



Greene County

(Multi-Jurisdiction)

All-Hazard Mitigation Disaster Plan

July 21, 2017

Prepared by Erik Wright, Coordinator - Greene County Office of Emergency Management

Greene County Government
320 West Court Street
Paragould, Arkansas 72450

Proposed Adoption Resolution

County, Participating Jurisdictions and Schools

RESOLUTION # _____

A RESOLUTION ADOPTING THE GREENE COUNTY ALL-HAZARD MITIGATION PLAN FOR THE *COUNTY/CITY/SCHOOL*

WHEREAS, areas of Greene County are subject to periodic flooding and other natural and man-made hazards with the potential of causing damage to properties within the area; and

WHEREAS, the *County/City/School* desires to prepare and mitigate for such occurrences; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) required that local jurisdictions have in place a FEMA-approved All-Hazard Mitigation Action Plan as a condition of receipt of certain future Federal mitigation funding; and

WHEREAS, to assist cities and schools in meeting this requirement, Greene County Judge and Office of Emergency Management has initiated development of the Multi-Jurisdiction Greene County All-Hazard Mitigation Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE *Quorum Court/City Council/School Board of Directors*

That the *County/City/School* in Greene County, Arkansas adopts those portions of the Plan relating to and protecting its jurisdictional area against all hazards and appoints the Office of Emergency Management Coordinator to assure that the Greene County All-Hazard Mitigation Plan be reviewed at least annually and that any needed adjustments to the Plan be developed and presented to the governing body for consideration at least every five years; and

Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Multi-Jurisdiction Greene County All-Hazard Mitigation Plan.

APPROVED and ADOPTED on this _____ day of _____, 2017.

County Judge/Mayor/Board Chair

ATTEST:

County Clerk/City Clerk/Secretary

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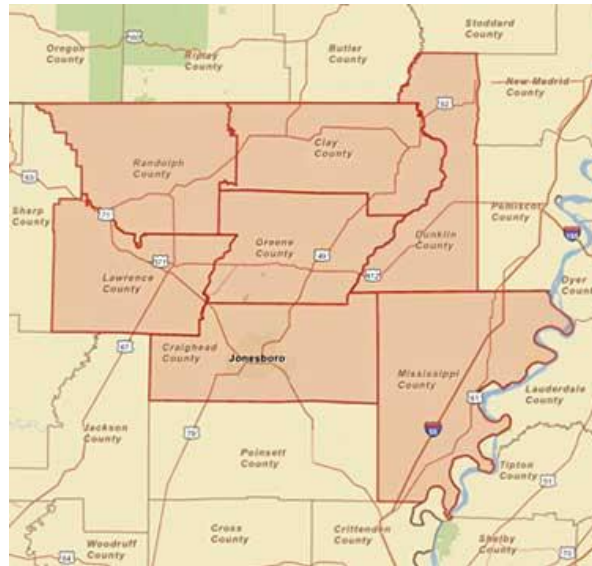
CHAPTER ONE: INTRODUCTION

1.1 Overview of Planning Area

This is a hazard mitigation plan update for Greene County. Greene County is located in northeast Arkansas and is bordered by five counties; Clay County to the north, Dunklin County (Missouri) to the east, Craighead County to the south, Lawrence County to the west, and Randolph County to the northwest. Greene County contains five incorporated communities and three public school districts, all of which participated in the plan. Total land area of Greene County is 578 square miles.

The primary economy for Greene County is manufacturing which generates approximately \$1,840,727 million annually. Manufacturing is the dominant source of income in the cities of JD1 and JD2. Farming and ranching are the dominant sources of income in the rural parts of the county while the second largest economy in Greene County is retail, with the majority of retail located in the city of JD1. A smaller, but equally significant, employer within Greene County is the American Railcar Industries located in the cities of JD1 and JD2, which employs nearly 1,300 residents. Anchor Industries is also located in both JD1 and JD2 and employs approximately 1,100 residents.

The population of Greene County is approximately 44,000. Paragould, which serves as the county seat, is the most heavily populated with approximately 27,900 residents. Marmaduke is the second most heavily populated. Oak Grove Heights, Lafe and Delaplaine are the least populated towns in Greene County, with an average of 250 residents in each town respectively.



Greene County (center) with surrounding counties.
(Courtesy of the Paragould Regional Chamber of Commerce.)

There is a total of 7779 students, K-12, in Greene County, with the highest population located in Greene County Tech Public School District (PS). Paragould Public Schools serves 3,260 students while Marmaduke Public Schools serves considerably less at 743 students. High school students from incorporated communities attend Greene County Tech, Paragould, and Marmaduke Public Schools, located within the respective cities in Greene County.

1.2 Participating Jurisdictions

The following jurisdictions are participating in this plan:

Greene County
City of Paragould (JD1)
City of Marmaduke (JD2)
City of Oak Grove Heights (JD3)
City of Lape (JD4)
City of Delaplaine (JD5)
Paragould School District
Greene County Tech. School District
Marmaduke School District

The term “**Planning Area**” refers to the participating jurisdictions previously listed.



Greene County is susceptible to a range of natural disasters. In 1930, the second largest meteorite ever recorded in North America fell in a rural part of Greene County.

CHAPTER TWO: PLANNING PROCESS

2.1 Overview of Planning Process

The Greene County Hazard Mitigation Planning Committee was formed to provide guidance during the preparation of this plan. The committee worked toward limiting the loss of life and property and the associated costs from natural and man-made hazards through cost effective recommendations of publicly accepted, prioritized, and multi objective actions. Committee participants provided local history, reviewed NCDC data, addressed and analyzed issues of cost versus health/safety, and made recommendations to the plan. The committee discussed these items in open meetings, approved the plan, and provided their recommendations to the Greene County Commissioners for plan approval.

The Greene County Hazard Mitigation Plan was developed during a series of meetings and outreach methods from June 16 2016 to July 3, 2017.

2.2 Planning Committee Members

Name	Title	Jurisdiction/ Agency Represented	Contribution to Planning Process
Erik Wright	Greene County OEM Coordinator	Greene County	Lead Planning Committee POC.
John DeFries	LEPC (Local Emergency Planning Committee) Chairman	Paragould Light, Water & Cable (PLWC) JD1	Provided estimated loss information for identified hazards.
Rusty McMillon	LEPC Member/Co. Judge	Greene County	Provided county hazard information.
Mike Gaskill	LEPC Member/Mayor	JD1	Provided county mitigation actions.
Steve Dixon	LEPC Member/Mayor	JD2	Assembled public comments from Greene County and provided county capabilities assessment.
Dave Tierney	Floodplain Administrator	Greene County	Provided flood hazard data, mitigation actions, repetitive loss data, and NFIP participation information.
Lenny Edgar	Dir. Public Works	JD1	Provided building infrastructure and vulnerability information.
Kevin Lang	Fire Chief	JD1	Provided hazard information, mitigation actions, and capabilities assessment.
Chris Rannals	Dir. Security, AMMC	AMMC	Provided hazard information, mitigation actions, and capabilities assessment.
Curtis Davenport	Chief, GC Rescue Squad	Volunteer	Provided hazard information, mitigation actions, and capabilities assessment.

Rick Mellow	Chief Deputy, GCSO	Greene County	Provided hazard information, mitigation actions, and capabilities assessment.
Todd Stovall	Police Chief	JD1	Provided hazard information, mitigation actions, and capabilities assessment.
James Potter	Fire Chief	West Fire Dist.	Provided wildfire data and mitigation action items.
Scott Crossno	Fire Chief	JD4	Provided wildfire data and mitigation action items.
Chris Wilcox	Fire Chief	JD3	Provided wildfire data and mitigation action items.
Jim Holland	Fire Chief	South Fire Dist.	Provided wildfire data and mitigation action items.
Nicki McDowell	Fire Chief	JD2	Provided wildfire data and mitigation action items.
Amy Lucius	Asst. Superintendent	GCT	Provided school district hazard information, mitigation actions, and capability assessment. Assembled public comments from school district staff.
Gene Weeks	Superintendent	GCT	Provided school district hazard information, mitigation actions, and capability assessment. Assembled public comments from school district staff.
Debbie Smith	Superintendent	Paragould School Dist.	Provided school district hazard information, mitigation actions, and capability assessment. Assembled public comments from school district staff.
Tim Gardner	Superintendent	JD2	Provided school district hazard information, mitigation actions, and capability assessment. Assembled public comments from school district staff.
Sue McGowan	CEO, Paragould Regional Chamber of Commerce	JD1/Greene County	Provided critical community, industrial, and agricultural demographic information.

2.3 Other Stakeholders

Organizations and agencies contacted were:

Neighboring Communities, Businesses, and Non-Profit Agencies Contacted

Name	Title	Agency Represented	How Agency Was Invited	Contributions to Plan
Bo Graham	Emergency Manager	Randolph Co.	Email / Phone	Provided information on county capabilities and aid agreements.
Alan Vaughn	Emergency Manager	Clay Co.	Email / Phone	Provided information on county capabilities and aid agreements.
David Moore	Emergency Manager	Craighead Co.	Email	Provided information on county capabilities and aid agreements.
Brad Harvey	FBI	Federal	Email / Phone	Provided information on state/federal capabilities
Anthony Coy	ADEM Coord.	ADEM/State	Email / Phone	Provided information on State protocols
Kyle Jackson	Asst. Chief	JD1 Fire	Email / Phone	Provided information on city capabilities and procedures.
Lisa Martin	Clinic Administrator	Greene Co. Health Unit	Email	Provided vulnerable population information.
Dean Hannah	Disaster Program Manager	American Red Cross	Email	Provided sheltering info.
Brandon Morris	Director, Public Affairs	Union Pacific RR	Email	Provided critical infrastructure data

Neighboring Communities, Businesses, and Non-Profit Agencies Contacted (continued...)

Name	Title	Agency Represented	How Agency Was Invited	Contributions to Plan
Bo Graham	Emergency Manager	Randolph Co.	Email and In-person	Provided information on county capabilities and aid agreements.
Alan Vaughn	Emergency Manager	Clay Co.	Email and In-person	Provided information on county capabilities and aid agreements.
David Moore	Emergency Manager	Craighead Co.	Email and In-person	Provided information on county capabilities and aid agreements.
Jodie Hightower	Public Health Preparedness Coordinator (Northeast Region)	State	In-person	Provided information on state/federal capabilities
Anthony Coy	ADEM Coord.	ADEM/State	In person	Provided information on State protocols
Kyle Jackson	Asst. Chief	JD1 Fire	In-person	Provided information on city capabilities and procedures.
Lisa Martin	Clinic Administrator	Greene Co. Health Unit	Email and In-person	Provided vulnerable population information.
Dean Hannah	Disaster Program Manager	American Red Cross	Email and In-person	Provided sheltering info.
Elizabeth Cazer-Jackson	Nurse	Arkansas 1 st Choice	In-person	Ham Radio Capabilities
Brandon Morris	Director, Public Affairs	Union Pacific RR	Email	Provided critical infrastructure data

State and Federal Agencies Contacted

Name	Title	Agency Represented	How Agency Was Invited	Contributions to Plan
Lacye Blake	Hazard Mitigation Planner	ADEM/State	Email and In-person	Provided guidance on plan requirements.
Bradley Harvey	Special Agent	Federal Bureau of Investigation (FBI)	Email and In-person	Provided terrorism data
Martha Kopper, RPG	Geologist	Arkansas Geological Survey	In-person and email	Provided information on earthquake vulnerabilities
Gary Woodall	Chief Meteorologist	U.S. National Weather Service (Memphis)	Email and In-person meeting	Provided climatological data

2.4 Public Involvement

All public meetings were designed to encourage and invite input from private citizens and local officials. The public was invited to attend all planning committee meetings held at the Greene County Courthouse in Paragould. The agenda for each meeting was posted according to the Arkansas Open Meeting Law. Each meeting was advertised in the local newspaper, posted at local libraries, and posted on each community's website. In addition, a draft copy of the Greene County Hazard Mitigation Plan was posted on the Greene County website.

Feedback received from the public proved valuable in the development of the plan. Based on feedback, the top three public priorities are: 1) additional warning devices for remote communities, 2) additional community saferooms, and 3) increased education and training on hazards.

2.5 Plans, Documents, and Literature Reviewed

During plan development, the Greene County Hazard Mitigation Planning Committee reviewed various plans and studies for information regarding hazards, disaster history, and potential impacted areas.

2.5.1 Literature and Resources Reviewed

Agency/Document	Relevant Information Used
Ark. Dept. Emergency Management (ADEM)	Information for IA/PA for FEMA disasters, 2006-2016
U.S. Dept. of Health and Human Services	Number of electric dependent individuals in planning jurisdictions
Arkansas Forestry Commission	Wildfire statistics and Firewise Program information
National Climatological Data Center (NCDC)	Hazard occurrences from 2012-2016.
US Geological Survey on Earthquakes, dated 11/4/2011	Data on increased seismic activity across Arkansas.
US Census Bureau Population Data, dated 3/10/2010	Population data for Greene County.
State University Agricultural Extension Service	Data on agricultural and ranching revenue from 2012-2016.
A Guide for Emergency Preparedness for People with Disabilities and Special Needs	Ideas of ways to reduce the impact of disasters for people with special needs.
State Department of Transportation	Data on county and US Highway routes was used when evaluating mitigation action items.
State Department of Mental Health, "Population Stresses During Disaster," dated 3/10/2013	Information on how vulnerable populations are affected by disasters.
State Health Department, "Health Considerations During Community Sheltering," dated 4/1/2012	Data on health safety precautions was used when evaluating mitigation action items.
US Department of Environmental Quality	Water purity data on rivers in Arkansas

2.5.2

Plans Reviewed

Plan Title	Relevant Information Used
Arkansas All-Hazard Hazard Mitigation Plan, September 2013	Hazard definitions, previous occurrence data, disaster history, and State goals.
Greene County Emergency Operations Plan, September 1, 2015	Capability Assessment.
City of Paragould Capital Improvement Plan (JD1)	Information was reviewed and integrated into the mitigation action items and critical facilities list.
St. Francis Levee District files	Information was reviewed and integrated into the capability assessment, risk assessment, and mitigation strategy.
School Emergency Action Plans	Wildfire extent, probability, and fuel sources.
Arkansas State Plan Hazard Mitigation Plan, 2/10/2014	Hazard definitions, previous occurrence data, disaster history, and State goals.
Arkansas Department of Health, “Arkansas Mass Fatality Management Plan” May 2012	General strategy for emergency response and resource coordination of multi-agencies in mass fatality incidents.
Local Records: (Greene County, JD1, JD2, JD3, JD4, JD5)	Evacuation Routes, high risk areas, and vulnerable populations.

2.5.3 Additional Information on Plans Used

JD1 Capital Improvement Plan

Infrastructure information from JD1's Capital Improvement Plans was reviewed and incorporated into the Greene County HM Plan. One of the five incorporated communities in Greene County have a Capital Improvement Plan in place with complete community inventory of public buildings and critical facilities. These plans were instrumental in determining the priority of mitigation action items. In addition, the Arkansas Department of Emergency Management (ADEM) is working with the Greene County Office of Emergency Management to identify, prioritize, and inventory critical infrastructure in Greene County, JD1, JD2, JD3, JD4, and JD5. The plan was presented to stakeholders at a closed meeting in March 2017.

2.6 Continued Public Involvement

Greene County will involve the public directly in the continual reshaping and updating of the Hazard Mitigation Plan. This plan will be posted on the Greene County website and on each jurisdiction's community website. Hardcopies for public viewing will be available at the Greene County Court House and at each jurisdiction's City Hall.

Annual planning committee meetings will be open to the public. Meeting notices will be posted in accordance with the policies for the Arkansas Open Meeting Law and will include advertisement in the local newspapers and posting the agenda and meeting time on each jurisdiction's community websites. An opportunity for public feedback will be scheduled into each meeting's agenda.

2.7 Plan Update Review, Evaluation, and Implementation

Upon final approval, the Greene County Hazard Mitigation Plan will be monitored, evaluated, and updated by the Greene County Emergency Manager. He/she will accomplish this by working with the Greene County Local Emergency Planning Committee (LEPC) and the Greene County Hazard Mitigation Planning Committee. The Greene County Emergency Manager will serve as the primary point of contact, and will be responsible for coordinating all meetings related to this plan.

Once a year, or as needed following local disaster events, the Greene County Hazard Mitigation Committee will meet to discuss the effectiveness of the plan. Each participating jurisdiction will provide a brief summary of how the plan met, or did not meet, its specific mitigation needs. These revelations can then be incorporated into the Greene County plan. In addition, each jurisdiction's representative will be responsible for seeking out grant funding opportunities.

The plan update process will begin eighteen months prior to plan expiration, and the plan will be updated every five years.

CHAPTER THREE: HAZARD IDENTIFICATION AND RISK ASSESSMENT

3.1 Introduction

Natural disasters fall into five (5) major categories: atmospheric, geological, hydrological, extraterrestrial, and biological. Natural disasters have resulted in enormous intangible losses and have had a profound effect on the population's resilience.

During development of this plan, the Greene County Hazard Mitigation Planning Committee identified hazards that are historical, typical, and possible within the planning area. These hazards were identified by incorporating Greene County Hazard Vulnerability Assessment data, planning committee input, public feedback, review of current Flood Insurance Rate Map (FIRM) data, and through research of past disaster declarations.

3.2 List of Identified Hazards

Greene County Hazards

Hazard	Jurisdictions Affected
Lightning	All Jurisdictions
Hail	All Jurisdictions
Tornado	All Jurisdictions
High Wind	All Jurisdictions
Winter Storm	All Jurisdictions
Flood	All Jurisdictions
Extreme Heat	All Jurisdictions
Wildfire	All Jurisdictions
Drought	All Jurisdictions
Dam/Levee Failure	Greene County, JD5
Earthquake	All Jurisdictions

In addition to the hazards listed above, the Arkansas Hazard Mitigation Plan also includes expansive soils, subsidence, and landslides as potential hazards. These three hazards were **not** included in the Greene County Hazard Mitigation plan for the following reasons:

- a) The soil found in Greene County consists of a low percentage of clay, which eliminates the potential for expansive soils.
- b) Lack of clay in the soil also reduces the exposure to subsidence, along with a stable water table and no mining activities within the planning area.
- c) Greene County consists of relatively flat terrain and is not at risk for landslides.

3.3 Disaster History

Greene County Federally-Declared Disaster History from 2008 to 2016

Disaster #	Declaration Date	Incident Type
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2/5/2016	DR4254	Tornadoes/Straight-Line Winds/Flooding
5/2/2011	DR1975	Tornadoes/Flooding
2/4/2010	DR1872	Severe Storms/Flooding
6/16/2009	DR1845	Tornadoes/Flooding
2/6/2009	DR1819	Severe Winter Storm
3/26/2008	DR1751	Severe Storms/Tornadoes/Flooding

3.4 Hazard Probability Rating

The probability rating in the hazards below is based on the following criteria:

High	=	Event probable in next year
Medium	=	Event probable in next 3 years
Low	=	Event probable in next 5 years
Very Low	=	Event probable in next 10 years

Based on history and using the previously mentioned probability statements, probability was quantified as follows:

High	=	Event has 1 in 1-year chance of occurring	100%
Medium	=	Event has 1 in 3 years chance	33%
Low	=	Event has 1 in 5 years chance	20%
Very Low	=	Event has 1 in 10 years chance	10%

Which result in the following ranges of probability:

High	=	greater than 33%
Medium	=	greater than 20%, but less than or equal to 33%
Low	=	greater than 10%, but less than or equal to 20%
Very Low	=	10% or less

3.5 Profiled Hazards

3.5.1 Lightning

Description

Lightning is a discharge of intense atmospheric electricity, accompanied by a vivid flash of light, from one cloud to another or from a cloud to the ground. Lightning is formed by the separation of positive and negative charges that occur when ice crystals collide high up in a thunderstorm cloud. As lightning passes through the atmosphere, the air immediately surrounding it is heated, causing the air to expand rapidly. The resulting sound wave produces thunder.

Location

Lightning affects the entire planning area.

Extent

According to information provided the Tulsa, OK National Weather Service (NWS) office, cloud-to-ground (CG) lightning is classified as either negative or positive. Positive CG flashes make up approximately 5-10% of the total CG lightning. Positive CG flashes typically originate in the upper portion of thunderstorms. This increases the distance between the charge region within the cloud and the earth. Stronger charge is needed to overcome the electric potential of this distance compared to negative CG flashes, which originate lower in the cloud. The result is that positive CG flashes have a higher peak current compared to negative CG flashes. Positive CG flashes may have a peak current 10x that of a negative CG flash.

The National Weather Service explained that positive CG flashes are often observed as far away as 10 miles or more from the main precipitation area of a thunderstorm due to the location of the upper charge region. This poses an extra fire danger, and can catch people who are outdoors off guard.

Once in contact with an object on the ground, a CG flash can have multiple return strokes, (this looks like a flickering flash), a continuous current, (this looks like a steady flash), or a combination of these two. Continuous current is more destructive and leads to a greater chance of fire. This is because the electricity remains in contact with an object for a longer period of time, allowing for greater heat to build up. (Lightning can be as hot as 50,000 degrees Fahrenheit). Positive CG flashes predominantly have continuous currents and are more likely to cause damage than negative CG flashes, due to the likelihood of continuous and high peak currents. It is important to remember that all lightning can cause damage.

Based on the information provided by the NWS, Greene County considers:

A **minor severity** lightning event: a negative cloud-to-ground flash with multiple return strokes, that causes no loss of life or injury and less than \$1,000 in property damage.

A **major severity** lightning event: a positive cloud-to-ground flash with a continuous or high peak current, that results in loss of life and/or injury and more than \$1,000 property damage.

Previous Occurrences: No recorded catastrophic lightning events have occurred in the planning area from 2012 to 2016.

None of the school districts participating in this plan reported damages from previous lightning events.

Probability of Future Events

The probability of damaging lightning events in the planning area is **medium**.

Impact and Vulnerability

People, buildings, schools, trees, electrical systems and equipment, and electrical components are all vulnerable to a lightning strike. A few of the impacts of a lightning strike could include injury or death, structural damages, fire, downed electrical lines, and power loss to electrical substations.

The greatest vulnerability to lightning in the planning area is the potential loss of human life. Property damage can also occur to structures, electrical equipment, water wells, etc. Anyone outdoors during a thunderstorm is exposed to, and at risk of, injury from lightning. Most people are injured or killed by lightning when participating in some form of outdoor recreation during a lightning event. Some of the area swimming pools and water parks are installing early warning devices to further protect citizens.

Greene County Tech School District utilizes lightening detection systems for outdoor events. Both Marmaduke Public Schools and Paragould Public Schools also utilize lightening detection systems during outdoor events in the form of mobile applications. In general, school officials will cancel outdoor events if lightning becomes a concern, although that system is vulnerable to varying perceptions of the severity of a lightning event.

3.5.2 Hail

Description

Hail is a form of solid precipitation that consists of balls or irregular lumps of ice, which are individually called hailstones. Hail formation requires an atmospheric environment of strong, upward moving air, called an updraft, within the subfreezing region of a thunderstorm cloud. Large hail stones greater than an inch in diameter (quarter size), can result from a severe thunderstorm and require a very powerful updraft to form. Most large hail is the product of supercell thunderstorms, which have a sustained rotating updraft that moves growing hailstones a long distance through the height of the cloud before falling to the ground.

Location

Hail affects the entire planning area.

Extent

Greene County and all participating jurisdictions use the Hail Size/Diameter in Relation to TORRO Hailstorm Intensity Scale chart below when considering hail severity.

Minor severity: any hail of H3 and below.

Major severity: any hail of H4 or higher.

Hail Size/Diameter in Relation to TORRO Hailstorm Intensity Scale

Size code	Maximum Diameter (in)	Description
H0	up to 0.39	Pea
H1	0.40-0.60	Mothball
H2	0.61-0.80	grape
H3	0.81-1.20	Walnut
H4	1.21-1.60	Pigeon's egg > squash ball
H5	1.61-1.99	Golf ball > Pullet's egg
H6	2.00-2.40	Hen's egg
H7	2.41-2.99	Tennis ball > cricket ball
H8	3.00-3.50	Large orange > Soft ball
H9	3.51-3.99	Grapefruit
H10	4+	Melon

Previous Occurrences

Hail Events from 2012 to 2016

Date of Event	Disaster #	Location	TORRO Size Code	Damages
1/22/2012	N/A	JD2	H2	N/A
6/7/2014	N/A	Stanford	H3	N/A
6/7/2014	N/A	JD1	H4	N/A
4/9/2015	N/A	Gainesville	H4	N/A
4/9/2015	N/A	JD4	H3	N/A
6/15/2016	N/A	Gainesville	H3	N/A
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Probability of Future Events

The probability of hail events in the planning area is **high**.

Impact and Vulnerability

Hail is capable of causing considerable damage to crops, buildings, and vehicles, and occasionally death to farm animals. While large hail poses a threat to people caught outside in a storm, it seldom causes loss of human life.

JD1, JD2, and JD4 as well as unincorporated areas of Greene County are the most vulnerable to residential and businesses property damage during a hail event due to the population densities they represent in the County.

Some local builders and roofing companies offer high-impact roofing materials, but due to the additional costs these options are not widely used.

All school districts have severe weather procedures in place to protect students from damaging hail. Most school districts, with the exception of JD1 PS, have bus barns to protect school buses. None of the schools in Greene County have high-impact roofing or impact-resistant window glass.

3.5.3 Tornado

Description

Tornados are violently rotating columns of air that reach from the bottom of a cumulonimbus cloud to the ground. Tornados are found in severe thunderstorms, but not all severe thunderstorms produce tornados. While all tornados touch both the ground and the bottom of a cloud, it is possible for only part of the tornado to be visible. A tornado may be on the ground for only a few seconds, or last for over an hour. They can appear in a variety of shapes and sizes, ranging from thin, rope-like circulations to large, wedge-shapes greater than one mile in width. However, a tornado's size is not necessarily related to its wind speed. The strongest tornados can have wind speeds in excess of 200mph. In Arkansas, most tornados occur between 3PM and 9PM, during the months of March through May, but may occur anytime the necessary atmospheric conditions of wind shear, lift, instability, and moisture are present.

Location

Tornados affect the entire planning area. **Note:** no record of a tornado from 2012 – 2016 has been recorded. However, the U.S. National Weather Service in Memphis, Tenn. has provided data on tornadoes during that time period from surrounding jurisdictions.

Extent

The Fujita Scale has been used to rate tornados since its development in 1971. In 2007 the scale was further developed into the Enhanced Fujita Scale, which has been used since. Tornado wind speeds are estimated after-the-fact based on the damage they produce.

Greene County and all participating jurisdictions use the Enhanced Fujita Scale when considering tornado severity.

Enhanced Fujita (EF) Scale

EF Category	Wind Speed (mph)	Potential Damage
EF0	65-85	Light Damage Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over
EF1	86-110	Moderate Damage Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.

EF2	111-135	Considerable Damage Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe Damage Entire stories 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	Devastating Damage Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.

Previous Occurrences

Tornado Events from 2012 to 2016

Date of Event	Disaster #	Location	EF Scale	Damages
9/1/2012	N/A	Clay Co.	EF2	N/A
9/1/2012	N/A	Clay Co.	EF0	N/A
10/31/2013	N/A	Craighead Co.	EF1	N/A
10/13/2014	N/A	Clay Co.	EF0	N/A
9/1/2012	N/A	Dunklin Co.	EF0	N/A

None of the school districts participating in this plan have reported any damages from previous tornado events.

Probability of Future Events

The probability of tornados in the planning area is **Medium**.

Impact and Vulnerability

Every structure in the planning area is vulnerable to tornados. Loss of utility service can affect large segments of the population for long periods of time. Economic losses to homeowners and businesses can be devastating. Cascading effects of power loss may include loss of water and sewer services, inability to fuel vehicles, and food spoilage, adding new challenges to disaster-stricken communities.

In our most heavily populated areas of JD1 and JD2, 19% of residences have safe rooms installed. In addition to JD1 and JD2, 8% of the residents in the remaining planning area have safe rooms installed. In 2006, Marmaduke School District received an FEMA Public Safe Room Grant which resulted in the installation of a 1,000 person-capacity safe room that was completed in early 2008.

In 2017 Greene County surveyed businesses and churches in order to evaluate their ability to protect citizens during a tornado. Of the organizations that responded, only 45% reported having a severe weather emergency action plan and only 30% had public safe rooms. This is a particular vulnerability for the citizens of Greene County.

Most public-school structures within the planning area could withstand an EF0 event, however, more serious tornado events could cause serious structural damage which could also impact school operations.

Many efforts have been made to protect all students of Greene County. Schools in the JD2, district all have a FEMA safe room on campus. Paragould School District has a basement at Oak Grove Elementary and a reinforced concrete “safe area” gymnasium under construction at Oak Grove Middle School, both in JD3.

3.5.4 High Wind

Description

High winds can result from thunderstorms, strong cold front passages, or gradient winds between high and low pressure. Damaging winds are often called “straight-line” winds to differentiate the damage they cause from tornado damage. Downdraft winds are a small-scale column of air that rapidly sinks toward the ground, usually accompanied by precipitation as in a shower or thunderstorm. A downburst is the result of a strong downdraft associated with a thunderstorm that causes damaging winds near the ground.

Location

High winds affect the entire planning area.

Extent

Previous Occurrences

High Wind Events from 2012 to 2016

Date	Disaster #	Location	Information/Damages
7/26/2012	N/A	JD1	EG (Estimated Gust) 50 kts. (knots).
9/1/2012	N/A	Bethel	EG 50 kts.
1/29/2013	N/A	Center Hill	EG 50 kts.
6/12/2014	N/A	JD1	EG 52 kts.
7/23/2014	N/A	Halliday	EG 54 kts.
4/19/2015	N/A	JD4	EG 50 kts.

Probability of Future Events

The probability of high winds in the planning area is **high**.

Impact and Vulnerability

Damages from high winds may exceed those caused by tornados. Structural impacts might include window and roof damage, and inundation of facilities by heavy rain. In addition to structural issues, high winds can also affect electrical and other utilities with service outages due to power lines grounding out or being knocked down. Transportation can be disrupted with the loss of stop lights and street lights, and dangerous cross winds could make travel difficult.

Wind-driven debris can penetrate windows, roofs, and even reinforced masonry walls, posing a threat to both property and occupants. The potential for injury or property damage due to flying debris exists in all jurisdictions, but increases in population-dense areas and areas that are under construction/development. Given the high volume of population and housing development, JD3 has the potential to be the most affected by damaging high wind events.

3.5.5 Winter Storm

Description

Winter Storm can refer to a combination of winter precipitation, including snow, sleet and freezing rain. A severe winter storm can range from freezing rain or sleet to moderate snow over a few hours to blizzard conditions and extremely cold temperatures that last several days.

Blowing snow is wind-driven snow that reduces visibility and causes significant drifting. Blizzards occur when falling and blowing snow combine with high winds of 35 mph or greater, reducing visibility to near zero.

Freezing rain is precipitation that falls, as liquid, into a layer of freezing air near the surface. When the precipitation makes contact with the surface, it forms into a coating or glaze of ice and even a small accumulation can cause a significant hazard.

Sleet is frozen precipitation that has melted by falling through a warm layer of the atmosphere and then refreezes into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and can accumulate like snow and cause a hazard to motorists.

Ice storms are extended freezing rain events, lasting several hours to sometimes days, when the freezing rain accumulates a thick enough glaze on surfaces to damage trees, utility lines, and cause major travel hazards. Ice loads on overhead power lines, combined with windy conditions, may cause the lines to “gallop.” This forceful motion often causes the lines to break away from the connectors and poles, resulting in widespread power failure.

Wind Chill is used to describe the relative discomfort and danger to people from the combination of cold temperatures and wind. The wind chill chart below from the National Weather Service shows the apparent temperature derived from both wind speed and temperature.

Location

Winter storms affect the entire planning area.

Extent

Wind Chills in Greene County can reach -19 as shown on the National Weather Service Wind Chill Chart below. A typical winter storm in Greene County will deposit 1-3 inches of snow, accompanied by sleet and ice. A severe winter storm is one that drops 4 or more inches of snow during a 12-hour period, or 6 or more inches during a 24-hour span.

Ice accumulations of only ½ inch can immobilize the town and cause damage to infrastructure. As little as 2 inches of snow combined with strong winds can cause blizzard conditions.

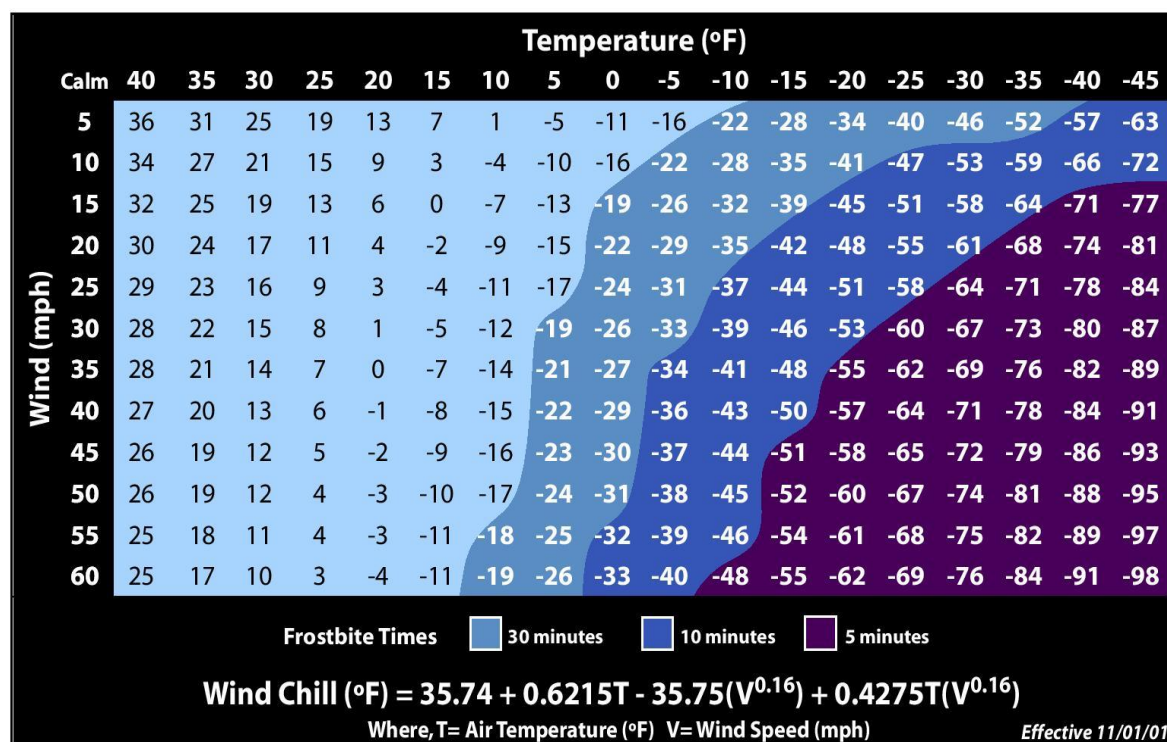
An index scale used by the utility industry to anticipate impact and damage of an icing event to transmission lines is the Sperry-Piltz Ice Accumulation Index (SPIA). As a tool for risk management and winter weather preparedness, the index uses National Weather Service forecast parameters to predict the spatial coverage, total ice accumulation, and potential damage from ice storms. Greene County considers:

Minor Severity: 1 or below on the SPIA chart.

Major Severity: 2 or above on the SPIA chart.



Wind Chill Chart



The Sperry-Piltz Ice Accumulation Index, or “SPIA Index” – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Previous Occurrences

Winter Storm Events from 2012 to 2016

Date	Disaster	Location	Additional Info.
12/25/2012	N/A	Greene County	Winter Storm
3/21/2013	N/A	Greene County	Heavy Snow
12/5/2013	N/A	Greene County	Winter Storm
2/2/2014	N/A	Greene County	Winter Storm
3/2/2014	N/A	Greene County	Winter Storm
2/15/2015	N/A	Greene County	Winter Storm
3/4/2015	N/A	Greene County	Winter Storm

Probability of Future Events

The probability of winter storms in the planning area is **high**.

Impact and Vulnerability

Winter storms can range from accumulating snow and/or ice over just a few hours to blizzard conditions with blinding wind-driven snow that can last several days. The

even months. Economic losses can occur to livestock producers and any business in the affected areas. Water systems being shut down or frozen can disrupt social services, schools, homes, and businesses. Carbon monoxide poisoning is always a possibility as homeowners and businesses use alternative heat sources to keep warm. Personal health can be affected in a variety of ways including mental and physical stress, and frostbite.

Historically, power outages due to downed lines have occurred in both urban and rural areas of Greene County, and have lasted for periods of days to weeks. As a result, electric utilities have contingency plans and mutual aid agreements with neighboring utility providers. These plans identify priority facilities such as hospitals that need power service restored as quickly as possible. As new lines are considered and/or replacement lines are needed, the providers should thoroughly investigate underground lines.

The primary impact of winter storms on school districts in Greene County is school closure, sometimes for extended periods of time. Therefore, all school districts in the planning area have plans for early dismissal of students, as well as protection of buildings from the effects of extreme cold during periods of inaccessibility.

3.5.6 Flood

Description

River flooding is when a river rises to its flood stage and spills over the banks. The amount of flooding is usually a function of the amount of precipitation in an area, the amount of time it takes for rainfall to accumulate, previous saturation of local soils, and the terrain around the river system. A river located in a broad, flat floodplain will often overflow to create shallow and persistent flood waters in an area that do not recede for extended periods of time. The excess water can be from snowmelt or rainfall far upstream. Flood effects can be local, impacting a neighborhood or community; or very large, affecting entire river basins and multiple states.

Floods in Greene County usually come in two forms: riverine and sheet (or “Flash”) flooding. Riverine flooding occurs when a stream becomes so full as to overflow onto adjacent lands. Sheet flooding occurs when excessive rainfall exceeds the design capabilities of drainage facilities and ponding occurs.

Location

All of the planning area is vulnerable to flooding. **Note:** no part of the planning area had any documented riverine flooding events for 2012-2016. Provided in the table below are documented sheet flooding events for that same period.

Extent

Severity of flooding is determined by several factors including rainfall intensity, duration, and location. Topography and ground cover are contributing factors for floods. The extent of flooding in Greene County will be determined by the Zone A, 100-year flood hazard areas on the FIRM maps. Major flood depths for participating municipalities are included below.

Previous Occurrences

Flooding Events from 2012 to 2016

Date	Location	Event	Disaster
Center Hill (JD1)	6/1/2013	Flash Flood	N/A
Paragould (JD1)	6/12/2014	Flash Flood	N/A
Bethel	7/2/2015	Flash Flood	N/A
Bethel	7/7/2015	Flash Flood	N/A
Paragould (JD1)	5/26/2016	Flash Flood	N/A
Beech Grove	12/26/2016	Flash Flood	DR-4254

NOTE: None of the school districts participating in this plan reported damages from previous flood events.

Probability of Future Events

The probability of flood events occurring in Greene County, JD1, JD2, JD3, JD4, and JD5 is **medium**.



Historic flooding in JD1 has been alleviated by the creation and maintenance of the Eight Mile Creek – Francis Bland Floodway Ditch through a partnership with the U.S. Army Corps of Engineers.

Impact and Vulnerability

Typical impacts from flooding in Greene County include minimally inundated homes and closed roadways. Residential and road flooding is less common in JD1 due to the creation of the Eight Mile Creek – Francis Bland Floodway Ditch. However, rural road flooding also occurs in the unincorporated areas of Greene County, specifically in the rural area west and east of Crowley's Ridge. Other incorporated communities typically don't experience flooding of residential structures or street flooding during rain events. Infrastructure damage in the unincorporated areas of the county is uncommon. County roads and bridges experience minimal damage from flood events.

In December 2015 through January 2016 flooding affected rural county roads in the northern part of Greene County (DR-4254).

Aside from infrastructure, farmers also suffer during flood events. Flood events have resulted in contamination of soils and water sources, impacting farming operations.

Another issue all jurisdictions face is the general public not heeding public safety notifications, going around barricades, and driving through flooded roadways. The Greene County Office of Emergency Management actively engages in social media campaigns to raise flood safety awareness.

The County has been able to Riprap several washout and erosion areas.

3.5.7 Extreme Heat

Description

Summertime temperatures routinely climb above the 100-degree mark (with relative heat index) which can create very uncomfortable conditions when combined with a high dew point. Temperatures that hover 10 degrees or more above the average heat temperature for an area, and last for several days or longer is one measure of extreme heat. In addition, humid or muggy conditions can persist and air quality can deteriorate during the summer when a dome of high atmospheric pressure creates a temperature inversion that traps a stagnant air mass near the ground.

Location

Extreme heat affects the entire planning area.

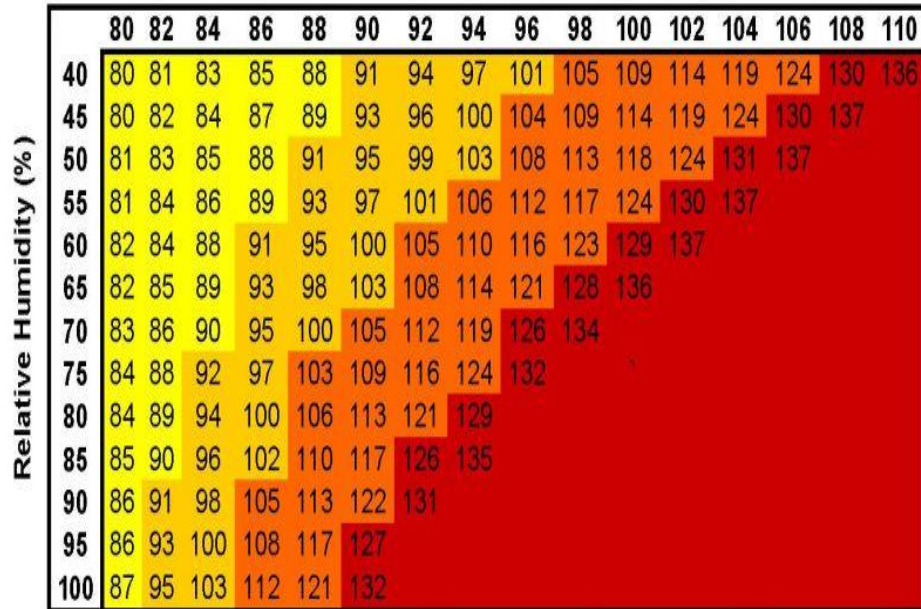
Extent

There are no uniform set of attributes that define extreme heat, although the NOAA/NWS Heat Index is widely used to gauge disorders due to prolonged heat exposure.

NOAA's National Weather Service

Heat Index

Temperature (°F)



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
 Extreme Caution
 Danger
 Extreme Danger

Extreme Heat Events from 2012 to 2016

Date	Disaster	Location	Remarks
7/19/2012	N/A	Greene Co.	Two-day duration
7/28/2015	N/A	Greene Co.	One-day duration
6/16/2016	N/A	Greene Co.	Two-day duration
7/22/2016	N/A	Greene Co.	Two-day duration
8/4/2016	N/A	Greene Co.	Two-day duration

Probability of Future Events

The probability of extreme heat in the planning area is **high**.

Impact and Vulnerability

Extreme heat has many negative consequences. Most significant is its impact on humans and animals, because prolonged exposure to extreme heat can result in death. Young children, elderly people, and those who are sick or overweight are more likely to become victims to extreme heat. This can also include generally healthy individuals whose job consists of strenuous labor outside. When temperatures reach 90 degrees and above, people and animals are more likely to suffer sunstroke, heat cramps, and heat exhaustion.

Roadways can also be affected by extreme heat. All of Greene County's state and city-maintained roadways are asphalt, which are susceptible to softening and buckling. Most of the county roads in Greene County are primarily gravel, which are susceptible to cracking. Road damage due to extreme heat costs Greene County and its municipalities an average of \$100,000 annually.

Another extreme heat hazard is air pollution. During summer months, consistent high temperatures and stagnant airflow patterns cause a build-up of hydrocarbons to form a dome-like ceiling over large cities. Factories, automobiles, lawn equipment, and other internal combustion machines emit high particulate matter. The resulting stagnant, dirty, and toxic air does not move away until a weather front arrives to disperse it.

Prolonged extreme heat can also lead to secondary hazards, including elevated wildfire danger, drought, and expansive soil issues.

The local Red Cross, public utilities, fire agencies, County health department, and volunteer organizations implement short term programs such as fan and air conditioner distribution, senior checkups, and voluntary or mandatory water conservation. JD1 also opens up cooling stations 110 degrees for three or more days. These cooling stations are located in the Community Center.

3.5.8 Wildfire

Description

A wildfire is an uncontrolled fire in a rural or wilderness area. The majority of wildfires in Arkansas occur in the late fall through winter and into early spring, which coincides with dormant vegetation and low precipitation. A wildfire often begins unnoticed and can spread quickly, lighting brush, trees, and structures. There are three different classes of wildfires. A surface fire is common in grasslands, or areas with open vegetation, and can spread quickly. A ground fire is a dense, very hot fire that has a thick fuel source and significantly damages the soil health where it occurs. Crown fires are those that move by jumping along the tops of trees. Wildfires often begin unnoticed, but are usually signaled by dense smoke that fills the area for miles around.

Location

Wildfires *could* possibly affect the entire planning area, but historically this is unlikely.

None of the school districts or jurisdictions participating in this plan reported damages from previous wildfire events.

Probability of Future Events

The probability of wildfire in the planning area is **low**

Impact and Vulnerability

Periods of drought, dry conditions, high temperatures, and low humidity set the stage for wildfires. Still, no wildfires have been reported in Greene County during the reporting period. A meeting with rural fire chiefs determined that the risk for wildfires is extremely low due to a small amount of combustible material in the areas susceptible to burning. If needed, burn bans are put in place by the Greene County Judge and JD1 has strict burning ordinances in place inside the jurisdiction to protect citizens and structures against careless burning.



Prescribed burns like this are often conducted on the heavily-wooded Crowley's Ridge in Greene County to help reduce the risk of wildfires.

Four out of five wildfires are human caused. Lightning strikes are another leading cause of wildfires. Other sources of ignition include railroads, catalytic converters on automobiles, and spontaneous ignition of hay bales. When wild lands are destroyed by fire, the resulting erosion can cause heavy silting of streams, rivers, and reservoirs. Serious damage to aquatic life, irrigation, and power production then occurs.

Mitigation and rapid emergency response are the most effective activities for reducing the impact of wildfires. Volunteer fire departments operate under a collaborative mutual aid in order to provide fire and emergency response when demand exceeds local capability. Greene County also participates in Fire Warning Device Give Away Programs in cooperation with the American Red Cross and JD1, JD2, JD3, JD4, and rural fire departments in the planning area.

3.5.9 Drought

Description

A drought is a period of drier-than-normal conditions. If dry weather persists and water supply problems develop, the dry period can become a drought.

Location

Drought may affect the entire planning area.

Extent

The Palmer Index varies roughly between -4.0 and +4.0. Weekly Palmer Index values are calculated for the Climate Divisions during every growing season and are on the World Wide Web from the Climate Prediction Center. The planning area may experience -4.0 on the PDSI.

Palmer Drought Severity Index

	< -4.0	Extreme Drought
	-3.99 to -3.0	Severe Drought
	-2.99 to -2.0	Moderate Drought
	-1.99 to -1.0	Mild Drought
	-0.99 to -0.5	Incipient Drought
	-0.49 to 0.49	Near Normal
	0.5 to 0.99	Incipient Moist Spell
	1.0 to 1.99	Moist Spell
	2.0 to 2.99	Unusual Moist Spell
	3.0 to 3.99	Very Moist Spell
	➤ 3.99	Extremely Moist Spell

Previous Occurrences

Drought Events from 2012 to 2016

No droughts occurred during the planning period.

Probability of Future Events

The probability of drought in the planning area is **low**.

Impact and Vulnerability

Drought has the impacts all communities within Greene County. Hot weather during the summer increases demand and subsequent use of supplies, as well as evaporation. In turn, increased water demand can stress many smaller and/or antiquated delivery and treatment facilities to the point of collapse. Prolonged drought has a much greater impact on rural communities, which usually rely on smaller watersheds that are especially vulnerable during such periods.

The most direct impact of drought is economic rather than loss of life or destruction of property. The Greene County economy is greatly dependent on agriculture. All jurisdictions produce a variety of crops, to include rice, wheat, oats, soybeans, and prairie hay, peanuts, and livestock. A long-term drought has the potential to cause widespread economic decline due to crop loss, crop damage, and risk to animal health, however, due to technological advancements in irrigation technology in the past 20 years, drought is no longer a significant concern to the planning area.

Greene County, through Soil Conservation, University of Arkansas Extension Services and other agencies, has policies to implement during a drought event.

3.5.10 Dam Failure

Description

A dam is an artificial barrier usually constructed across a stream channel to impound water. Timber, rock, concrete, earth, steel or a combination of these materials may be used to build the dam. In Greene County, many dams are situated on private property, but are subjected to State regulation. A dam that impounds water in the upstream area is referred to as a reservoir. The amount of water impounded is measured in acre-feet. An acre-foot is the volume of water 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 acre-feet of water. Two factors influence the potential severity of a full or partial dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream.

Location

Dam failure affects rural residents in the planning area and potentially JD5.

According to the Arkansas Water Resources Center (AWRC) and the National Inventory of Dams (NID), there are 10 dams in Greene County. All have been classified as Low Hazard Potential.

There is no High Hazard Potential dam in neighboring counties,

Extent

FEMA Dam Failure Hazard Classification:

LOW HAZARD POTENTIAL: Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses.

SIGNIFICANT HAZARD POTENTIAL: Dams where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant Hazard Potential dams are often located in predominantly rural or agricultural areas, but could be located in areas with population and significant infrastructure.

HIGH HAZARD POTENTIAL: Dams where failure or mis-operation will probably cause loss of human life.

Based on the information provided by the AWRC and the NID, Greene County considers:

Minor Severity Event: A dam failure when seepage or small breach where the water stays within the downstream river channel

Major Severity Event: A breach large enough to exceed the capacity of the river or creek channel and overflow causing damage to homes, businesses, critical facilities, and state buildings, and putting people at risk.

Previous Occurrences

There is no history of dam failure within Greene County, or from the dam in a neighboring

Probability of Future Events

The probability a dam failure occurring in Greene County is **low**.

Impact and Vulnerability

Dam failure within Greene County, and a neighboring would affect personal safety, property, the economy, power and utilities, roadways and travel, recreation, and the environment.

With no historical events recorded, no significant or high hazard potential dams within a few miles, and only one high hazard potential dam located outside of Greene County and approximately 15 miles away from a Greene County population center, the impacts are anticipated to be minimal.

3.5.11 Earthquake

Description

An earthquake occurs when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter.

Most earthquakes occur as the result of slowly accumulating pressure that causes the ground to slip abruptly along a geological fault plane on or near a plate boundary. The resulting waves of vibration within the earth create ground motion at the surface that vibrates in a very complex manner.

Location

Earthquakes affect the entire planning area.

Extent

The size of an earthquake can be expressed quantitatively as a magnitude and the local strength of shaking as intensity. The inherent size of an earthquake is expressed using a magnitude. The following Richter Scale is the most commonly used scale.

(<http://earthquake.usgs.gov/learn/topics/mercalli.php>)

Magnitude	Mercalli	Description	Earthquake Effects
2	I	Instrumental	Not felt except by a very few under especially favorable conditions.
	II	Feeble	Felt only by a few persons at rest, especially on upper floors of buildings.
3	III	Slight	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
	IV	Moderate	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.
4	V	Rather Strong	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5	VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
	VII	Very Strong	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.
6	VIII	Destructive	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
7	IX	Ruinous	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
	X	Disastrous	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
8	XI	Very Disastrous	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
	XII	Catastrophic	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Greene County considers the following earthquake events to be minor/major:

Minor Event: An earthquake that registers as magnitude 3.9 or below.

Major Earthquake Event: An earthquake that registers as magnitude 4.0 or above.

Previous Occurrences

Earthquake Events from 2012 to 2016

Location	Magnitude / Date
8km ENE Bono, Arkansas (Craighead Co.)	2.5 Magnitude / Feb. 2, 2015
15km S Hoxie, Arkansas (Lawrence Co.)	2.5 magnitude / January 1, 2014

No earthquakes were recorded by the United States Geological Survey (USGS) in Greene County during the planning period. However, two 2.5 magnitude earthquakes were recorded in 2014 and 2015 in adjoining counties by the USGS. Greene County is at high risk for a devastating earthquake as the county sits atop the New Madrid Fault. Specifically, the far southeast corner of Greene County rests on the western edge of the fault which, between 1811 and 1812, produced a series of violent earthquakes in the region. The deep fault zone remains seismically active today.

To help better prepare the citizens of Greene County for the potential hazards of a large-scale earthquake, the Greene County Office of Emergency Management actively participates in earthquake exercises and continuing education. In the spring of 2017, the Greene County OEM along with the Greene County Judge and JD1 Fire Department participated in a multi-day New Madrid Earthquake Rehearsal of Concepts drill. Following the drill, the Greene County OEM inventoried a number of Points of Distribution (PODs) throughout the county in the event of the earthquake. The POD sites have since been sent for inclusion in the Arkansas State National Guard plan for an earthquake in the region.

In addition, the Greene County OEM has prepared a variety of public outreach products to help keep Greene County citizens better informed of the dangers associated with an earthquake. These products are available online via the Greene County website, through social media, and in-person during events such as the Greene County Fair and at the Greene County Courthouse in JD1.

The public outreach products are designed to supplement the products available from Arkansas state agencies as well as FEMA which are also available to the public through the Greene County OEM office in JD1.

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 - Pochontas 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 casualties or damage to facilities.

As previously discussed, the New Madrid Fault is a very active area of seismic events. Every month Northeast Arkansas can expect to have some type of seismic event, although usually low.

Probability of Future Events

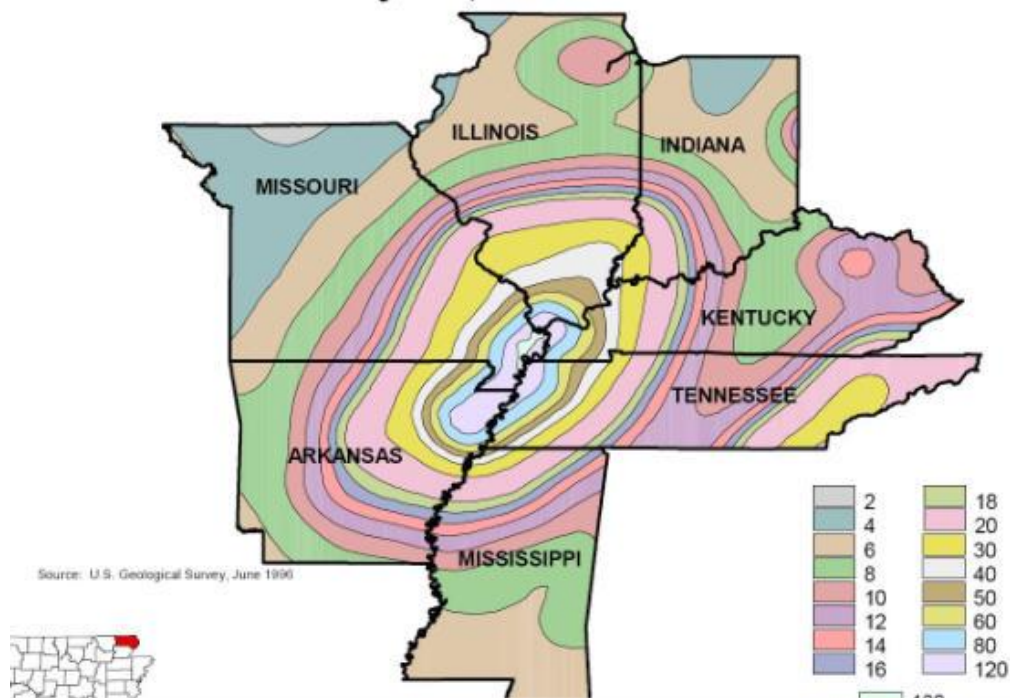
The probability an earthquake occurring in Greene County is **medium**.

Impact and Vulnerability

Earthquake damage can range from minor cracks in walls to collapse of buildings and roadways. Secondary impacts can include fires from ruptured pipelines, and catastrophic infrastructure failure leading to death, destruction, and long-term displacement of business and commerce within affected areas

Although Greene County is in the geographic area of under the 3% peak ground acceleration (PGA) with a 10% chance of being exceeded over 50 years, it has seen a statistical uptick in earthquake activity over the past ten years.

Figure 3-7: Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 years; CUSEC* States



Despite the absence of injection well activity in Greene County, the issue of whether it leads to increased seismic activity is the subject of intense scrutiny which will be monitored by the mitigation team.

Most facilities in Greene County have not been constructed to withstand an earthquake, but, as previously discussed, residents have been educated on what they can do to prevent injury from an earthquake event.

CHAPTER FOUR: MITIGATION STRATEGY

4.1 Capabilities Assessment

Each community has a unique set of capabilities, including authorities, policies, programs, staff, and funding, and resources to accomplish mitigation and reduce long-term vulnerability. By reviewing the existing capabilities in each jurisdiction, the planning committee identified capabilities that currently reduce disaster losses or could be used to reduce losses in the future. School Districts completed a capability assessment in March 2017, and that information is included at the end of this section.

4.1.1 Existing Institutions, Plans, and Ordinances

The checkmark (√) indicates that the jurisdiction reported to have the authority to implement the specified regulatory tool and that the tool is currently in place.

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purpose Ordinance	Growth Management Ordinance	Site Plan Review Requirements	Comprehensive Plan	Capital Improvement Plan	Economic Development Plan	Emergency Response Plan	Post-Disaster Recovery Plan
Greene County			√	√					√	√	√
JD1	√	√	√	√		√	√	√	√	√	√
JD2	√	√									
JD3											
JD4											
JD5											

Legal and Regulatory Capabilities

Subdivision ordinances offer an opportunity to account for natural hazards prior to the development of land as they formulate regulations when the land is subdivided.

Subdivision design that incorporates mitigation principles can reduce the exposure of future development to hazard events.

Building Code

Building codes regulate construction standards and are developed for specific geographic areas of the country. They consider the type, frequency, and intensity of hazards present

in the region. Structures built to applicable building codes are inherently resistant to many hazards such as strong winds, floods, and earthquakes, up to certain levels of severity. Due to the location-specific nature of the building codes, they are very valuable tools for mitigation.

Zoning Ordinance

Zoning is a useful tool to consider when developing a mitigation strategy. It can be used to restrict new development, require low-density development, and designate specific uses, (e.g. recreational), in hazard-prone areas. Private property rights must be considered, but enacting a zoning ordinance can reduce or potentially eliminate damages from future hazard events. According to the Arkansas Multi-Hazard Mitigation Plan, all local communities in the State are encouraged to incorporate mitigation standards in zoning and land use ordinances.

Subdivision Ordinance

Subdivision ordinances offer an opportunity to account for natural hazards prior to the development of land as they formulate regulations when the land is subdivided. Subdivision design that incorporates mitigation principles can reduce the exposure of future development to hazard events.

Special Purpose Ordinance

A special purpose ordinance is a form of zoning in which specific standards dependent upon the special purpose or use must be met. For example, many special purpose ordinances include basic development requirements such as setbacks and elevations. The community's floodplain management ordinance may be a special purpose ordinance. The special purpose ordinance is a useful mitigation technique particularly when implemented to reduce damages associated with flooding.

Growth Management Ordinance

Growth management ordinances are enacted as a means to control the location, amount, and type of development in accordance with the larger planning goals of the jurisdiction. These ordinances often designate the areas in which certain types of development is limited and encourage the protection of open space for reasons such as environmental protection and limitation of sprawl.

Site Plan Review Requirements

Site plan review requirements are used to evaluate proposed development prior to construction. An illustration of the proposed work, including its location, site elevations, exact dimensions, existing and proposed buildings, and many other elements are often included in the site plan review requirements. The site plan reviews offer an opportunity to incorporate mitigation principles, such as ensuring that the proposed development is not in an identified hazard area and that appropriate setbacks are included.

Comprehensive Plan

A comprehensive plan is a document which illustrates the overall vision and goals of a community. It serves as a guide for the community's future and often includes anticipated demographics, land use, transportation, and actions to achieve desired goals. Integrating

mitigation concepts and policies into a comprehensive plan provides a means for implementing initiatives through legal frameworks, and also enhances the opportunity to reduce the risk posed by hazard events.

Capital Improvement Plan

Capital Improvement Plans schedule the capital spending and investments necessary for public improvements such as school, roads, libraries, and fire services. These plans can serve as an important mechanism to manage development in identified hazard areas through limited public spending.

Economic Development Plan

Economic development plans offer a comprehensive overview of the local or regional economic state, establish policies to guide economic growth, and include strategies, projects, and initiatives to improve the economy in the future. Economic Development Plans, similar to Capital Improvement Plans, offer an opportunity to reduce development in hazard prone areas by encouraging economic growth in areas less susceptible to hazard events.

Emergency Response Plan

Emergency Response Plans provide an opportunity for local governments to anticipate an emergency and plan the response accordingly. In the event of an emergency, a previously established Emergency Response Plan can reduce negative effects of an event by pre-determining the responsibilities and means by which resources are deployed.

Post-Disaster Recovery Plan

A post-disaster recovery plan guides the physical, social, environmental, and economic recovery and reconstruction procedures after a disaster. Hazard mitigation principles are often incorporated into post-disaster recovery plans in order to reduce repetitive disaster losses. The post disaster recovery plan is included as a chapter of the comprehensive plan.

4.1.2 Administrative and Technical Capability

The ability of a local government to develop and implement mitigation projects, policies, and programs is contingent upon its staff and resources. Administrative capability is determined by evaluating whether there are an adequate number of personnel skilled in surveying and Geographic Information Systems.

The checkmark (✓) indicates that the local government reported that they maintain a staff position for the given function.

Administrative and Technical Capability
--

Jurisdiction	Planner(s) or Engineer(s) with knowledge of land development and management practices	Engineer(s) or professional(s) trained in construction practices related to buildings and fire	Planner(s) or Engineer(s) with an understanding of natural and/or human caused hazards	Floodplain Manager	Surveyors	Staff with education or expertise to assess the communities vulnerability to hazards	Personnel skilled in GIS and/or HAZUS	Scientists familiar with the hazards of the community	Emergency Manager	Grant writers
Greene County		√	√	√	√	√	√	√	√	√
JD1		√	√	√	√	√	√	√	√	√
JD2		√	√	√	√	√	√	√	√	√
JD3		√	√	√	√	√	√	√	√	√
JD4		√	√	√	√	√	√	√	√	√
JD5		√	√	√	√	√	√	√	√	√

Staffing Resources

Having a planner or engineer trained in land development, construction practices, or one who has an understanding of natural or man-made hazards are great resources to a community. Having their level of knowledge and expertise will help in the process of assessing and mitigating risks while limiting risk to new development or redevelopment.

Floodplain Management

By employing floodplain management, the jurisdiction can protect its citizens against much of the devastating financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

Surveyors

Surveyors gather information that is needed by the city engineers or city projects that involve development or redevelopment. A surveyor records geographic conditions and man-made features as they currently exist. Other noted information might include: terrain, drainage, property boundaries and ownership, soil condition, and other physical features.

GIS/HAZUS

Geographical Information Systems (GIS) and HAZUS are powerful resources that the jurisdictions can be used to identify important facts about the community. HAZUS is

methodology for estimating potential losses from earthquakes and floods. HAZUS uses GIS technology to estimate physical, economic, and social impacts of disasters.

Emergency Manager

An emergency manager performs administrative and technical work in the development, implementation, and coordination of the community's emergency management program. This position also acts as the authority in disaster recovery efforts, oversees the disaster training, exercises and public awareness programs, and performs related duties as assigned.

4.1.3 Financial Capabilities

Financial Capability

Jurisdiction	Capital Improvements Project Funding	Authority to levy taxes for specific purposes	Water, Sewer, Gas, or Electric Service Fees	Incur fees for new development	Incur debt through general obligation funds and/or special tax bonds	Community Development Block Grant	Federal funding programs	State funding programs
Greene County	√	√			√	√	√	√
JD1	√	√	√	√	√	√	√	√
JD2		√	√				√	√
JD3		√	√				√	√
JD4		√	√				√	√
JD5		√	√				√	√

4.1.4. Education and Outreach Capabilities

Education & Outreach Capability

Jurisdiction	Local citizen groups/Non-profit organizations willing to assist with mitigation activities	Ongoing public education or information programs	Natural disaster or safety related programs	StormReady Certification	Firewise Communities Certification	Public-Private partnership initiatives addressing disaster-related issues
Greene County	√	√	√			√
JD1	√	√	√			√
JD2	√	√	√			√
JD4	√	√	√			√
JD5	√	√	√			√

StormReady

StormReady is a national voluntary program, administered through the National Weather Service, which gives communities the skills and education needed to cope with and manage potential weather-related disasters, before and during the event. The program encourages communities to take a new pro-active approach.

Firewise

Firewise communities are those that have taken appropriate measures to become more resistant to wildfire structure damage. Firewise techniques include minimizing the risk of home ignition by carefully landscaping around residential structures such as thinning trees and brush and choosing fire-resistant plants, selecting ignition-resistant building materials, and positioning structures away from slopes.

4.1.5 Opportunities for Public Education and Outreach

Education opportunities exist for disseminating emergency preparedness information to diverse populations. Most, if not all of the following entities / capabilities were identified in Greene County:

- Agribusiness organizations (UofA Extension, Future Farmers of America, CO-OPs)
- Amateur radio organizations (Ham Radio)
- Annual calendar promotions – National Preparedness month, Fire Prevention Week, Great American Shakeout, etc.

- Business/fraternal groups (Lions, Rotary, Optimists, American Business Women's Association, Kiwanis, Exchange Club, Masons, Veterans of Foreign Wars, American Legion)
- Paragould Regional Chambers of Commerce
- Coalition meetings
- Direct mailing pieces
- FEMA and other free online training venues
- Insurance groups
- Local Emergency Planning Committees (LEPCs)
- National Weather Service storm spotter training
- Neighborhood watch programs
- Point of Sale (POS) sites
- Parent-Teacher Organizations
- Public education campaigns/Social media
- Public lecture series, seminars. Webinars, demonstrations
- Public Service Announcement (PSAs) and other media campaigns
- Schools/student organizations
- Special events (rodeo, county fair, health fairs, street shows)
- Targeted outreach products developed by Greene County OEM
- Town Hall meetings or topic specific public forums
- Utility companies
- Volunteer Organizations Active in Disaster (VOAD)
- Web sites, public white boards, Facebook pages
- Wednesday newspaper inserts or display advertising
- Youth groups (YMCA, Boys & Girls Club, Scouting, and entrepreneurial groups).

4.1.6 School District Capability Assessment

School Districts were asked to provide information on their capabilities as they relate to those outlined for each participating jurisdiction. Each School Superintendent answered the following questions:

1. Has your school district had positive responses to bond issues?
2. Based on population, is the school district population growing or declining?
3. Has the school district taken any measures to protect students during hazard events?
4. List any damages your school has experienced during the last 10 years due to weather events or natural disaster.

JD1 Public Schools (Paragould School District)

1. Has your school district had positive responses to bond issues? **Yes, current bonds in place are highly supported within the district.**

2. Based on population, is the school district population growing or declining? **The school district is growing.**

3. Has the school district taken any measures to protect students during hazard events? **Yes, the school district has a newly-built safe area at Oak Grove Middle School as well as the Rave Panic button system for all campuses.**

4. List any damages your school has experienced during the last 10 years due to weather events or natural disaster: **None.**

Other capabilities identified include: JD1 PS has Capital Improvements Plan. The district has an Emergency Action Plan and an ongoing Continuity of Operations Plan, which include the schematics of utility cut-offs. Additionally, a transportation director is on staff. JD1 PS conducts drills multiple times each year to meet the state requirements for safety drills. The District also identified the following: local citizen groups willing to assist with mitigation activities, ongoing public education or information programs, natural disaster or safety related programs, public-private partnerships addressing disaster related issues. The district can continue to expand on capabilities through continued education and coordination with Greene County Emergency Management.

JD1 Public Schools (Greene County Tech School District)

1. Has your school district had positive responses to bond issues? **Yes, current bonds in place are highly supported within the district.**

Based on population, is the school district population growing or declining? **The school district is growing.**

5. Has the school district taken any measures to protect students during hazard events? **The district has no safe room available, but utilizes the Rave Panic Button in all campuses.**

6. List any damages your school has experienced during the last 10 years due to weather events or natural disaster: **None.**

Other capabilities identified include: JD1 PS has Capital Improvements Plan. The district has an Emergency Action Plan and an ongoing Continuity of Operations Plan, which include the schematics of utility cut-offs. Additionally, a transportation director is on staff. JD1 PS conducts drills multiple times each year to meet the state requirements for safety drills. The District also identified the following: local citizen groups willing to assist with mitigation activities, ongoing public education or information programs, natural disaster or safety related programs, public-private partnerships addressing disaster related issues. The district can continue to expand on capabilities through continued education and coordination with Greene County Emergency Management.

JD2 Public Schools (Marmaduke School District)

Has your school district had positive responses to bond issues? **Yes, current bonds in place are highly supported within the district**

- 1.
2. Based on population, is the school district population growing or declining? **The school district population is steady in recent years.**
3. Has the school district taken any measures to protect students during hazard events? **In 2008, the school district completed a FEMA-approved 800-1,000-person capacity community safe room on campus. The school district also utilizes the Rave Panic Button system.**
4. List any damages your school has experienced during the last 10 years due to weather events or natural disaster: **None.**

Other capabilities identified include local citizen groups willing to assist with mitigation activities and ongoing public education or information programs. The district can continue to expand on capabilities through continued education and coordination with Greene County Emergency Management.

4.1.7 Conclusion

The capability assessment finds that Greene County and the participating jurisdictions collectively have a significant level of legal, technical, and fiscal tools and resources necessary to implement hazard mitigation strategies. All of the jurisdictions have the legal capabilities, ordinances, and codes in place that have the potential to reduce loss due to a disaster. The jurisdictions, including school districts, have a range of staff who have knowledge about hazards and their impacts. While some jurisdictions lack an Emergency Manager in their community, the Greene County Emergency Management Department can provide assistance.

All participating jurisdictions have financial resources that can be used towards mitigation. Most of those resources are Capital Improvement funds or tax bonds. JD1 PS, JD2 PS rely on their respective communities for wildfire mitigation actions and funding.

All communities in Greene County have local citizen groups that are willing to assist in emergency management efforts. While most jurisdictions participate in the safety related school programs and are not yet StormReady certified, none of the jurisdictions are a Firewise community. Greene County and JD1 have incorporated a community wildfire plan, while Greene County solely utilize burn bans.

The Greene County Planning Committee put a significant amount of effort into making this plan a useful document. Because the information in this plan is relevant and was developed by the planning team members directly, the plan will be more easily integrated into the plans and ordinances listed in this section. The Emergency Manager for the county and each respective jurisdiction will provide a copy of this plan to parties responsible for other planning processes in the planning area. This document can be integrated into other plans when determining future growth areas, Capital Improvement projects, building code and ordinance proposals, and prioritizing local funds.

Note: All public schools in the planning area also have on-campus School Resource Officers.

4.2 NFIP Participation

Greene County has been a National Flood Insurance Program (NFIP) Community since December 13, 1977, CID # 050435, and has adopted a Flood Damage Prevention Ordinance that restricts development in floodplain areas, through a building development permit system. A copy of this ordinance may be found at the Greene County Courthouse Office of the County Commissioners.

The City of JD1 is the Greene County Seat and has been a participant in the NFIP since September 7, 1973, CID # 050085. The City of JD2 has been participating in the NFIP since December 13, 1977, CID # 050346. The City of JD3 has been participating in the NFIP since December 13, 1977, CID # 050510. The Town of JD 4 has been participating in the NFIP since July 10, 1979, CID # 050569. The Town of JD5 has been participating in the NFIP since December 13, 1977, CID # 050252. Each jurisdiction has in place a Flood Damage Prevention Ordinances which are reviewed annually for compliance. In addition, each jurisdiction provides reference material on flood hazards, flood insurance, and proper construction measures to all builders and residents applying for building permits. There are 0 Repetitive Loss and 0 Severe Repetitive Loss Properties in Greene County.

4.3 Mitigation Goals

During the update of the Greene County Hazard Mitigation Plan the goals were reviewed and were found to be adequate for the update of the plan:

Goal 1: To increase countywide ability to communicate and respond quickly and efficiently to disasters.

Goal 2: To enhance public awareness and understanding of hazard mitigation.

Goal 3: To enhance the availability of lightening detection systems in schools.

Goal 4: To develop and educate responders and health care providers regarding mitigated measures for specific hazards.

Goal 5: To enhance the availability of community saferooms.

4.4 Action Items

Action Item 1	Additional County-Wide Outdoor Warning Devices
Hazard(s) Addressed	Tornado, Flood, High Wind, Lighting, Hail, Dam Failure, Earthquakes*
Jurisdiction(s)	All jurisdictions
Action	Purchase and install additional outdoor warning devices for the incorporated communities in order to supplement current devices. The Emergency Management Directors should review the effectiveness of the current warning devices and upgrade as needed. Some current devices are not reaching all areas of the communities as growth has caused expansion beyond the capabilities of the original devices. Current systems need additional capability to warn communities of more than one hazard.
Responsible Party	Mayors of each jurisdiction, Greene County Emergency Management
Potential Implementation Timeline	Ongoing as funding becomes available

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Cost	\$30,000 per unit, 10 units county wide (total=\$300,000)
Potential Funding Sources	HMGP, Community Budget, REAP funds, Dept. of Agriculture and Dept. of Public Safety

*Note: Flood and Dam Failure are site-specific hazards. Not all jurisdictions listed are vulnerable to the site-specific hazards addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 2	County-Wide Communications System
Hazard(s) Addressed	All hazards listed in HM plan*
Jurisdiction(s)	Greene County, JD1, JD2, JD3, JD4, and JD5
Action	An additional communications tower which will allow dependable communications between the Emergency Operations Center and the communities of JD2, JD3, JD4, JD1, and JD5 need to be purchased and a site needs to be found at which the tower can be constructed allowing telecommunication throughout the county.
Responsible Party	Emergency Management Director and Greene County
Potential Implementation Timeline	Ongoing as funding becomes available
Cost	\$100,000-equipment, tower and long-term land lease
Potential Funding Sources	HMGP, CDBG

*Note: Flood and Dam Failure are site-specific hazards. Not all jurisdictions listed are vulnerable to the site-specific hazards addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 3	Public Education and Awareness Campaign
Hazard(s) Addressed	All hazards listed in plan*
Jurisdiction(s)	All jurisdictions, Greene County
Action	Prepare a public education and awareness campaign, distributing awareness and safety literature through utility inserts and to school children to take to home. This should include information on all hazards identified in this plan.
Responsible Party	Emergency Management Director & Red Cross
Potential Implementation Timeline	6-12 Months
Cost	\$10,000
Potential Funding Sources	County/Community Budgets, HMGP

*Note: Flood and Dam Failure are site-specific hazards. Not all jurisdictions listed are vulnerable to the site-specific hazards addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 4	Erosion Assistance on County Roads
Hazard(s) Addressed	Flood, Hail, Tornados, Winter Storm
Jurisdiction(s)	Greene County
Action	Apply rip-rap to several county road locations to prevent deterioration of the roadbed. Heavy rains frequently cause erosion of the roads.
Responsible Party	Greene County
Potential Implementation Timeline	1 year
Cost	\$100,000
Potential Funding Sources	County Budget, REAP, HMGP

Action Item 5	Educate Public on Flood Insurance and the NFIP
Hazard(s) Addressed	Flood
Jurisdiction(s)	Greene County, JD1, and JD2
Action	Host educational workshops regarding flood insurance and the NFIP
Responsible Party	County Flood Plain Coordinator & Emergency Management Director
Potential Implementation Timeline	Conduct workshop on an annual basis as funding is available.
Cost	\$10,000
Potential Funding Sources	County Budget, OFMA grant, HMGP

Action Item 6	National Flood Insurance Program Participation
Hazard(s) Addressed	Flood
Jurisdiction(s)	JD1 and JD2
Action	Add the Towns of JD1 and JD2 into the National Flood Insurance Program and meet mitigation criteria for enrollment.
Responsible Party	Mayors of JD1 and JD2

Potential Implementation Timeline	1 Year
Cost	\$50,000
Potential Funding Sources	Town Budget, REAP, OWRB

Action Item 7	Develop and Distribute Digital Mapping of Appropriate Areas Which Impact Disaster Mitigation and Disaster Recovery
Hazard(s) Addressed	All hazards listed in plan*
Jurisdiction(s)	All jurisdictions
Action	GPS Identification and Mapping
Responsible Party	Emergency Management Coordinator and County LEPC
Potential Implementation Timeline	1 year
Cost	\$25,000
Potential Funding Sources	City/County Budget, REAP

*Note: Flood and Dam Failure are site-specific hazards. Not all jurisdictions listed are vulnerable to the site-specific hazards addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 8	Construct Safe Room in County Schools
Hazard(s) Addressed	High Wind, Tornado
Jurisdiction(s)	JD4 PS
Action	Build a safe room in JD4 PS High School
Responsible Party	School District Superintendents
Potential Implementation Timeline	Ongoing as funding allows
Cost	\$159,000
Potential Funding Sources	School Bond Issues, HMGP

Action Item 9	Education on Public Land Management
Hazard(s) Addressed	Drought, Wildfire
Jurisdiction(s)	All jurisdictions

Action Item 10	Public Education of Dangers Associated with Extreme Temperature Events
Hazard(s) Addressed	Extreme Heat
Jurisdiction(s)	All jurisdictions
Action	Work with Greene County on a public education campaign informing citizens of the dangers associated with extreme temperature events such as heat exhaustion, heat stroke, etc.
Responsible Party	Greene County Emergency Manager
Potential Implementation Timeline	24 months
Cost	\$8,000
Potential Funding Sources	Budget

Action Item 11	Upgrade Construction Technique for Future Buildings
Hazard(s) Addressed	Lightning, Hail, Tornado, High Winds, Winter Storm
Jurisdiction(s)	All jurisdictions
Action	Use hail and wind resistant construction techniques when constructing new critical facilities. This will reduce loss of life and property, and continued operability of facilities during weather events. A continuous load path will also strengthen the integrity of facilities during winter storm events.
Responsible Party	Greene County Emergency Manager, Community Officials, School Officials
Potential Implementation Timeline	24 months
Cost	\$8,000
Potential Funding Sources	Budget

Action Item 12	Purchase and Installation of Generators to Power Critical Facilities
Hazard(s) Addressed	Winter Storms, Tornados, High Wind, Lightning, Drought, Flood, Extreme Heat*
Jurisdiction(s)	All jurisdictions
Action	Install generators at critical facilities in Greene County such as the Greene County Courthouse, County Barns rural water districts, shelters, nursing home, etc.

Responsible Party	Greene County Emergency Manager
Potential Implementation Timeline	36 months
Cost	\$250,000
Potential Funding Sources	HMGP, County Budget

*Note: Flood is a site-specific hazard. Not all jurisdictions listed are vulnerable to the site-specific hazard addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 13	Tree Management
Hazard(s) Addressed	Winter Storms
Jurisdiction(s)	Greene County
Action	Work with all Greene County utility providers and citizens to develop and implement programs to keep trees from threatening utility infrastructure, lives, and property.
Responsible Party	Greene County
Potential Implementation Timeline	24 months
Cost	\$1,00,000
Potential Funding Sources	Greene County Budget, HMGP

Action Item 14	Lightning Detection Systems and Warning System
Hazard(s) Addressed	Lightning
Jurisdiction(s)	All jurisdictions
Action	Purchase and install lightning detection and warning system, allowing local and school officials to move spectators indoors when lightning threatens.
Responsible Party	Greene County Emergency Management Director
Potential Implementation Timeline	30 Months
Cost	\$18,000
Potential Funding Sources	HMGP, County Budget

Action Item 15	Lightning Suppression Systems at Critical Facilities
Hazard(s) Addressed	Lightning
Jurisdiction(s)	Greene County, JD1, JD2, JD3, JD4, and JD5
Action	Install lightning protection and suppression systems protecting radios and other essential equipment at critical facilities throughout the County.
Responsible Party	The Mayors of each community and the Greene County Emergency Management Director
Potential Implementation Timeline	24 Months
Cost	\$150,000
Potential Funding Sources	HMGP, County Budget

Action Item 16	Rebate Program to Create Defensible Space Around Residential and Commercial Structures in Wildfire Concern Areas.
Hazard(s) Addressed	Wildfires
Jurisdiction(s)	All jurisdictions
Action	Implement defensible space program in areas with high wildfire concern.
Responsible Party	The Mayors of each county and the Greene County Emergency Management Director
Potential Implementation Timeline	36 Months
Cost	\$50,000
Potential Funding Sources	HMGP, County Budget

Action Item 17	Install Fire Breaks
Hazard(s) Addressed	Wildfires
Jurisdiction(s)	All jurisdictions
Action	Provide Fire Breaks
Responsible Party	Mayors of each community and the Greene County Commissioners

Potential Implementation Timeline	24 Months
Cost	Less than \$10,000.00
Potential Funding Sources	Greene County and Municipal resources

Action Item 18	Renew Current and Future Commitment to Floodplain Management
Hazard(s) Addressed	Flood
Jurisdiction(s)	Greene County, JD1, JD2, JD3, JD4, and JD5
Action	Pass resolutions renewing present and future commitment to enforcement of floodplain management ordinances/regulations
Responsible Party	Mayors of each community and Greene County Government
Potential Implementation Timeline	24 Months
Cost	Less than \$5000.00
Potential Funding Sources	Greene County, Local Municipal Resources

Action Item 19	Reduction of Earthquake Property Damage
Hazard(s) Addressed	Earthquakes
Jurisdiction(s)	All jurisdictions
Action	Coordinate with participating jurisdictions to adopt and utilize international building code standards for seismic design in order to reduce potential damages from earthquake activity.
Responsible Party	Greene County Emergency Manager, Mayors of each community, and school superintendents
Potential Implementation Timeline	1 year
Cost	\$15,000
Potential Funding Sources	Operating Budget, STCI, HMGP

Action Item 20	Public Education on the Possibility of Earthquakes
Hazard(s) Addressed	Earthquakes
Jurisdiction(s)	All jurisdictions
Action	Educate the public on the possibility of earthquakes and how to mitigate earthquake damage. This is in addition to the material provided in Action Item 3, due to the recent uptick in earthquake activity across OK and the public unease about this hazard.
Responsible Party	Greene County
Potential Implementation Timeline	1 Year
Cost	Less than \$5000.00
Potential Funding Sources	Budget, HMGP

Action Item 21	Inventory and Inspect Permitted Dams
Hazard(s) Addressed	Dam Failure, Flood
Jurisdiction(s)	Greene County
Action	Coordinate dam inspections and maintenance requirements with dam owners. This will continue to be Greene County's policy.
Responsible Party	Greene County
Potential Implementation Timeline	1 year
Cost	\$10,000
Potential Funding Sources	County Funds

Action Item 22	Provide Early Flood Warning to the Public
Hazard(s) Addressed	Levee Failure, Flood*
Jurisdiction(s)	Greene County, JD1, JD2, JD3, JD4, and JD5
Action	Provide early flood warnings to the public, and have a detailed flood response plan for the residents of the planning area.

Responsible Party	Greene County
Potential Implementation Timeline	2 Years
Cost	\$100,000.00
Potential Funding Sources	HMGP

*Note: Dam Failure is a site-specific hazard. Not all jurisdictions listed are vulnerable to the site-specific hazard addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 23	Dam Failure and Flood Evacuation and Sheltering
Hazard(s) Addressed	Dam failure and flood*
Jurisdiction(s)	Greene County, JD1, JD2, JD3, and JD5
Action	Incorporate evacuation routes and procedures for the areas affected by dam failure or flood, and establish dry area shelter locations within the Greene County.
Responsible Party	Greene County
Potential Implementation Timeline	2 Years
Cost	\$10,000.00
Potential Funding Sources	HMGP

*Note: Dam Failure is a site-specific hazard. Not all jurisdictions listed are vulnerable to the site-specific hazard addressed. Jurisdictions at risk to these hazards are outlined in the risk assessment.

Action Item 24	Implement Fuel Reduction Program for Schools
Hazard(s) Addressed	Wildfire
Jurisdiction(s)	JD1 PS, JD2 PS, JD3 PS, JD4 PS, and JD5 PS
Action	Perform vegetation maintenance, including fuel management techniques such as pruning and clearing dead vegetation, selective logging, cutting high grass, planting fire-resistant vegetation, and creating fuel/fire breaks to areas where the spread of wildfires will be slowed or stopped by the removal of fuels.
Responsible Party	Greene County, School Superintendents
Potential Implementation Timeline	Annual (on-going)

Cost	Annual budget
Potential Funding Sources	HMGP

4.5 Action Item Prioritization

The Greene County Hazard Mitigation Planning Committee reviewed, analyzed, and prioritized the action items using the Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) Method. This enabled the committee to ensure that an appropriate Cost Benefit performance was maintained. The mitigation goals previously listed were determined to have the greatest benefit in hazard reduction to the county. This priority remains the same from the previous plan, and will be readdressed in the five-year update to account for any growth and development in the planning area.

STAPLEE Evaluation

Category	Evaluation
Social	Members of Local, County, State, and Federal Government were members of the Hazard Mitigation Planning Committee and had input throughout the planning process. It must be noted that many small town political leaders are also business or professional persons. Existing community plans were used wherever possible. Members of the media were contacted and invited to attend all HMPC meetings.
Technical	The following persons/agencies were consulted as to the technical feasibility of the various projects: Greene County Justices of the Peace, UofA Agriculture Extension Service, USDA Soil Conservation Service, Greene County and Arkansas Health Departments, and Arkansas Forestry Service. All comments and suggestions received were incorporated into the prioritization.
Administrative	Staffing for proper implementation of the plan will rely on existing members of the various agencies involved. It is the opinion of the committee that current staffing levels are insufficient, and this is due to budget constraints. Technical assistance is available from Paragould Regional Chamber of Commerce and various State agencies. JD1 has incorporated hazard mitigation efforts into their Capital Improvement Plan. The Local Emergency Planning Committee in Greene County, led by the Greene County Emergency Management Coordinator, has agreed to an annual review and assessment of the plan and its progress. Operations costs are under discussion by the relevant department heads.
Political	A representative of the Greene County Justices of the Peace and each local government, (the Mayors or his/her representative), attended the HMPC meetings and were consulted on all aspects of the HM Plan.
Legal	Members of the HMPC discussed legal issues with the County Justices of the Peace, and it was their opinion that no significant legal issues were involved in the projects that were selected by the HMPC.

Economic	Economic issues were the predominant issues discussed by all concerned. Each entity felt the projects selected would help the community be better prepared for a disaster and would have a positive effect, including attracting additional business and recreation to the area. Funding for the various projects was the major concern as local budgets were not capable of fulfilling the needs due to the economic down turn. Reliance on outside grants will be relied on heavily for completion of projects. A cost benefit analysis was prepared and used in determining the feasibility of each project. Some communities felt it would require a bond issue to fulfill the project, while others felt that the funds could be raised by cutting funding to other projects or relying on grant assistance.
Environmental	X Department of Environmental Quality, X Forestry Service, and the X Water Resources Board were all consulted on the various action items proposed. They determined there would be no negative impact. Local governments are currently considering zoning of environmentally sensitive areas.

4.6 Integration of Data, Goals, and Action Items

The Greene County Hazard Mitigation Plan will be incorporated into all jurisdictions on multiple levels. To begin with, the mitigation goals and action items will be posted onto each jurisdiction's website to begin the process of public "buy-in." This is an important first step in educating the public on the benefits of hazard mitigation and encouraging communities to invest in proposed projects.

The tables listed in sections 4.1.1, 4.1.2, 4.1.3, and 4.1.4 outline the planning mechanisms that Greene County, JD1, JD2, JD3, JD4, and JD5 have to incorporate hazard mitigation data, goals, and action items. This plan will be reviewed annually by local governments to look for opportunities for hazard mitigation into existing Emergency Action Plans, Capital Improvement Plans, building codes, and local regulations.

JSD1 PS and JD2 PS will evaluate all applicable mitigation action items annually to determine which ones can be incorporated into proposed bond issues.

CHAPTER FIVE: PLAN UPDATE PRIORITIZATION AND REVIEW

5.1 Changes in Jurisdictional Development

Greene County and participating jurisdictions experienced some changes in development since planning began. There was a steady increase in population and new housing growth over the past three years in all planning jurisdictions, especially JD1. Unemployment in Greene County in May 2016 was reported at 3.9 % while in May 2017 it dropped to 3.2 %. 55 housing permits were issued for JD1 in 2016 while 59 permits were issued in 2017 for the same period.

All public schools in the planning area saw increases in enrollment.

5.2 Status of Previous Mitigation Action Items

Action Items Accomplished

Action Item	Hazard Mitigated	Jurisdiction Impacted
Upgrade of warning devices	Tornado	JD1
Construction of interoperability 911 dispatch center in JD1	All listed in HM plan	All jurisdictions
Continuing public safety outreach programs for citizens in planning area	All listed in HM plan	Greene County / Planning Area
Safe room installed	Tornado, high wind, hail	JD2

Action Items Not Accomplished

Action Item	Hazard Mitigated	Jurisdiction Impacted	Reason Not Accomplished	Is Action Item Still Relevant?
Safe room installation	Tornado, high wind, hail	JD1 PS GCT/P'gould	Lack of Funding	Y
Improved Education on County-specific hazards	All hazards	Planning area	Lack of funding	Y
Community safe room in public Library or community center	Tornado, high wind, hail	JD1	Lack of interest, and concerns about maintaining public shelter and costs associated	Y

5.3 Changes in Jurisdictional Priorities

There has been a slight shift in priorities since the initial development of this plan. Due to the complexities of having saferooms accessible to the public, all jurisdictions have begun encouraging homeowners and landlords to install individual saferooms and on-site saferooms. The intent is to reduce the road traffic during a hazardous weather event and to encourage residents to shelter-in-place. In addition, citizens are encouraged to individually learn about county-specific hazards through materials provided by Greene County Office of Emergency Management.

In addition, Greene County and all participating jurisdictions have also experienced an increase of earthquake awareness campaigns. Although no damage has been reported due to real world earthquake activity, the community is interested in receiving more education as to how earthquake damage can be mitigated.

5.4 Conclusion

The Greene County Planning Committee understands that regular evaluation of this plan, to include the action items listed, will guarantee that this plan serves as a useful tool for all participating jurisdictions. The public also has a vital role to serve in this process. Continuing to canvas public feedback and incorporating it into the evaluation process is a critical step in ensuring our mitigation resources and actions will benefit the highest number of Greene County citizens.

