity
  - Significant events in 1811,1812 (NMSZ), 1984, 1995, 2004, 2005
  - "Possible" probability with low risk
- 2013 Summary
  - No change to geologic conditions
  - Landslide events in 2009 and 2010 added to Historical Statistics

Landslide Potential with Arkansas' Incorporated Places



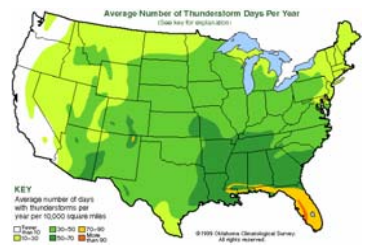
Landslide

- Vulnerability and Loss Estimation
  - 2010 Plan based on 2000 census data
  - 2013 Plan uses 2010 census data
- Data Needs
  - Is there new/better GIS data available other than the USGS map?
  - Has the landslide database, recommended in the current plan's Mitigation Strategy, been created?
  - Updated State Insurance office data is needed to evaluate risk and loss estimation for state facilities.

Severe Storms

P: Highly Likely
S: Limited
Moderate

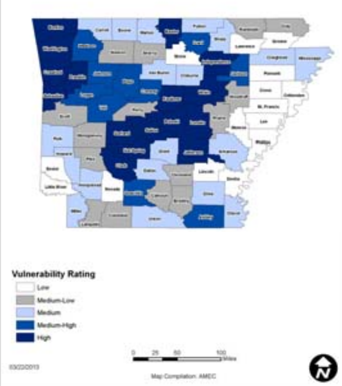
- 2010 Summary
  - Based on NCDC data since 1996
  - 31 severe storm events with $500,000+ in reported property damages
  - 25 lighting events with $75,000+ in property damages
  - 15 hail events since with $150,000+ in property damages



- 2013 Summary
  - National Climatic Data Center's Severe Storms Database from 1996 through 2012, all counties in Arkansas have experienced severe (>58 mph) straight-line winds and straight-line wind damage.
  - 123 recorded fatalities due to lightning in Arkansas from 1959 to 2011.
  - Severe storm events are common throughout the State of Arkansas. The probability of at least one severe storm event per year in each county.

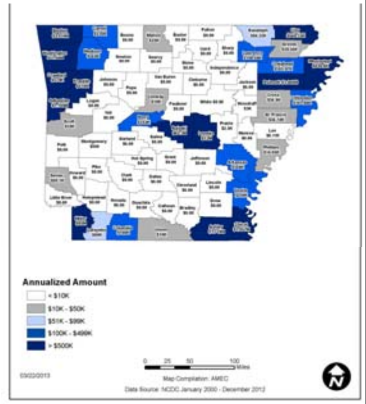
Severe Storms

- Vulnerability
  - Data gathered from NCDC database for years spanning 2000-2012.
  - Will divide by Hail, Lightning, Wind
  - Low Rating, 0 to 48 number of storms occurred over a ten year period.
  - Medium-Low Rating, 51 to 59 number of storms occurred over a ten year period.
  - Medium Rating, 61 to 79 number of storms occurred over a ten year period.
  - Medium-High Rating, 80 to 99 number of storms occurred over a ten year period.
  - High Rating, spanned from 102 to 198 number of storms occurred over a ten year period.



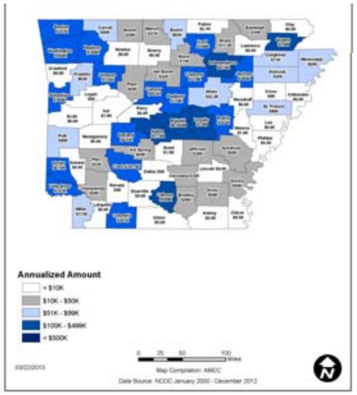
Severe Storms - Hail

- Loss Estimation
  - Annualized Hail Damages by County
  - Damages calculated from total Property Losses and Crops Losses.
  - Data Taken from NCDC from 2000-2012.



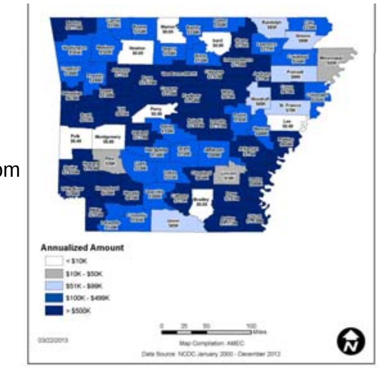
Severe Storms - Lightning

- Loss Estimation
  - Annualized Lightning Damages by County
  - Damages calculated from total Property Losses and Crops Losses.
  - Data Taken from NCDC from 2000-2012.



Severe Storms - High Winds

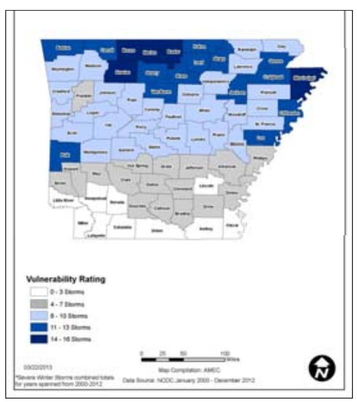
- Loss Estimation
  - Annualized High Wind Damages by County
  - Damages calculated from total Property Losses and Crops Losses.
  - Data Taken from NCDC from 2000-2012.



Severe Winter Storm

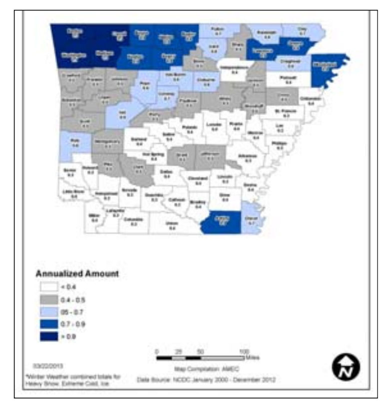
P: Highly Likely
S: Critical/Catastrophic
High

- 2010 Summary
  - National Climatic Data Center
    - Average 15 occur annually
    - Benton and Carroll Counties
  - Jan 13, 2007 – Ice, Rain, Flooding
  - Jan 2009 – Ice, Rain, Flooding
  - Feb 10, 2010 – Winter Storms
- 2013 Summary
  - National Climatic Data Center
  - Data spans ten years, from 2000-2012



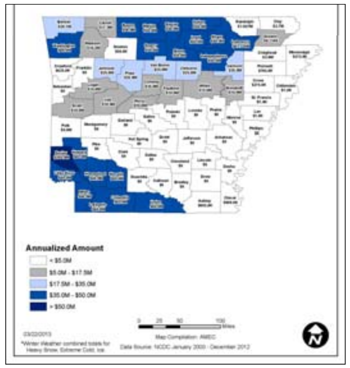
Severe Winter Storm

- Vulnerability
  - Annualized # of occurrences for heavy snow occurrences, extreme cold occurrences, and ice



Severe Winter Storm

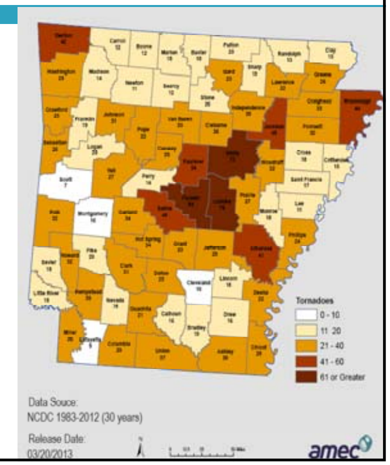
- Loss Estimation
  - Property Losses and Crop Losses
  - Annualized $ damages from heavy snow occurrences, extreme cold occurrences, and ice occurrences



Tornado

P: Highly Likely
S: Critical/Catastrophic
High

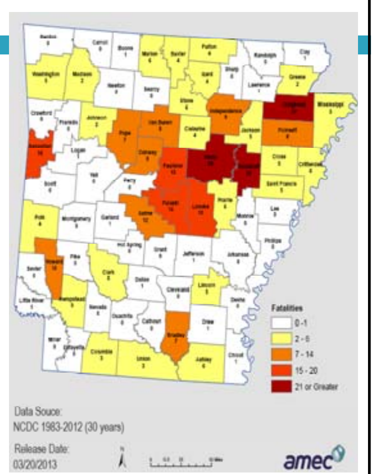
- 2013 Summary
  - Since 1970, there have been 18 Presidential Disasters that involved tornadoes.
  - According to National Climatic Data Center Storm Events database, there have been **1,978** tornadoes in Arkansas from 1983-2012 (30 yrs).
  - Annualized 66 tornadoes, $55 M in property losses, 12 deaths & 170 injuries.



Tornado

Tornado Fatalities by County 1983-2012

County	Fatalities
White	59
Craighead	37
Woodruff	32
Lonoke	18
Pulaski	16
Sebastian	16
Faulkner	15
Saline	12
Howard	10
Conway	8
Independence	8
Poinsett	8
Van Buren	8



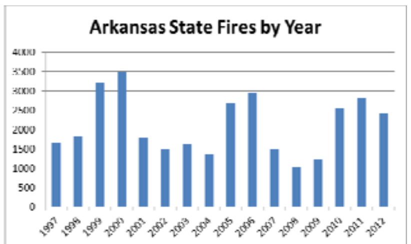
Tornado

- Vulnerability
  - Not Completed – based on exposed populations by County
- Loss Estimation
  - Map of Annualized Property Losses by County 1983-2012

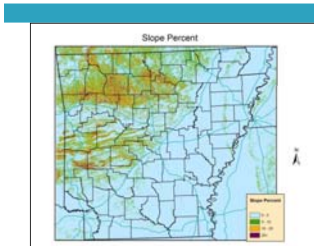
Wildfire

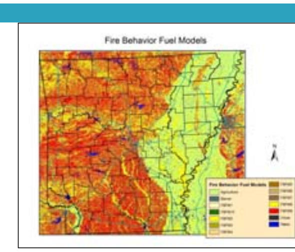
P: Highly Likely
S: Critical
High

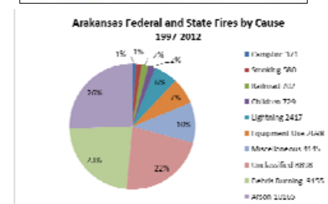
- 2013 Summary
  - Hazard – discussed in terms of potential fire behavior as indicated by topography, fuels, and past fire behavior
  - Vulnerability – represented by mapping of the wildland-urban interface and past fire occurrence
  - Silvis data will be used to map the WUI and identify areas with the highest concentration of values at risk to wildfires.



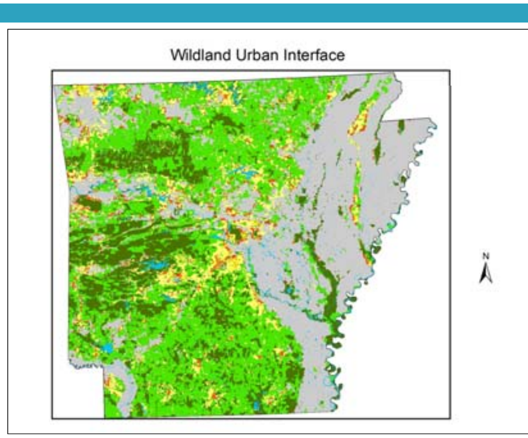
Wildfire







Wildfire



Risk Assessment – 2013

Natural Hazards

2010 HAZARDS	PROBABILITY	2013 HAZARDS	PROBABILITY	SEVERITY	PRIORITIZATION
Drought	Possible	Drought	Possible	Critical	**Moderate**
Earthquake	Likely	Earthquake	Likely	Critical/Catastrophic	**High**
Expansive Soils	Unlikely	Expansive Soils	Unlikely	Limited	**Low**
Flood	Highly Likely	Flood	Highly Likely	Critical/Catastrophic	**High**
		Dam and Levee Failure	Possible	Catastrophic	**Moderate**
Landslide	Possible	Landslide	Possible	Negligible	**Low**
Severe Storm	Highly Likely	Severe Storm			
		Hail	Highly Likely	Limited	**Moderate**
		Lightning	Highly Likely	Limited	**Moderate**
Straight-line Wind	Highly Likely	Straight-line Wind	Highly Likely	Limited	**Moderate**
Severe Winter Storm	Highly Likely	Severe Winter Storm	Highly Likely	Critical/Catastrophic	**High**
Tornado	Highly Likely	Tornado	Highly Likely	Critical/Catastrophic	**High**
Wildfire	Highly Likely	Wildfire	Highly Likely	Critical	**High**

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Risk Assessment
Man-made Hazards

2010 HAZARDS	PROBABILITY	SEVERITY	2013 PRIORITIZATION
Hazardous Materials - Commercial	High	5	**Moderate**
Hazardous Materials - Pine Bluff Arsenal	Moderate	1	N/A
Hazardous Materials - Meth Labs	Highly Likely	6	**Moderate**
Hazardous Materials - Transported, Highway	Highly Likely	4	**Moderate**
Hazardous Materials - Transported, Railway	Highly Likely	2	**High**
Hazardous Materials - Transported, Pipeline	Possible	3	**High**
Hazardous Materials - Transported, Water and Air	n/a	7 and 8	**Low**
Nuclear -SEFOR	Unlikely		N/A
Nuclear -ANO	Unlikely		**Moderate**
Terrorism	Unlikely		**Low / Moderate**

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Risk Assessment
Man-made Hazards

2010 HAZARDS	PROBABILITY	2010 PRIORITIZATION	2013 PRIORITIZATION
Biological Risk -Avian Flu	Unlikely	2	**High**
Biological Risk -Swine Flu	Highly Likely	1	**High**
Biological Risk -Influenza	Possible	3	**High**
Biological Risk -Anthrax	Unlikely	4	**Moderate**
Biological Risk -West Nile	Likely	5	**Moderate**
Biological Risk -Small Pox	Unlikely	6	**Moderate**
Biological Risk -Foot and Mouth	Unlikely	7	**Low**
Biological Risk -Mad Cow	Unlikely	8	**Low**

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Hazardous Materials Incident

- 2010 Summary
  - Fixed Facility Incidents
    - Commercial Facilities
    - Superfund Sites
    - Pine Bluff Arsenal
    - Meth Labs
  - Transportation Incidents
    - Highway
    - Railway
    - Pipeline
    - Air
    - Water

- 2013 Summary
  - Pine Bluff Arsenal-destruction of chemical weapons stockpile completed
  - Added county-level data/incidents to refine analysis of how this hazard varies by county
  - Added # of Tier II Chemical Facilities per county
  - Added pipeline mileage per county
    - Natural Gas Transmission & Liquid Haz-Mat
  - Added transportation incidents per county
  - Added pipeline significant incidents per county
  - Added population per county w/in ½ mile of:
    - Tier II Chemical Facilities, Major Highways/Interstates, Railways, & Pipelines
  - Added # of Special Populations per county w/in ½ mile of Tier II Chemical Facilities
    - Health Facilities, Colleges, Educational Facilities, Aging Facilities, Childcare Facilities, Correctional Institutions

Hazardous Materials Incident

- Vulnerability
  - Combined # of Tier II Facilities and Miles of Pipelines by County

County	# of Tier II Facilities	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Total (based on 1 point for each facility and 1 point for each pipeline mile)
White	86	476	206	768
Union	38	316	210	564
Pulaski	140	197	143	480

  - Combined Annual Average Incidents by County

County	Highway Annual Avg.	Rail Annual Avg.	Air Annual Avg.	Water Annual Avg.	Pipeline Annual Avg.	Total Annual Avg.
Pulaski	76.00	3.00	0.90	0.00	0.27	80.17
Craighead	8.80	0.00	0.60	0.00	0.00	9.40
Crittenden	8.70	0.60	0.00	0.00	0.00	9.30

  - Population in ½ mile of fixed facilities and transportation routes by county

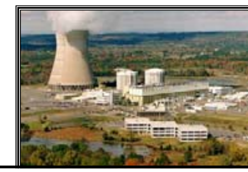
- Loss Estimation
  - Transportation incidents loss estimate based on DOT incidents data
    - Out of 1,715 incidents over 10 yrs, dollar losses were provided for 413
    - Average losses were $26,087 per incident
    - $1,077,427 per year
  - Meth Lab Clean-up based on Institute for Government Research average cleanup cost of $5,000
    - 5,100 meth lab incidents in AR in 9 yrs.
    - 567 annual average
    - $2,835,000 per year
  - Fixed Facility Spill Scenario
    - $21,215 per spill

Nuclear Events

- 2010 Summary
  - Southwest Experimental Fast Oxide Reactor (SEFOR) – located in NW corner of State.
    - In 2009, University of AR (SEFOR owner) got a USDoE grant to complete "characterization study" to determine clean up needs.
  - Arkansas Nuclear One (ANO) – located near Russellville.
    - Ways to minimize Radiation exposure.
- 2013 Summary
  - SEFOR
    - Not Operational
    - Not Radiological Hazard
    - Awaiting funding for complete clean up.
  - ANO owned & operated by Entergy Nuclear.
    - The 2 Units supply approx 30% of the total energy demand of the State.
    - Geographic area affected

Nuclear Events

- Vulnerability
  - The counties of Pope, Johnson, Logan and Yell are within the ANO 10 mile Emergency Planning Zone (EPZ) and have a relatively higher radiological risk than other counties, but the potential for an incident is extremely low.
- Loss Estimation
  - The major hazards to people in the vicinity of the plume are radiation exposure to the body from the cloud and particles deposited on the ground, inhalation of radioactive materials and ingestion of radioactive materials.



Terrorism Event

- 2010 Summary
  - Domestic Terrorism
  - International Terrorism
  - Weapons of Mass Destruction
  - Previous Events included all over the world.
  - Human population impact analysis at venues in Arkansas
  - Mental Effects on Humans
  - Commercial Agriculture impact analysis.
- 2013 Summary
  - According to Southern Poverty Law Center in 2012, there were 26 active hate groups in Arkansas.
  - Previous events for Arkansas only.

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Terrorism Event

- Vulnerability
  - The large venues in Arkansas could be a target for a terrorist event.
  - Nuclear Power Plant, infrastructure, railroad bridges, river traffic on Mississippi River, college football games, etc.
  - Commercial Agriculture Impact – closure of production plants, destruction of animals, & loss of millions to agriculture companies and farmers.
- Loss Estimation
  - Analysis of vulnerable populations by a program developed by Johns Hopkins University in 2006 called Electronic Mass Casualty Assessment and Planning Scenarios.
    - Chemical Attack-Toxic Gas
    - Biological Attack-Food Contamination of Anthrax
    - IED Device Attack
    - Dirty Bomb Attack

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Major Disease Outbreak
formerly Biological Event

- 2010 Summary
  - Human Diseases
    - Foodborne Illness
    - Pandemic Influenza
    - Potential Terrorism Agents
  - Animal Diseases
    - West Nile Virus
    - BSE
    - Avian Influenza
  - Included information regarding response and prevention of illness was included
  - List of State Infrastructure was included
    - Hospitals
    - Laboratories
- 2013 Summary
  - Additional Foodborne Outbreaks information included
    - Cantaloupe 2011
    - Salmonella 2012
  - Additional BSE Cases included
  - Info from 2009 “Pandemic”
  - Data Needs
    - Reportable Disease Report for Arkansas?
    - Vaccination Rates?
  - Response and Prevention activities removed (EOP instead)
  - Any other updates?

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Major Disease Outbreak
formerly Biological Event

- Vulnerability
  - Included information regarding numbers of uninsured Arkansans
  - Discussed role of local public health units
  - Community containment information included
- Loss Estimation
  - National level information included for pandemic influenza costs and foodborne influenza.

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Take a Break!

Mitigation Strategy

- Goals and Objectives
  - Review and Update, as needed
- Action Items
  - Review Current Action Items – status update

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Mitigation Strategy

- Goal 1
  - The reduction of vulnerability in Arkansas to all hazards and the promotion of sustainable infrastructure and environment.
- Goal 1 - Suggestion
  - ***REDUCE*** the vulnerability of Arkansas and its communities to all hazards
  - ***PROMOTE*** sustainable and disaster resilient development within Arkansas and its communities

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Mitigation Strategy

GOAL 1

- **Mitigation Objective 1.1:** ~~Research and~~ Participate in all appropriate federal programs related to disaster planning and mitigation including FEMA, DHS, CDC, and others.
- ~~**Mitigation Objective 1.2:** Hold regular meetings to communicate mitigation goals, objectives and actions with state, county and local jurisdictions and stakeholders from the private sector.~~ Action Item
- **Mitigation Objective 1.3:** ~~Institutionalize hazard mitigation by~~ Educate and assist The Governor's Office and The Arkansas General Assembly in developing policies and state legislation that will further enhance hazard mitigation ~~and sustainability~~.
- **Mitigation Objective 1.4:** Expand mitigation project opportunities throughout Arkansas.

NEW GOAL 2

- **Mitigation Objective 1.5:** Promote NFIP compliance as the major starting point for any community serious about hazard mitigation.
- **Mitigation Objective 2.1:** Promote NFIP participation and compliance for all communities throughout the State.
- **Mitigation Objective 1.6:** Coordinate with non-profit organizations that engage in emergency response or planning activities or are responsible for promoting and or implementing sustainable development or "smart growth" initiatives.
- **Mitigation Objective 2.2:** Promote sustainable development and "smart growth" initiatives through coordination with state agencies and non-profit organizations.

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Mitigation Strategy

- Goal 2
  - Identify mitigation grant opportunities for state and local governments, their sub-jurisdictions and the general public, and provide effective technical support.
- Goal 3 - Suggestion
  - ***Support*** mitigation grant opportunities for local governments, their sub-jurisdictions and the general public.

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Mitigation Strategy

- **Mitigation Objective 2.1:** Provide direct technical assistance to local public officials and help local jurisdictions to obtain funding for mitigation planning and project activities.
- **Mitigation Objective 3.1:** Provide mitigation grant program technical assistance and funding to local jurisdictions for eligible planning and project activities.
- **Mitigation Objective 2.2:** Provide floodplain management resources.
- **Mitigation Objective 3.2:** Provide floodplain management technical assistance and resources to all communities.
- ~~**Mitigation Objective 2.3:** Allocate federal and state grant funding to local jurisdictions for the purpose of implementing local mitigation plans and eligible hazard mitigation projects.~~ See 3.1

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Mitigation Strategy

- Goal 3
  - Offer training, education, and technical assistance to local jurisdictions as they develop local hazard mitigation plans and mitigation projects.
- Goal 4 - Suggestion
  - Offer hazard mitigation training, education, and technical assistance to local jurisdictions in the development of hazard mitigation plans and implementation of projects.

Mitigation Strategy

- **Mitigation Objective 3.1:** The state will work with local jurisdictions to improve the local hazard mitigation planning process including technical assistance in developing, adopting, and implementing building codes, fire codes, and land-use ordinances.
- **Mitigation Objective 4.1:** Provide training, education and technical assistance to local jurisdictions in the development of local mitigation plans.
- **Mitigation Objective 4.2:** Provide training, education and technical assistance to local jurisdictions in the implementation of local mitigation plans.
- **Mitigation Objective 4.3:** Provide training, education and technical assistance to local jurisdictions in the use of FEMA's Benefit-Cost Analysis software.
- **Mitigation Objective 4.4:** Increase awareness and knowledge of hazard mitigation principles and practices among local public officials.

Mitigation Strategy

- Goal 4
  - Formulate objectives using state of the art knowledge to reduce vulnerability to all identified hazards.
- Goal 5 - Suggestion
  - ***Utilize*** the latest technology to improve vulnerability assessments of all identified hazards.

Mitigation Strategy

- ~~**Mitigation Objective 4.1:** Maximize the utilization of best-available technology.~~ Same as Goal
- **Mitigation Objective 4.2:** Cooperate and coordinate with partners at all government levels in planning and use of best technology.
- **Mitigation 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.
- **Mitigation Objective 4.3:** Identify and track repetitive losses from all hazards and analyze this data to prevent future losses.
- **Mitigation Objective 5.2:** Develop and implement a repetitive loss strategy to prevent future losses.
- **Mitigation Objective 4.4:** Develop a methodology for identifying, prioritizing and implementing new mitigation activities based largely on loss reduction criteria.
- **Mitigation Objective 5.3:** Develop and implement a methodology for identifying and prioritizing new mitigation projects based upon on loss reduction criteria.
- **Mitigation Objective 5.4:** Develop and monitor any mitigation data deficiencies referenced in the current state mitigation plan.

Questions?

- Josh Rogers
  - Josh.Rogers@adem.arkansas.gov
  - (501) 683-6724
- Cindy Popplewell
  - cindy.popplewell@amec.com
  - (615) 333-0630 ext. 122
- David Stroud
  - david.stroud@amec.com
  - (919) 765-9986

amec

Popplewell, Cindy

From: Rogers, Josh [Josh.Rogers@adem.arkansas.gov]
Sent: Thursday, March 14, 2013 4:17 PM
To: Pogue, Veronica; Annable, Sheila; Minster, Donald; Harmon, Kenny; Kelley, Danita; Wright, Kathy; scott.ausbrooks@arkansas.gov; Bailey, Claire; bassett@adeq.state.ar.us; jldavidson_2000@yahoo.com; gld@adeq.state.ar.us; elliotr@arkansasredcross.org; david.johnston@arkansas.gov; chris.king@ar.usda.gov; bekki.white@arkansas.gov; jwilkinson@cusec.org; Tony.Evans@arkansashighways.com; Lyons, Edwin; ssharp@aecc.com; michael.sullivan@ar.usda.gov; nancy.gambill@arkansas.gov; Borengasser, Mike; jtritt@arkhospitals.org; renee.fair@noaa.gov; dtootle@uaex.edu
Cc: Matthew.Dubois@fema.dhs.gov; Reiff, David; Popplewell, Cindy
Subject: State Mitigation Plan Meeting

Good Afternoon,

The Arkansas Department of Emergency Management (ADEM) is in the process of updating the State Hazard Mitigation Plan. The purpose of this plan is to reduce or eliminate long-term risk to the people and property of Arkansas from the effects of natural and man-made hazard events. The hazard mitigation planning process kicked off at the winter meeting of the Arkansas Pre-Disaster Mitigation Advisory Council (APDMAC) and the Governor's Earthquake Advisory Council (AGEAC) on January 24th, 2013.

The hazard mitigation planning process is heavily dependent on the participation of representatives from state government agencies and departments, the public, and other stakeholder groups. Your organization's participation is requested due to your ability to contribute needed information, technical knowledge, or other valuable experience to the plan. Please designate a representative to attend the upcoming risk analysis and mitigation strategy update meeting. This meeting will review the hazard identification and risk assessment and begin the process of updating mitigation actions identified in the 2010 All-Hazards Mitigation Plan.

Arkansas All-Hazards Mitigation Plan
Risk Review and Mitigation Strategy Update Meeting
Tuesday, March 26, 2013
9:00 am-12:00 pm
Arkansas Department of Emergency Management
Building #9501 Camp Joseph T. Robinson
North Little Rock, AR 72199-9600

Please respond as to whether or not you or your representative will be able to attend the kickoff meeting by contacting myself at josh.rogers@adem.arkansas.gov.

Thank you for your early attention and response to this important project. We look forward to seeing you on March 26th.

Sincerely,

Josh Rogers
State Hazard Mitigation Officer/
Mitigation Branch Manager
(501) 683-6724
(501) 683-7890 Fax

Arkansas Department of Emergency Management
Building #9501 Camp JT Robinson
North Little Rock, AR 72199-9600
Josh.Rogers@adem.arkansas.gov

STATE OF ARKANSAS

EXECUTIVE DEPARTMENT

PROCLAMATION

EO 13-15

TO ALL TO WHOM THESE PRESENTS COME -- GREETINGS:

EXECUTIVE ORDER ADOPTING THE STATE OF ARKANSAS ALL HAZARDS 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 risks 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; building of partnerships among local, state, federal, private, and nonprofit share holders; identification of financial and technical resources; a reduction in loss of life and injury-recovery time; and costs associated with natural disasters;

NOW, THEREFORE, I, MIKE BEEBE, Governor of the State of Arkansas, pursuant to Section 322 of the Federal Disaster Mitigation Act of 2000, do hereby formally adopt the State of Arkansas All Hazards Mitigation Plan.

IN TESTIMONY WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Arkansas to be affixed this 11th day of September, in the year of our Lord 2013.

MIKE BEEBE, GOVERNOR

Mark Martin

MARK MARTIN, SECRETARY OF STATE

APPENDIX B
GIS DATASETS FOR CRITICAL FACILITIES

GIS datasets were obtained from the Arkansas Geographic Information Office (AGIO) for the following critical facility categories:

- Emergency Response;
- Schools and Universities;
- Medical Facilities;
- Infrastructure;
- Private Business; and
- Transportation.

Dataset information is presented in Table B.1 and Figures B2 through B33.

Table B.1 State-Owned and Leased Facilities

	GIS Datasets	Category	Total Number of Assets	File Name from GeoStor
B1.	State Owned or Leased Facilities	Administrative	5,442	From Arkansas Insurance Department
B2.	Fire Stations	Emergency Response	1346	STRUC_DBO_FIRE_STATIONS_TGS_point.shp
B3.	Law Enforcement Facilities	Emergency Response	524	STRUC_DBO_LAW_ENFORCE_TGS_point.shp
B4.	National Guard Armories	Emergency Response	142	CULTU_DBO_ARMORIES_AHTD_point.shp
B5.	Military Installations	Emergency Response	6	ADMIN_DBO_INSTALLATION_AREAS_ANG_polygon.shp
B6.	Fairgrounds and Speedways (Potential Shelters)	Emergency Response	97	CULTU_DBO_FAIRGROUNDS_SPEEDWAY_AHTD_point.shp
B7.	County or State Correctional Institutions	Infrastructure	21 126	CULTU_DBO_COUNTY_STATE_PRISONS_AHTD_point.shp STRUC_DBO_CORRECTIONAL_INSTITUTIONS_TGS_point.shp
B8.	Public Schools – Elementary, Middle, and High Schools	Schools and Universities	1098	STRUC_DBO_PUBLIC_SCHOOLS_DOE_point.shp
B9.	Private Schools	Schools and Universities	192	STRUC_DBO_PRIVATE_SCHOOLS_DOE_2001_point.shp
B10.	Universities and Colleges (4 yr and 2 yr)	Schools and Universities	22 21	STRUC_DBO_COLLEGES_4YR_ADHE_2001_point.shp STRUC_DBO_COLLEGES_COMMUNITY_ADHE_2001_point.shp
B11.	Hospitals	Medical Facilities	110	HEALT_DBO_HOSPITALS_ADH_point.shp
B12.	Emergency Medical Services and Ambulance Services	Medical Facilities	195	HELT_DBO_EMERG_MEDICAL_SERVICES_AHD_point.shp
B13.	Veteran's Affairs Hospitals and Medical Facilities	Medical Facilities	17	HEALT_DBO_VETERANS_AFFAIRS_SERVICES_ADH_point.shp

	GIS Datasets	Category	Total Number of Assets	File Name from GeoStor
B14.	Local Government Health Departments	Medical Facilities	90	HEALT_DBO_LOCAL_HEALTH_UNITS_ADH_points.shp
B15.	Long-Term Health Care Facilities and Nursing Care Facilities	Medical Facilities	449	HEALT_DBO_LONG_TERM_CARE_FACILITIES_ADH_points.shp
B16.	County Health Units, Hospices, and Related Medical Facilities	Medical Facilities	609	HEALT_DBO_HOSPITAL_RELATED_SERVICES_ADH_point.shp
B17.	Rural Health Clinics	Medical Facilities	72	HEALTH_DBO_RURAL_HEALTH_CLINICS_ADH_point.shp
B18.	Airports	Infrastructure	535	CULTU_DBO_AIRPORTS_AHTD_point.shp
B19.	Interstate and Highways	Transportation	33,118	TRANSP_DBO_ROAD_INVENTORY_AHTD_line.shp
B20.	Bridges	Transportation	7,303	From Arkansas State Highway and Transportation Department, See Figure B.1
B21.	Railroads	Transportation	2179	TRANP_DBO_RAILROAD_AHTD_line.shp
B22.	Intermodal Transportation Terminals, Elevators, Docks, and Ports	Infrastructure	62	TRANSP_DBO_INTERMODAL_TERMINALS_BTS_1998_point.shp
B23.	Pipeline Networks	Transportation	641	UTILIT_DBO_PIPELINES_USGS_1986_line.shp
B24.	Electricity Providers	Infrastructure	36	UTILIT_DBO_ELECTRIC_PROVIDERS_EIA_2001_point.shp
B25.	Power Plants	Infrastructure	26	CULTU_DBO_POWER_PLANTS_AHTD_point.shp
B26.	Power Substations	Infrastructure	501	CULTU_DBO_POWER_SUBSTATIONS_AHTD_point.shp
B27.	AWIN Communications Tower Locations	Infrastructure	473	UTILIT_DBO_CELL_TOWERS_FCC_point.shp
B28.	TV and Radio Stations	Infrastructure	657	CULTU_DBO_RADIO_TEELVISION_STATION_AHTD_point.shp
B29.	US Post Offices	Infrastructure	705	STRUC_DBO_POST_OFFICES_AGIO_point.shp
B30.	Dams	Infrastructure	1232	STRUC_DBO_DAMS_ANRC_point.shp
B31.	Environmental Facilities	Infrastructure		ENVIR_DBO_FACILITIES_ADEQ_point.shp
B32.	Chicken Houses and Related Industries	Private	21,477	CULTU_DBO_CHICKEN_HOUSES_AHTD_point.shp
B33.	Houses of Worship	Private	9112 11	CULTU_DBO_CHURCHES_AHTD_point.shp STRUC_DBO_JEWISH_SYNAGOGUES_TGS_point.shp

Figure B1. State-Owned and Leased Facilities

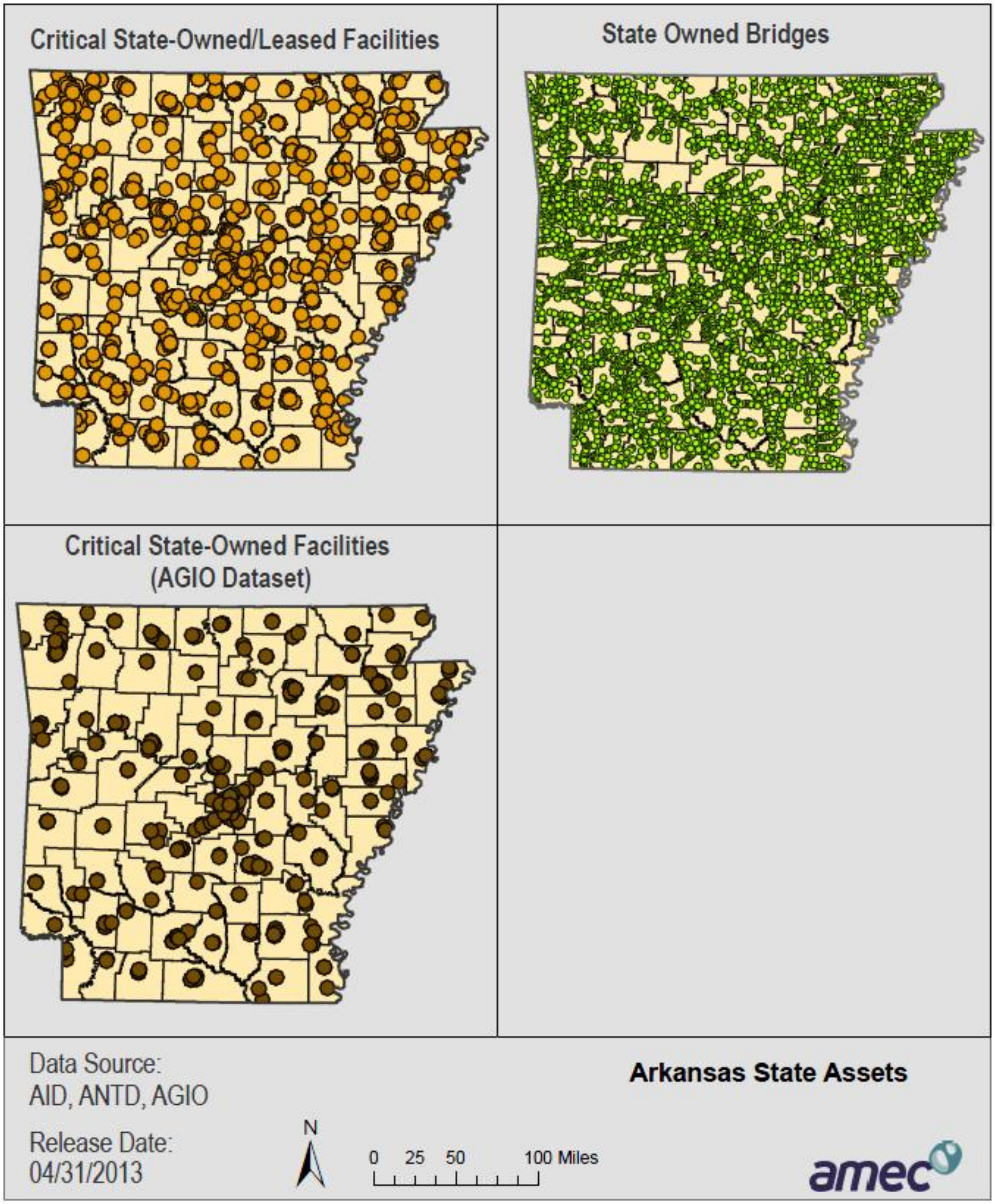
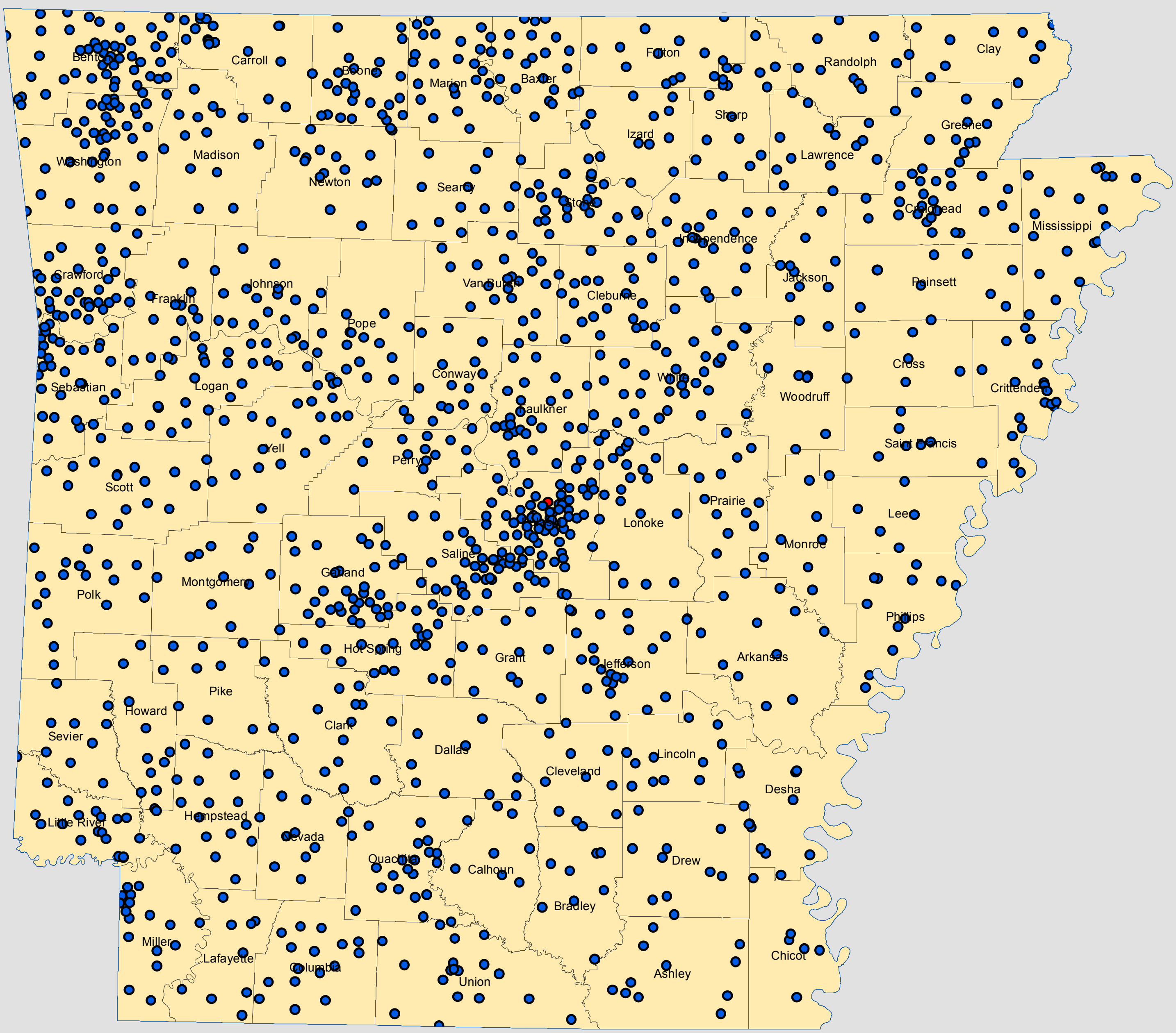


Figure B2 - Firestations



STATE OWNED ASSETS

MUNICIPAL, LOCAL, & RURAL
FIRE DEPARTMENTS &DISTRICTS

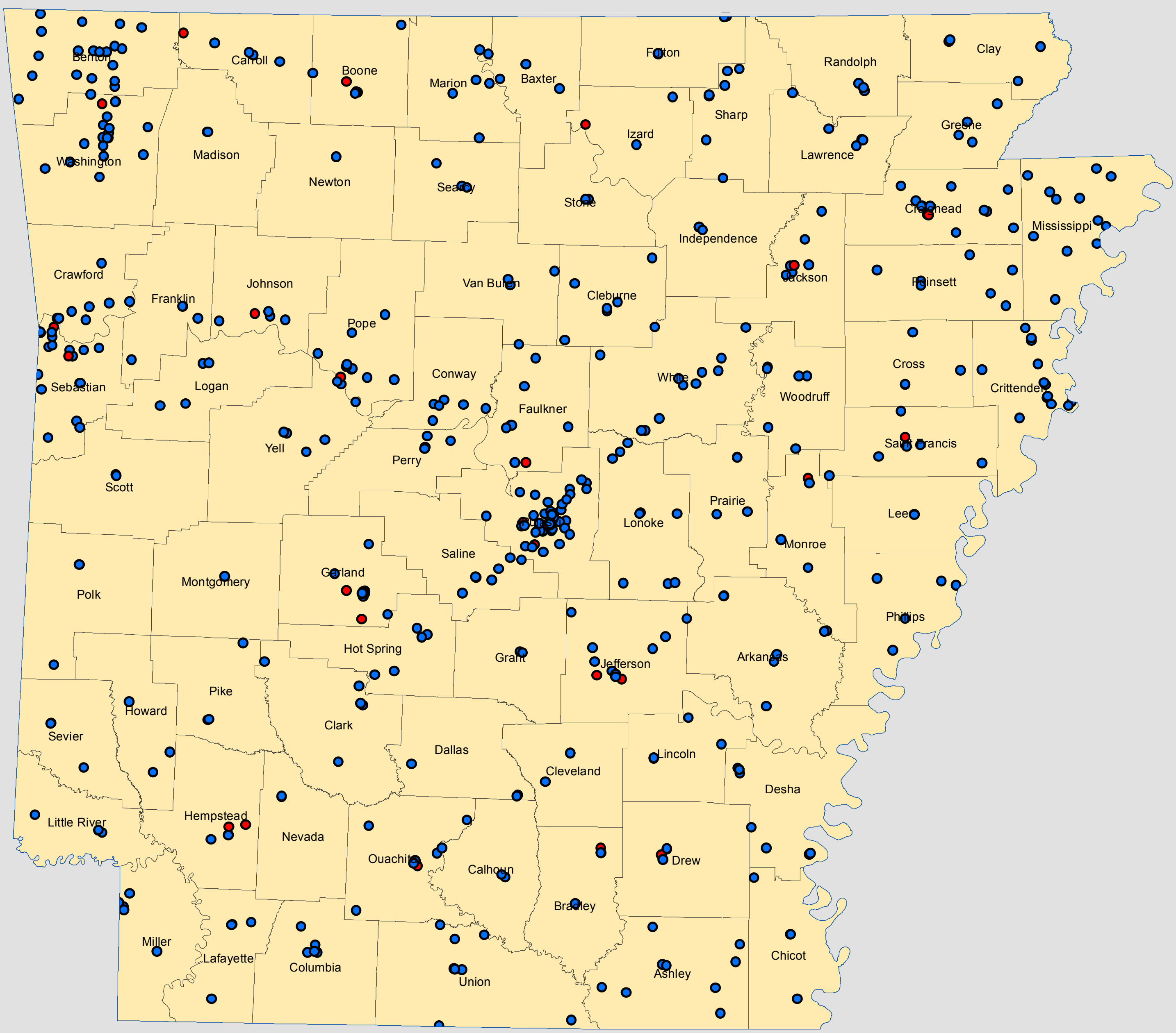
N

0 12.5 25 50 Miles

Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

Figure B3 - Law Enforcement



STATE OWNED ASSET

HIGHWAY PATROL, IMMIGRATION SERVICES, MARSHALL'S OFFICE, ATF, DEA, FBI, PARK, MILITARY & LOCAL POLICE DEPARTMENTS

Data Source:
Arkansas Geographic Information Office

Release Date:
04/15/2013

N

0 12.5 25 50 Miles

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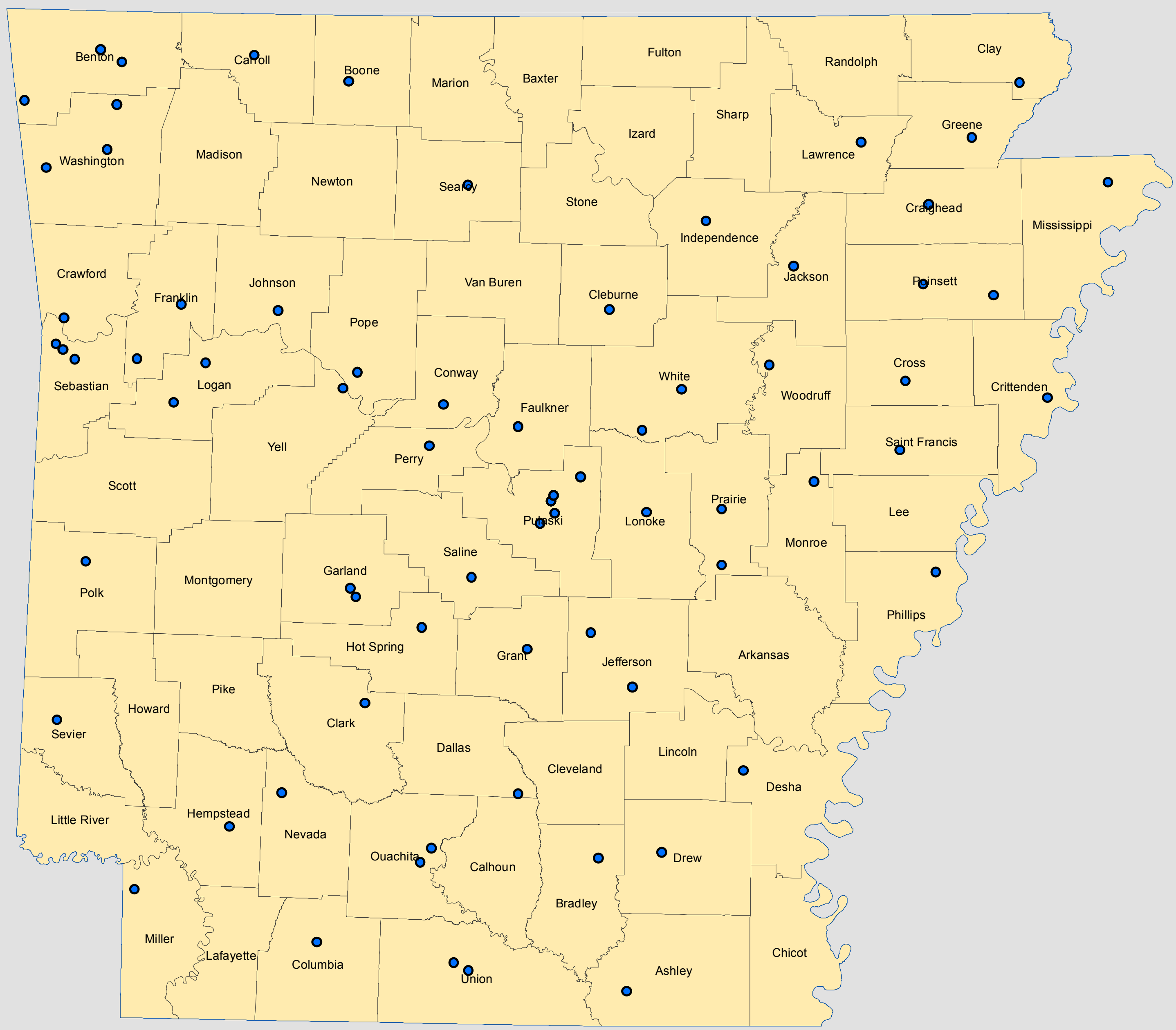
Figure B4 - National Guard Armories



STATE OWNED ASSETS

MARINE, ARMY & NAVY RESERVE,
AIR & ARMY NATIONAL GUARD

Data Source:
Arkansas Geographic
Information Office

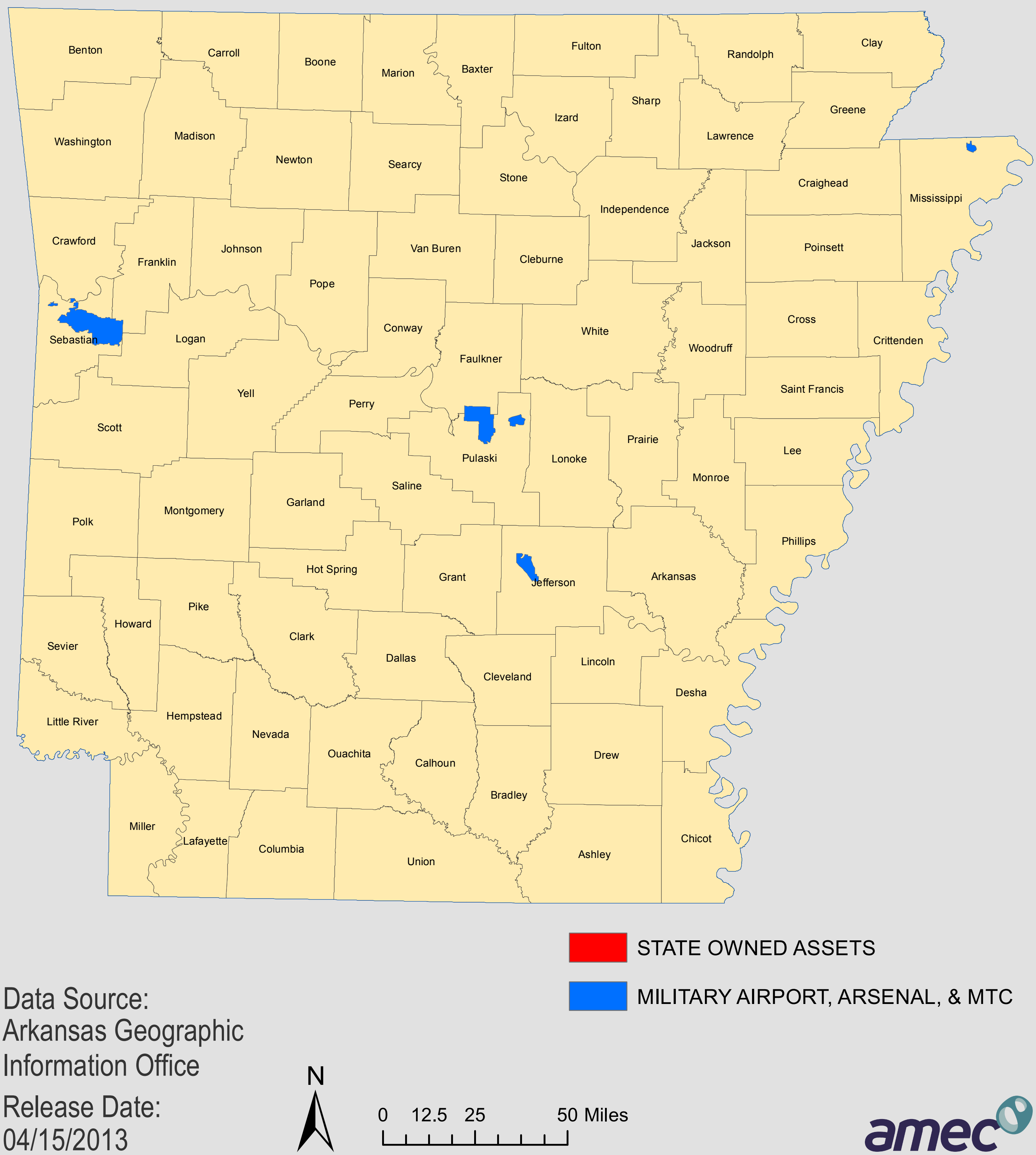
Release Date:
04/15/2013

N

0 12.5 25 50 Miles

amec

Figure B5 - Military Installations



STATE OWNED ASSETS

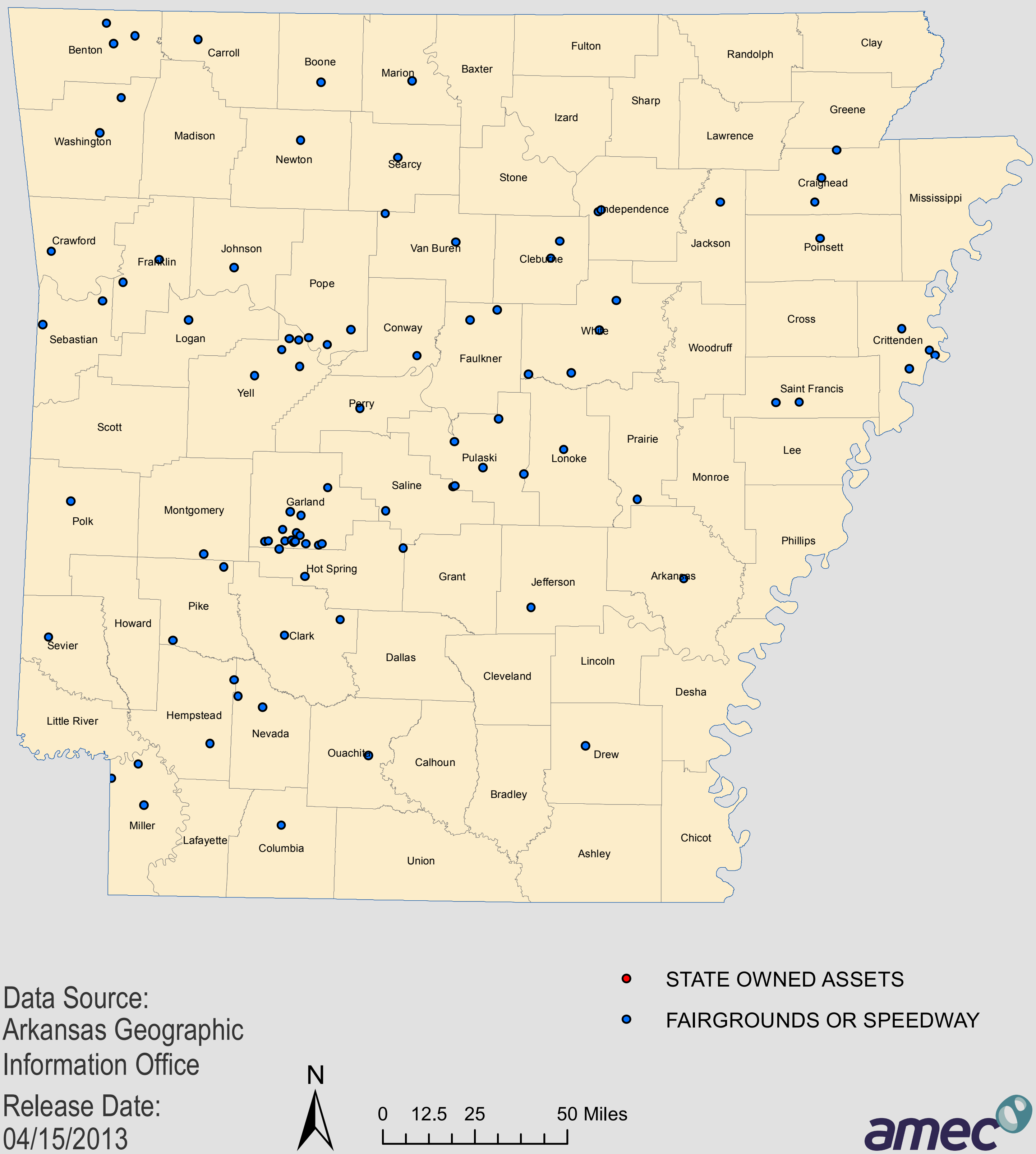
MILITARY AIRPORT, ARSENAL, & MTC

Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure 6B - Fairgrounds and Speedways

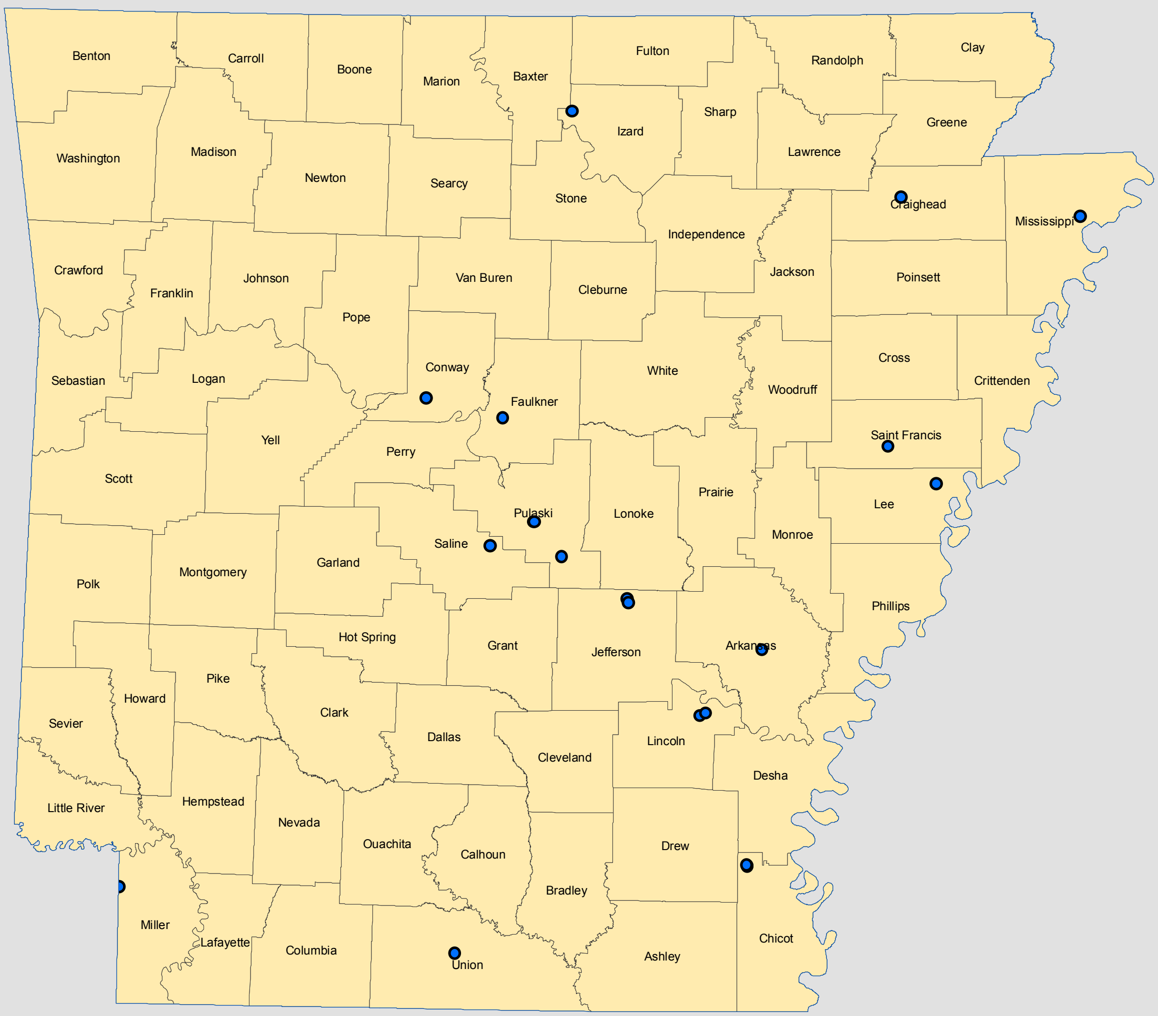


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure B7 - County or State Correctional Institutions



STATE OWNED ASSETS

CORRECTIONAL INSTITUTIONS

Data Source:
Arkansas Geographic
Information Office

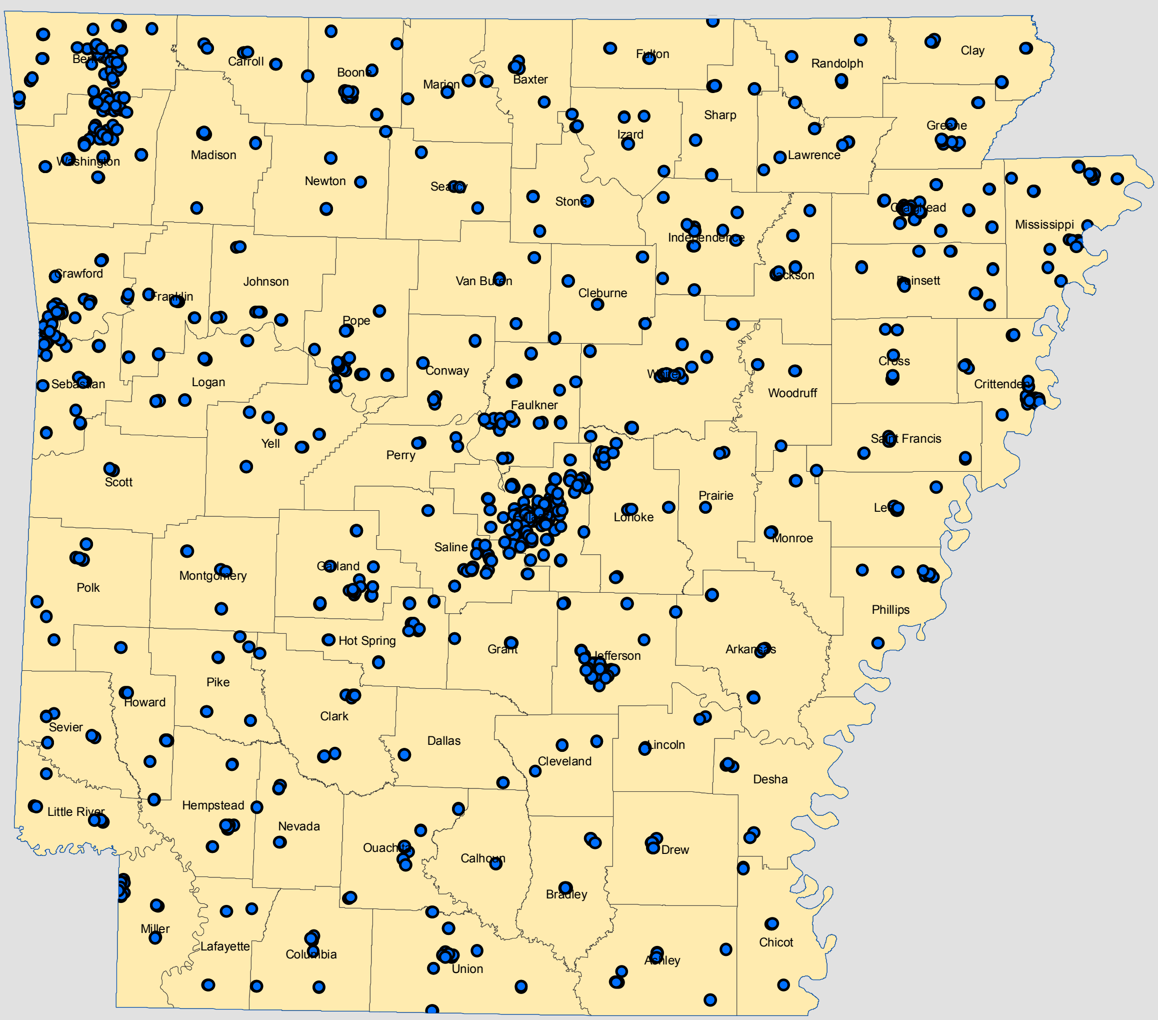
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

Figure 8B - Public Schools



STATE OWNED ASSETS

PUBLIC SCHOOLS

Data Source:
Arkansas Geographic
Information Office

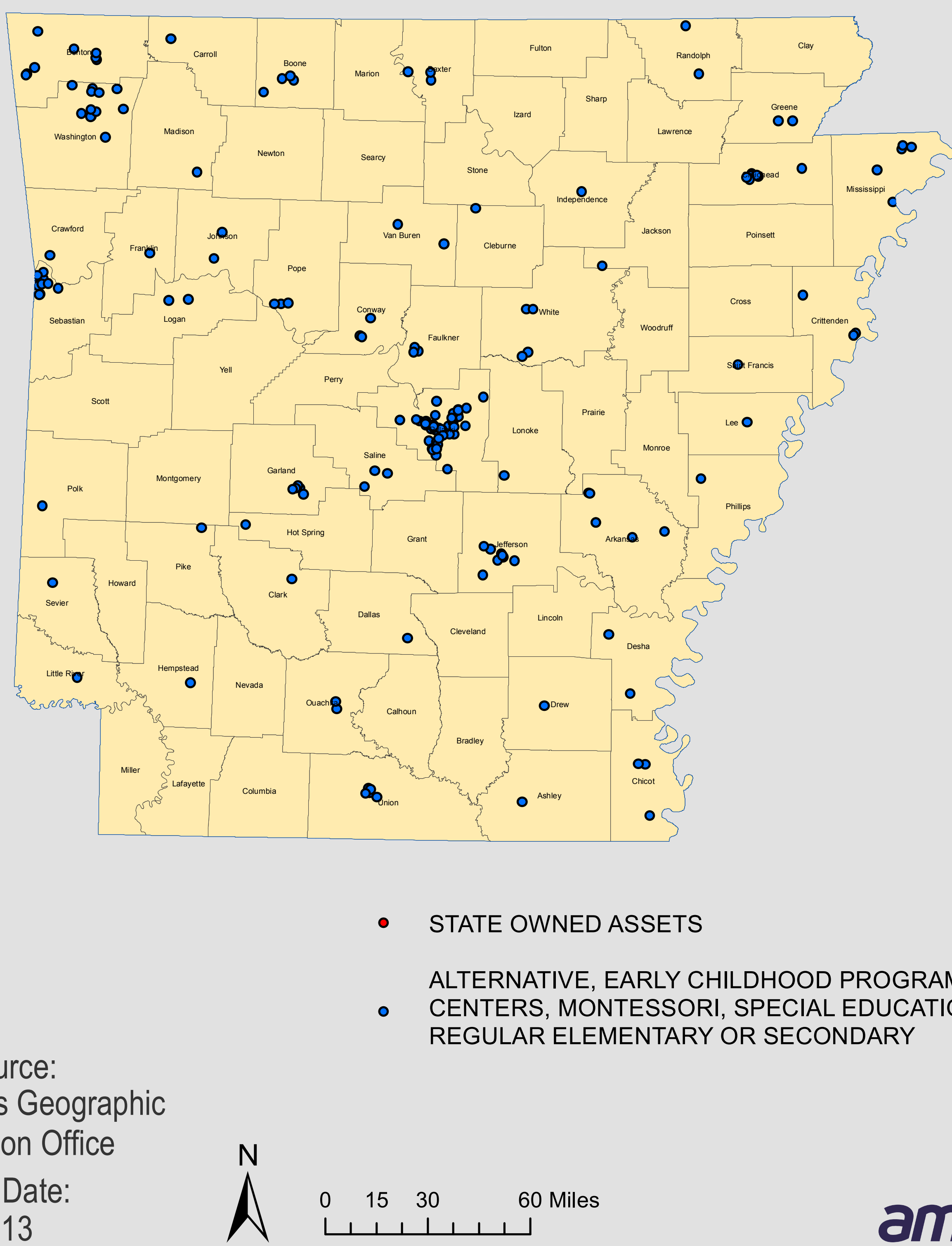
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

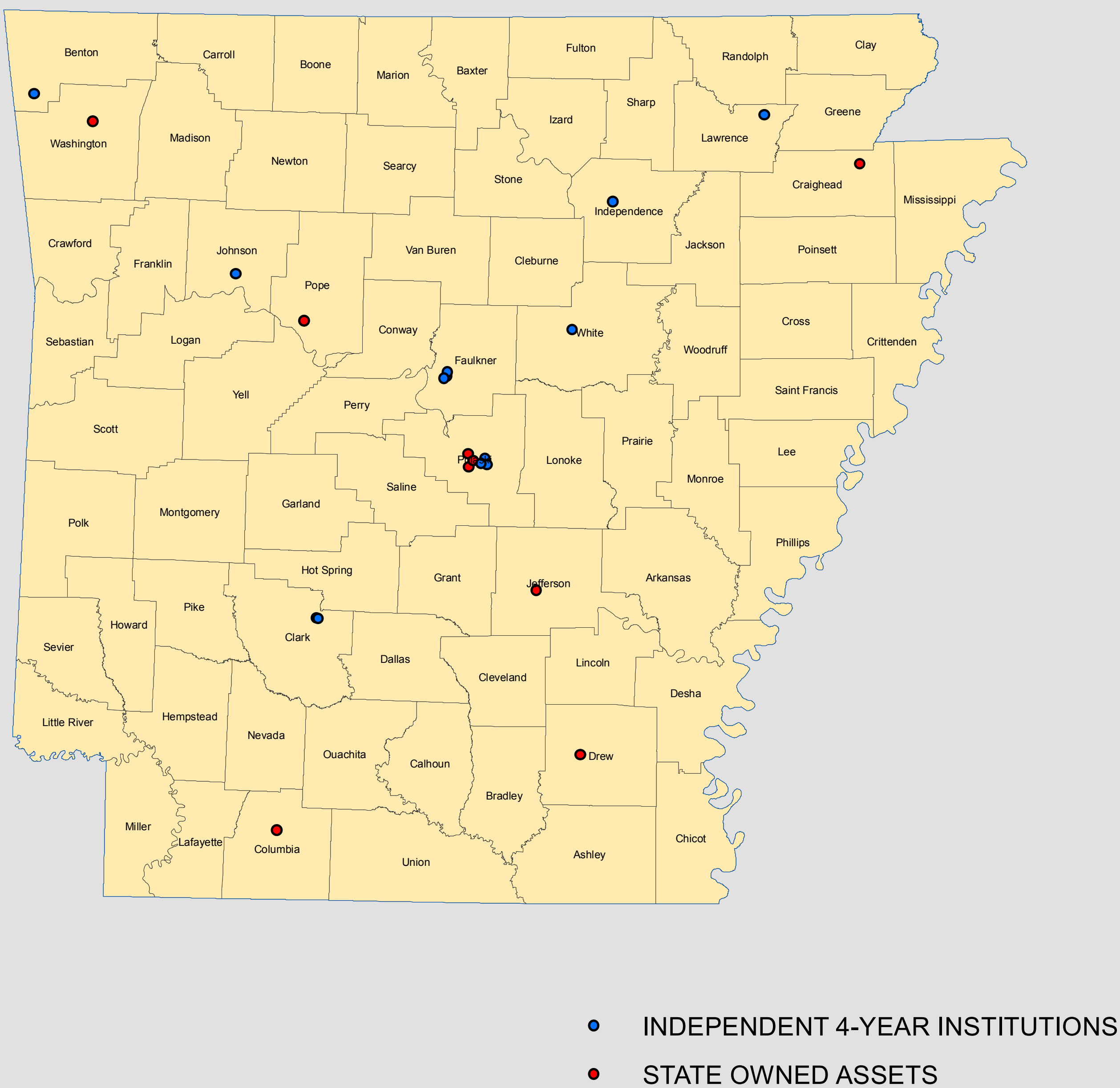
Figure 8B - Private Schools



Data Source:
Arkansas Geographic Information Office

Release Date:
04/15/2013

Figure B10 - Colleges & Universities



Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

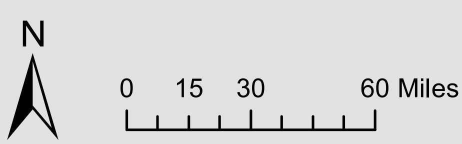
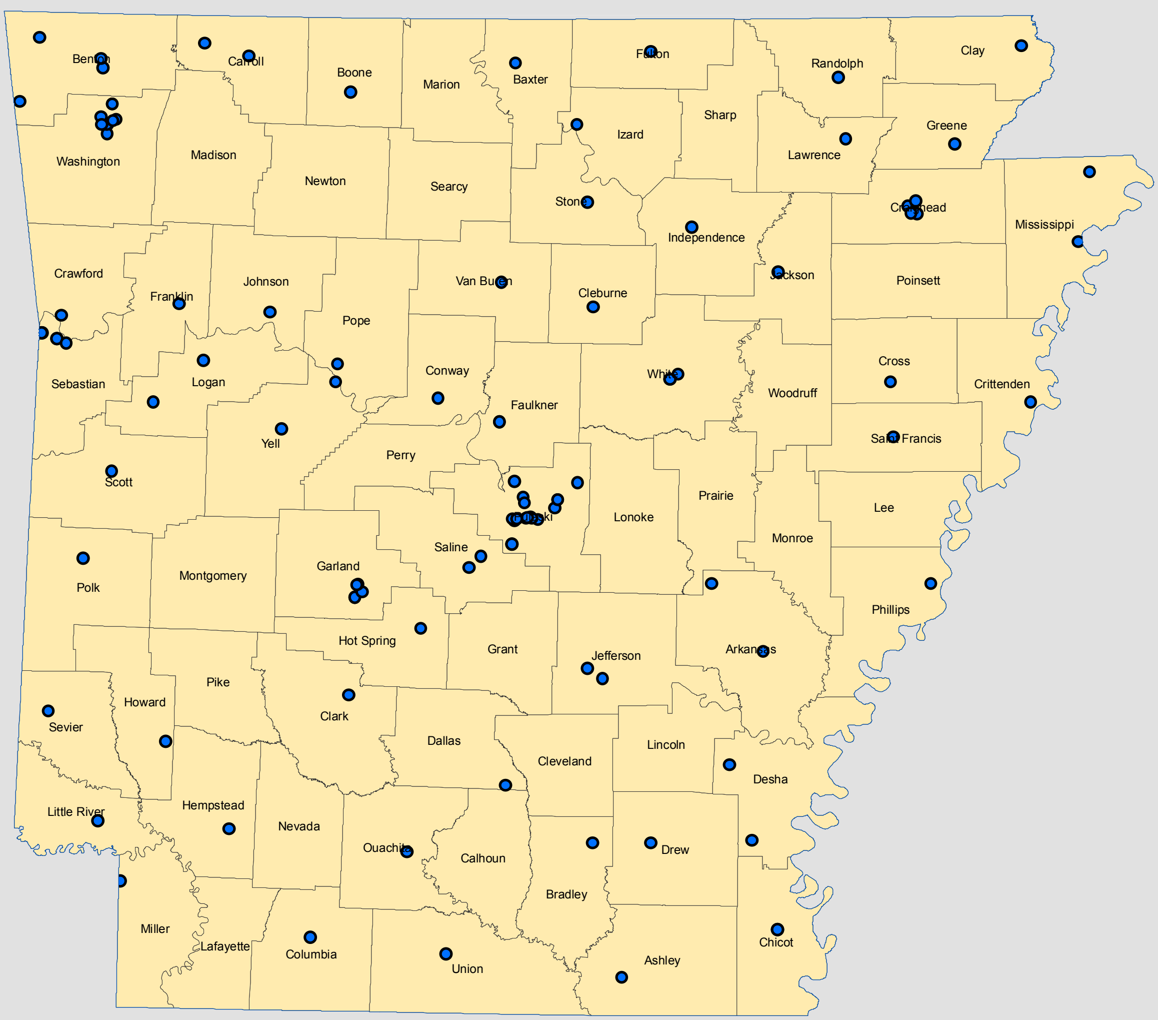


Figure B11 - Hospitals



STATE OWNED ASSETS

GENERAL, SURGERY & GENERAL MEDICAL CARE, CAH, LTAC, PSYCHIATRIC & REHABILITATION

Data Source:
Arkansas Geographic Information Office

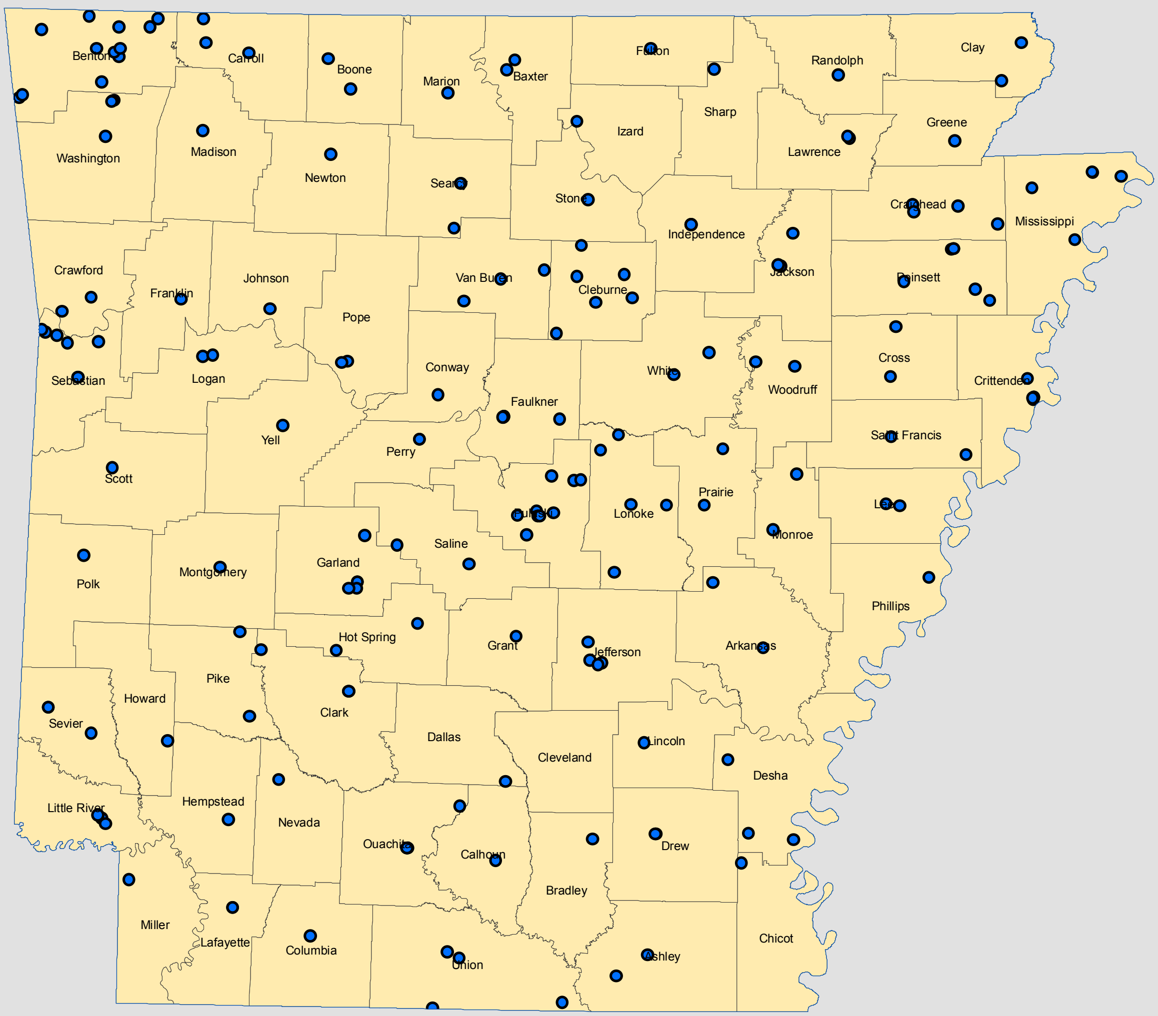
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

Figure B12 - Emergency Medical Services (EMS) & Ambulance Services



STATE OWNED ASSETS

EMS, AMBULANCE & AIR EVAC

Data Source:
Arkansas Geographic
Information Office

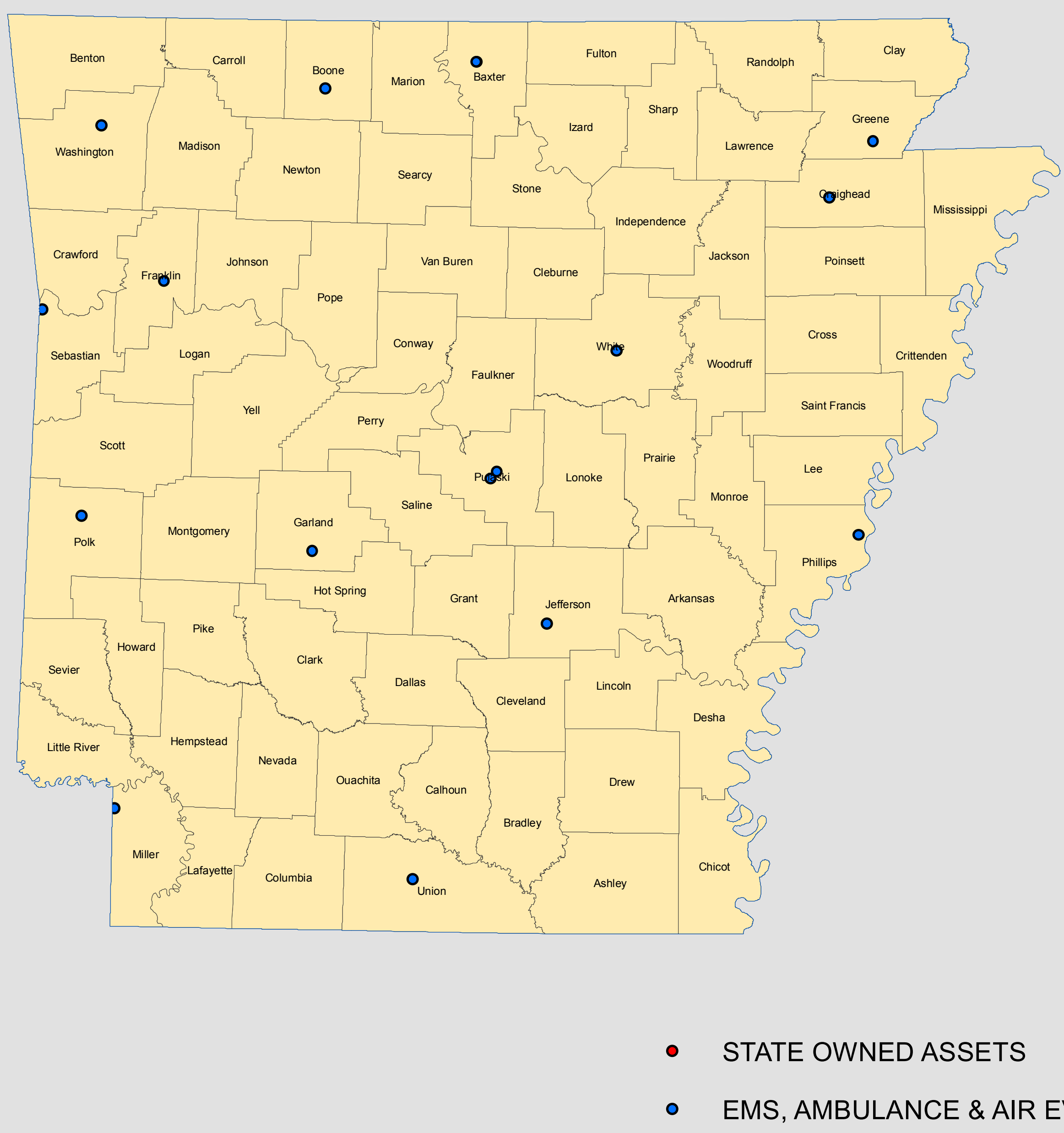
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

Figure B13 - Veteran's Affairs Hospitals and Medical Facilities

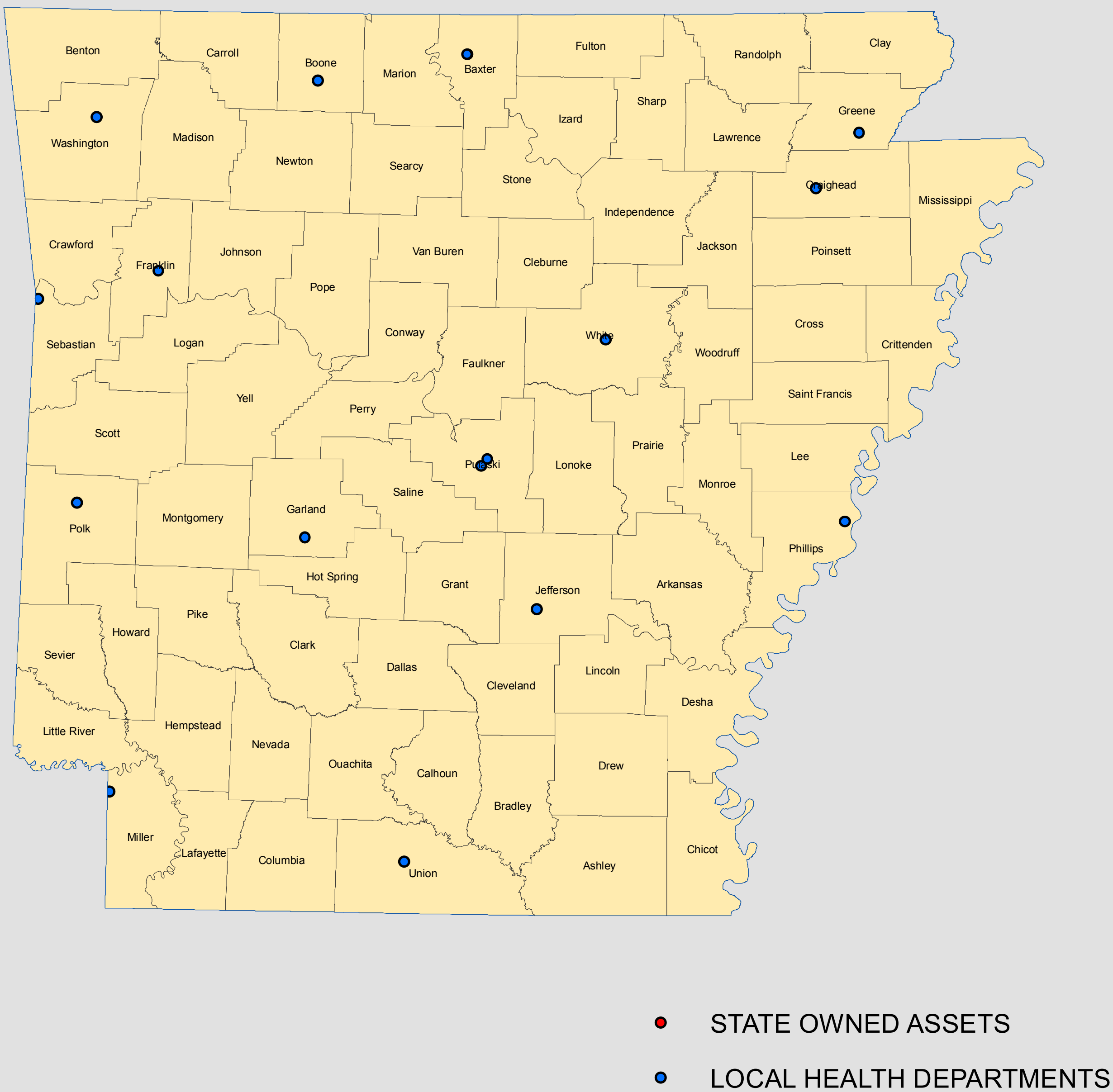


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure B14 - Local Health Department Units



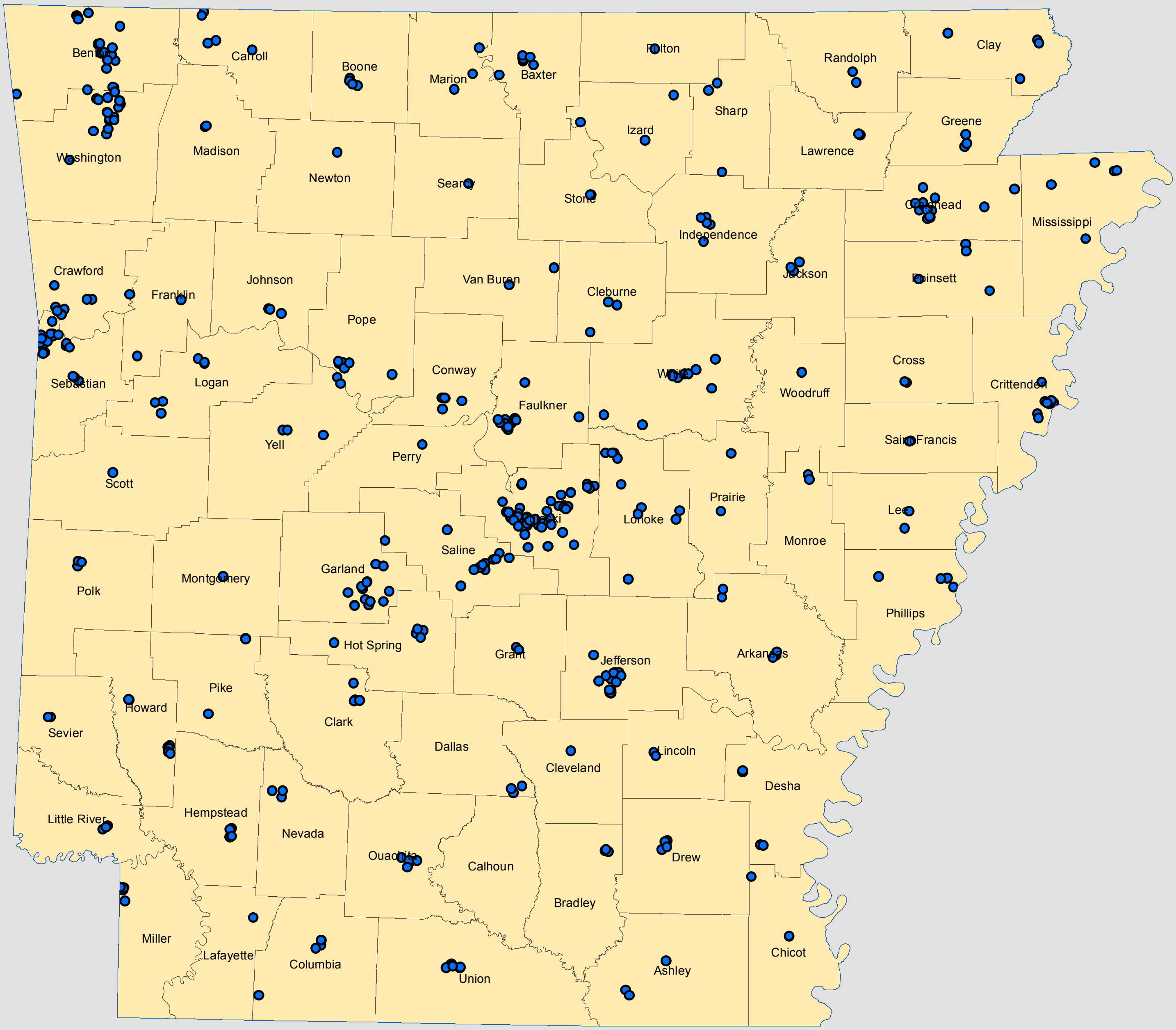
Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

N

0 15 30 60 Miles

Figure B15 - Long Term Care Facilities



STATE OWNED ASSETS

ADULT DAY CARE, ASSISTED LIVING FACILITY #1, ASSISTED LIVING FACILITY #2, ICFMR, NURSING HOME, POST ACUTE HEAD INJURY, & RESIDENTIAL CARE FACILITY

Data Source:
Arkansas Geographic
Information Office

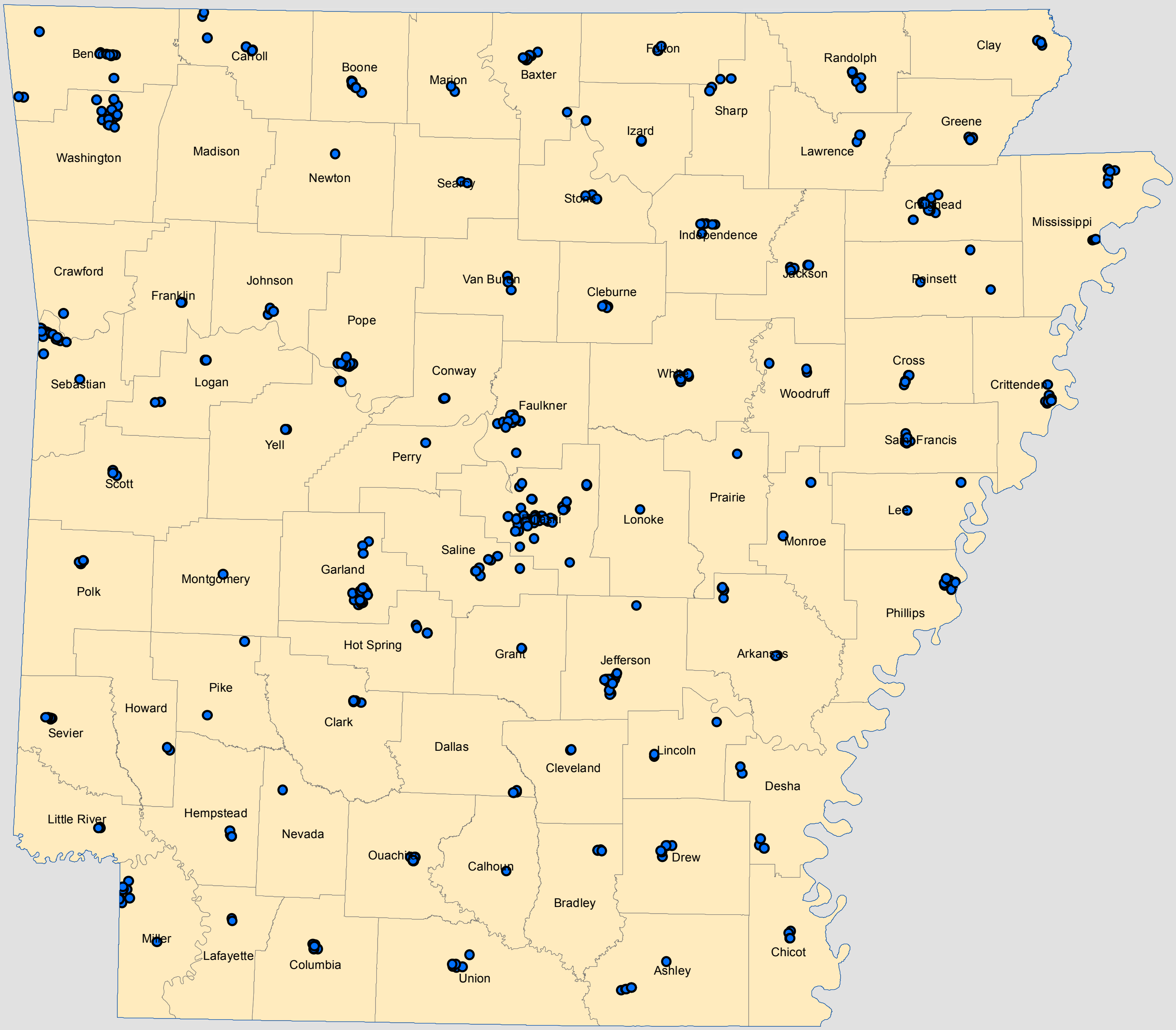
Release Date:
04/15/2013

N

0 12.5 25 50 Miles

amec

Figure B16 - County Health Units, Hospices and Related Medical Facilities



STATE OWNED ASSETS

ABORTION CLINIC, ALCOHOL/DRUG ABUSE CLINIC, COMPREHENSIVE REHABILITATION FACILITY, END-STAGE RENAL DIALYSIS FACILITY, HEALTH MAINTENANCEORGANIZATION (HMO), HOME HEALTH AGENCY, HOSPICE, INFIRMARIES, OUTPATIENT PHYSICAL/SPEECH/OCCUPATIONAL THERAPY FACILITIES, OUTPATIENT PSYCHIATRIC CENTERS, OUTPATIENT SURGERY CENTERS/ AMBULATORY SURGERY CENTERS, PORTABLE X-RAY PROVIDERS, PRIVATE CARE AGENCIES, PSYCHIATRIC HOSPITALS & PSYCHIATRIC UNITS, RECUPERATION CENTERS, REHABILITATION HOSPITALS & REHABILITATION UNITS & SWING-BEDS

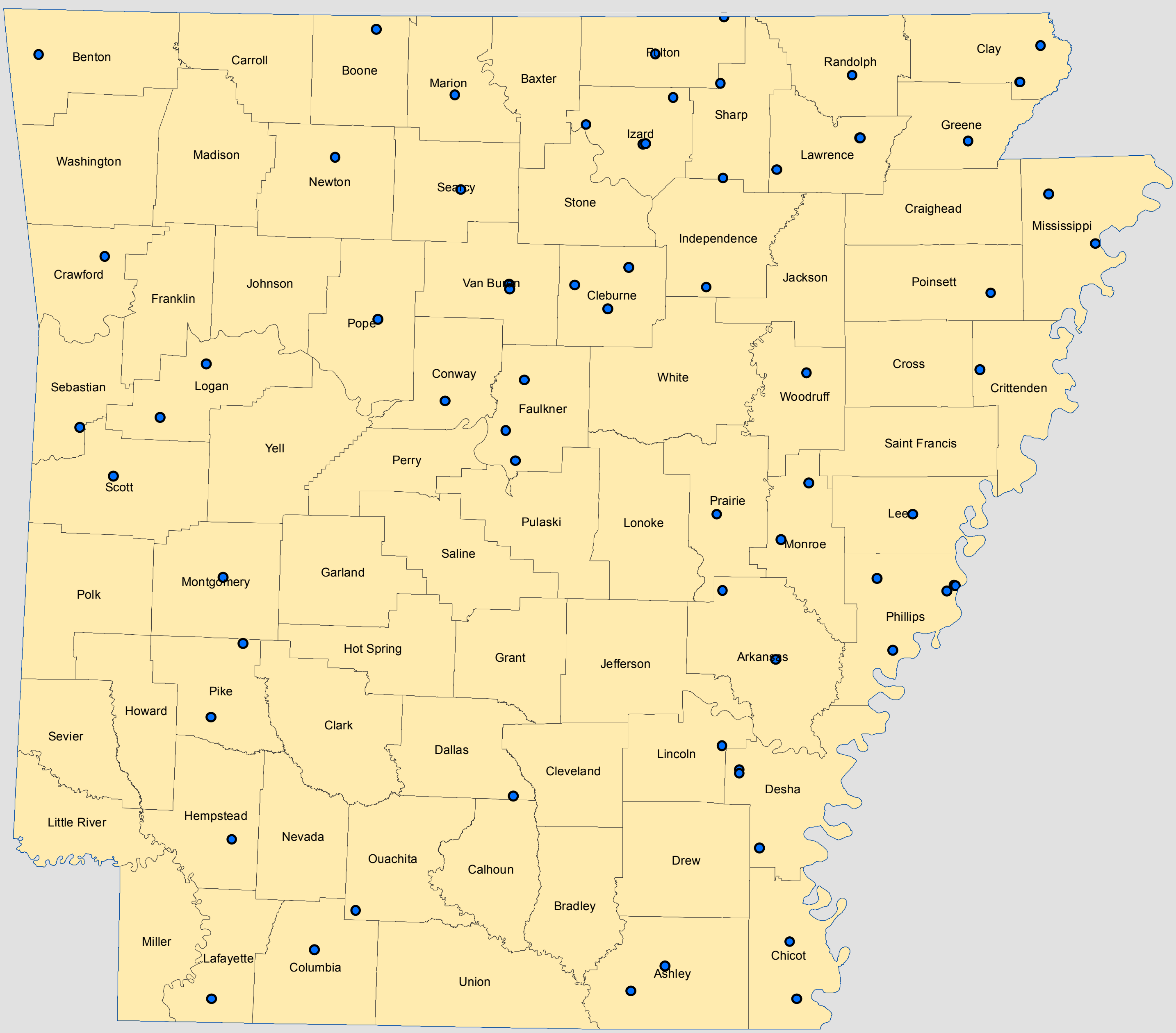
Data Source:
Arkansas Geographic Information Office

Release Date:
04/15/2013

N

0 12.5 25 50 Miles

Figure B17 - Rural Health Clinics



STATE OWNED ASSETS

RURAL HEALTH CLINICS

Data Source:
Arkansas Geographic
Information Office

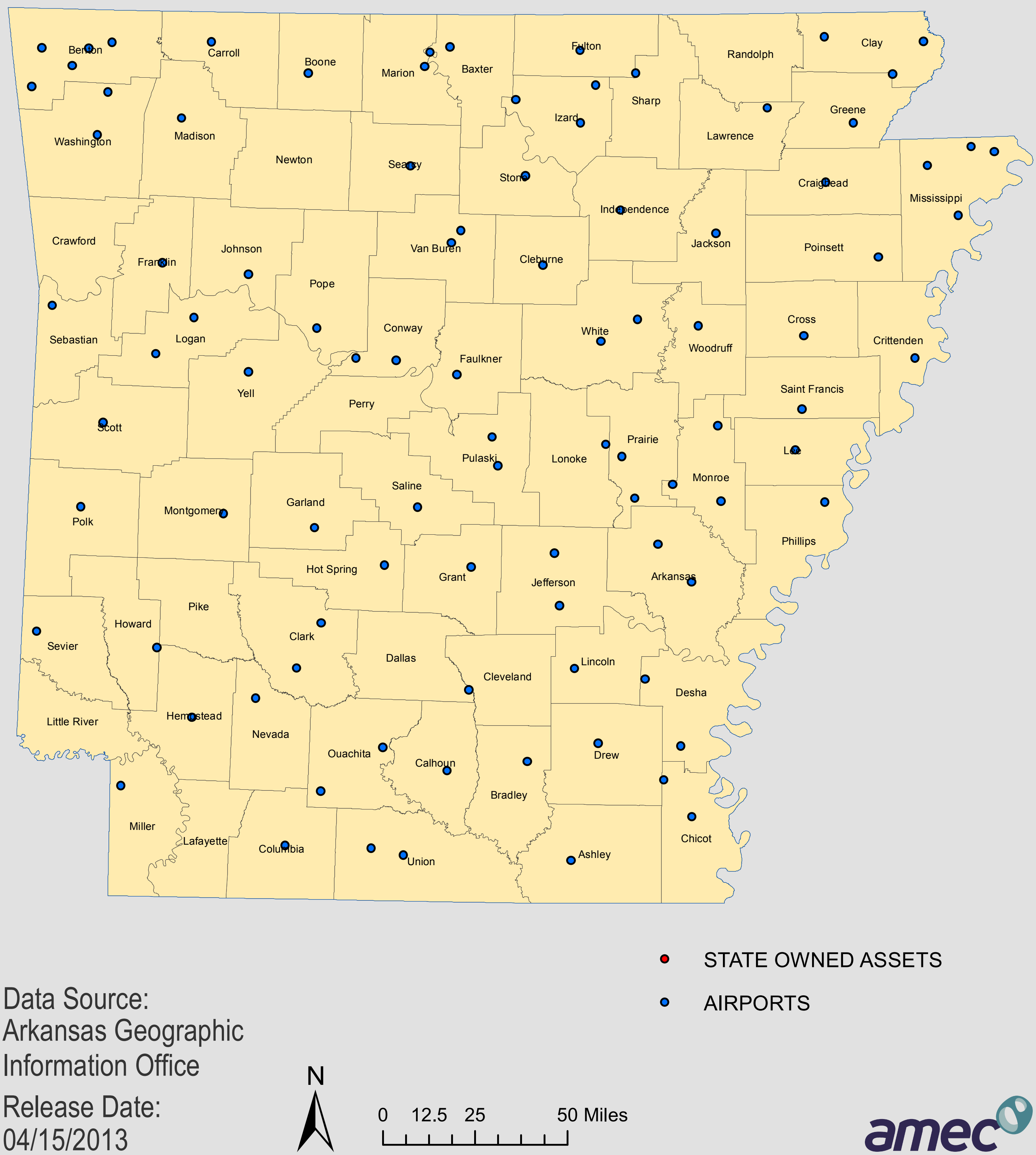
Release Date:
04/15/2013

N

0 12.5 25 50 Miles

amec

Figure B18 - Airports

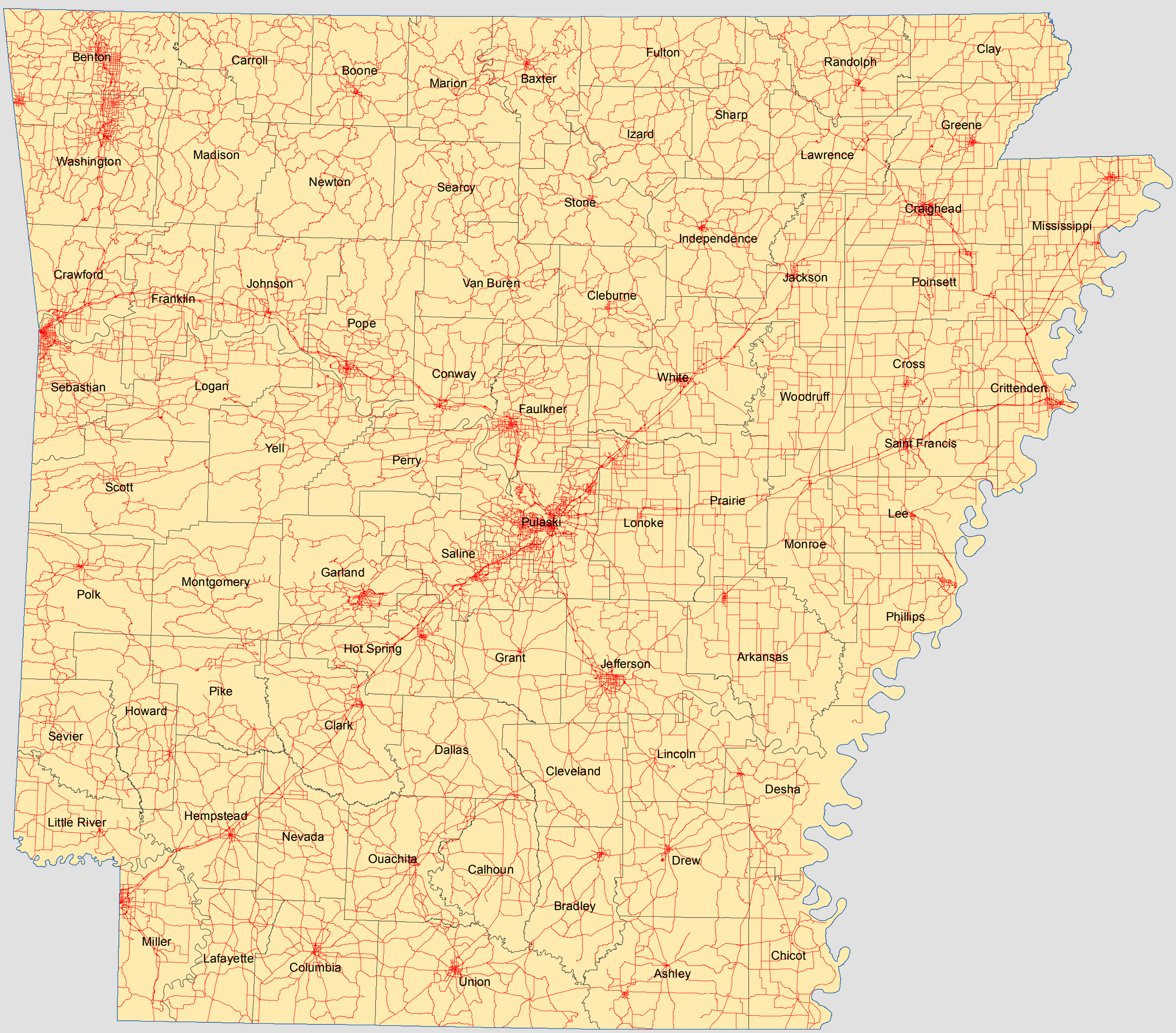


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure B19 - Interstates & Highways



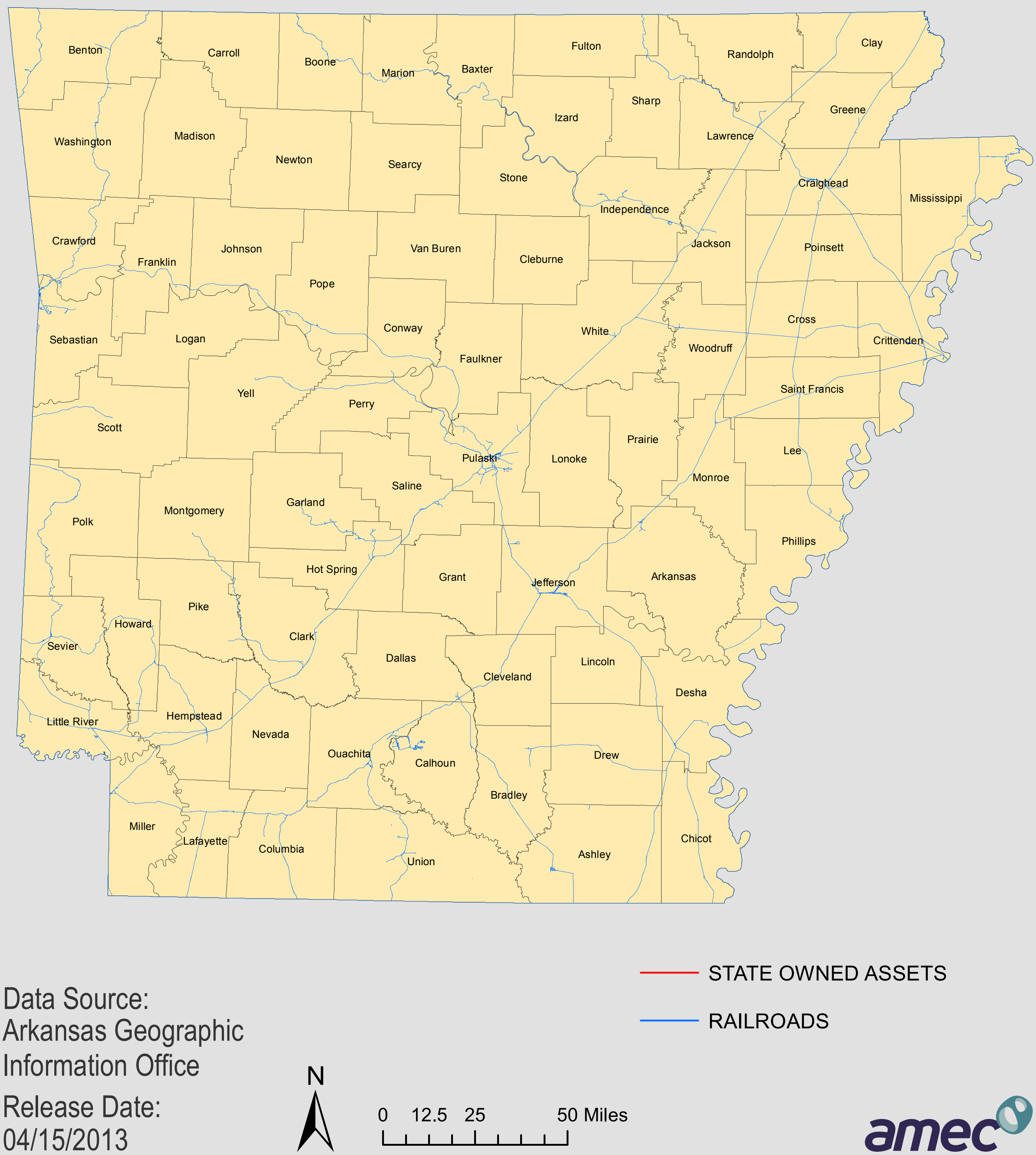
Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

N

0 12.5 25 50 Miles

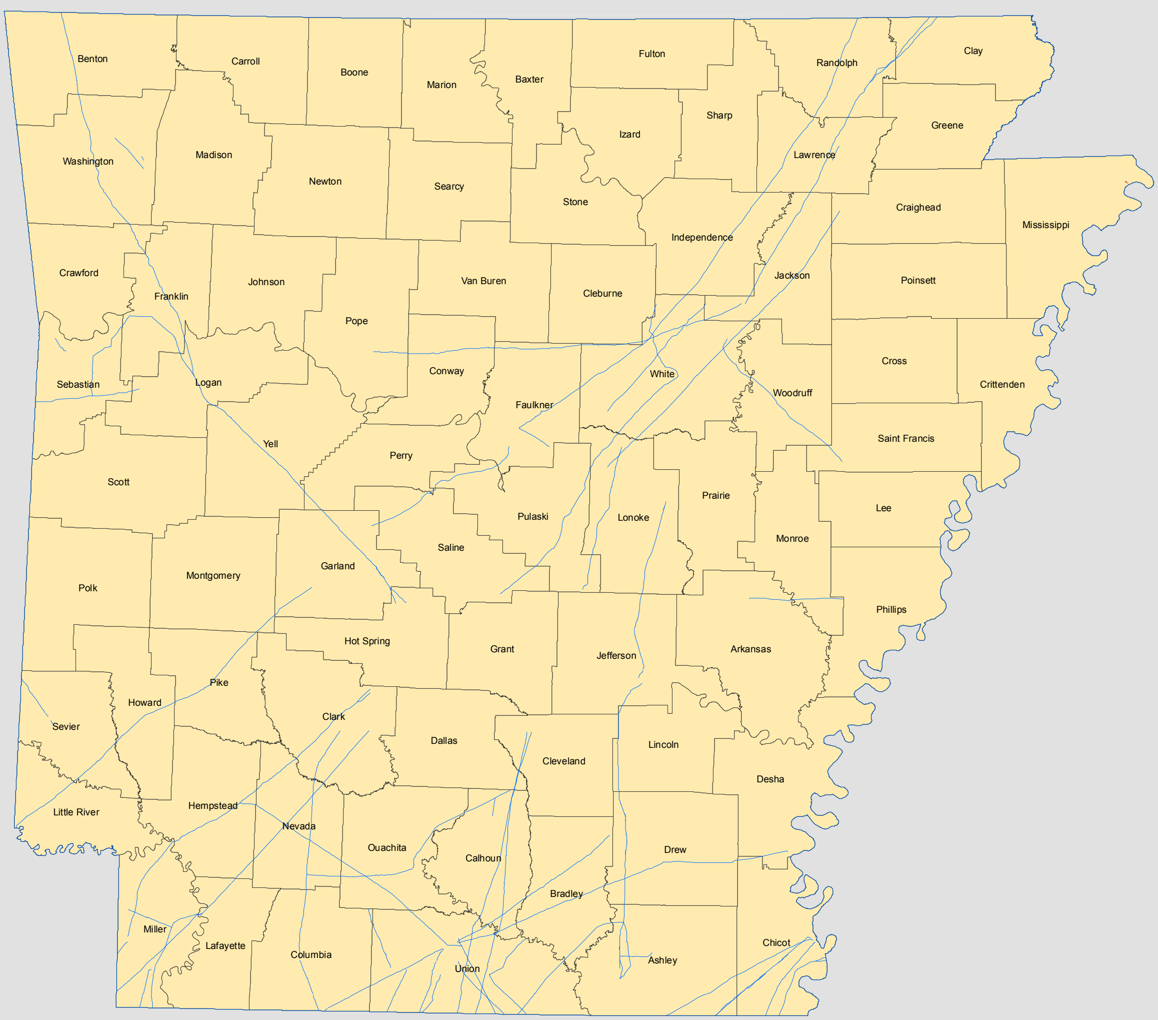
Figure B21 - Railroads



Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

Figure 23B - Utility Pipelines

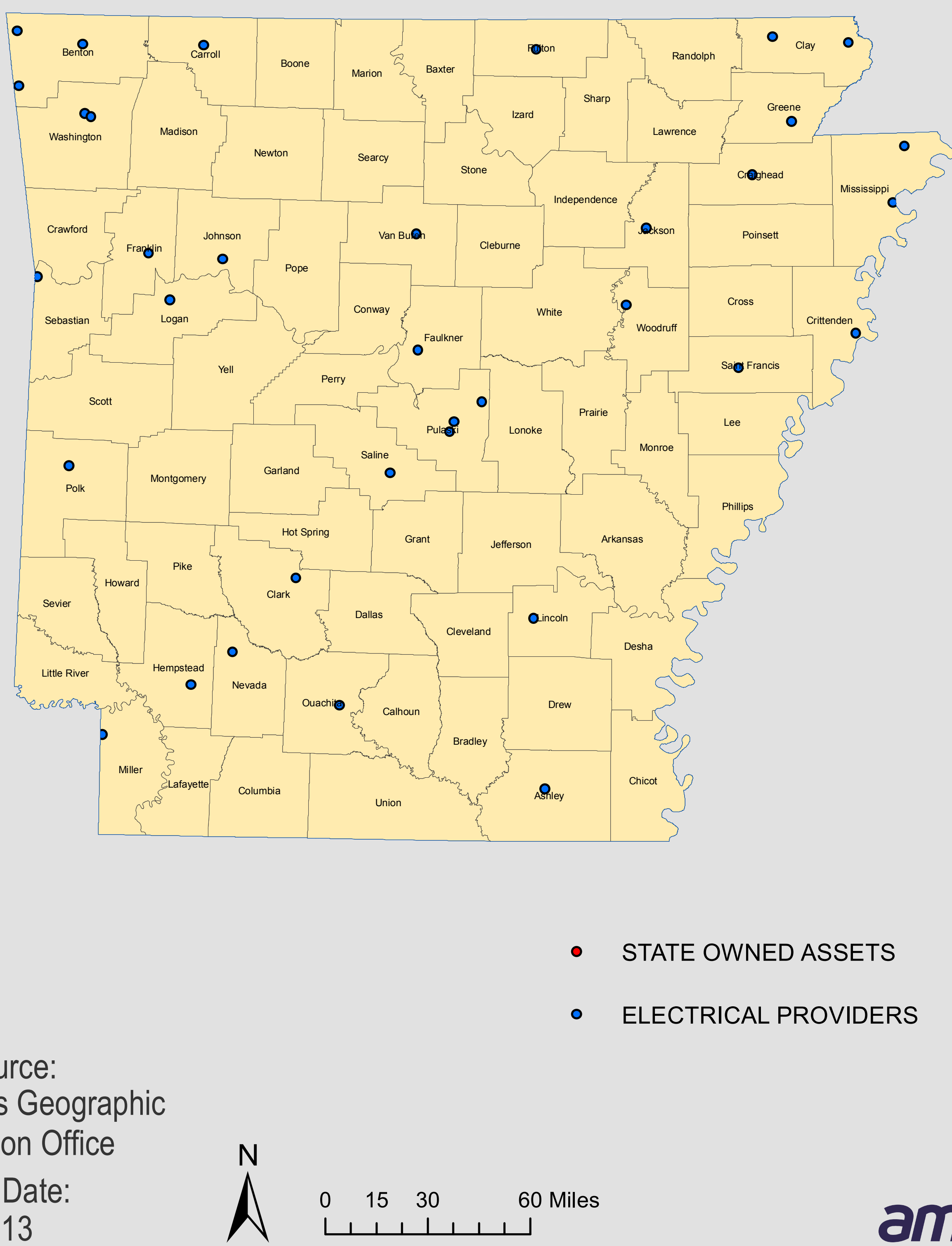


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

0 15 30 60 Miles

Figure B24 - Electrical Providers

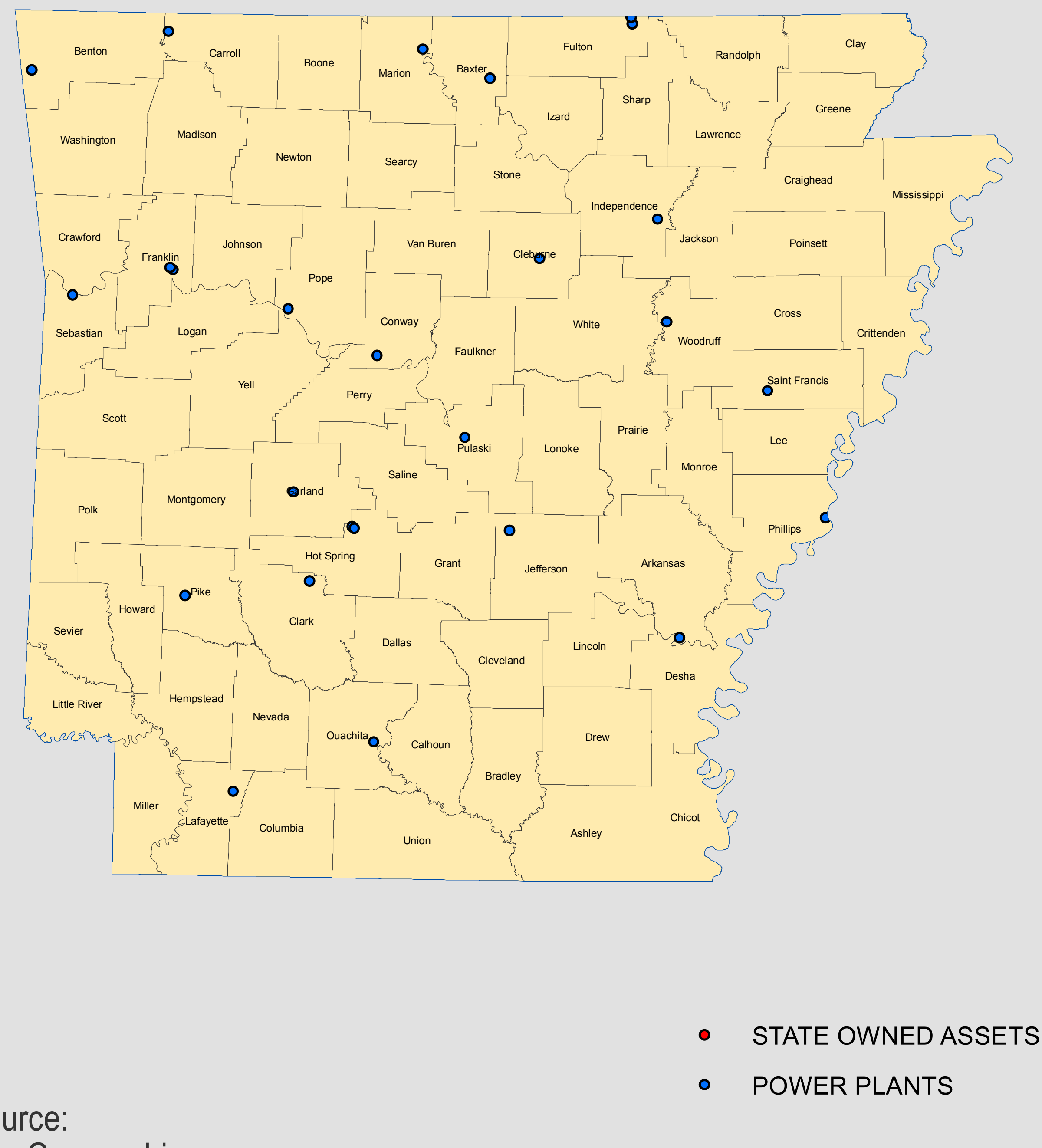


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure B25 - Power Plants

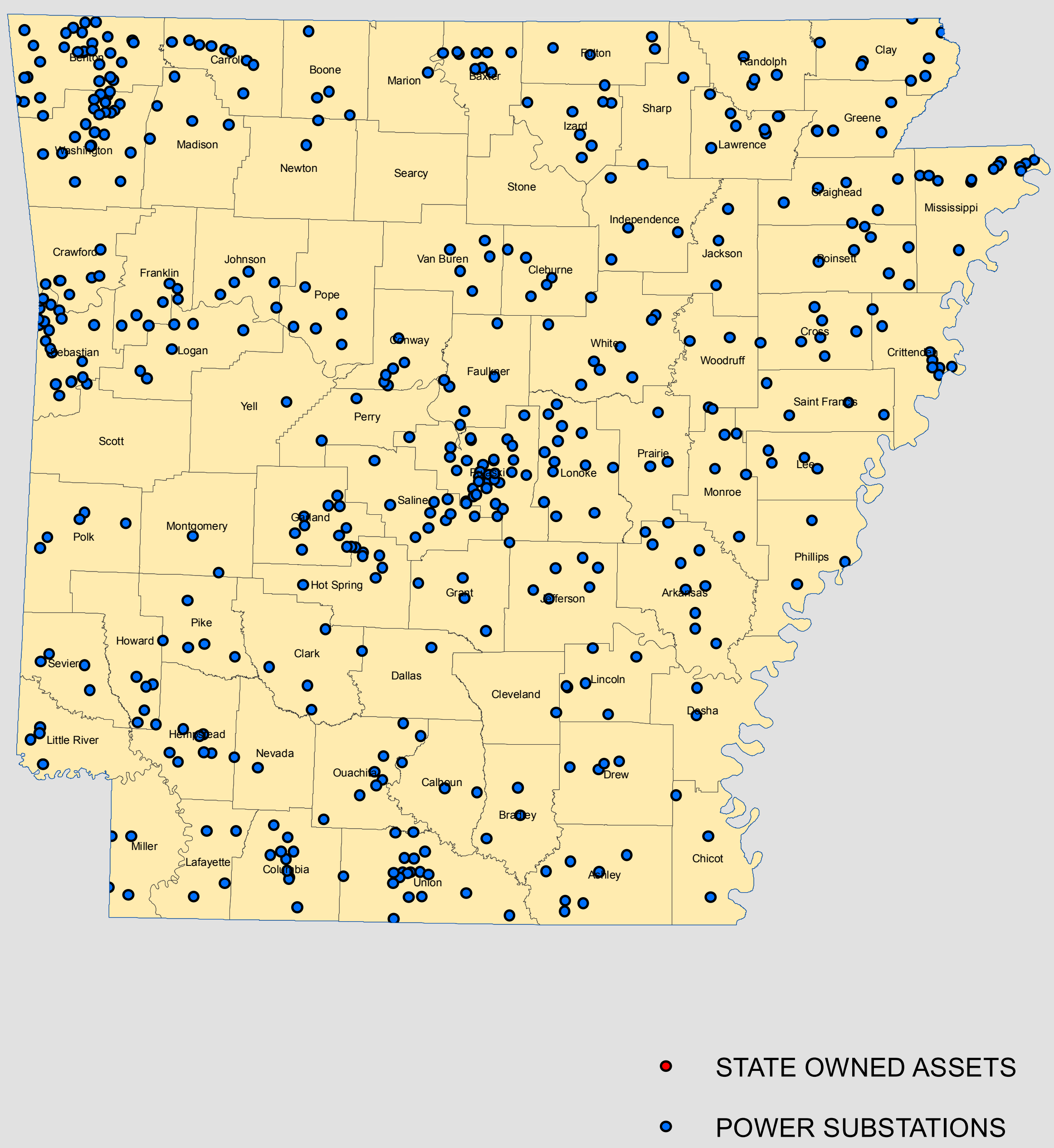


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

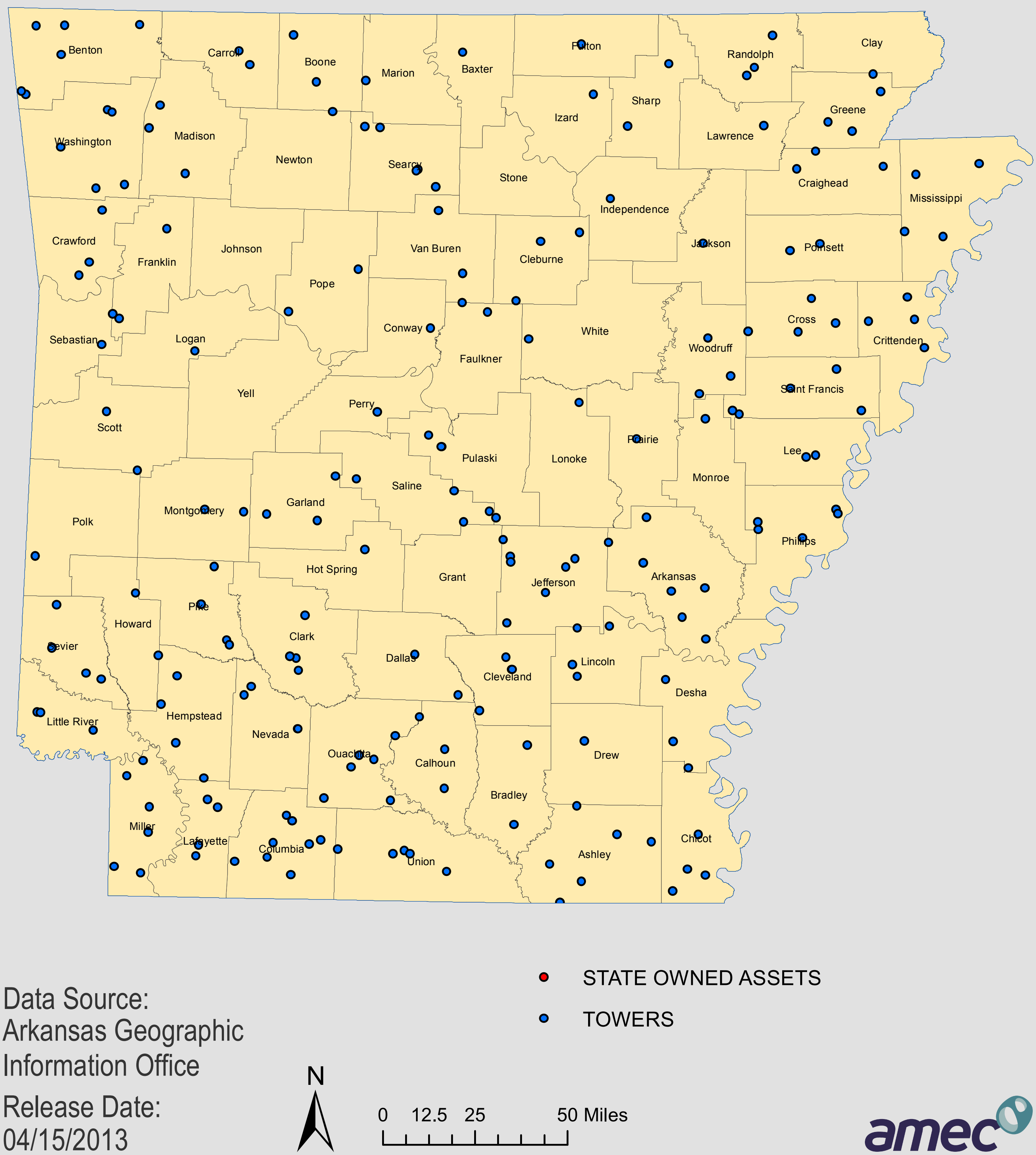
Figure B26 - Power Substations



Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

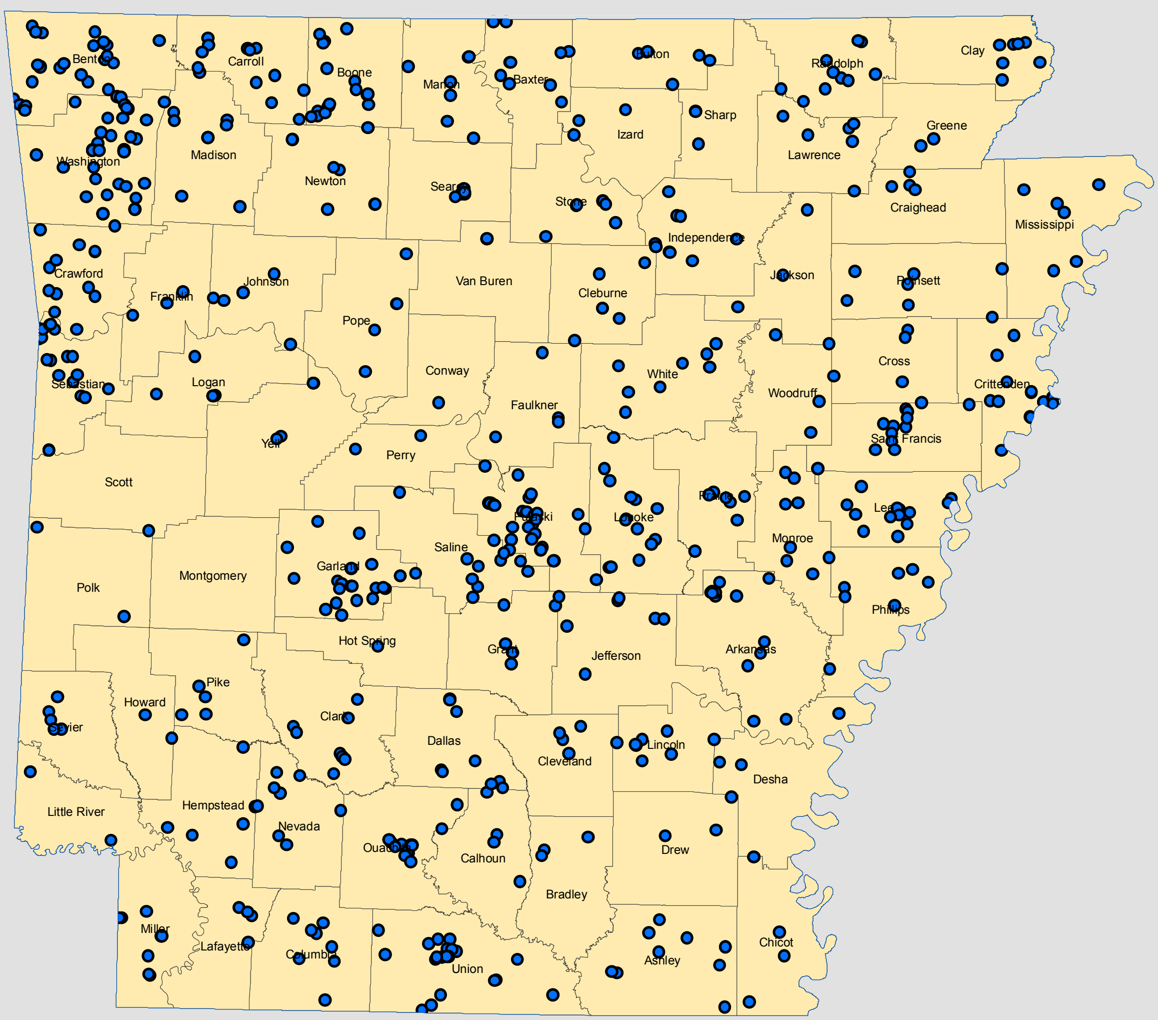
Figure B27 - AWIN Communications Tower Locations



Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

Figure B28 - TV & Radio Stations



STATE OWNED ASSETS

TELEVISION OR RADIO STATIONS

Data Source:
Arkansas Geographic
Information Office

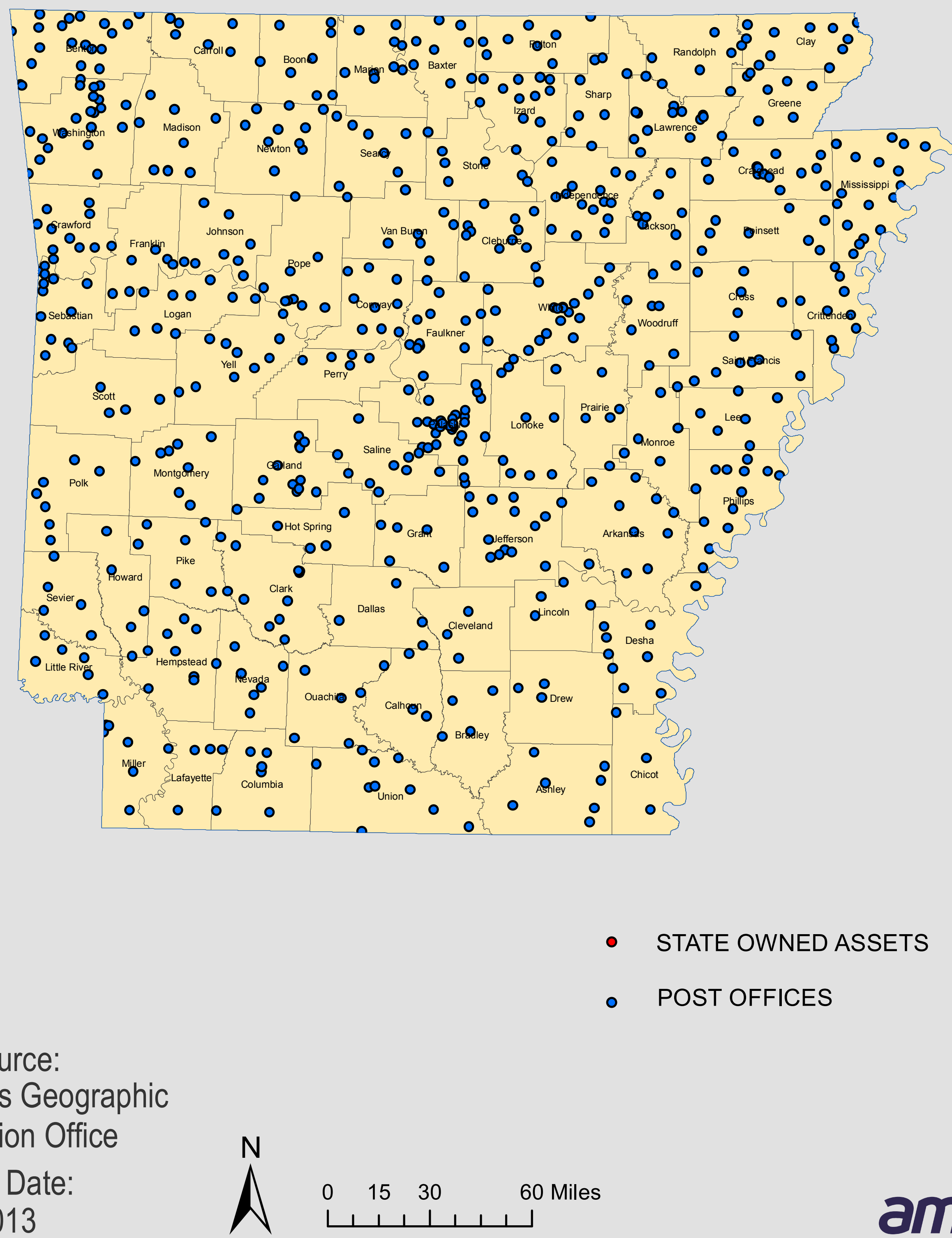
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

Figure B29 - Post Offices

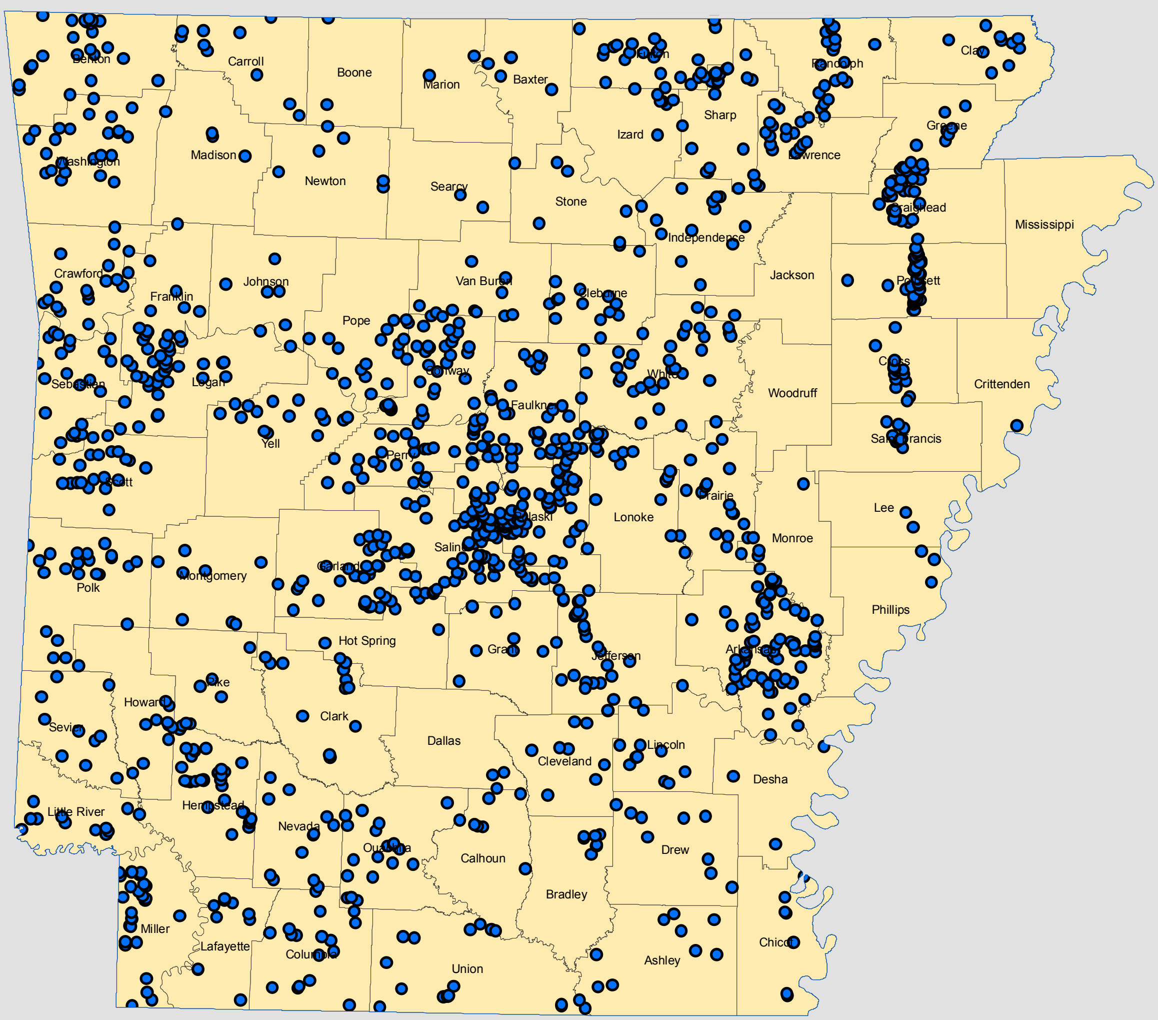


Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure B30 - Dams



STATE OWNED ASSETS

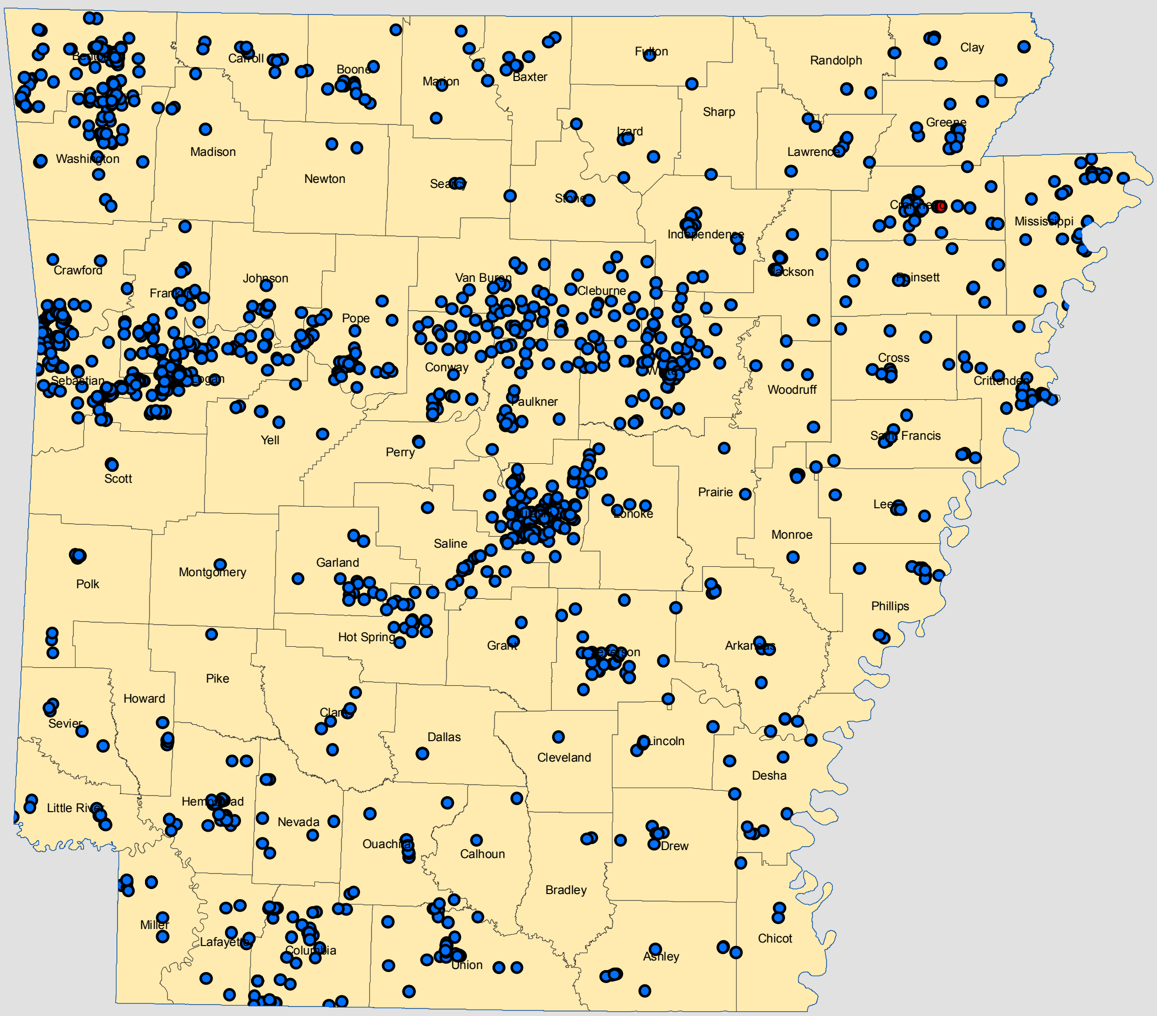
DAMS

Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

amec

Figure B31 - Environmental Facilities



STATE OWNED ASSETS

ENVIRONMENTAL FACILITIES

Data Source:
Arkansas Geographic
Information Office

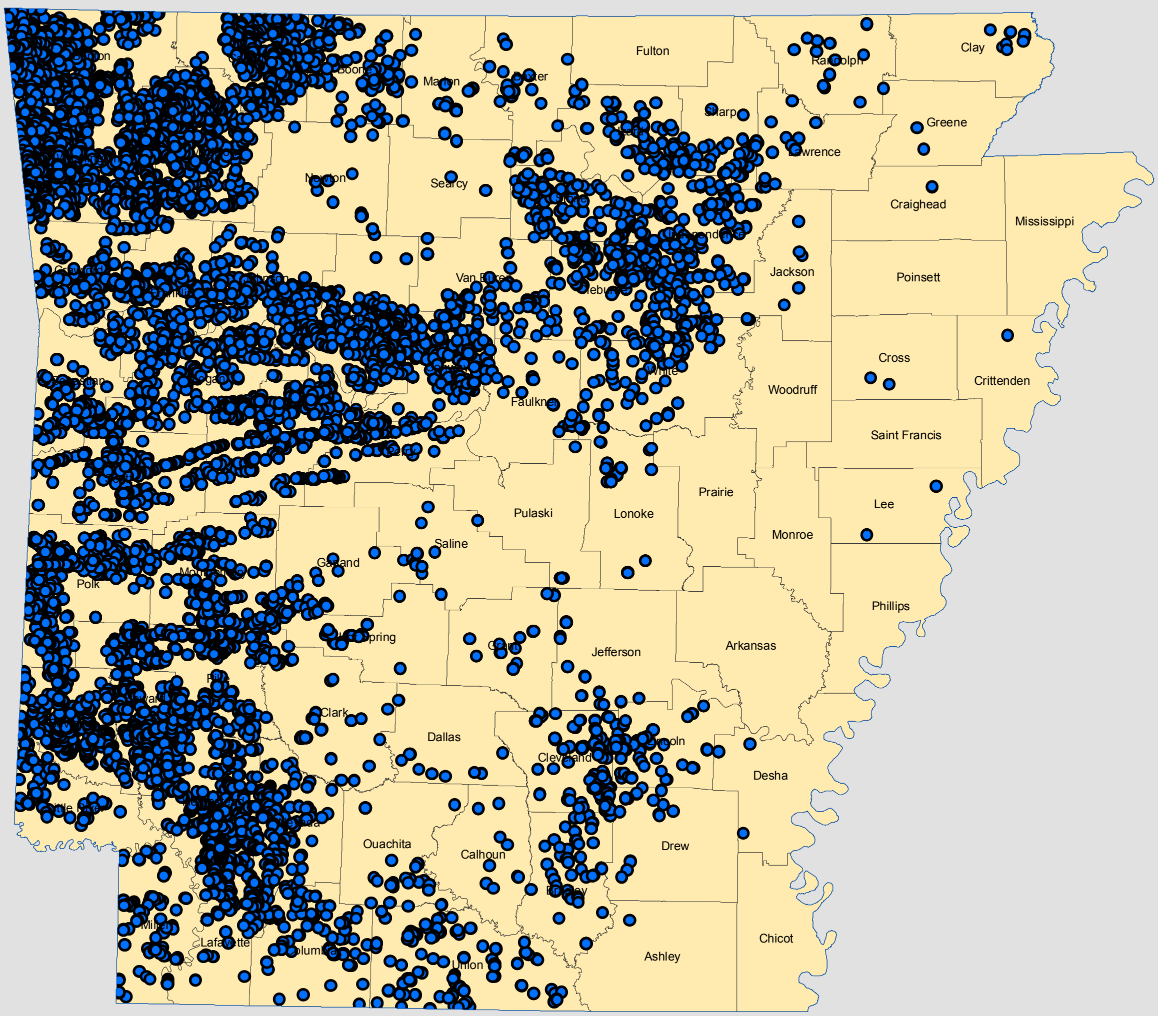
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

Figure B32 - Chicken Houses & Related Industries



STATE OWNED ASSETS

CHICKEN HOUSES

Data Source:
Arkansas Geographic
Information Office

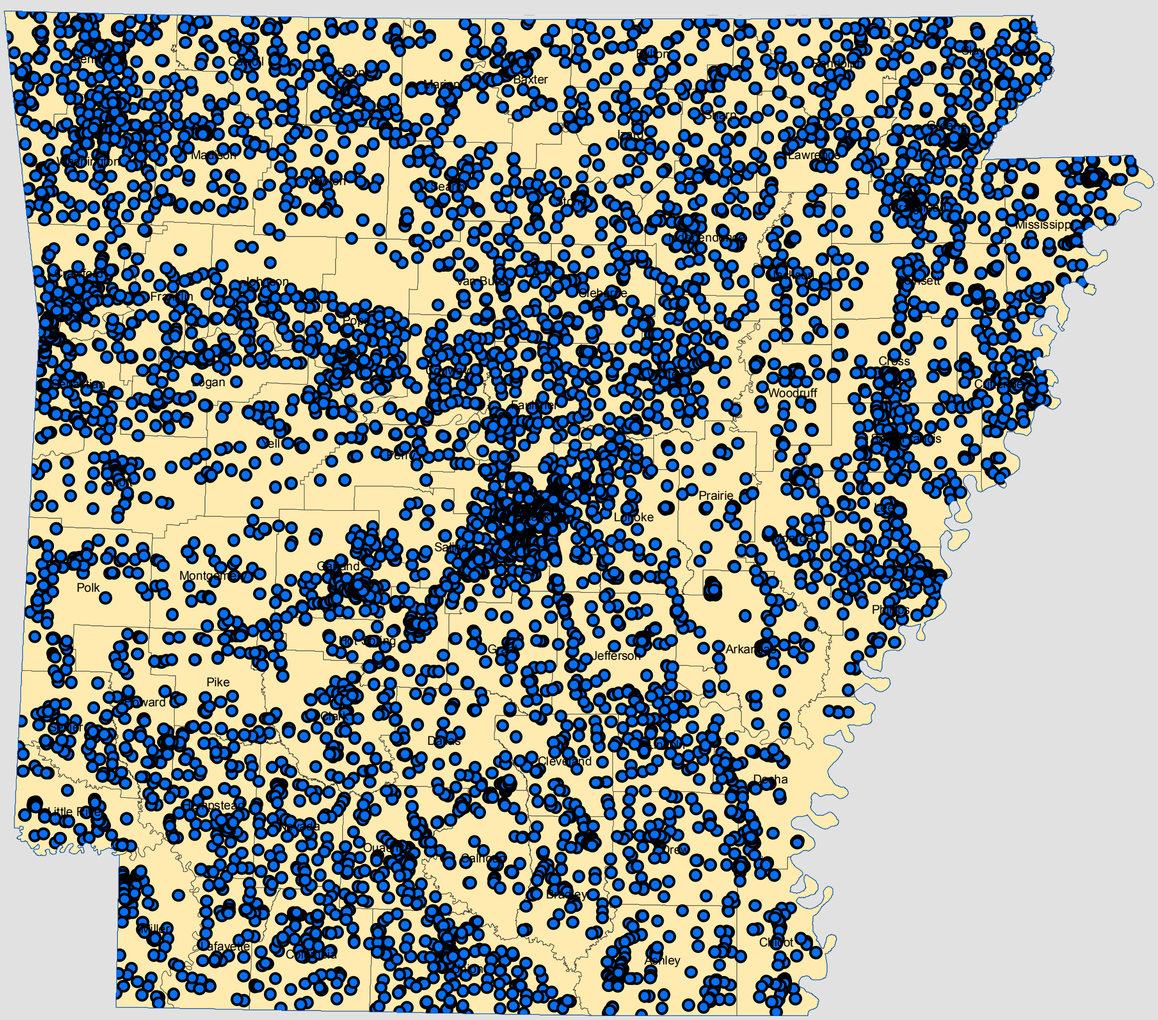
Release Date:
04/15/2013

N

0 15 30 60 Miles

amec

Figure B33 - Houses of Worship



● STATE OWNED ASSETS

● CHURCHES & SYNAGOGUES

Data Source:
Arkansas Geographic
Information Office

Release Date:
04/15/2013

N

0 15 30 60 Miles

amec