

CARTER COUNTY OKLAHOMA



HAZARD MITIGATION PLAN 2023 UPDATE

*Including the towns/cities of: Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson
The Public School Districts of: Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis, and Southern Oklahoma Technology Center*

25 A ST NW
Ardmore, OK 73401

Developed by the Carter County Hazard Mitigation Planning Team
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CARTER COUNTY, OKLAHOMA HAZARD MITIGATION PLAN 2022 UPDATE
Participating Jurisdictions

Carter County

The city of:

- Ardmore

The towns of:

- Dickson
- Gene Autry
- Healdton
- Lone Grove
- Ratliff City
- Springer
- Tatums
- Wilson

Public School Districts of:

- Ardmore
- Dickson
- Fox
- Healdton
- Lone Grove
- Plainview
- Springer
- Wilson
- Zaneis

Other:

- Southern Oklahoma Technology Center (Southern Tech)

Distribution List

Agency	#
Carter County Commissioners	1
Carter County Emergency Management	2
City of Ardmore	1
Chickasaw Nation	1
Town of Dickson	1
Town of Gene Autry	1
City of Healdton	1
City of Lone Grove	1
Town of Ratliff City	1
Town of Springer	1
Town of Tatums	1
Town of Wilson	1
Ardmore Public Schools	1
Dickson Public Schools	1
Fox Public Schools	1
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Section 1

Introduction

SECTION ONE

Introduction

This Plan is a hazard mitigation plan update for Carter County, the City of Ardmore, the Towns of Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, and Wilson. This plan also includes the school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, and Zaneis. It also includes Southern Tech. The City of Ardmore and the Ardmore and Plainview School Districts are new participants in this plan. When referring to the “Planning Area,” the term is inclusive of all participating jurisdictions listed. Carter County is bordered by Garvin and Murray Counties to the north, Johnston and Marshall Counties to the east, Love County to the south, and Jefferson and Stephens Counties to the west. The total land area within the County is approximately 834 square miles.



Carter County Planning Area

Planning Process:

Carter County Planning Team Members:

Name	Title	Jurisdiction Represented	Contribution to Planning Process
Paul Tucker Shelly Stahlbusch Cary Williamson Allen Henry Amber Wilson Joe David McReynolds Bill Baker Jerry Alvord Charles Brady James Allen	County EM 911 Coordinator LEPC Health Department EM Commissioner Commissioner Commissioner GIS GIS	Carter County City of Ardmore Carter County Carter County Carter County City of Ardmore Carter County	<ul style="list-style-type: none"> • Lead planning team • Provided County hazard information • Provided County Mitigation Actions • Assembled public comments from Carter County • Provided County capability assessment • Provided mapping data for city/county
Bobbie Robbins *Robert Thornton Ron Hayes *Sally Jantz Brian Scribner *Frank Schaff *David Colaw Troy Duke *Judy Cavner Lovie Carter *Stacy Phelps Chris Young Ann Marutzky Denny Meeks Justin Nipp Herbert McConnell	City Clerk EM EM City Manager Water Sup. Mayor Vice-Mayor Fire Chief Mayor City Clerk Fire Chief Code Officer City Clerk Fire Chief Fire Chief Fire Chief	Ratliff City Ratliff City Healdton Healdton Healdton Wilson Gene Autry Dickson Springer Tatums Lone Grove Lone Grove Wilson Springer Wilson Tatums	<ul style="list-style-type: none"> • Provided city hazard information • Provided city mitigation actions • Provided city capability assessment
Matt Krimmer *Jeff Coclosure *Brent Phelps *Terry Shaw *Mary Jane Miller *Cynthia Hunter *Tonya Finnerty *Ryan Cole *Kerry Blankenship Sherry Carlile *Mr. Kim Holland *Karl Stricker	Principle Superintendent Superintendent Superintendent Superintendent Superintendent Superintendent Superintendent Safety Secretary Superintendent Superintendent	Dickson Schools Dickson Schools Fox Schools Healdton Schools Lone Grove Schools Springer Schools Wilson Schools Zaneis Schools Southern Tech Wilson Schools Ardmore Schools Plainview Schools	<ul style="list-style-type: none"> • Provided school district hazard information, mitigation actions, and capability assessment. • Assembled public comments from school district staff.
Charles Newell Steven Leverett	Citizen Citizen	Dickson Springer	<ul style="list-style-type: none"> • Provided mitigation actions and hazard information.

Shawn Duke	Citizen	Dickson	
Kevin Stearns	Citizen	Wilson	

*Denotes primary contact for jurisdiction.

The Carter County Hazard Mitigation Planning Committee was formed to provide guidance during the preparation of this Plan. This committee was comprised of representatives from local government, County Commissioners, state government, local businesses/industries and citizens. Their contribution to the planning process is listed in the chart above.

The Carter County Hazard Mitigation Plan update was developed during several meetings that were held throughout the county from September 2021 thru December 2021 to allow participants the opportunity to provide input for the plan update. The public provided input on mitigation action items and hazard information. The public was invited to the six planning meetings thru a variety of means, to include, social media posts, website postings and postings on community boards within City Halls and other locations.

Meeting Date:	Location:
10-5-2021	Ardmore Public Library, Ardmore
11-9-2021	Dickson Community Center, Dickson
11-18-2021	Healdton Armory, Healdton
12-1-2021	Ardmore Public Library, Ardmore
12-7-2021	Dickson Community Center, Dickson
12-9-2021	Healdton Armory, Healdton

Information pertaining to capabilities of the jurisdictions and schools districts was also collected to be incorporated into the plan update.

Several school districts and towns were unable to attend meetings held on the above listed dates. However, phone conferences were conducted with Wilson SD (Tonya Finnerty), Healdton SD (Terry Shaw), Springer SD (Cynthia Hunter), Zaneis SD (Ryan Cole), the Town of Springer (Denny Meeks, Lindsey Whittle and Steven Leverett), the town of Wilson (Justin Nipp and Kevin Stearns), the town of Ratliff City (Robert Thornton and Bobbie Robbins), and the town of Tatums (Herbert McConnell).

Discussion was had on the hazards assessment of the County, they were reviewed and determined that they still pose a significant threat to the County and its residents. The top three were determined to be that of Tornados, Wildfire and Flooding. Mitigation actions were reviewed for all hazards and found to be still viable for this plan update. Several new mitigation actions will be added to this update.

Other Stakeholders

There are many public agencies, private organizations, and businesses that contend with natural hazards. These entities were contacted; either in person, via email, or phone to collect information on the hazards and to help determine how their programs could best supports the County’s mitigation program. Among the organizations and agencies contacted were:

Neighboring Communities, Businesses, and Non-Profit Agencies Contacted:

- Walmart Supercenter—Store Manager
- Lowes Home Improvement—Store Manager
- Mercy Hospital Ardmore—Lori Smith, Safety
- Mercy Hospital Healdton—Kasie Owens, Nurse
- Healdton Family Center—Kevin Marshal, Owner
- Delbert’s Grocery—Curtis Key, Manager
- Michelin North America—Clyde Ellis, Safety
- Valero Refinery— Safety Coordinator
- Chickasaw Nation—Sara Billings, Emergency Manager
- American Red Cross—Rene Beezley, Regional Coordinator
- The Salvation Army—Nathan Newell, Social Services Director
- Emergency Managers:
 - City of Ardmore—Amber Wilson
 - Town of Healdton—Ron Hayes
 - Garvin County—David Johnson
 - Johnston County—Jason Bryant
 - Love County—Ashleigh Gillham
 - Marshall County—Daniel Nixon
 - Murray County—Brian McDaniels
 - Stephens County—Gary Curtis

State and Federal Agencies Contacted:

- National Weather Service—Rick Smith, Warning Coordination Meteorologist
- Oklahoma Water Resources Board—State NFIP Coordinator
- Oklahoma Department of Emergency Management—Kim Jenson (Hazard Mitigation Planner)
- Oklahoma Department of Emergency Management—Kristal Kuhn (SE Coordinator)
- OSU Extension Office—Taylor Denman (Extension Educator)
- Natural Resources Conservation Service—(District Conservationist)
- US Army Corps of Engineers—(Emergency Manager)

Community Mitigation Goals:

During the update of the Carter County Hazard Mitigation Plan, the goals were reviewed and were found to be adequate for the update of the plan.

- Goal 1: Protect public health and safety and property.**
- Goal 2: Continue to improve infrastructure by reducing potential vulnerability to all hazards in Carter County.**
- Goal 3: Continue to identify and reduce repetitive flooding in Carter County.**
- Goal 4: To enhance pre-disaster and prevention activities.**

Existing Plans/Programs:

There are various local, state, and federal agency operational plans, along with private organizations discussed in the Carter County All-Hazard Mitigation Plan, which coordinate or interact with this Hazard Mitigation Plan. Below is a list of the current plans that were reviewed and integrated, where appropriate, into the Carter County All-Hazard Mitigation Plan:

Plan Title	Information Used
Jurisdictional Emergency Operations Plans	Capability Assessment
State Hazard Mitigation Plan 2019	Hazard definitions, previous occurrence data, disaster history and state goals.
School Emergency Action Plans	Wildfire extent, probability, fuel sources. Evacuation and transportation procedures.
Local Records	Evacuation Routes, High risk areas, vulnerable populations.
Arbuckle Dam Emergency Action Plan	Information was reviewed and integrated into the capability assessment, risk assessment, and mitigation strategy.
Caddo Creek Watershed Emergency Action Plans for Dam Nos. 8, 13, 18, 27 & 29.	Information was reviewed and integrated into the capability assessment, risk assessment, and mitigation strategy.
Marshall County Hazard Mitigation Plan 2022	General guidance on the hazard mitigation activities and history of mitigation activities within Marshall County.
Pittsburg County Hazard Mitigation Plan 2021	General guidance on the hazard mitigation activities and history of mitigation activities within Pittsburg County.
Chickasaw Nation Hazard Mitigation Plan 2021	General guidance on the hazard mitigation activities and history of mitigation activities within The Chickasaw Nation.

Plan Point of Contact:

Primary

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Plan Maintenance

Monitoring, Evaluating, and Updating Plan:

The Carter County and City of Ardmore Emergency Managers will perform any necessary monitoring site visits on an as needed basis. He/she will also be the lead contact for phone calls, scheduling of meetings, and will:

- Monitor and evaluate the hazard analysis for changes and additions.
- Monitor and evaluate the objectives and determine if they meet current and expected hazardous conditions.
- Determine if there were any implementation problems, such as social, technical, administrative, political, legal, economic, and environmental or coordination issues with other agencies.

The mayors, superintendents, and emergency management (planning team) will be responsible for the monitoring. The emergency managers will be responsible for the evaluation of the plan. The plan will remain an active and relevant document with continued public participation.

The chairperson of the planning team will be responsible for notifying planning team members regarding scheduled meetings and topics. If any planning team members are not able to continue as part of the planning team the lead representative of each plan participant will be responsible to designate a new planning team member to represent their community.

Annually the planning team will meet to evaluate the risk assessment to ensure the hazard information along with the vulnerabilities and impacts originally addressed are still valid for the participating communities. The planning team will also monthly monitor and evaluate and document any changes in the processes and requirements identified in the Carter County Hazard Mitigation Plan. The planning team will submit reports at bi-annual meetings summarizing the effectiveness of the ongoing maintenance processes, as well as the incorporation of the Hazard Mitigation Plan into each of the jurisdictions planning mechanisms. In addition to monitoring and evaluating the plan, each representative on the planning team will monitor the progress of the mitigation actions and seek out grant funding as programs announce availability.

Twenty-four months before the plan expiration, the plan update process will begin. The planning team will reconvene quarterly plan development meetings as described in this 2025, Carter County Hazard Mitigation Plan's planning process to discuss the findings of the meetings, update the risk assessment, and revise the strategy and plan components as needed. A draft plan will be submitted to Oklahoma Emergency Management for review twelve months before the plan expiration. Any revisions will be incorporated into the document as necessary, and the plan resubmitted to FEMA for approval. Once approved, participating jurisdictions will adopt the plan by resolution.

Continued Public Participation and Involvement:

Carter County will involve the public directly in the continual reshaping and updating of the Hazard Mitigation Plan. The Carter County Emergency Management Director and the City of Ardmore Emergency Management Director, with the assistance of the planning committee will conduct an annual review of the Plan. The Plan will be updated every five years. Every attempt will be made to ensure the public will be able to directly comment on and provide feedback about the Plan by utilizing electronic surveys/forms, and e-mails. Meetings will be publicized on Emergency Management websites and social media pages and open to the public for comment. City and county websites will also be utilized to notify the public and additional stakeholders of the opportunity to comment as well as serving as a tool they can utilize to submit comments for review. Upon completion of the update process, the plan will be submitted

to the State and FEMA for approval. These meetings will provide the public a forum where Carter County residents can express their concerns, opinions, or ideas about the Plan.

A copy of this plan will be available at the Carter County Emergency Management office and the plan will be available to any citizen upon request. Copies of the Plan will be distributed to every City Hall, Emergency Management Directors, and School Superintendents.

A draft copy of this plan has been made available for public review and comment at the Carter County Emergency Management Office and the City of Ardmore Emergency Management Office.

Section 2

Capabilities Assessment

SECTION 2

Capability Assessment:

Each community has a unique set of capabilities, including authorities, policies, programs, staff, and funding, and other resources available to accomplish mitigation and reduce long-term vulnerability. By reviewing the existing capabilities in each jurisdiction, the planning team identified capabilities that currently reduce disaster losses or could be used to reduce losses in the future, as well as capabilities that inadvertently increase risks in the planning area. The following is a capability assessment for Carter County and participating municipalities. School Districts completed a capability assessment in November 2021. That information is included at the end of this section.

This table provides a summary of the plans, codes, policies, and ordinances currently in place in each participating jurisdiction. Existing programs and policies were reviewed in order to identify those that may weaken or enhance the hazard mitigation objectives outlined in this document. This list does not necessarily reflect every plan, ordinance, or other guidance document within each jurisdiction; however, this is a summary of the guidance documents known to and recommended for review by the members of the planning team. The checkmark (√) indicates that the jurisdiction reported having the authority to implement the specific regulatory tool and that the tool is currently in place.

Legal and Regulatory Capabilities

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purpose Ordinance	Comprehensive Plan	Capital Improvement Plan	Economic Improvement Plan	Emergency Operations Plan	Post Disaster Recovery Plan	Site Plan Review Requirements
Carter County				√				√		
Ardmore	√	√	√	√	√	√	√	√		√
Dickson	√	√	√					√		
Gene Autry				√				√		
Healdton	√	√		√			√	√		√
Lone Grove	√	√	√			√	√	√		
Ratliff City				√				√	√	
Springer								√		
Tatums								√		
Wilson				√				√		

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 table below provides a summary of the administrative and technical capabilities currently in place in each participating jurisdiction. The checkmark (√) indicates that the local government reported maintaining a staff member 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
Carter County	Contract Only	Contract Only	√	√	Contract Only	√	√		√	√
Ardmore	√	√	√	√	Contract Only	√	√		√	√
Dickson									√	
Gene Autry				√					√	
Healdton	Contract Only	Contract Only		√	Contract Only				√	
Lone Grove				√			√		√	
Ratliff City									√	√
Springer									√	
Tatums									√	
Wilson				√					√	

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 cost associated with flood disasters to all levels of government.

Carter County has been a National Flood Insurance Program (NFIP) Community since May 11, 2012, CID # 400030 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 Carter County Emergency Management Office of the County Commissioners and is available

online. Carter County Emergency Management also maintains a copy of the Flood Damage Prevention Ordinances for the towns of Lone Grove and Healdton.

The City of Ardmore has been a participant in the NFIP since January 6, 1982. The Town of Gene Autry has been a participant in the NFIP since November 1, 2007, CID # 400032. The Town of Healdton has been participating in the NFIP since January 2, 1986, CID # 400033. The City of Lone Grove has been participating in the NFIP since March 16, 1989, CID # 400395. The Town of Wilson has been participating in the NFIP since July 3, 1985, CID # 400035. Each jurisdiction has in place Flood Damage Prevention Ordinances.

The Town of Dickson, Ratliff City, Springer, and Tatums (no mapped flood zones within town limits) are not listed as participants in the NFIP, but are investigating what needs to be done for their jurisdictions to become NFIP compliant. These jurisdictions are also in the process of identifying a floodplain manager.

There are 2 Repetitive Loss (homes) and 0 Severe Repetitive Loss Properties in Carter County, both are located within the City limits of Healdton.

In total there are only 2 Repetitive Loss Structures (homes) within Carter County.

Carter County, the City of Ardmore, and the towns of Lone Grove, Healdton, Gene Autry and Wilson will continue compliance in the NFIP by having continual education of floodplain managers on a yearly basis.

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	Community Development Block Grant	Federal funding programs	State funding programs
Carter County		√			√		√	√
Ardmore	√	√	√		√	√	√	√
Dickson								
Gene Autry								
Healdton	√	√	√		√	√		
Lone Grove	√	√	√	√	√			
Ratliff City	√	√	√		√			
Springer								
Tatums								
Wilson								

Education and Outreach Capability

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	Fire wise Communities Certification	Public-Private partnership initiatives addressing disaster-related issues
Carter County	√	√	√	√		√
Ardmore	√	√	√	√	√	√
Dickson						
Gene Autry						
Healdton	√	√				
Lone Grove	√	√	√			
Ratliff City	√	√	√	√		√
Springer						
Tatums						
Wilson						

OPPORTUNITIES FOR PUBLIC EDUCATION AND OUTREACH:

Countless education opportunities exist for disseminating emergency preparedness information to diverse populations.

Most, if not all of the following entities/capabilities were identified in Carter County:

- Agribusiness organizations (OSU Extension, Future Farmers of America, CO-OPs).
- Amateur radio organizations.
- Annual calendar promotions—National Preparedness Month, Fire Prevention Week, etc.
- FEMA and other free online training venues.
- Local Emergency Planning Committees (LEPCs).
- National Weather Service storm spotter training.
- Public education campaigns.
- Public lecture series, seminars.
- Public Service Announcements (PSAs) and other media campaigns.
- Schools/student organizations.
- Special events (rodeos, county fair, health fairs, street shows).
- Town Hall meetings or topic specific public forums.
- Volunteer Organizations Active in Disaster.
- Web sites, public white boards, Facebook pages.
- Youth groups (YMCA, Boys & Girls Club, Scouting, and entrepreneurial groups).
- Community Emergency Response Teams (CERTs).

SCHOOL DISTRICT CAPABILITY ASSESSMENT:

The **Oklahoma Department of Education** oversees public K-12 education and public libraries in Oklahoma. Following the ratification of the Oklahoma Constitution in 1907, the governor, secretary of state and the attorney general of Oklahoma served as the State Board of Education. The Department in its current iteration was created by the Oklahoma School Code of 1971, which also established the Oklahoma State Board of Education.

The **Oklahoma public school system** (prekindergarten through grade 12) operates within districts governed by locally elected school boards and superintendents.

Oklahoma Public School Funding

Ad Valorem Tax Levies

General Fund:

15-mill Levy	15 mills**	Certification of Need
County 4-mill Levy	4 mills	Constitutional
County 15-mill Levy	5 mills	Constitutional
Emergency Levy	5 mills	Majority Vote
Local Support Levy	10 mills	Majority Vote
General Fund = 39 mills		

Building Fund: 5 mills Majority Vote

Sinking Fund: As voted for Bond Issues
and levied for Judgments **

Counties who have done away with their individual personal property tax have been allowed to raise their 15-mill Levy based on a formula in Article X, Section 8A, Paragraph (b) of the Constitution.

In addition to the Ad Valorem the State provides Aid to School districts for salaries and other education needs. Available to schools are additional State and Federal grants too numerous to list.

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 during the planning process:

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 hazardous events?
4. List any damages your school has experienced during the last 10 years due to weather events or natural disaster.

Integration of the Hazard Mitigation Plan into existing school district plans and programs will be handled as follows:

The Emergency Managers will provide a copy of this plan to each school Superintendent for adoption with their School Board. This document will be reviewed by the School Board when they are evaluating their respective Capital Improvement Plans, and it will be reviewed by each school principal when updating each schools' natural hazard response protocols. Information from this document will be integrated during their update/review cycles as needed. Each Superintendent will provide an update on

mitigation action item progress to the Emergency Managers during the annual HM Planning Team review meetings.

School District	Emergency Action Plan	Fire	Tornado	Earthquake	Active Shooter
Ardmore City Schools	√				
Dickson Schools	√				
Fox Schools	√				
Healdton Schools	√				
Lone Grove Schools	√				
Plainview Schools	√				
Springer Schools	√				
Wilson Schools	√				
Zaneis Schools	√				
Southern Technology Center	√				

ARDMORE PUBLIC SCHOOLS:

1. Yes. In the last 7 years on the last two bonds we have passed at 60% or more.
2. Enrollment has decreased this year.
3. Yes, building saferooms, and with all safety drills done throughout the year.
4. 2016 lightning struck the middle school causing \$11,578.00 in damages. In February 2021, \$143,000.00 in damages caused by severe winter weather to 3 buildings throughout the district.

DICKSON PUBLIC SCHOOLS:

1. Yes, latest past in 2015.
2. Slight growth.
3. We are currently working to upgrade security with bond funds and will begin updating safety plan in the fall.
4. Unaware of any damages.

FOX PUBLIC SCHOOLS:

1. Yes.
2. Staying steady.
3. We have emergency plans and conduct emergency drills.
4. Hail and wind damage due to severe storms.

HEALDTON PUBLIC SCHOOLS:

1. Yes
2. Slowly growing—but growing.
3. Yes, we have installed tornado/ballistic proof shelter in the elementary (7) and middle school (2) buildings.
4. A. Football field press box blown down during severe winds.

- B. Severe wind damage to middle school roof.
- C. Many “heavy rain” issues with roofs.
- D. Lightning damage to phones and electrical systems.

LONE GROVE PUBLIC SCHOOLS:

- 1. Yes
- 2. Maintaining and growing.
- 3. We have emergency plans and conduct emergency drills.
- 4. Some damage due to the 2009 tornado and also damages from Tropical Storm Bill in 2015.

PLAINVIEW PUBLIC SCHOOLS:

- 1. Yes, we have had positive responses to the school bonds.
- 2. Our population trend is growing.
- 3. Yes, we will be constructing a saferoom at our middle school which will complete our goal of having a saferoom at each school site.
- 4. We have experienced flood damage to our main gym during the big flooding of 2015. The rain overloaded our roof system and flooded our gym floor. In early 2021, during the freezing event, we had some damage due to bursting pipes.

SPRINGER PUBLIC SCHOOLS:

- 1. Yes, overall there has been support for the board issues.
- 2. Growing slightly.
- 3. Yes, we have the cafetorium/saferoom and there are local individuals who are able to unlock it for community use after school. We have added “go bags” to each classroom for emergencies. We drill and we work with the local fire department.
- 4. Roof damage due to wind/hail/rain. HVAC unit damage due to lightning strikes, several servers and routers ruined due to lightning strikes, and fire suppression unit damaged due to recent ice storm.

WILSON PUBLIC SCHOOLS:

- 1. Yes.
- 2. Slight decline.
- 3. Emergency plans are in place and emergency drills are conducted regularly. Currently have 3 safe rooms on campus to house students during severe weather.
- 4. Lightning damage has been received to several A/C units.

ZANEIS PUBLIC SCHOOLS:

- 1. Have not had any bond issues in over 20 years.
- 2. Growing
- 3. Currently have written emergency plans and conduct emergency drills regularly.
- 4. Have had roof damage due to hail storms.

SOUTHERN OKLAHOMA TECHNOLOGY CENTER:

- 1. We do not do bond issues.
- 2. Growing
- 3. We have emergency plans and conduct emergency drills.
- 4. None.

Capability Assessment Conclusion and Plan Integration into Mechanisms:

Mitigation requires capabilities necessary to reduce loss of life and property by lessening the impacts of disasters. Each jurisdiction has demonstrated a set of capabilities unique to their community. The capability assessment finds that Carter 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 or ordinances and codes in place that might help reduce loss due to a disaster. The jurisdictions including school districts have a range of staff trained or have knowledge about hazards and their impacts. While some jurisdictions lack an emergency manager in their community, there is Carter County Emergency Management that can provide assistance.

All participating jurisdictions have financial resources that can be used toward mitigation. Most of those resources are capital improvement funds or tax bonds. All communities in Carter 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 the County is StormReady certified; none of the jurisdictions are a Fire Wise community. None of the participating jurisdictions have incorporated a community wildfire plan and solely utilize burn bans. These jurisdictions can expand their capabilities by implementing wildfire plans. The majority of the participating jurisdictions have an Emergency Operations Plan in place.

The Carter County Planning Team 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 easily integrated into the plans and ordinances listed in this capability section. The Carter County Planning Team will use the same efforts currently in place for other community plans and the previous mitigation plan to ensure integration of the data, goals, and action items of the Carter County Multi-Jurisdictional Hazard Mitigation Plan into each jurisdictions' planning mechanisms. 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 during those plans review process.

The Emergency Manager for the county and each jurisdiction, through maintenance of this document, will provide a copy of this plan to parties responsible for other planning processes in the planning area. It is the responsibility of the Planning Team members to make contact with those in their jurisdictions who oversee the plans, ordinances, and community programs on an annual basis to suggest integration. It is also the responsibility of each Planning Team member to stay apprised of their own jurisdictions new and existing plans, as well as the implementation and/or overseeing of their jurisdiction's action items. They will report any new updates or changes at each Planning Team meeting. In addition, each existing and new plan will be reviewed for opportunities for integration before they are renewed or when they are being updated. Examples of these plans include Emergency Operations Plans, Floodplain Ordinances, and Capital Improvement Plans. It is the responsibility of the Carter County Emergency Manager to update the County Commissioners of any significant changes for the jurisdictions, planning process, and action items. This will be done at every public County Commissioner meeting. It is the responsibility of the

County Commissioners to ensure the Planning Team is making clear and actionable steps to implement the Plan and integrate into other jurisdictional plans within the Planning Area.

During the last five years, the Hazard Mitigation Plan has been integrated into other plans by each jurisdiction in order to receive grants for projects. It has also been used when reviewing the jurisdictional EOP's, Capital Improvement Plans, and each of the schools' hazard protocols, information was integrated as needed. While there has not been a deliberate effort to integrate it into every jurisdictional planning mechanism in the past, the jurisdictions will make more of an effort to integrate the hazard mitigation data into more planning mechanisms going forward.

The Emergency Management Directors will be responsible for monitoring the Emergency Operations Plans and integrating the Hazard Mitigation Plan into it along with any updates on an annual basis. The Emergency Management Directors will coordinate with other city/town leaders and department heads responsible for the other plans to ensure the changes to the hazard mitigation plan and other plans are coordinated and kept current. Changes from the Hazard Mitigation Plan and Emergency Operations Plans will be incorporated as applicable. Review existing ordinances and policies annually to strengthen ordinances to better withstand the impacts of hazards. The plan will remain an active and relevant document with continued public participation.

The Planning Committee determined that the priorities of the plan or the participating jurisdictions have not changed since the last plan. It is the priority of all jurisdictions to address all the hazards identified.

Section 3
Hazard Assessment

SECTION THREE

Hazard Assessment

Introduction:

The regulations in 44 CFR 201.6(c)(2) outline the specific information that local jurisdictions must consider when completing the hazard assessment portion of the plan. The hazard assessment must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses for identified hazards.

Only natural hazards are profiled in this plan. Other hazards certainly exist, although their occurrence is rare in Oklahoma and they have caused no known damage in Carter County. Future editions of this plan will contain information on those only if an occurrence has a significant impact to the risk of human life or property.

PROBABILITY OF OCCURRENCE—DEFINITION	
4—HIGHLY LIKELY	Event is probable within the calendar year. Event has a 1 in 1 year chance of occurring.
3—LIKELY	Event is probable within the next three years. Event has a 1 in 3 year chance of occurring.
2—POSSIBLE	Event is probable within the next 5 years. Event has a 1 in 5 year chance of occurring.
1—UNLIKELY	Event is possible within the next 10 years. Event has a 1 in 10 year chance of occurring.

The probability of occurrence shown above is the determination, based on past history and consideration of the elements necessary for a specific disaster event to occur. Combined with how many of those factors are present estimates of how likely a hazard is to occur in Carter County can better be estimated.

Carter County Hazard Prioritization						
Priority #	Hazard	History of Events 2012-2022	Vulnerability	Max Threat	Probability	Overall Rating
1	Tornado	4	HIGH	HIGH	HIGH	HIGH
2	Severe Th-Storm	31	HIGH	HIGH	HIGH	HIGH
3	Wildfire	563	HIGH	MED	HIGH	HIGH
4	Flood	7	HIGH	HIGH	HIGH	HIGH
5	Winter Storm	3	HIGH	HIGH	HIGH	HIGH
6	Hail	42	MED	MED	HIGH	MED
7	Extreme Heat	25	HIGH	HIGH	HIGH	HIGH
8	Drought	40	HIGH	HIGH	MED	HIGH
9	Earthquake	716	MED	LOW	HIGH	MED
10	Dam Failure	0	MED	MED	LOW	MED

Review of Natural Hazards:

The Carter County Hazard Mitigation Planning Team has identified 10 natural hazards that could continue to affect Carter County. (Note: Lightning and High Winds were combined with Severe Thunderstorms and profiled together.) Through reviewing FEMA disaster declarations in the county; NCDC data and reports completed by the County Emergency Management Office, the following list was compiled:

NATURAL HAZARDS FOR CARTER COUNTY			
Hazard	How Reviewed	Why Identified	Jurisdictions Affected
Dam Failure	<ul style="list-style-type: none"> Oklahoma Water Resource Board National Inventory of Dams 	Out of 60 dams in Carter County; only 4 are high hazard. Most are in need of repair or replacement.	Carter Co, Ardmore, Gene Autry, Dickson PS, Springer PS, Lone Grove PS, Plainview PS, Southern Tech
Drought	<ul style="list-style-type: none"> Information from the Oklahoma Climatological Survey Oklahoma Water Resources Board 	Temperatures in Oklahoma can easily reach over 100 degrees & persist for many days and weeks. History of drought, i.e. ‘Dust Bowl’, and recent episodes of drought.	All Jurisdictions
Earthquake	<ul style="list-style-type: none"> Information from Oklahoma Geological Survey Past Historical Records 	Past history, existing fault lines within Carter County and surrounding counties.	All Jurisdictions
Extreme Heat	<ul style="list-style-type: none"> National Weather Service Oklahoma Climatological Survey 	Carter County has prolonged periods of high temperatures and is prone to wide swings in temperature.	All Jurisdictions
Flood	<ul style="list-style-type: none"> Local Emergency Management Records FEMA Declarations NCDC 	There is often flooding Carter County due to heavy rains.	All Jurisdictions, with a higher probability near waterways and lakes.
Hail	<ul style="list-style-type: none"> NCDC 	Carter County Experiences hailstorms during severe thunderstorms, sometimes causing severe damage.	All Jurisdictions
Severe Thunderstorm/ Lightning/High Winds	<ul style="list-style-type: none"> NCDC Oklahoma Climatological Survey NWS-Norman Storm Prediction Center 	Carter County is susceptible to severe thunderstorms, lightning and high winds every year.	All Jurisdictions
Tornado	<ul style="list-style-type: none"> Local Emergency Management Records FEMA Declarations 	Carter County has experienced 4 tornados since the beginning of 2012.	All Jurisdictions

	<ul style="list-style-type: none"> • NCDC 		
Wildfire	<ul style="list-style-type: none"> • State Fire Marshall Records • Local Fire Department Records • SGSF WRAP 	Carter County experiences several wildfires during the dry season.	All Jurisdictions
Winter Storm	<ul style="list-style-type: none"> • National Weather Service • FEMA Declarations 	Severe ice storms occur regularly in SE Oklahoma including Carter County. The last occurrence was in 2021.	All Jurisdictions

The Hazards of Landslides and Expansive soils were considered by the planning team, but since these hazards don't have sufficient data available and haven't historically impacted Carter County, they are not included. These hazards will be assessed again during the next update.

The information in this chapter includes:

- **Hazard Profile**—A description of each hazard, its effects, frequency of occurrence and how the hazard is measured.
- **Location**—Provides information on the location(s) within Carter County that are primary areas of concern for the profiled hazard.
- **Extent**—The size or intensity of a hazard event.
- **Previous Occurrences**—The known historical occurrences of the hazard in the Carter County area.
- **Probability of Future Occurrences**—Defines the calculated potential of future events occurring in Carter County based on past history; geological or climatological potential.
- **Vulnerability and Impact**—Describes how vulnerable or susceptible to damage the citizens, infrastructure, economy and structure in the jurisdiction are to the profiled hazard and resulting consequences.

Recent Declared Disaster History:

The planning area has experienced 2 natural disasters for which the county has been declared a disaster area by the President. The table below has a detailed summary of the federally declared disaster history of the planning area since 2012.

Carter County Disaster Declarations—10 Year History (Excludes Fire Management Assistance History)		
Date	Nature of Disaster	FEMA #
May 26, 2015	Flooding	DR 4222-OK
Apr. 5, 2020	COVID-19 Pandemic	DR-4530
Feb. 15, 2021	Winter Storms	EM-3555
Feb. 24, 2021	Winter Storms	DR 4587-OK

Hazard Profile—Dam Failure:

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete or mine tailings. A dam failure is the collapse, breach, or other failure of a dam structure resulting in potential downstream flooding. Dam failures typically occur when spillway capacity is inadequate and excess flow overtops the dam, or when internal erosion (piping) through the dam or foundation occurs. The Oklahoma Water Resources Board (OWRB) coordinates a state dam safety program that ensures the safety of more than 4,500 dams in the state, with priority placed on the protection of downstream life and property. The program requires inspections every three to five years for and significant hazard structures, respectively. The program also requires annual inspection of the state’s 165 high-hazard dams, so designated due to the presence of occupied dwellings immediately downstream. Lake of the Arbuckle’s and Lake Murray are the primary lake sources of drinking water for the county however most of the county gets their water from wells and small lakes around the area. The lakes profiled in this plan are primary drinking water for the City of Ardmore. They are profiled due to the potential hazard they pose to the residents of Carter County. Inundation Maps for all dams, with the exception of the Arbuckle Lake Dam, are included in Appendix C—(Maps) and are not available for Public Dissemination, but are available on a need-to-know basis only.

Location:

OWRB Classification of Hazard Potential		
Category	Loss of Life	Economic Loss
LOW	None—No probable future development, may be zoned to prevent future development.	Minimal—undeveloped to occasional structure or agriculture.
SIGNIFICANT	None—Potential for future development exists; habitable structures may exist in inflow design floodplain; however, dam failure would not endanger lives that would not be in endangered if structure did not exist.	Appreciable—notable agriculture, industrial or structural.
HIGH	Yes—One or more habitable structures with loss of life due to dam failure likely.	Excessive extensive community, industrial or agricultural losses. Possible loss of life.

According to the Oklahoma Water Resources Board (OWRB) and the National Inventory of Dams (NID), there are 60 dams in Carter County, of which 52 have been classified as LOW HAZARD, 4 as SIGNIFICANT HAZARD and 4 as HIGH HAZARD. There is also a HIGH HAZARD dam in neighboring Murray County. Only the High Hazard potential dams will be identified in this plan as they are the only dams to pose a Significant threat to the county.

ARBUCKLE DAM:

The Arbuckle Dam (NID OK02501) is located in Murray County between the communities of Sulphur and Dougherty. It is owned and maintained by the Department of the Interior (DOI). Construction of the dam was completed in 1962. The dam spans 1,900 feet and holds back 62,571 acre-feet of water from the Lake of the Arbuckle’s.

The Arbuckle Dam has been classified by OWRB and NID as having a HIGH HAZARD potential.

The Arbuckle Dam is required to develop an Emergency Action Plan (EAP), in the event of a dam breach or failure. As part of the EAP, Arbuckle Dam included maps of inundation areas. Maps of these inundation areas are not available for Public Dissemination, but are available on a need to know basis; they will not be included in this plan.

The maps identify a Probable Max Flood (PMF) event of the Arbuckle Dam and the inundation of Carter County. Only portions of the Town of Gene Autry along with unincorporated areas of Carter County would be inundated by an event. Based on inundation maps, approximately 15 residential structures along State Highway 53A would be impacted by a dam breach within one hour. Inundation areas are very similar to those of Caddo Creek Dam NO. 29, see inundation maps provided in appendix. No schools would be affected, and the only difference between these dams' inundation areas is that the Arbuckle dams' inundation area goes into the airpark, but stays in the drainage ditch.

CADDO CREEK DAM NO. 27:

Caddo Creek Dam No. 27 (NID OK00446) is located in north central Carter County. Caddo Creek Dam No. 27 is owned and maintained by the Arbuckle Conservation District. Construction of the dam was completed in 1969 and is located 4.5 miles west of Springer and 1.5 miles north of HWY 53. The dam spans 1,540 feet and holds back 4,634 acre-feet of water.

The Caddo Creek Dam No. 27 has been classified by the OWRB and NID as having a HIGH HAZARD potential.

The Caddo Creek Dam No. 27 is required to develop an Emergency Action Plan by OWRB in the event of a dam breach or failure. As part of the EAP, Arbuckle Conservation District included maps of inundation areas. Maps of inundation areas are not available for Public Dissemination, but are include in Appendix C to this plan on a need to know basis; they will not be available for Public Dissemination. The maps identify a Probable Max Flow event of the Caddo Creek Dam No. 27 and the inundation of Carter County. Only unincorporated areas of Carter County would be inundated by an event. No participating jurisdictions or schools are at risk.

After reviewing the projections of failure of the Caddo Creek Dam No. 27, only those homes (5 residential structures) and roads that are in the flood zones will be affected within 35 minutes of a breach with a range of 1 to over 3 feet of water. Maps will be reviewed at the five-year update to account for any development in the planning area.

CADDO CREEK DAM NO. 13 (Lake Jean Neustadt):

Lake Jean Neustadt Dam (NID OK00433) is located on Richland Road, 1.5 miles west of HWY 77, and is owned and maintained by the City of Ardmore. Construction of the dam was completed in 1969 and spans 5,550 feet and holds back 14,645 acre-feet of water.

Lake Jean Neustadt Dam has been classified by the OWRB and NID as having a HIGH HAZARD potential.

Lake Jean Neustadt Dam is required to develop an Emergency Action Plan by OWRB in the event of a dam breach or failure. As part of the EAP, the City of Ardmore included maps of inundation areas.

The maps identify a Probable Max Flow event of the Lake Jean Neustadt Dam and the inundation of Carter County. Only unincorporated areas of Carter County would be inundated by an event. No participating jurisdictions or schools are at risk.

After reviewing projections of failure of the Lake Jean Neustadt Dam, only roads that are in flood areas would be affected almost immediately. Maps will be reviewed at the five-year update to account for any development in the planning area.

CADDO CREEK DAM NO. 18 (Lake Scott King):

Lake Scott King Dam (NID OK00438) is located 6 miles north on Kings Road and .75 miles east on Acorn Road, and is owned and maintained by the City of Ardmore. Construction of the dam was completed in 1979 and spans 1,030 feet and holds back 6,583 acre-feet of water.

Lake Scott King Dam has been classified by OWRB and NID as having a HIGH HAZARD potential.

Lake Scott King Dam is required by OWRB to develop an Emergency Action Plan in the event of a dam breach or failure. As part of the EAP, the City of Ardmore included maps of inundation areas. Maps of inundation areas are not available for Public Dissemination, but are include in Appendix C to this plan on a need to know basis; they will not be available for Public Dissemination.

The maps identify a Probably Max Flood event of the Lake Scott King Dam and the inundation of Carter County. Only the unincorporated areas of Carter County would be inundated by an event. No participating jurisdictions or schools are at risk.

After reviewing projections of failure of the Lake Scott King Dam, only roads that are in the flood areas would be affected almost immediately. Maps will be reviewed at the five-year update to account for any development in the planning area.

CADDO CREEK DAM NO. 29:

Caddo Creek Dam No. 29 (NID OK00448) is located in northeastern Carter County near the town of Gene Autry. The dam is owned and maintained by the Arbuckle Conservation District. Construction of the dam was completed in 1965 and is located .3 miles west of the HWY 53/53A junction. The dam spans 800 feet and holds back 670 acre-feet of water.

The Caddo Creek Dam No. 29 is classified by the OWRB and NIB is having a HIGH HAZARD potential.

The Caddo Creek Dam No. 29 is required by the OWRB to develop an Emergency Action Plan in the event of a dam breach or failure. As part of the EAP, Arbuckle Conservation District included maps of inundation areas. Maps of inundation areas are not available for Public Dissemination, but are include in Appendix C to this plan on a need to know basis; they will not be available for Public Dissemination.

The maps identify a Probably Max Flow event of the Caddo Creek Dam No. 29 and the inundation of Carter County. The town of Gene Autry and unincorporated areas of Carter County are at risk of inundation by an event. Approximately 15 residential structures would be impacted.

After reviewing the projections of failure of the Caddo Creek Dam No. 29, only those houses and roads that are in flood areas will be affected within 15 minutes of a breach with flood levels of 1 to over 3 feet can be expected. Maps will be reviewed at the five-year update to account for any development in the planning area.

Extent:

Research of dam locations within Carter County by the Oklahoma Water Resources Board revealed that a dam breach in City Lake or Mountain Lake would not cause disaster conditions in Carter County. There could; however, be some areas within Carter County that would be affected from a major breach in Lake Scott King or Lake Jean Neustadt.

As with any location in which man-made structures are built, potential failure of the structure could place lives and property at risk. The best way to minimize potential failure is to identify structures whose failure could cause the greatest loss of life and/or property, and to require those structures to undergo a rigorous inspection regime. From a hazard management perspective, the most noteworthy structures are those categorized as “high hazard” dams. This designation relates solely to potential impacts of a structural breach; it is not an indication of the quality of construction or maintenance. Dam failures can result from any one or a combination of five reasons:

- Overtopping caused by water spilling over the top of a dam.
- Structural failure of materials used in the construction of the dam.
- Cracking caused by movements like the natural settling of a dam or an earthquake.
- Inadequate maintenance and upkeep such as failure to remove trees or repair internal seepage problems.
- Piping—when seepage through a dam is not properly filtered and soil particles continue to progress and form sink holes in the dam.

Inundation mapping indicates water depths could range from less than one (1) foot to over 12 feet. Carter County considers a dam failure releasing one foot or more of flood waters into homes, businesses or flowing over roads to be of major severity.

Previous Occurrences:

It should be noted that between 2012 and 2022 no disasters or accidents involving Carter County regarding a dam breach or failure from dams within the county or outside of the county.

Probability of Future Events:

Even though Carter County has a number of dams in the vicinity, only four are classified as “HIGH HAZARD” which would only have a minimal threat. Dam failure affecting Carter County is UNLIKELY.

Vulnerability and Impact:

The scenario that would have the greatest impact would be a complete loss of a dam structure itself. This would negatively impact the assessed dam inundation zones within the planning area, affecting personal safety, property, traffic flow, power and utilities, recreation, the environment, etc.

With no historical events recorded, and managed by State and National Dam Authorities of the 4 significant and 4 high hazard potential dams within the county, and only 1 high hazard dam located outside the county, the vulnerability is anticipated to be low.

	Vulnerability	Impact
Carter County	As seen in the location section, there are several high hazard dams located in Carter County.	Flooding from these dams would most likely impact rural areas and farm lands.
City of Ardmore	While the City of Ardmore is within 5 miles of the Caddo Creek Dam #13, #18, #27 and #29, it isn't considered to be threatened by them.	
	Ardmore Airpark is located near a high hazard dam that is outside of the county. This dam being the Arbuckle Dam.	If a dam failure were to occur, southern portions of the Airpark would be completely inundated.
Town of Dickson	Dickson is not affected by this hazard.	
Town of Gene Autry	Gene Autry is within 5 miles of the Caddo Creek Dam #29 and 12 miles from the Arbuckle Dam.	If a dam failure were to occur from either of these dams, a significant number of homes would be inundated with water anywhere from 1 foot to over 3 feet.
City of Healdton	Healdton is not affected by this hazard.	
City of Lone Grove	Lone Grove is not affected by this hazard.	
Town of Ratliff City	Ratliff City is not affected by this hazard.	
Town of Springer	Springer is not affected by this hazard.	
Town of Tatums	Tatums is not affected by this hazard.	
City of Wilson	Wilson is not affected by this hazard.	
Ardmore PS	Ardmore PS bus routes would be affected if a dam failure occurred at Caddo Creek #13 and #18.	If a dam failure were to occur, high water could potentially cause bus routes to detour.
Dickson PS	Dickson PS bus routes would be affected if a dam failure occurred at Caddo Creek #13, #18, #29 and Arbuckle Dam.	If a dam failure were to occur, high water could potentially cause bus routes to detour.

Fox PS	Fox PS is not affected by this hazard.	
Healdton PS	Healdton PS is not affected by this hazard.	
Lone Grove PS	Lone Grove PS is not affected by this hazard.	
Plainview PS	Plainview PS bus routes would be affected if a dam failure occurred at Caddo Creek #27 and #18.	If a dam failure were to occur, high water could potentially cause bus routes to detour.
Springer PS	Springer PS bus routes would be affected if a dam failure occurred at Caddo Creek #13, #18, and # 27.	If a dam failure were to occur, high water could potentially cause bus routes to detour.
Wilson PS	Wilson PS is not affected by this hazard.	
Zaneis PS	Zanies PS is not affected by this hazard.	
Southern Tech	Southern Tech bus routes would be affected if a dam failure occurred at Caddo Creek #13, #18, #27, # 29, and Arbuckle Dam.	If a dam failure were to occur, high water could potentially cause bus routes to detour.

Hazard Profile—Drought:

Drought is a persistent and abnormal moisture deficiency having adverse impacts on vegetation, animals or people. There are dozens of more specific drought definitions used around the world based on the lack of rain over various time periods or measured impacts such as reservoir levels or crop losses. Because of the various ways people measure drought, no one has produced an objective drought definition upon which everyone can agree.

Drought Types: There are three main ways to consider drought.

1. **METEOROLOGICAL** drought is usually based on long-term precipitation departures from normal, though high temperatures often play a role.
2. **HYDROLOGICAL** drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, and as lake, reservoir, and ground water levels.
3. **AGRICULTURAL** drought occurs when there isn't enough soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought is typically evident after meteorological drought but before hydrological drought.

When no rain or only a small amount of rain falls, soils can dry out and plants die. When rainfall is less than normal for several weeks, months, or years the flow of streams and rivers decline, water levels in lakes and reservoirs and even aquifers fall, causing the depth of water in wells to decrease. If dry weather persists and water supply problems develop, the dry period can become a drought. The first evidence of drought usually is seen in records of decreased rainfall. Within a short period of time, the amount of moisture in soils can begin to decrease. The effects of a drought on flow in streams and rivers or on water levels in lakes and reservoirs may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more after the drought begins due to aquifer availability.

The effects of drought can be economic, social or environmental. Lack of rainfall for an extended period of time can be catastrophic to farmers and major metropolitan areas. Typically, cities suffering from drought ask citizens to stop washing their cars, cease watering the grass, and to take other water conservation steps. Counties, because they are largely rural with small communities spotted throughout, generally do not consider such steps, but look at the overall picture related to water, livestock and infrastructure status.

During drought emergencies, the National Weather Service and Oklahoma Emergency Management issues regular updates of drought and wildfire conditions. If conditions are severe enough, updates are issued on a daily basis. Nationally, the National Drought Mitigation Center (NDMC), housed at the University of Nebraska-Lincoln, helps states, institutions, and individuals develop and implement measures to reduce societal vulnerability to drought. The organization's U.S. Drought Monitor (a comprehensive drought monitoring effort between the NDMC, USDA and NOAA/CPC) is an excellent source of national drought news and data. NOAA's Drought Information Center also provides abundant links and information regarding the onset of drought and prospects for dry conditions throughout the U.S.

Meteorologists typically determine the onset and the end of drought by carefully monitoring meteorological and hydrological variables such as precipitation and stream flow. Because there is no single definition for drought, its onset and termination are difficult to determine. We can, however, identify various indicators of drought, and tracking these indicators provides us with a crucial means of monitoring drought.

Location:

Drought affects the entire planning area.

Extent:

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and the particular application. Several indices developed by Wayne Palmer, as well as the Standardized Precipitation Index, are useful for describing the many scales of drought.

Common to all types of drought is that fact that they originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (say, a few weeks or a couple months), the drought is considered short-term. But if the weather or atmospheric circulation pattern becomes entrenched and precipitation deficits last for several months to several years, the drought is considered to be a long-term drought. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-term pattern that results in short-term wet spells.

The Palmer Drought Severity Index (PDSI) has been widely used by the U.S. Department of agriculture to determine when to grant emergency drought assistance, but the Palmer Index is best used when working with large areas of uniform topography.

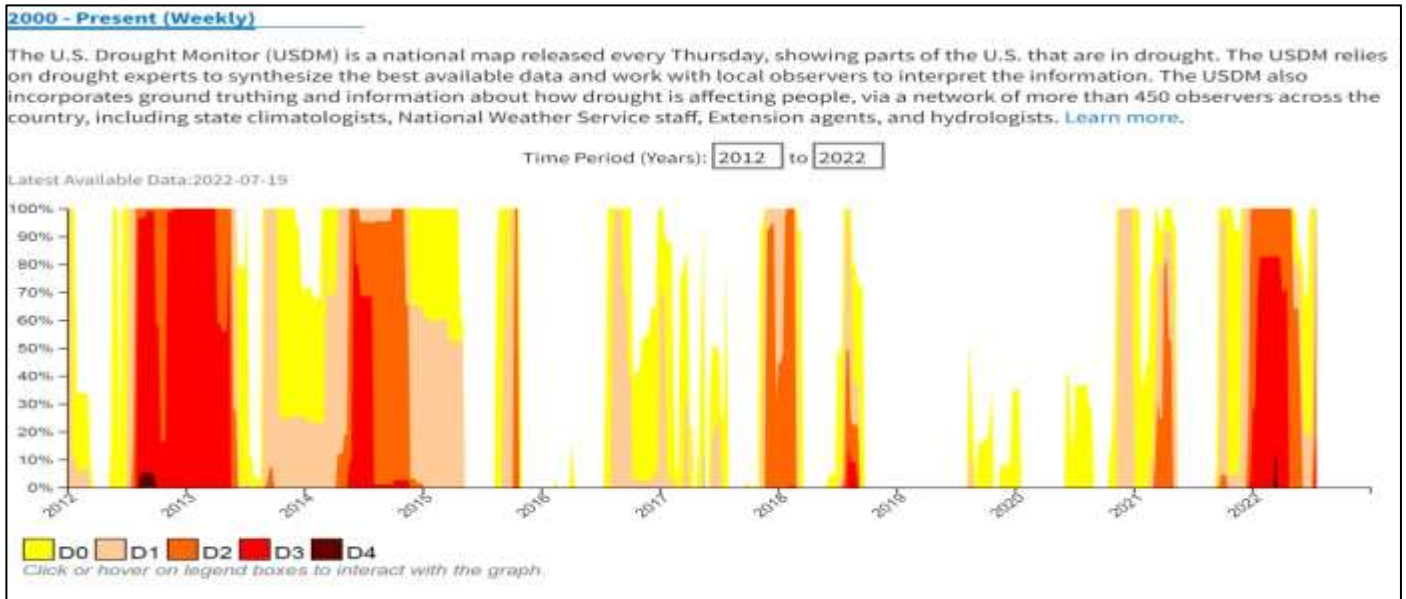
Carter County and all participating jurisdictions have experienced and will continue to experience the entire PSDI scale.

PDSI Classifications for Dry and Wet Periods	
4.00 or more	Extremely Wet
3.00 to 3.99	Very Wet
2.00 to 2.99	Moderately Wet
1.00 to 1.99	Slightly Wet
0.50 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.50 to -0.99	Incipient Dry Spell
-1.00 to -1.99	Mild Drought
-2.00 to -2.99	Moderate Drought
-3.00 to -3.99	Severe Drought
-4.00 or less	Extreme Drought

Previous Occurrences:

According to the National Climatic Data Center (NCDC), there were 10 events during 2012 through 2022. According to the National Climatic Data Center (NCDC), four drought events affected Carter County from July 2012 through May 2015 with one event lasting an entire year.

Since 2016 Oklahoma and Carter County have been involved in generally a steady drought with a few periods of relief. 2015, 2016 and early 2019 have been wetter than normal, relieving Carter County of its drought conditions during those years. 2022 has seen a return of drought conditions to the Carter County area.



The potential exists however, that major drought will always be an issue for Carter County. The following is a history of droughts affecting Carter County.

Carter County Drought Events Data from National Climatic Data Center 2012-2022	
Date	Description
2012	<p>As a mid level ridge of high pressure built into the Southern Plains late in July, few opportunities for rain lead to expanding drought conditions across much of Oklahoma. Hot and dry conditions continued for much of the month beneath a persistent upper-level ridge over the southern Plains. This led to worsening of the already-severe drought. Drought conditions continued over the southern Plains following a hot and very dry summer. A few beneficial rain events did occur during September, resulting in improving drought conditions in some areas.</p> <p>With lack of any appreciable rainfall during the month of October, drought conditions persisted and/or worsened during the month.</p> <p>Very few rainfall events occurred during the month of November over Oklahoma. This allowed drought conditions to persist or even worsen in some areas.</p> <p>Very few rainfall events occurred during the month of December over Oklahoma. This allowed drought conditions to persist or even worsen in some areas.</p>
2013	<p>Very few rainfall events occurred during the month of January over Oklahoma. This allowed drought conditions to persist or even worsen in some areas.</p> <p>Several winter storms occurred during middle to late February over much of Oklahoma. This allowed drought conditions to improve slightly over much of the region.</p> <p>Precipitation totals for March were below normal across most of central and western Oklahoma, resulting in a continuation of the long-term drought.</p> <p>Drought conditions persisted across much of Oklahoma during the month of April, however, several rainfall events allowed for modest improvement across portions of central and even southwest Oklahoma. Extreme to exceptional drought persisted over much of western Oklahoma.</p> <p>Some rainfall events occurred during May, but with a heavy bias toward central Oklahoma</p>

	<p>near the I-35 corridor, where drought conditions continued to improve. Drought was eliminated for the first time since June 2012 in and around the Oklahoma City metro area, extending southeast toward Ada and Atoka. However, extreme to exceptional drought persisted over much of western Oklahoma, including some worsening along the border with the Texas Panhandle.</p> <p>Rainfall for the month of June was generally around average for central and south central Oklahoma, but remained below average across western and northern Oklahoma, where the worst drought conditions were already in place. As a result, drought continued across southern, western and northern Oklahoma. Over central Oklahoma, the area of no drought expanded slightly in coverage.</p> <p>Precipitation over most of Oklahoma was relatively plentiful during the first half of the month over northern and central sections of the state. This was followed by drier conditions to end the month. Ultimately, drought conditions improved slightly over the northern two-thirds of the state, while holding to slightly worsening over the southern tier of counties.</p> <p>Rainfall ranged from somewhat below to somewhat above average during September in Oklahoma. The northern half of the state generally saw a marginal improvement in drought conditions, while the southern half saw marginal worsening with less rainfall.</p> <p>Rainfall was near to slightly above average across most of the state during October. As a result, drought conditions generally remained similar through the month. The most notable change was the improvement of drought conditions across portions of central, south-central and southeast Oklahoma.</p>
2014	<p>With very few precipitation events and unseasonably warm temperatures, drought conditions worsened over much of western, northern and central Oklahoma.</p> <p>Despite several rounds of shower and thunderstorm activity, rain was fairly sparse through the month. A bout of very warm temperatures through the first half of the month allowed for substantial surface drying and drought conditions worsened across all of Oklahoma.</p> <p>Rains throughout the month brought widespread moderate improvements to the drought. Most of these improvements were seen over northern and central Oklahoma, which experienced above normal precipitation for the month.</p> <p>While several rainfall events occurred throughout the month, drought conditions remained mostly unchanged across Oklahoma.</p> <p>With only a handful of rainfall events, drought conditions persisted or worsened across Oklahoma.</p> <p>With very few rainfall events across Oklahoma during the month of September, drought conditions persisted or worsened.</p> <p>Drought persisted in the absence of meaningful rainfall.</p> <p>Drought persisted with minor improvements in the absence of meaningful rainfall.</p>
2015	<p>After a long period of little rain, flash drought (D0-D2) began to creep back into southeast Oklahoma. This event continues into October.</p> <p>Severe drought expanded across southern Oklahoma during the first half of the month. Toward the end of the month, several heavy rain events came through bringing drought levels back down to moderate. This event is a continuation from September.</p>
2017	<p>With a lack of rainfall, severe drought began to develop across southeast and south central Oklahoma.</p> <p>With a lack of rainfall, severe drought began to develop across western Oklahoma and persisted across south central Oklahoma.</p>
2018	<p>With a lack of rainfall, severe drought spread over the western two thirds of Oklahoma and</p>

	<p>extreme drought encroached upon much of western Oklahoma.</p> <p>Extreme and severe drought spread further through Oklahoma through the first half of the month. Toward the last week of February, rainfall brought some relief to the central third of Oklahoma, confining the severe and extreme drought areas to western Oklahoma.</p> <p>Severe to extreme drought persisted across southwest Oklahoma and severe drought expanded across south central Oklahoma while parts of northern Oklahoma saw some improvement in drought conditions.</p> <p>Severe to extreme drought persisted across southwest Oklahoma and parts of north central Oklahoma, while south central Oklahoma saw a little bit of improvement.</p> <p>Extreme drought was eliminated and severe drought was greatly reduced through the month of September. By the end of the month, severe drought was confined to southwest Oklahoma.</p>
2021	<p>Drier than normal conditions during the month of April led to expanding drought across portions of southern and west-central OK.</p> <p>Drought rapidly expanded across the area during the month of September, with moderate drought increasing from 7% coverage at the beginning of the month to 70% by month's end.</p> <p>Drought was extensive across much of western Oklahoma and western north Texas during the beginning of the month, with continued dry conditions causing the eastward expansion of drought across much of central Oklahoma by month's end.</p>
2022	<p>Drought continued to worsen through the month of January as meaningful precipitation continued to evade the Oklahoma and north Texas area. Nearly the entire county warning area was in at least severe drought by month's end, with 65% of the area in extreme drought.</p> <p>Severe to exceptional drought persisted across all of central and western Oklahoma during the month of February with the lack of much significant precipitation.</p> <p>Drought worsened over the first half of the month before a few precipitation episodes lessened the drought for northern and central portions of Oklahoma. Severe to extreme drought persisted for southwestern OK which saw little measurable precipitation during the month of March.</p> <p>Continued dry conditions led to persistence and even expansion of severe to extreme drought during the month of April, especially across western Oklahoma and western north Texas.</p> <p>Severe drought persisted across much of western and central Oklahoma through the first half of the month, although much needed rains began to alleviate drought conditions over the course of the month.</p> <p>Hot and dry conditions allowed for drought to rapidly expand during the month of July, encompassing most of the western two thirds of Oklahoma by the end of the month.</p> <p>Hot and dry conditions allowed for drought to rapidly expand during the month of July, encompassing most of the western two thirds of Oklahoma by the end of the month.</p> <p>Drought persisted and remained largely unchanged through the month of August as hot temperatures and only sporadic rainfall were observed.</p>

Probability of Future Events:

Based on past recent history, the probability of future drought events in Carter County is **HIGHLY LIKELY**.

Vulnerability and Impact:

In all droughts, agriculture feels the impact, especially in non-irrigated areas such as dry land farms and rangelands. Other heavy water users, such as landscapers, are also negatively impacted. Water related activities of residential users might be restricted. Droughts also cause power shortages in Oklahoma, because much of the state’s power comes from hydroelectric plants. Heavy power users can be negatively affected by the results of electricity shortages due to drought, such as brownouts, blackouts, and spiking prices.

The primary threat to structures in Carter County from drought is from the secondary impact of drought from Wildfire. See the Wildfire Hazard for more information on this hazard.

Critical facilities most impacted by drought are those that rely upon water to fulfill their primary functions, or to operate at all, such as fire departments, rural water districts, medical and health care facilities, water and wastewater treatment plants, and schools and daycare centers.

In many communities, drought can have impacts on the community’s ability for firefighting, with both wildland and structure fires. Fire services could potentially be affected if a severe drought reduces availability of water for fire suppression. Police and medical services would not face any vulnerabilities outside those experienced by other County services/facilities.

Drought increases the demand for water and at the same time may impact the availability of raw water. While the towns of Healdton, Ratliff City, Lone Grove, and Wilson are supplied by their own wells. Other areas of the county are supplied by Rural Water Districts or Southern Oklahoma Water Corporation.

	Vulnerability	Impact
Carter County	County roads and bridges can buckle and crack with extreme drought conditions.	Broken infrastructure would require regular maintenance that slows traffic and causes minor delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
City of Ardmore	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
Town of Dickson	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely	Broken water lines can cause disruptions to services for 12 up

	breaks during drought conditions.	to 24 hours.
Town of Gene Autry	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
City of Healdton	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
City of Lone Grove	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
Town of Ratliff City	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
Town of Springer	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
Town of Tatums	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.

City of Wilson	City streets, water lines, and roofing can break during drought conditions.	Broken infrastructure would require regular maintenance that causes minor traffic delays.
	Aging infrastructure throughout the waterline system routinely breaks during drought conditions.	Broken water lines can cause disruptions to services for 12 up to 24 hours.
Ardmore PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Dickson PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Fox PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Healdton PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Lone Grove PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Plainview PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.

Springer PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Wilson PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Zaneis PS	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.
Southern Tech	Parking lots and campus sidewalks can buckle and crack during drought conditions.	Broken surfaces can cause tripping hazards and require regular maintenance. Diverting limited school funds to make necessary repairs causes other projects to be delayed.

Hazard Profile—Earthquakes:

An earthquake (also known as a quake, tremor or temblor) is the perceptible shaking of the surface of the Earth, resulting from the sudden release of energy in the Earth's crust that creates seismic waves. Earthquakes can be violent enough to toss people around and destroy whole cities. The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time.

Earthquakes are measured using observations from seismometers. The moment magnitude is the most common scale on which earthquakes larger than approximately 5 are reported for the entire globe. The more numerous earthquakes smaller than magnitude 5 reported by national seismological observatories are measured mostly on the local magnitude scale, also referred to as the Richter magnitude scale. These two scales are numerically similar over their range of validity. Magnitude 3 or lower earthquakes are mostly imperceptible or weak and magnitude 7 and over potentially causes serious damage over larger areas, depending on their depth. The largest earthquakes in historic times have been of magnitude slightly over 9, although there is no limit to the possible magnitude. Intensity of shaking is measured on the modified Mercalli scale. The shallower an earthquake, the more damage to structures it causes, all else being equal.

At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacement of the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity.

In its most general sense, the word earthquake is used to describe any seismic event — whether natural or caused by humans — that generates seismic waves. Earthquakes are caused mostly by rupture of geological faults, but also by other events such as volcanic activity, landslides, mine blasts, and nuclear tests. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

Location:

Earthquakes affect the entire planning area of Carter County. Carter County is located within the USGS 3%g Peak Ground Acceleration (PGA) with 10% probability of exceedance in 50 year seismic maps. Major faults are present in the Arbuckle Mountains located on the northern edge of Carter County. There are also numerous fault lines within Carter County itself. Earthquakes may occur at any or all locations throughout Carter County.



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. Carter County and all participating jurisdictions have experienced and can expect to experience a magnitude between 2.0 to 5.0 on the Richter scale.

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.

Previous Occurrences:

Carter County has experienced earthquakes in the past; however, not all are felt by the population. As shown in the Previous History Table below, all earthquakes in Carter County were 2.8 in magnitude or below. According to the Oklahoma Geological Survey the last earthquake experienced by Carter County was on September 25, 2022, when a 1.7 earthquake occurred in an area 1 mile east of the town of Ratliff City at around 12:47 pm. Since 2012 Carter County has experienced 716 earthquakes, 650 of those occurred in 2021. The table below shows the number of earthquakes by year, that have occurred in Carter County. Only minor damage, such as cracked drywall, or falling pictures has been reported with any of the felt earthquakes.

Previous History of Earthquakes in Carter County 2012-2022		
Year	Highest Magnitude	Number of Earthquakes
2012	1.7	4
2013	2.6	14
2014	2.4	22
2015	N/A	0
2016	N/A	0
2017	2.5	4
2018	2.1	2
2019	2.7	9
2020	N/A	0
2021	2.8	650
2022	2.2	11
Total		716

Probability of Future Events:

The probability of future earthquakes in Carter County based on the Arbuckle Mountain range which, as mentioned earlier in this plan, has experienced or has the potential for felt earthquakes. Based on past history of the area around Carter County, it would appear the probability is low of a future damaging earthquake.

Based on the above, Carter County has rated the probability of a future earthquake as HIGHLY LIKELY.

Vulnerability and Impact:

In Carter County, including all participating jurisdictions, there are no means to prevent earthquakes and currently no possibility exists to predict short-term occurrence with accuracy in terms of location and size of an earthquake and time of occurrence. The only possibilities to reduce the earthquake damages are appropriate planning and construction measures. Earthquakes usually occur without warning and can impact areas a great distance from their point of origin.

An earthquake exceeding 5.0 in Carter County will cause an assortment of damage depending on the density of population and building and infrastructure construction in the area shaken by the quake. Some areas may be more vulnerable than others based on soil type, the age of the buildings and building codes in place. Residential and commercial buildings owned by Carter County citizens and infrastructure constructed of unreinforced masonry or any other construction materials having inadequate resistance to lateral forces of ground shaking can result in more severe damage. The degree of exposure is dependent on many factors, including the age and construction type of buildings and the soil type on which buildings are constructed. A building's construction determines how well it can withstand the force of an earthquake. Buildings with foundations resting on unconsolidated landfill or other unstable soil, and mobile homes and trailers that are not tied to their foundations are at a higher risk because they can be shaken off their mountings during an earthquake. Un-reinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward, whereas steel and wood buildings absorb more of the earthquake's energy. The few buildings that are built to seismic codes and standards will have

less chances of severe damage from earthquakes. Damages to lifelines such as loss of power, communications facilities and water and gas outages could even impact populations that did not suffer direct damage from the earthquake itself.

The county does not enforce building codes in the unincorporated areas. For schools it is not state mandated for drills therefore there is a lack of education in schools. Although the incorporated jurisdictions within the county do have building codes, they may not be the most up to date.

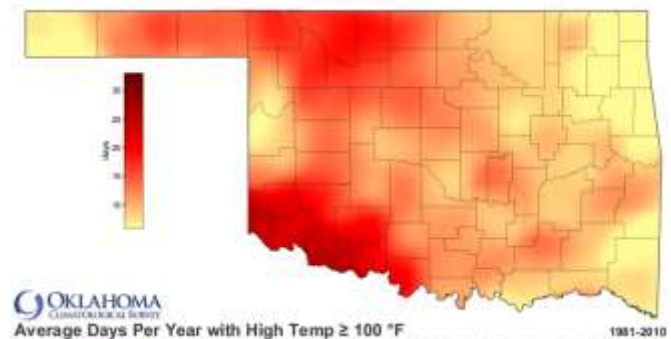
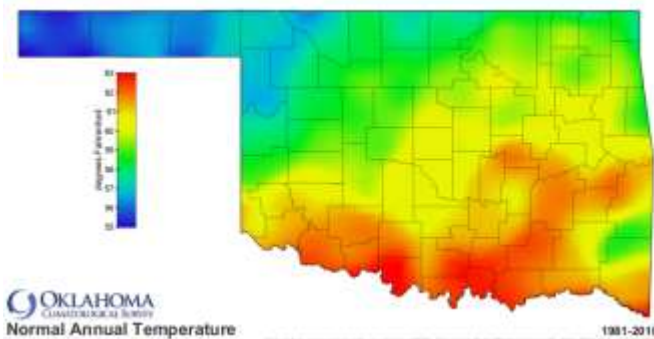
Hazard Profile—Extreme Heat:

Oklahoma, as part of the Southern Great Plains is prone to wide swings of temperature. Summertime temperatures routinely climb above the 100 degree mark. Temperatures that hover 10 degrees or more above the average high temperature for the area and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a “dome” or high atmospheric pressure traps hazy, damp air near the ground.

The hottest period of the Oklahoma summer extends from mid-July through mid-August. Overall, August, the third and final month of the climatological summer, is Oklahoma’s second hottest, fifth driest, and least windy month. The normal statewide monthly temperature is 80.9 degrees Fahrenheit. Information from the Oklahoma Climatological Survey shows Carter County averages 10-20 days over 100 degrees during the summer.

Temperature:

Average Annual: 63 degrees
Average Maximum: 75 degrees
Average Minimum: 52 degrees
Highest: 115 degrees (Healdton, August 2, 1896)
Days of 90 degrees or Higher: 85



Location:

Carter County experiences 10-20 days of temperatures greater than 100 degrees annually according to the Oklahoma Climatological Survey. All of Carter County and the jurisdictions included in this plan are equally at risk of extreme heat.

Extent:

It is often extremely hot and humid during the summer in the planning area. Extreme heat in the planning area is measured using NOAA’s National Weather Service Heat Index. The heat index is how the heat and humidity in the air combine to make individuals feel. Higher humidity plus higher temperatures often combine to make us feel a superficial temperature that is higher than the actual air temperature. In general, the planning area can experience temperatures up to 115 degrees.

Table 3-10

NOAA's National Weather Service

Heat Index

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- Caution
 Extreme Caution
 Danger
 Extreme Danger

Legend	
80-89 degrees	Fatigue is possible with prolonged exposure and/or physical activity.
90-104 degrees	Sunstroke, heat cramps and heat exhaustion are possible with prolonged exposure and/or physical activity.
105-129 degrees	Sunstroke, heat cramps and heat exhaustion are likely. Heat stroke is possible with prolonged exposure and/or physical activity.
130+ degrees	Heat stroke/sunstroke is highly likely with continued exposure.

The planning area considers any extended periods of temperatures up to 104 degrees with relative humidity 50% to be hazardous and cause for concern with periodic checks on the elderly and other at risk populations. However at 90 degrees and humidity at 20% the planning area can start to see impacts.

Previous Occurrences:

Carter County has experienced several heat events between 2012 and 2022 with excessively high temperatures causing significant problems for citizens.

Table 3-11

Significant Carter County Extreme Heat History 2012-2022	
Year	# of days >90 degrees
2012	98
2013	82
2014	62
2015	87
2016	91
2017	63
2018	85
2019	77
2020	75
2021	73
2022	93

Probability of Future Events:

While extreme heat is a hazard for Oklahomans, efforts are being made throughout the state to mitigate the effects of the extreme heat. The National Weather Service is now issuing Excessive Heat warnings by county through the NOAA Weather Radio. They are issued within 12 hours of the onset of the following criteria: heat index of at least 105 degrees for more than 3 hours per day for 2 consecutive days, or heat index more than 115 degrees for any period of time. The entire State of Oklahoma is at risk for extreme heat. In Carter County, based on past history, the probability of a future extreme heat event is HIGHLY LIKELY.

Vulnerability and Impact:

Carter County has a significant extreme heat hazard due to its climate. Summers are hot and usually dry, with daytime highs in the upper 80's to the mid-90's and generally less than 3 inches of rain in July and August.

Power supplies throughout the county are often affected due to high use by the population which causes power "brownouts" or outages. Some elderly citizens either do not have air conditioners or fans that work or do not use them because of electric cost concerns and many become victims of the extreme heat. Extreme heat deaths are usually from that group of citizens, although the handicapped and very young can sometimes be victims of extreme heat also.

Roads are often affected by extreme heat. Some older asphalt roads tend to "melt" or get soft with continued heat. Many of these roads are used by school buses and mail carriers. Concrete roads "explode" and crack due to the heat leading to higher maintenance costs. The damaged roads often cause citizens to find alternate transportation routes.

People working outside in the planning area are susceptible to extreme temperatures. Outdoor sporting events and other activities expose students and staff to excessive temperatures where, if not closely monitored, could result in heat related problems such as cramps, heat exhaustion, or heat stroke.

	Vulnerability	Impact
Carter County	The county does not have a reliable database or a process in place to document the vulnerable populations within the county. Any information related to vulnerable populations is anecdotal information based on sheriff deputy reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
City of Ardmore	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
Town of Dickson	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
Town of Gene Autry	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.

City of Healdton	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
City of Lone Grove	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
Town of Ratliff City	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
Town of Springer	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
Town of Tatums	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.

City of Wilson	The town does not have a reliable database or a process in place to document the vulnerable populations within the city limits. Any information related to vulnerable populations is anecdotal information based on police reports.	The lack of a reliable list of vulnerable populations results in an inability to locate vulnerable citizens when the town partners with NGOs like the Red Cross for fan distributions or other outreach programs.
Ardmore PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Dickson PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.

Fox PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Healdton PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Lone Grove PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as

		their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Plainview PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Springer PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Wilson PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.

	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Zaneis PS	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.
Southern Tech	Extreme heat causes the roofing to buckle and crack.	The cracks in the roofing causes leaks during rainfall, resulting in an economic loss to school property within the affected area inside.
	The school does not have backup generators and no means of preserving food service in a power outage caused by extreme heat.	The lack of backup power to preserve food service during a prolonged power outage results in an economic loss for the school. It also results in vulnerable student populations that rely on the food service as their primary means of having a reliable meal would possibly be without food during a prolonged power outage caused by extreme heat.

Hazard Profile—Flood:

A flood is an overflow of an expanse of water that submerges land, a deluge. In the sense of “flowing water”, the word may also be applied to the inflow of the tide. Flooding may result from the volume of water within a body of water, such as a river or lake, which overflows, with the result that some of the water escapes its normal boundaries. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, it is not a significant flood unless such escapes of water endangers land areas used by man like a village, city or other inhabited area.



Floods can also occur in rivers, when the strength of the river is so high it flows out of the river channel, particularly at bends or meanders and cause damage to homes and businesses along such rivers. While flood damage can be virtually eliminated by moving away from rivers and other bodies of water, man has lived and worked by the water to seek sustenance and capitalize on the gains of cheap and easy travel and commerce by being near water.

A flash flood is a rapid flooding of geomorphic low-lying areas—washes, rivers and streams. It may be caused by heavy rain associated with a thunderstorm, winter snow thaws or tropical storms. Flash floods can also occur after the collapse of human structures, such as a dam, for example. Flash floods are distinguished from regular floods by having a timescale of less than six hours.

Location:

Most of the known floodplains in the U.S. have been mapped by FEMA, which administers the National Flood Insurance Program (NFIP). When a flood study is completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). An FIS is a compilation and presentation of flood risk data for specific water-courses, lakes and coastal flood hazard areas within a community and include causes of flooding.

The FIS report and associated maps delineate Special Flood Hazard Areas (SFHAs), designate flood risk zones, and establish base flood elevations (BFEs), based on the flood has a 1% chance of occurring annually, better known as the 100-year flood.

Carter County maintains current FEMA flood plain mapping for the county. Mapping showing the Special Flood Hazard Areas (SFHA) of Carter County are shown in Appendix C of this plan.

The entire planning area is susceptible to flooding. Included in the appendix are FIRM Maps which depict areas within the planning area located in the SFHA who may have a higher susceptibility to flooding, but all jurisdictions within the planning area such as the school districts and the Southern Oklahoma Technology Center are susceptible to flash flooding as well as other forms of flooding.

Extent:

According to Carter County Highway Districts, the county has numerous areas on county roads that consistently flood when there are heavy rains.

According to records there are no repetitive flood loss claims for unincorporated Carter County. Only 2 residential structures within the jurisdiction of Healdton are identified as repetitive loss structures.

Flooding events where vehicles stall and require water rescues create a problem for Carter County officials and 1st Responders. Citizens continue to disregard barriers and signage warning of flooded areas. Public education remains a high priority when communicating the dangers of driving through flood waters. Flooding events in Carter County are not considered a severe event until water starts entering homes. There have been some areas of repetitive flooding forcing citizens to find alternate routes of transportation due to road closings, but is not considered a major problem for Carter County.

Inundation mapping indicates water depths could range from less than one (1) foot to over 12 feet. Carter County considers flood waters of one foot or more in homes, businesses and over roadways to be of major severity.

Previous Occurrences:

Carter County has a history of flash flooding primarily affecting streets and low lying areas. According to local emergency personnel and records, flooding occasionally enters a mobile home or conventional home or business but it is minor and seldom does much damage.

Table 3-12

Carter County Flood History Information provided by the National Climatic Data Center 2012-2022					
Date	Description	Prop. DMG	Crop DMG	Inj.	Fatal
1 Sep 2020	Slow moving thunderstorms along a nearly stationary frontal boundary led to numerous flooding reports during the morning of the 1st across central and southern Oklahoma. Numerous reports of street flooding and vehicles stranded.	0	0	0	0
9 Jun 2019	A strong line of thunderstorms moved southward across central Oklahoma on the morning of the 9 th making many streets impassable.	0	0	0	0
5 Jun 2019	Scattered slow-moving thunderstorms brought isolated reports of flooding to southern Oklahoma on the 5th. Video on social media of street flooding with water flowing over roadways.	0	0	0	0
21 Sep 2018	Abundant moisture from the gulf and a remnant tropical system converged with a front coming in from northwest early on	0	0	0	0

	<p>the morning of the 21st resulting in widespread heavy rain and numerous reports of flash flooding across central and south central Oklahoma and western north Texas through the day.</p> <p>Wingate road, Delta road, Inwood road, Samedan road, Longview road, Cargo road, and Mobil roads in or near Ratliff city were closed due to flash flooding.</p>				
17 Jun 2015	<p>As tropical storm Bill made its way up through eastern and central Oklahoma through the 17th and 18th, widespread flash flooding ensued. Carter County EM reported at least approximately 225 homes with flooding damage (est. \$20k per home). At least one of these had 6 feet of water. Numerous had 4 feet of water. 1 older building collapsed. 20-40 tinhorns washed out (est. \$20k per tinhorn). 1 bridge out (est. \$180K). A two year old boy was swept away from his father's arms into Hickory Creek. Another individual lost his life when his vehicle was washed from a bridge by flowing water.</p>	5.02M	Unk	Unk	2
19 May 2015	<p>Severe storms developed near a stalled boundary across Oklahoma and the panhandles and moved eastward through the afternoon and evening of the 19th, causing widespread heavy rainfall and additional flooding. Numerous streets and county roads flooded in and around the Lone Grove and Ardmore areas.</p>	Unk	Unk	Unk	0
8 May 2015	<p>Another round of storms developed across the Texas panhandle and developed into a line as it moved eastward across southern Oklahoma. Several vehicles stranded in two to three feet of running water over Commerce Street.</p>	Unk	Unk	Unk	0

Probability of Future Events:

It should be remembered also that Carter County, although a mountain range lies to the north of the county, is generally a very flat topography. This tends to cause heavy rain to accumulate and not runoff

as quickly as it might in other less level terrain and is likely to cause problems with flash flooding. Based on past history, the potential of at least flash flooding in Carter County is LIKELY.

Vulnerability and Impact:

In Carter County, people have driven into flooded roadways and have been swept off by the heavy currents, or have driven off into a hole caused by a washed out roadway that was “hidden” by the flood waters, sometimes losing their lives. Flooded roadways often force people to find alternative transportation routes. Farmers and ranchers have lost thousands of dollars’ worth of crops or hay, as well as livestock when flood waters overrun their fields. School districts would also be affected by flooding. Although their physical locations may not be affected by flooding directly, all districts within the county would face flooding issues with bus routes being the primary problem.

	Vulnerability	Impact
Carter County	Multiple county roads and bridges become overwhelmed in flooding events. These areas need to be rebuilt to withstand the flooding and keep the roads open.	Flooding in these low-lying areas cause road closures and detours must be taken. These closures and detours could impede any response efforts that need to go through these areas, in addition to the normal traffic.
City of Ardmore	Some streets in Ardmore experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
Town of Dickson	Some streets in Dickson experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.

Town of Gene Autry	Some streets in Gene Autry experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
City of Healdton	Some streets in Healdton experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
City of Lone Grove	Some streets in Lone Grove experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
Town of Ratliff City	Some streets in Ratliff City experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.

Town of Springer	Some streets in Springer experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
Town of Tatums	Some streets in Tatums experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
City of Wilson	Some streets in Wilson experience nuisance flooding due to poor drainage.	Aging infrastructure needs to be replaced and budgetary constraints limit how many areas can be replaced annually.
	In significant rains, the creeks that run through town can occasionally exceed the banks, and the emergency responders must monitor the water levels that flood certain areas of town. On rare occasions, certain areas must be evacuated.	As the water rises, certain homes along creeks might need evacuated to safety. If the necessity of evacuating residents were to occur, the effectiveness of moving residents safely and efficiently is not guaranteed.
All Public School Districts and Southern Tech	Flooding along county roads and bridges can inundate areas along the bus routes.	When detours and closures occur due to flooding in low-lying areas along bus routes, it can delay the arrival of students to and from school.

Hazard Profile—Hail:

Hail forms in storms when super cooled water droplets freeze on contact with condensation nuclei, such as dust. The storm's updraft blows the hailstones to the upper part of the cloud. The updraft dissipates and the hailstones fall down, back into the updraft, and are lifted up again. The hailstone gains an ice layer and grows increasingly larger with each ascent. Once a hailstone becomes too heavy to be supported by the storm's updraft, it falls out of the cloud. This movement up and down inside the cloud, through cold then warmer temperatures, causes the droplet to add layers of ice and can become quite large, sometimes round or oval shaped and sometime irregularly shaped. The size ranges from smaller than a

pea to as large as a softball and larger, and can be very destructive to buildings, vehicles and crops. Hail is the most expensive by product of thunderstorms. Oklahoma crop losses due to hail average approximately \$2.5 million per year in loss claims alone—not including property/casualty claims. Hail damage to automobiles, roofs, windows and farm crops is staggering. Large hail is also a threat to small mammals and it kills many birds. Large hail is generally one inch in diameter or larger and can cause a great deal of damage. Large hailstones can fall at speeds faster than 100 mph.



The National Weather Service uses a network of Nexrad Doppler radars to detect hail. Hail size and probability can be determined from radar data by a computer by different algorithms. This, in combination with an analysis of the radar display is an accurate way of detecting hail.

Location:

All of Carter County and the jurisdictions included in this plan are equally at risk of hail storms. Usually associated with severe thunderstorms, all structures, wildlife, livestock and the entire population is subject to hail damage.

Extent:

Hail usually last an average of 10 to 20 minutes but may last much longer in some storms and is usually in relatively small coverage areas. Hail causes \$1 billion in damage to crops and property each year in the U.S. Even small hail can cause significant damage to young and tender plants. The peak period in Oklahoma for hail storms is late spring and early summer, which also correlates to the thunderstorm

season in Oklahoma. The planning area can experience any hail size as depicted on the TORRO Hail Intensity Scale, but generally expects to receive hail that is H0-H5.

The Torro Hail scale below describes the levels of hail possible and the damage that results.

Table 3-13

Combined NOAA/TORRO Hailstorm Intensity Scales				
Size Code	Intensity Category	Typical Hail Diameter (inches)	Approximate Size	Typical Damage Impacts
H0	Hard Hail	Up to 0.33	Pea	No damage.
H1	Potentially Damaging	0.00-0.60	Marble or Mothball	Slight damage to plants/crops.
H2	Potentially Damaging	0.60-0.80	Dime or Grape	Significant damage to fruit/crops/vegetation.
H3	Severe	0.80-1.20	Nickel to Quarter	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.
H4	Severe	1.20-1.60	Half Dollar to Ping Pong Ball	Widespread glass damage, vehicle bodywork damage.
H5	Destructive	1.60-2.00	Silver Dollar to Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries.
H6	Destructive	2.00-2.40	Lime or Egg	Aircraft bodywork dented, brick walls pitted.
H7	Very Destructive	2.40-3.00	Tennis Ball	Severe roof damage, risk of serious injuries.
H8	Very Destructive	3.00-3.50	Baseball or Orange	Severe damage to aircraft bodywork.
H9	Super Hailstorms	3.50-4.00	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.
H10	Super Hailstorms	4.00+	Softball and up	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.

Carter County considers anything in the magnitude of H3 or higher on this scale significant due to crop losses and economic hardship it creates for farmers and ranchers.

Once the size of hail rises to H3-H4 magnitude it becomes disastrous to equipment that is parked outside due to insufficient cover.

Carter County and all participating jurisdictions used the Combined NOAA/TORRO Hailstorm Intensity Scales when considering the severity of hail and considers anything above H3 to be severe.

Previous Occurrences:

There have been numerous incidents of hail produced by the severe thunderstorms that occur in Carter County each year. The northern half of Carter County reported fewer hail events than the south, however it should be noted that the northern part of the county may not receive reports as often due to lower populations.

Table 3-14

Carter County Major Hail Storm History (Profiling Events With > .075 Inch) 2012-2022		
Date	Location	Hail Size
5/28/2012	HEALDTON	1.25
6/11/2012	CARTER COUNTY	1.75
9/5/2012	GENE AUTRY	1.75
3/31/2013	ARDMORE	1
5/15/2013	RATLIFF CITY	1
8/9/2013	ARDMORE	1.5
4/13/2014	WILSON	1.75
4/27/2014	LONE GROVE	1
6/6/2014	GENE AUTRY	1
6/7/2014	CARTER COUNTY	1.5
10/2/2014	RATLIFF CITY	0.88
10/6/2014	LONE GROVE	1
10/10/2014	SPRINGER	1
4/18/2015	HEALDTON	1.75
5/18/2015	DICKSON	1
5/19/2015	ARDMORE	1.25
3/23/2016	ARDMORE	1
4/11/2016	ARDMORE	1.25
5/10/2016	DICKSON	1.75
5/29/2016	ARDMORE	1
3/26/2017	CARTER COUNTY	1.75
5/18/2017	LONE GROVE	0.88
5/19/2017	HEALDTON	1.5
5/27/2017	CARTER COUNTY	2.5
6/23/2017	ARDMORE	1
7/2/2017	LONE GROVE	1.5
3/26/2018	LONE GROVE	0.75
4/13/2018	SPRINGER	1.25
6/5/2018	LONE GROVE	1.75
10/6/2018	HEALDTON	1
3/23/2019	MILO	0.88
5/1/2019	HEALDTON	1.75
5/29/2019	HEALDTON	1
10/10/2019	SPRINGER	0.75

4/21/2020	RATLIFF CITY	0.88
4/22/2020	CARTER COUNTY	1.75
5/4/2020	CARTER COUNTY	3
5/8/2020	HEALDTON	1.5
8/16/2020	CARTER COUNTY	2
5/3/2021	CARTER COUNTY	1.75
4/4/2022	LONE GROVE	1
5/15/2022	CARTER COUNTY	1.75

Probability of Future Events:

Carter County property and citizens are susceptible to hail storms and will continue to be at risk. Carter County experiences several hailstorms a year, some of them causing damage. Damage usually occurs to structural glass, roofs, vehicles and crops. The entire county is at risk from hail and the probability of future events is HIGHLY LIKELY.

Vulnerability and Impact:



Oklahoma has significant exposure to hail events including Carter County. Hail from H3 to H5 can begin to damage vehicles and roofs and occasionally glass. Hail larger than this is dangerous, severely damaging windows, vehicles and roofs causing the need for expensive repairs. Hail larger the H8 can cause holes in roofs, destroy vehicles and cause extensive structural damage. It can also injure or kill people and animals. Early warning research is ongoing through the National Weather Service and the Oklahoma Climatological Survey to

improve warning and threat information for the public. Hail damage, generally to roofs of structures cause roofs to be replaced more frequently than the normal life of roofs costing insurance companies and property owners thousands of dollars. Property owners on occasion have to find temporary housing or a new business location due to the amount of roof damage done to their structure. For businesses this can result in loss of business and in extreme cases could even affect employee jobs.

School districts will typically suffer the same types of damages as those of businesses and private property. Busses could be damaged, roofs will be damaged, A/C units, and windows could be damaged causing an unsafe condition within the schools itself.

Given the climatic environment in this jurisdiction, all demographic groups located within Carter County are vulnerable to the effects and potential damages of hailstorm events. Particularly vulnerable are those pursuing farming and/or ranching activities, as crop damage is the highest percentage of reported hail damages. In addition, people engaged in outdoor recreational activities, such as team sports, golfing or camping, may find themselves without sufficient shelter.

Severe hailstorms cause considerable damage to buildings and (increasingly) to automobiles, but rarely results in loss of life. Given its significant exposure to hailstorms, virtually all buildings and structures in the jurisdiction are at risk. The entirety of Carter County and Carter County school districts are vulnerable to the damaging effects of hail.

All critical facilities are vulnerable to hail damage. Hail, however, is unlikely to render a critical facility non-operational.

During a hail event, public vehicles may sustain damage. If severe enough—such as a “Very destructive” H8 event, there could be some loss of functionality, possibly disrupting normal County operations.

Fire, Police and Medical Services would all be similarly at risk to the secondary effects of a hail event. Response vehicles in the open would likely be exposed to window and/or windshield damages. A secondary effect could be an increased call and work volume for County services.

If a major hail event were to occur between 7:30 – 8:30 am or 5 – 6 pm on any weekday, the risk of commuters being caught in the event is substantially higher. Drivers seeking to pull under bridges to escape vehicle damage could cause accidents and injuries.

	Vulnerability	Impact
Carter County	Several critical facilities within the county are lacking generators, including the county courthouse, several fire departments and others.	Hail events can take out power lines and render the county without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
City of Ardmore	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Town of Dickson	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical

		facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Town of Gene Autry	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
City of Healdton	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
City of Lone Grove	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.

Town of Ratliff City	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Town of Springer	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Town of Tatums	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.

City of Wilson	Some critical facilities within the city do not have generators.	Hail events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Ardmore PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Dickson PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Fox PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.

	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Healdton PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Lone Grove PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Plainview PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Springer PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.

	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Wilson PS	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Zaneis PS	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.
Southern Tech	The school district does not have emergency generators.	Should a Hail occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
	The jurisdiction stores a large portion of equipment and vehicles uncovered outside that is considered vulnerable to this hazard.	Equipment and vehicles left out in the elements are vulnerable to hail. Hail can dent, damage, and destroy vehicles and equipment.

Hazard Profile—Severe Thunderstorms (High Winds/Lightning):



Thunderstorms occur when moist air near the ground becomes heated, especially in the summer, and rises, form cumulonimbus clouds that produce precipitation. Because thunderstorms almost always produce lightning and high winds, these hazards will be profiled as a part of the thunderstorm hazard profile. They will, however meet requirements for Hazard Mitigation Plans individually within the thunderstorm profile. The other element of many thunderstorms, hail, will be profiled independently. The National Weather Service estimates that over 100,000 thunderstorms occur each year in the U.S. Approximately 10% are classified as “severe”.

A severe thunderstorm, as defined by the National Weather Service, is a storm with hail equal to or greater than 1 inch in diameter and convective wind gusts equal to or greater than 58 mph. Lightning, flash flooding, wind-blown hail (even small hail), and downbursts as the thunderstorm collapses pose a threat to life and property. Severe thunderstorms also have the potential of producing a tornado with little or no advanced warning. Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes; however, weather-monitoring reports indicate that coherent thunderstorm systems can travel intact for distances in excess of 600 miles.

Nearly 1,800 thunderstorms are occurring at any moment around the world. Despite their small size, all thunderstorms are dangerous. Severe thunderstorms spawn as many as 1,000 tornados each year throughout the U.S.



High winds are a common feature of thunderstorms, particularly severe thunderstorms. As shown in the picture to the left, of a building at Healdton Elementary In May 2009 provides an example of wind damage. The National Weather Service uses winds in excess of 58 mph as one of the measurements in determining a thunderstorm to be severe. Wind is defined as the motion of air relative to the earth’s surface. High winds can result from thunderstorm inflow and outflow, or downburst winds when the storm cloud collapses, and can result from strong frontal systems, or gradient winds (high or low pressure systems) moving across Oklahoma. “High winds” are wind

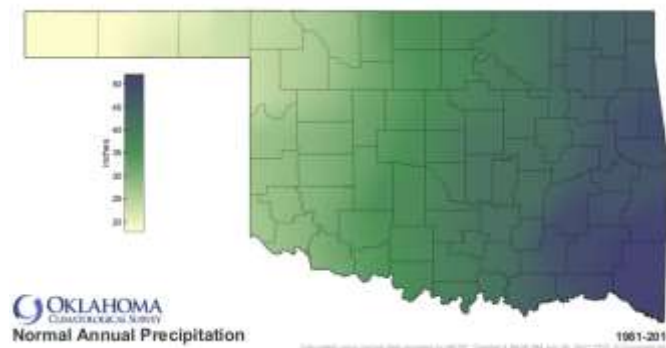
speeds reaching 50 mph or greater, either sustained or gusting. Damage similar to that cause by tornados and other cyclonic windstorms can result from downburst or microburst winds. Microbursts can occur anywhere convective weather conditions (thunderstorms, rain showers, and particularly hail or virga) occur. Virga is rain that evaporates before it reaches the ground and is associated with a dry microburst. Observations suggest that approximately five percent of all thunderstorms produce a microburst and significant wind damage can be related to them. Downdrafts associated with microbursts conversely are typically only a few hundred to a few thousand feet across. When the downdraft reaches the ground, it spreads out horizontally and may form one of more horizontal vortex rings around the downdraft. The outflow is typically 6-12 thousand feet across and the vortex ring may rise 2 thousand feet above the ground. Either can do severe damage to structures and as a result of that damage, have caused injuries and deaths. Straight-line wind is a term used to define any thunderstorm wind that is not associated with rotation, and is used mainly to differentiate from tornadic winds. A downdraft is a small-scale column of air that rapidly sinks toward the ground.



Lightning is a result of electrical charges accumulating at the base of the clouds until lightning is discharged. Thunder is caused by the extreme heat associated with the lightning flash. In less than a second, the air is heated from 15,000 to 60,000 degrees. When the air is heated to this temperature, it rapidly expands producing thunder. When lightning strikes very close by, the sound will be a loud bang, crack or snap. Thunder can typically be heard up to 10 miles away. Lightning is a thunderstorm's number two killer each year in the U.S. killing more people annually than tornados. Each year lightning causes an average of 93 deaths and 300 injuries in the U.S. Lightning also causes several million dollars in damage to homes, business, churches, barns, and forests each year.

Location:

Thunderstorms and lightning are underrated killer events experienced in nearly every region of the United States. Oklahoma averages 240 thunderstorms annually, some of which produce tornados. A history of Carter County thunderstorm activity is show in the Previous Occurrences section of this profile. All jurisdictions are vulnerable to thunderstorm high winds and lightning.
















Oklahoma Average Precipitation per year.

Carter County experiences 40-45 inches per year.

Extent:

Thunderstorms and lightning are underrated killers. They are experienced throughout Oklahoma where people and property are exposed to the elements. They have caused damage to buildings and, due to downed power lines, caused major power outages. Many times businesses have to close due to power outages and lose business as a result. Carter County experiences 21-30 high wind events on average annually. In comparison with thunderstorms, 1/3 to half of the wind events in the county occur during thunderstorms.

Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

The Beaufort Wind Scale is a system of estimating and reporting wind speeds. Officials in Carter County consider anything higher than a force 9 on the Beaufort scale to be high enough to warrant high wind warnings.

Wind events in Carter County are generally associated with thunderstorms, although not always. Wind events can occur without the signature thunderstorm. Microbursts occur often when a thunderstorm is collapsing perhaps miles away from the microburst damage end product. Strong winds can also be produced especially during the winter months from the Arbuckle Mountains that are only 10 miles north of Ardmore. Carter County experiences 21-30 high wind events annually based on NCDC records (winds exceeding 60 knots).

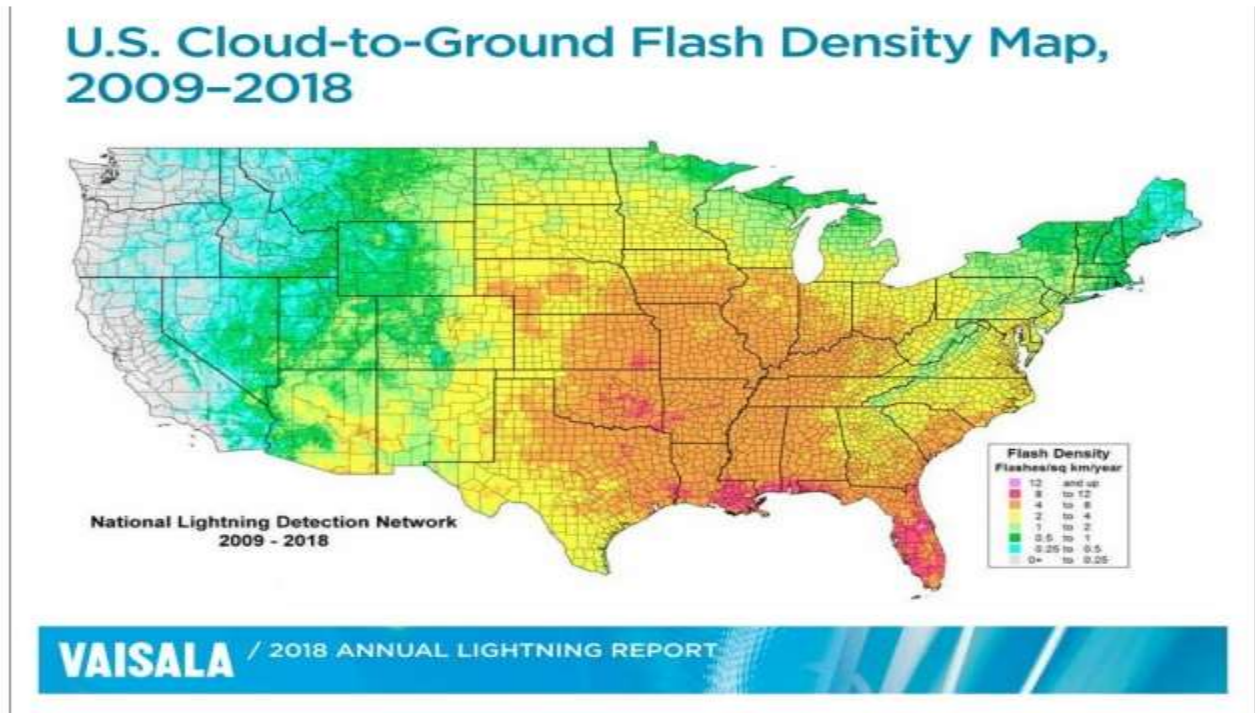
Carter County and all participating jurisdictions use the National Weather Service's severe weather criteria when considering high winds severity and can expect to experience any range of wind on the Beaufort Scale.

Lightning in Oklahoma is as frequent as thunderstorms. Unfortunately, NCDC records are not complete concerning lightning events in Carter County. Records are not kept in Carter County on every lightning event unless it causes major damage to structures or starts major fires. Carter County officials consider all events which contain lightning to be severe. Carter County and all participating jurisdictions used the Lightning Activity Level chart when considering lightning severity. Based on this chart, the planning area can experience the entire range of severity.

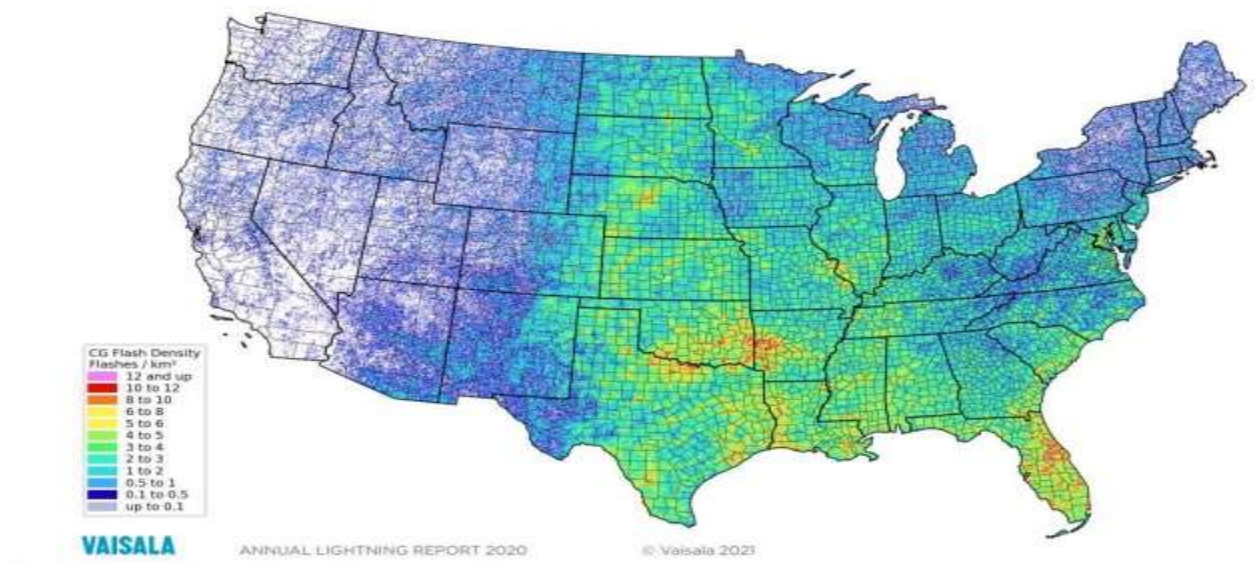
Lightning Activity Level (LAL)	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Previous Occurrences:

There are hundreds of thunderstorm events across Oklahoma each year, most bringing welcome precipitation but many cause significant damage or injury and even death. Carter County experiences a number of thunderstorms every year. Many of those thunderstorms include high wind and lightning. Examples of thunderstorm incidents in the Carter County area are reflected in the table below. There have been numerous thunderstorms with wind and lightning that have occurred causing only tree damage. Those are not listed in the interest of space. The storms listed, caused actual structural damage. Based on the Vaisala Lightning maps the planning area can experience 64 and 98 lightning strikes per year.

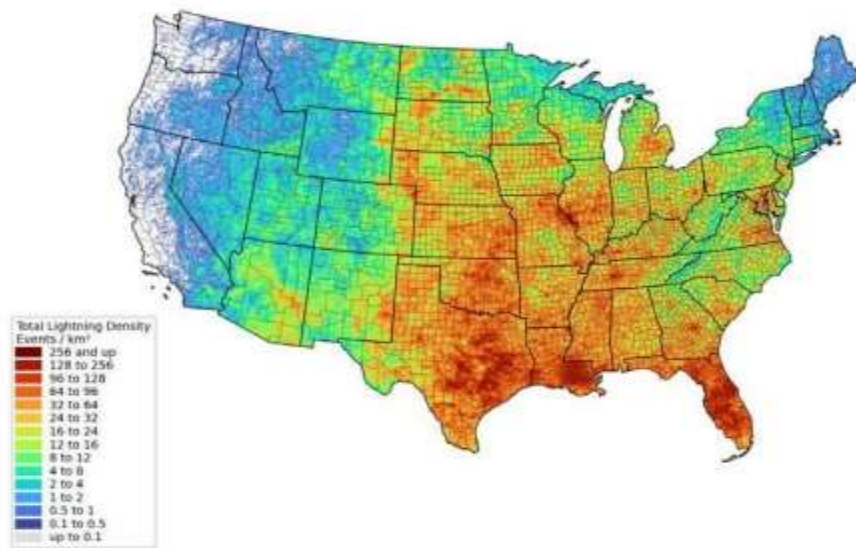


U.S. cloud-to-ground flash density in 2020



Total lightning density gridded map 2021

Cloud-to-ground strokes plus cloud pulses



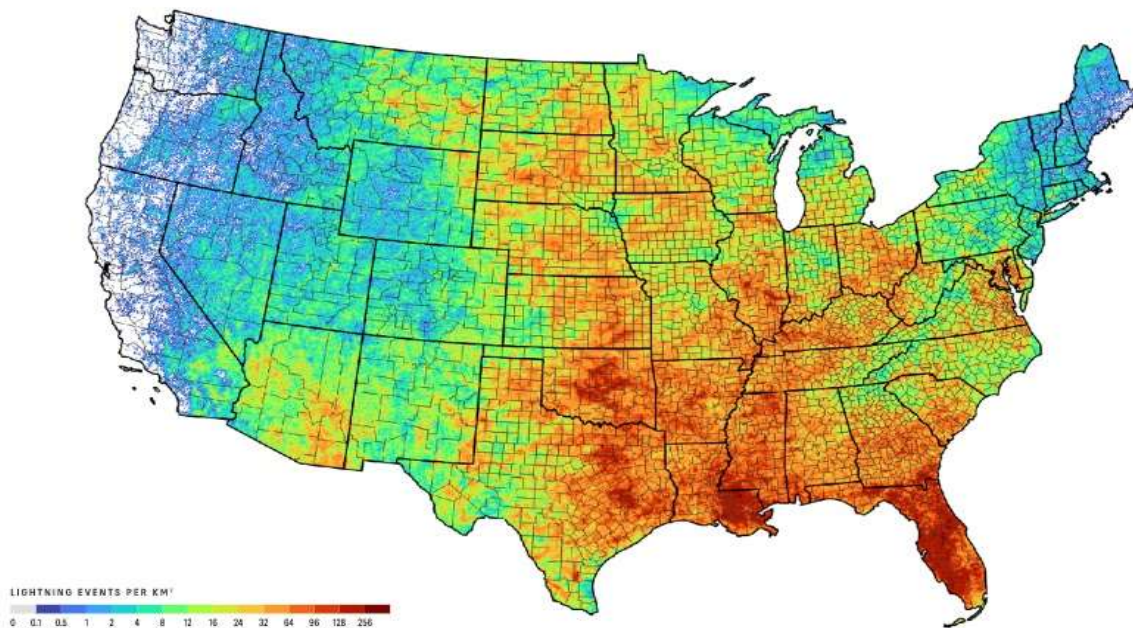
VAISALA

2021 ANNUAL LIGHTNING REPORT

© Vaisala 2022

Total lightning density map 2022

21



VAISALA **x**weather

Total Lightning Statistics 2022

© Vaisala 2023

Table 3-15

Carter County Thunderstorm History (Profiles only structural damage and winds exceeding 58 knots.) 2012-2022			
Date	Location	Description	Est. Damage
5/30/2012	SPRINGER	Another active weather day occurred across parts of Oklahoma as a surface low deepened across the Texas Panhandle. This drove a dryline into western Oklahoma during the late afternoon hours. Severe storms developed rapidly along and ahead of the dryline in a moist and unstable environment with upper level winds support of sustained supercell storms. Large hail and damaging winds were reported over a large area.	\$0.00
9/5/2012	ARDMORE	A weak cold front moved into Oklahoma during the afternoon, initiating scattered thunderstorms mainly south of interstate 40. Several storms produced severe wind gusts, along with some large hail.	\$3,000.00
10/13/2012	HEALDTON	Numerous quasi-discrete thunderstorms developed along and ahead of a dryline across western Oklahoma during the early afternoon. These storms continued into the evening hours, affecting much of Oklahoma south of I-40. One tornado was reported, as well as widespread damaging winds and severe hail.	\$0.00
3/31/2013	DICKSON	A warm and seasonably moist airmass was in place ahead of a weak cold front stretching from western to northern Oklahoma during the afternoon. During the late afternoon, several supercells developed and moved east-southeast from near Lawton to east of Oklahoma City. These storms dissipated by late evening following the loss of daytime heating. A second round of thunderstorms rapidly developed during the early morning hours of the 31st along the cold front as it moved into central Oklahoma. Numerous hail and wind reports were received from the Oklahoma City area south and east toward Ardmore and Ada. Extensive hail damage occurred in central Oklahoma, with estimated damages totaling \$2 million around the Norman, OK area.	\$500.00
5/20/2013	GENE AUTRY	A tornado outbreak occurred during the afternoon and evening hours of the 20th. Several tornadoes occurred from central Oklahoma down through south central Oklahoma near the Red River. The strongest tornado touched down near Newcastle and traveled through Moore and south Oklahoma City. This tornado caused catastrophic damage in these areas, with a maximum rating of EF-5. The tornado claimed 24 lives and caused billions of dollars in damage. In addition to the tornadoes, large hail and damaging	\$25,000.00

		winds cause damage in many areas.	
5/23/2013	DICKSON	Moderate northwest flow aloft existed over Oklahoma, with a diffuse frontal boundary extending west-east across the center of the state. Elevated thunderstorms developed in the early morning before sunrise, primarily near the I-35 corridor, and trained over a region roughly extending from Kingfisher to Durant. Damaging winds and marginally severe hail were reported, along with some flash flooding.	\$0.00
5/29/2013	ARDMORE	A large upper trough was ejecting out of the Rockies, with a dryline extending from western Nebraska through the Texas Panhandle. Strong wind shear and instability were in place over the southern Plains. Supercells developed along the dryline during the early to mid afternoon, then progressed eastward into western Oklahoma, producing hail, wind and isolated tornadoes. Additional severe thunderstorms developed farther east over western and central Oklahoma during the mid to late afternoon, with severe wind and hail reported.	\$0.00
10/2/2014	POOLEVILLE	A stalled front across northern and western Oklahoma served as a focus for scattered thunderstorms late on the 1st. With moderate mid level winds, wind shear was sufficient for occasional severe thunderstorm development. Several instances of strong and damaging winds occurred, along with sporadic hail.	\$0.00
3/25/2015	TATUMS	A strong upper level storm system moved across the Southern Plains during the late afternoon and evening. At the surface, a slow moving cold front and dryline served as foci for severe thunderstorm development. With strong instability and wind shear, very large hail and damaging winds were widespread. A couple of tornadoes also developed, with the most significant tornado moving through portions of the south Oklahoma City metro.	\$0.00
5/19/2015	ARDMORE	Severe storms developed near a stalled boundary across Oklahoma and the panhandles and moved eastward through the afternoon and evening of the 19th, causing widespread heavy rainfall and additional flooding. One fatality occurred near Cole in McClain county, as a vehicle was swept into floodwaters.	\$0.00
5/25/2015	LONE GROVE	As an upper level trough continued to move over the central plains, storms formed ahead of a cold front in west Texas. These storms formed a line as the moved eastward and developed northward into Oklahoma.	\$0.00
5/28/2015	FOX	Another round of severe weather moved through Oklahoma on the 28th. Hail up to golfball size and winds to 70 mph were reported with yet another round of flash flooding rainfall.	\$3,000.00

11/17/2015	CARTER COUNTY	A line of storms formed along an eastward moving front overnight on the 16th and continued into the morning of the 17th. Several of these storms produced severe winds, and a few produced tornadoes.	\$6,000.00
4/26/2016	CARTER COUNTY	The 26th began with a few isolated storms forming out ahead of the dryline and becoming severe. Later in the afternoon, the dryline surged east and storms fired along the boundary. These storms quickly became severe and gradually merged into a line as they moved eastward through the evening.	\$15,000.00
5/29/2016	DICKSON	Storms formed the evening of the 28th along a front in central Texas before moving up through south central Oklahoma overnight. A few of the storms were severe just after midnight on the 29th.	\$0.00
5/31/2016	LONE GROVE	A line of storms moved southeast out of Kansas on the morning of the 31st ahead of a cold front. Later that evening, additional storms formed along the cold front across central Oklahoma.	\$0.00
10/26/2016	(ADM)ARDMORE APT	A line of storms moved south over eastern Oklahoma on the afternoon of the 26th as a cold front made its way through.	\$0.00
5/18/2017	HEALDTON	A line of storms fired along and just ahead of a dryline and cold front on the afternoon of the 18th and continued eastward across the state overnight into the 19th.	\$11,000.00
5/27/2017	LONE GROVE	Thunderstorms formed in the vicinity of a cold front and dryline late on the 27th and continued till just after midnight on the 28th.	\$0.00
6/30/2017	(ADM)ARDMORE APT	Another line of storms formed along a cold front as it pushed into southern Oklahoma and western north Texas late on the 30th.	\$0.00
7/2/2017	LONE GROVE	Showers and storms developed during the afternoon and evening of the 2nd along and behind a northward moving warm front.	\$0.00
8/6/2017	LONE GROVE	After widespread rain and thunderstorms moved through during the predawn hours and weakened during the day, instability increased during the afternoon and intense thunderstorms developed along a stationary front across southern Oklahoma on the 6th. These storms moved slowly in a very moist environment causing heavy rainfall amounts and localized flooding and flash flooding. One severe wind gust was measured in Carter County but no damage was reported.	\$0.00
6/24/2018	ARDMORE	A line of storms came down out of Kansas just after midnight on the 24th, sweeping through northern Oklahoma. A second round formed right on the tail of the first, making its way southward through Oklahoma	\$10,000.00

		later that morning through the afternoon.	
6/25/2018	ARDMORE	A line of storms coming off the Rockies swept through Oklahoma late on the 24th and overnight into the early morning of the 25th, producing numerous severe wind gusts.	\$20,000.00
10/6/2018	GENE AUTRY	During the late afternoon and early evening of the 6th, a line of thunderstorms developed along a cold front within a very moist environment, focused over south-central Oklahoma.	\$0.00
10/9/2018	ARDMORE	A narrow line of thunderstorms formed during the morning of the 9th along a fast-moving pre-frontal trough, producing numerous brief tornadoes along with a few wind and flood reports.	\$0.00
4/22/2020	LONE GROVE	Storms initiated along a warm front amid strong instability and enough shear for multiple storms producing very large hail up to the size of baseballs and a few brief tornadoes on the evening of the 21st.	\$0.00
7/12/2020	LONE GROVE	An outflow boundary was the focus for thunderstorm development during the evening of the 11th. Several supercells produced large hail before merging into a cluster of storms that led to several significant severe wind reports that lasted into the early morning of the 12th.	\$0.00
8/16/2020	WILSON	A weak surface boundary served as a focus for thunderstorm development during the afternoon of the 16th across southern Oklahoma and western north Texas with numerous severe wind and hail reports were received.	\$3,000.00
7/10/2021	ARDMORE	A line of thunderstorms originating across eastern Kansas built southwestward into northern and central Oklahoma during the evening of the 10th, leading to numerous severe wind, hail and flood reports.	\$0.00
5/15/2022	DICKSON	An outflow boundary moving into an extremely unstable airmass sparked multiple supercell thunderstorms with very large hail close to softball sized and strong damaging wind gusts.	\$0.00

Probability of Future Events:

Carter County will continue to have thunderstorms with high winds and lightning, some being severe. There will continue to be damage from thunderstorm high winds and lightning. Considering the averages experienced over the last 58 years, there could be considerable thunderstorm activity in the next few years. The probability of thunderstorms with high winds and lightning in Carter County is **HIGHLY LIKELY**.

Vulnerability and Impact:

Many residents of Carter County have built safe rooms or underground tornado shelters, but many still do not have the means to complete such a project. All of the schools in Carter County have locations to help remove students and staff from danger but are not safe rooms and provide minimal protection. Wilson Schools and Dickson Schools have safe rooms on their campuses. Additional safe rooms are needed in Carter County school districts.

Those living in mobile homes are significantly more vulnerable to the effects of high winds than any other identifiable population. While the number of mobile homes is a small fraction of total residential dwellings, the number of deaths in mobile homes significantly exceeds the number of deaths associated with inhabitants of permanent homes.

Also at an increased risk for these events are members of the hard-of-hearing/deaf community, people for whom English is not their primary language and those without access to broadcast media messages (television or radio) alerting them of approaching severe weather. While much progress has been made in expanding communication resources for these individuals, there are still a large number of residents facing these challenges unable to receive vital warnings in a timely manner.

All critical facilities within Carter County should be considered vulnerable to the effects of a severe thunderstorm/high wind event. Structural integrity may be compromised if in the direct path of the storm, in addition to secondary impacts, such as power disruption, water damage from accompanying rain, injury to workers/residents, etc.

Carter County’s primary electrical service is provided by Oklahoma Gas & Electric (OG&E) based in Oklahoma City, with service in the southern portion of the county provided by Red River Valley Rural Electric, with offices in Marietta.

	Vulnerability	Impact
Carter County	Lack of public storm shelters	Lack of public storm shelters leaves the public vulnerable to this hazard. People caught out in the elements without proper shelter can experience severe injury or death.
	The county has several areas where storm sirens can’t be heard.	These areas are mostly rural. Storm sirens may be the only warning in these areas.
	The county has identified several educational needs to lessen the effects of this hazard. Education for this hazard would include social media campaigns, public education books, and public informational seminars.	Lack of education can hinder the public’s ability to form a plan and delays reaction time in disaster situations that could endanger lives and property.
	Several critical facilities within the county are lacking	High wind events can take out power lines and render the

	generators, including the county courthouse, several fire departments and others.	county without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Ardmore	The City of Ardmore does not have a public storm shelter.	In the event high winds, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Dickson	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The Town of Dickson does not have a public storm shelter.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
Town of Gene Autry	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Healdton	The City of Healdton does not have a public storm shelter.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Lone Grove	The City of Lone Grove does not	In the event of high winds,

	have a public storm shelter.	having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Ratliff City	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Springer	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Tatums	The Town of Tatums does not have a public storm shelter.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Wilson	The City of Wilson does not have a public storm shelter.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	High wind events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather

		event so that vital services to the public are not delayed.
Ardmore PS	Not all campuses have shelters. Students have to shelter in place. Will need multiple to keep from bussing place to place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Dickson PS	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Fox PS	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Healdton PS	Not all campuses have shelters. Students have to shelter in place. Will need multiple to keep from bussing place to place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Lone Grove PS	Not all campuses have shelters. Students have to shelter in place. Will need multiple to keep from bussing place to place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need

		to be functional to safely accommodate kids until the event is over.
Plainview PS	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Springer PS	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Wilson PS	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Zaneis PS	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should high winds occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Southern Tech	Not all buildings have shelters. Students have to shelter in place.	In the event of high winds, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have	Should high winds occur during

	emergency generators.	school hours, the buildings need to be functional to safely accommodate kids until the event is over.
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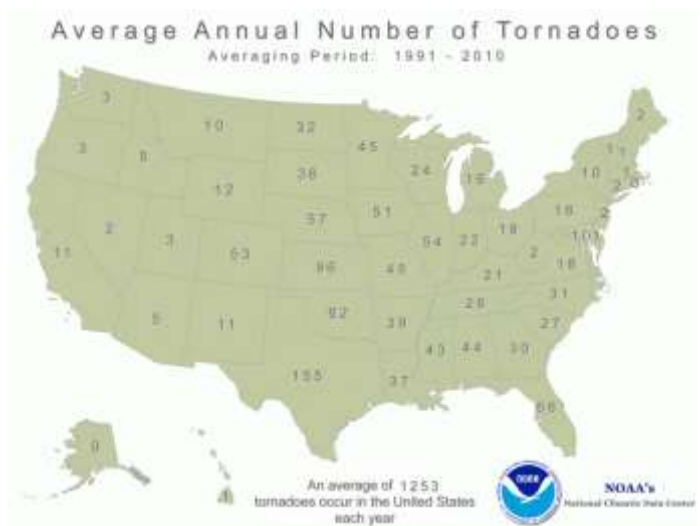
Hazard Profile—Tornado:



EF 4 Tornado Kills 8 in Lone Grove

Tornados are defined as violently rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air **not** in contact with the ground; however, the violently rotating column of air may reach the ground very quickly—becoming a tornado. A tornado is spawned by a thunderstorm when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally April through June in Oklahoma, although tornados can occur at any time of the year. Over 80% of all tornados strike between 3:00 pm and 9:00 pm, but can occur at any time of day or night. Tornados are found most frequently in the United States east of the Rocky Mountains.

Tornados are among the most unpredictable of weather phenomena. While tornados can occur almost anywhere in the world, they are most prevalent in the United States. Tornados can occur in any state but are more frequent in the Midwest, southeast, and southwest. Oklahoma averages 62 tornados annually. NCDC documents that Carter County has experienced 54 tornados since 1950. According to the NCDC, only 8 tornados have affected Carter County since 2005.



Tornado season is generally April through June in Oklahoma, although tornados can occur at any time of the year. They tend to occur in the afternoons and evenings: over 80% of all tornados strike between 3:00 pm and 9:00 pm, but can occur at any time of day or night.

The most violent tornados are capable of tremendous destruction, with wind speeds in excess of 300 miles per hour. Damage paths can exceed one mile wide and be several hundred miles long. According to the National Weather Service, about 42 people are killed each year because of tornados.

Location:

The entire state of Oklahoma is at risk for tornados including all of Carter County’s jurisdictions and public school districts. Carter County is located in the infamous “Tornado Alley”. Tornado Alley is an area of states generally making up the primary area of the United States in which significant tornados occur most often. It is a region from Iowa to Oklahoma to Mississippi, with the highest threat in Oklahoma. In addition, this area has a consistent season each year—from April through mid-June, with the most tornados normally occurring in May.



These two facts—the conjunction of high frequency of strong and violent tornados and the relative

consistency of the season from year to year from north Texas up into western Iowa—provide a natural, objective way to define Tornado Alley.

Extent:

Tornado wind speeds are estimated after the fact based on the damage they produce. In 1971, Dr. Theodore Fujita devised a scale to classify U.S. tornadoes into six intensity categories. These categories are based upon the estimated maximum winds occurring within the tornado. The Fujita Scale has subsequently become the definitive scale for estimating wind speeds within tornadoes, based upon the damage done to buildings and structures. It is used by meteorologists to estimate the speed of winds after a tornado by studying the damage caused by the tornado to structures.

The Enhanced Fujita Scale replaced the original Scale on February 1, 2007 which made wind speed estimates become more accurate than the previous scale. All events after 2/1/2007 are estimated using the enhanced scale. References to older storms will still rely on the original scale.

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

Tornado wind speeds are estimated after the fact based on the damage they produce. Tornadoes are categorized on a scale of EF0 (weakest) to EF5 (strongest) according to the Enhanced Fujita Scale. Carter County may experience any of these levels at any time during the year. The following pictures are examples of the damages experienced in the various levels of tornadic winds. Carter County and all participating jurisdictions used the Enhanced Fujita Scale when considering tornado severity.

Minor Severity: An EF2 or below
Major Severity: An EF3 or above



EF0 damage



EF1 damage



EF2 damage



EF3 damage



EF4 damage



EF5 damage

Previous Occurrences:

Table 3-18

Carter County Tornadoes 2012-2022					
Date	Location	Description	Injuries	Fatal	Damages
10/13/2012	HEALDTON	A sheriff's deputy encountered a rain-wrapped tornado near Healdton that was embedded within a larger area of severe thunderstorm winds. The tornado developed approximately 3 miles southwest of Healdton and moved northeast toward Healdton Lake. Trees and power lines were damaged along the path. The most significant damage occurred at Healdton Lake where five mobile homes were destroyed. Two injuries reported in one of these homes. The tornado likely dissipated over or just northeast of Healdton Lake. EF1	2	0	\$0.00
5/19/2015	WILSON	A tornado was observed approximately 8 miles southwest of Wilson. No damage was reported. EF0	0	0	\$0.00
5/19/2017	SPRINGER	A storm chaser observed the first of four tornadoes near Springer. No damage was reported and the location was estimated. EFU	0	0	\$0.00
5/19/2017	SPRINGER	This was the second of four tornadoes observed near Springer. No damage was reported and the location was estimated. EFU	0	0	\$0.00
5/19/2017	SPRINGER	This was the third of four tornadoes observed near Springer. No damage was reported and the location was estimated. EFU	0	0	\$0.00

5/19/2017	SPRINGER	This was the fourth of four tornadoes observed near Springer. This tornado was observed to be larger and more persistent than the previous tornadoes. No damage was reported and the location was estimated. EFU	0	0	\$0.00
5/27/2017	(ADM)ARDMORE APT	A television storm chaser observed a tornado develop about 3 miles south-southeast of Dougherty. The tornado is believed to have moved through a small portion of rural Carter County before crossing the Washita River into Murray County. No damage is known to have occurred. EFU	0	0	\$0.00
4/22/2020	SPRINGER	A brief tornado was observed by a storm chaser at close range. Debris observed by the chaser is believed to have been from a damaged outbuilding. This was a brief first tornado that occurred about a minute before a much larger tornado developed northeast of Springer. EF0	0	0	\$2,000.00
4/22/2020	SPRINGER	Damage was observed in high-resolution satellite imagery from a large tornado that occurred in areas of the southern Arbuckle Mountains inaccessible to ground survey teams. The large tornado developed on the southern slopes of the Arbuckle Mountains and was observed by many storm spotters and storm chasers as it moved northeast into the Arbuckles. The satellite imagery indicated a clear path of tree damage that moved intermittently northeast and east-northeast with the most significant and widest area of tree damage along a tree line along Cool Creek where numerous large trees were toppled along a 600 yard wide path. The tornado crossed into Murray County south-southwest of Dougherty. EF2	0	0	\$0.00

Probability of Future Events:

Based on the location of Oklahoma between the warm humid air from the Gulf of Mexico, and arid hot air from New Mexico and the cool air from the Rocky Mountains, conditions are right as proven by the history of tornados in Oklahoma and threaten Carter County.

Fortunately, better construction practices can limit the damage potential from all but the most violent tornados. The residences and businesses of today are more likely to withstand the damaging winds of weaker tornados than those structures built fifty years ago however there are still many older homes in the county and as was demonstrated in Lone Grove in 2009, even the stronger modern structures are not immune to major tornados. The map on the right reflects the tornados in Carter County from 1950—2021.



The National Weather Service is also taking steps to improve warning time. The next step in NOAA’s long-time weather radars is phased array radar. Available in the next few years, these radars, using electronic controls of beams and frequencies, can scan more quickly, thereby increasing lead times for tornado warnings.

The potential for future tornados in Carter County is **LIKELY**.

Vulnerability and Impact:

Many residents of Carter County have built safe rooms or underground tornado shelters, but many still do not have the means to complete such a project. All of the schools in Carter County have locations to help remove students and staff from danger but are not safe rooms and provide minimal protection. Wilson Schools and Dickson Schools have safe rooms on their campuses. Additional safe rooms are needed in Carter County school districts.

Those living in mobile homes are significantly more vulnerable to the effects of a tornado than any other identifiable population. While the number of mobile homes is a small fraction of total residential dwellings, the number of deaths in mobile homes significantly exceeds the number of deaths associated with inhabitants of permanent homes.

Also at an increased risk for these events are members of the hard-of-hearing/deaf community, people for whom English is not their primary language and those without access to broadcast media messages (television or radio) alerting them of approaching severe weather? While much progress has been made in expanding communication resources for these individuals, there are still a large number of residents facing these challenges unable to receive vital warnings in a timely manner.

All critical facilities within Carter County should be considered vulnerable to the effects of a tornado event. Structural integrity may be compromised if in the direct path of the storm, in addition to secondary impacts, such as power disruption, water damage from accompanying rain, injury to workers/residents, etc.

Carter County’s primary electrical service is provided by Oklahoma Gas & Electric (OG&E) based in Oklahoma City, with service in the southern portion of the county provided by Red River Valley Rural Electric, with offices in Marietta.

Fire, Police and Medical Services are all similarly at risk to secondary effects of a tornado, such as downed power lines or debris blocking county and community roads and streets. Excessive debris in the streets could lead to damage to emergency vehicles, potentially reducing the number of vehicles available for response. Medical Services (including treatment facilities) could be strained in responding to large numbers of injuries.

	Vulnerability	Impact
Carter County	Lack of public storm shelters	Lack of public storm shelters leaves the public vulnerable to this hazard. People caught out in the elements without proper shelter can experience severe injury or death.
	The county has several areas where storm sirens can’t be heard.	These areas are mostly rural. Storm sirens may be the only warning in these areas.
	The county has identified several educational needs to lessen the effects of this hazard. Education for this hazard would include social media campaigns, public education books, and public informational seminars.	Lack of education can hinder the public’s ability to form a plan and delays reaction time in disaster situations that could endanger lives and property.
	Several critical facilities within the county are lacking generators, including the county courthouse, several fire departments and others.	Tornado events can take out power lines and render the county without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Ardmore	The City of Ardmore does not have a public storm shelter.	In the event of a having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Dickson	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for

		critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
	The Town of Dickson does not have a public storm shelter.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
Town of Gene Autry	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Healdton	The City of Healdton does not have a public storm shelter.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Lone Grove	The City of Lone Grove does not have a public storm shelter.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Ratliff City	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.

Town of Springer	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Tatums	The Town of Tatums does not have a public storm shelter.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Wilson	The City of Wilson does not have a public storm shelter.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the public vulnerable to injury or death.
	Some critical facilities within the city do not have generators.	Tornado events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Ardmore PS	Not all campuses have shelters. Students have to shelter in place. Will need multiple to keep from bussing place to place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Dickson PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Fox PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial.

		If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Healdton PS	Not all campuses have shelters. Students have to shelter in place. Will need multiple to keep from bussing place to place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Lone Grove PS	Not all campuses have shelters. Students have to shelter in place. Will need multiple to keep from bussing place to place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Plainview PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Springer PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Wilson PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need

		to be functional to safely accommodate kids until the event is over.
Zaneis PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Southern Tech	Not all buildings have shelters. Students have to shelter in place.	In the event of a tornado, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Tornado occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.

Hazard Profile—Wildfires:

A wildfire is often a raging inferno that rapidly spreads out of control. It happens most frequently in the summer, fall, and even winter when the brush is dry and flames can move unchecked through wooded or heavily grassed areas. During years of drought, wildfires can become a problem anytime due to the unusually dry conditions. A fire often begins unnoticed and spreads quickly, lighting brush, trees and eventually homes or outbuildings. It may be started by a campfire that was not extinguished properly, a tossed cigarette, burning debris, lightning or arson.

Wildfire is a natural part of Oklahoma’s ecosystem. Before Carter County was settled, wildfires, usually started by lightning, ran across the plains, or through the forests replenishing nutrients to the soils and controlling invasive plant species. With settlement, however, the interaction of wildfire and the environment has changed. Now, people, towns and structures are at risk from flames spreading across Carter County. Today, Carter County has many wild lands, creating an urban-wild land interface that is at risk of uncontrolled burns.

The development of such urban-wild land interfaces is part of a growing national problem. Fire losses and suppression costs have skyrocketed over the past decade. As homes and businesses have edged into valleys, forestlands and canyons, often far away from water sources that can be used to extinguish flames, costs of fire control have increased for local fire departments. Carter County Fire Departments are mostly volunteer fire departments doing an outstanding job. Carter County has experienced numerous wildland fires, many of them being long term.

Location:

Although the entire planning area is susceptible to wildfires, there are areas within the planning area who may have a higher susceptibility and these areas are depicted on the Wildland/Urban Interface Map (WUI) located in Appendix C.

Extent:

Carter County is threatened by a variety of grassfire and wildfire conditions found in the Keetch-Byram Drought Index (KBDI).

Keetch-Byram Drought Index (KBDI Fire Danger Rating System	
0-200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.
200-400	Fires more rapidly burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400-600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600-800	Fires will burn to mineral soils. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Carter County and participating jurisdictions can experience wildfires thru-out the entire range of the KBDI scale. However; the planning team considers anything above 200 on the KBDI to be of major concern.

Previous Occurrences:

In recent years, Carter County has experienced numerous wildland fires. As stated earlier, Carter County has an abundance of prairie land, forests and heavily wooded areas as well as mountainous terrain. Some of the county, particularly in the mountainous areas, create hazardous and often inaccessible areas for firefighters. Frequently, aerial support from the Oklahoma National Guard has to be requested in order to access the fire area. Sometimes, the fires have to “come out” to an area where the firefighters can access it.

In the last 10 years Carter County has had numerous wildfires throughout the county that were able to be controlled by local fire departments. At the time of writing this plan, the planning team was unable to attain a data listing all the wildfires that have affected the county. This can be attributed to a data deficiency in the ability to collect this information from the appropriate fire departments. An action item will be created to help address this issue.

Probability of Future Events:

The State of Oklahoma and Carter County have a significant wildfire hazard due to the climate, the types of fuels present and the cultural practices used. Carter County is south of the Snow Belt, leaving its grassy fuels exposed and vulnerable to fire in the dormant season. It is far enough north of the Gulf of Mexico that it is influenced by the continental climate in the winter. Summers are hot and usually dry, with daytime highs in the mid-90s and generally less than 4 inches of rain in July and August. Oklahoma recognizes 10 months as fire season. Wild land fuels are prone to burning from July through April. Only May and June are not considered “fire season”, however during droughts such as was recently present in Carter County, grass and wild land fire is more likely. Most at risk are those people who make their homes in woodland settings in or near forests and the rural areas of Carter County. Carter County has homes and businesses located in woodland and grassy areas complicated by mountainous terrain. Adding to the natural problem is an abundance of cedar and pine trees which along with the natural winds cause fires to spread quickly. Based on past experience and the fact that Carter County experiences dry conditions during fall and winter months as well as during our hot dry summers especially during July and August, and due to the fact Carter County has experienced a number of major wildfires the probability of future wildland fires is HIGHLY LIKELY.

Vulnerability and Impact:

Though wildfires can potentially impact anywhere in the planning area, the combination of pastureland, brush, and trees around the schools of Fox, Zaneis, Springer, and Dickson call for concern. These schools have all had several close calls in the past 10 years. The schools should continue to maintain defensible space around the facilities.

All rural and urban/wildland interface areas of Carter County are vulnerable to the wildfire hazard.

Any structures/buildings constructed within the wildland/urban interface area or on ranches/farms situated in grassy/wooded areas should be considered at risk to the effects of a wildfire event.

Critical facilities such as medical care facilities, resident care homes, daycare facilities, and utility out-stations located in these high-risk areas should be considered vulnerable to the effects of wildfires.

The largest threat to the delivery of electrical service would be the destruction/damage of power poles/lines, and flashovers from line to ground via smoke.

Roadway inaccessibility would be the largest vulnerability posed to the transportation system during a Wildfire event. During a wildfire located near a major highway, it may become necessary to close a section of highway or divert traffic along that route. Roads and bridges in Carter County would be at risk during a widespread event as they are located in closer proximity to fields/grasslands that could become involved in a wildfire.

Fire, Police and Medical Services would all be similarly at risk to effects of a Wildfire event. During a severe outbreak of wildfire, roads may become impassable, potentially isolating portions of the community to vital services and/or supplies. Residential developments in the wildland/urban interface areas of Carter County, along with any businesses/utilities supporting them in the immediate area, are especially at risk in the event of a large wildfire event.

	Vulnerability	Impact
Carter County	Unincorporated Carter County is primarily open wildland areas with pastureland and agricultural fields. These areas rely on volunteer fire departments for wildfire response. Volunteer fire departments vary on the number of people available to fight fires, and these volunteers often have jobs away from the areas they serve.	Response time and availability of the volunteer fire fighters can greatly vary and prolong the response time, causing more damage in the unincorporated areas.
City of Ardmore	The Ardmore fire district is primarily within the city limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
Town of Dickson	The Dickson fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.

Town of Gene Autry	The Gene Autry fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
City of Healdton	The Healdton fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
City of Lone Grove	The Lone Grove fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
Town of Ratliff City	The Ratliff City fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
Town of Springer	The Springer fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
Town of Tatum	The Tatum fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.
City of Wilson	The Wilson fire district extends beyond the town limits. While wildfires within city limits are not a serious concern, responding to wildfires along the perimeter or in neighboring fire districts can be.	Response times to mutual aid calls for wildfire can vary, and any significant delays arriving to the wildfires results in more potential damage to the area and properties in the path of the wildfire.

Ardmore PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Dickson PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Fox PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Healdton PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.

	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Lone Grove PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Plainview PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Springer PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.

	and are of particular concern.	
Wilson PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Zaneis PS	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.
Southern Tech	The bus routes extend into the rural areas of the county. If a wildfire were along a bus route, smoke and fire could potentially cause detours to ensure the safety of students.	Drifting smoke from a wildfire could cause visibility problems for bus drivers as they seek safe detour routes.
	Some of the school buildings are in areas where wildfires are of a particular concern because some buildings are right on the Wildland Urban Interface. School bus routes extend into rural areas of the planning area and are of particular concern.	A lack of knowledge for newly hired or inexperienced bus drivers regarding wildfires could potentially endanger students' safety if a bus continues down a road with poor visibility due to smoke in the area from wildfires.

Hazard Profile—Winter Storms:

A winter storm can range from moderate snow over a few hours to blizzard conditions with high winds, or can be freezing rain or sleet, heavy snowfall with blinding wind-driven snow and extremely cold temperatures that last several days. Winter storms vary in size from affecting several states to affecting only a small part of one state.

Flurries are snow events with light snow falling for short durations. No accumulation or only a light dusting is all that is expected with little or no effect on the population of the state.

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.

Winter Storm refers to a combination of winter precipitation, including snow, sleet, freezing rain, etc.

Blowing Snow is wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground and picked up by the wind.

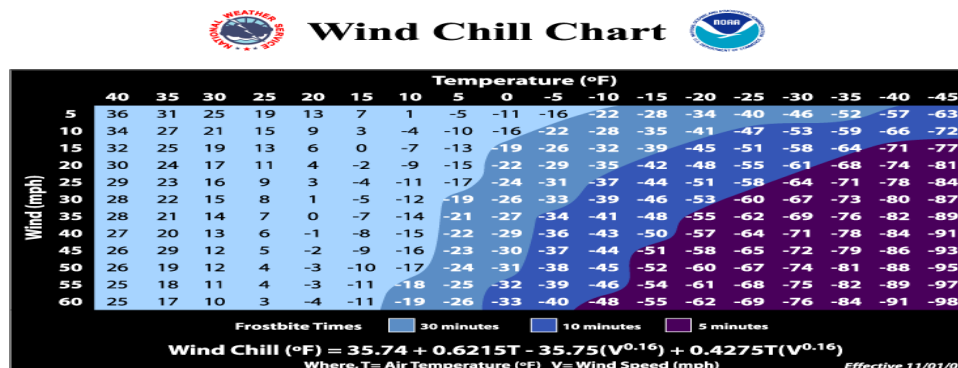
Blizzards though infrequent in Oklahoma, are due to winds over 35 mph with snow and blowing snow reducing visibility to near zero.

Ice Storms occur when freezing rain or sleet falls and freezes immediately on impact.

Freezing Rain is rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces such as trees, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.

Sleet is rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists.

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 wind chill derived from both wind speed and temperature. The Wind Chill Index was created in 1870. On November 1, 2001, the National Weather Service released a more scientifically accurate equation, which we use today. The table gives a range of physical intensities from winter storms along with the potential effect.

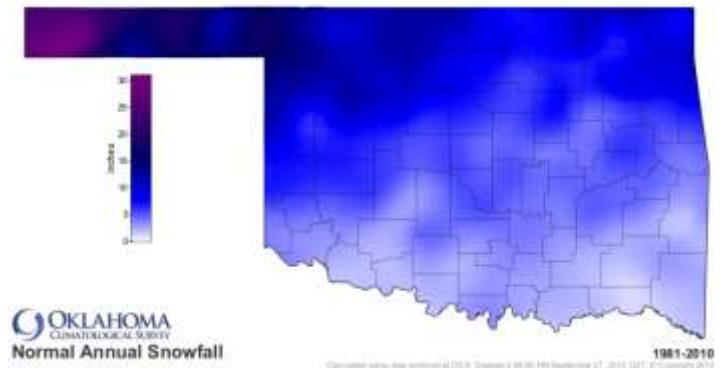


Location:

Oklahomans have been plagued with a series of major ice storms during the last decade. Ice storms are extended freezing rain events, lasting several hours to days with heavy ice accumulations. The icy cover downs power lines and tree limbs, causing millions of dollars in damage and widespread power outages. These events, which generally last several days or weeks, are extremely paralyzing to the communities and citizens affected. All of Carter County, including public school districts, is at risk for winter storms.

Extent:

Heavy snow can immobilize an area and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency services. Accumulations of snow, in rare instances, can collapse buildings and more frequently knock down trees and power lines. The cost of snow removal, repairing damages, and loss of business can have a large economic impact on cities and towns.



Carter County snow storms range generally from 3-6 inches annually. Wind chills also play a huge part in Carter County severe winter weather since the welfare of the public is directly related to wind chill. When wind chills warnings are issued by the National Weather Service, Carter County also issues a warning for Carter County citizens warning them to take extra precautions. Wind chill is the combination of wind and temperature that serves as an estimate of how cold it actually feels to exposed human skin. Carter County considers wind chill values below -19 degrees extremely dangerous to the population although hypothermia can occur at higher temperatures and cause deaths. Since wind can dramatically accelerate heat loss from the body, a blustery 30 degree day would feel just as cold as a calm day with 0 degree temperatures. The planning area can experience any range of the SPIA Index.

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

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is extensive. Outages lasting 1 - 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 - 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

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

The planning area can experience any wind chill temperature up till 30 minutes.

Previous Occurrences:

Carter County was affected by a major ice storm in the last past. In December of 2007 ice storms caused major damage throughout the area. Snow storms have also affected the area.

Carter County Winter Storm History 2012-2022	
Date	Description
12/25/2012	A strong upper storm system moved into Oklahoma from Christmas Eve through Christmas Day. Much of southern and western Oklahoma received considerable snowfall, while northern and central Oklahoma saw measurable snows. A brief period of blizzard conditions also occurred over southwest Oklahoma, where over 6 inches of snow fell in some areas. Healdton reported 4 inches of snow.
12/05/2013	A mixture of sleet and freezing rain occurred during the evening hours of the 5th. This continued into the morning of the 6th, with snow mixed in before the system moved east. By the time the storm had ended, Ardmore had received an inch or more of sleet with a dusting of snow, and areas east of Healdton reported 1.5 inches of snow and sleet.
02/27/2015	A deep Arctic air mass had settled into the Southern Plains. Several upper level disturbances moved across the region, bringing moderate to heavy snow to parts of the area. Snow came in two waves, with the heaviest snow being confined to both northwestern Oklahoma and south central and southeastern Oklahoma. Snow began falling during the late morning of the 27th and persisted through the morning of the 28th. By the time snow had ended, widespread 3 to 4 inch snowfall totals were reported. Ratliff City saw around 4 inches of snow, while Lone Grove and Gene Autry recorded 3 inches of snow. Ardmore only received around 2 inches.
03/04/2015	Light rain transitioned over to freezing rain and sleet briefly, before transitioning to all snow during the evening hours. Snow became heavy at times, with up to 4 inches measured at Ardmore, and around 2 inches at Healdton.
02/14-16/2021	Extreme and record breaking cold peaked across Oklahoma and Texas during the 14th-16th, with wind chills of -20 to as low as -30 degrees reported in much of the area. Air temperatures in the -10 to -20 range were also common on the 16th, with OKC reporting its second coldest low temperature ever recorded. A range of four to 12 inches of snow were reported across the area during this time frame.
2/23/2022	Up to an inch of sleet accumulation with a glaze of freezing rain was reported across the county.

Probability of Future Events:

Oklahoma’s location between the cold winter temperatures of the Rocky Mountains and the moisture from the Gulf of Mexico gives Oklahoma the potential for further ice and snow events. The probability of future winter storms in Carter County is LIKELY.

Vulnerability and Impact:

Residents of Carter County have been plagued with a series of major ice and snow storm during the last decade. Ice storms typically last several hours to days with heavy ice accumulations.

Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms can knock down trees, utility poles, and power lines. Heavy accumulations of ice also bring down trees, electrical wires, telephone poles and lines, and communications towers. Most electric and telephone line in Carter County are above ground although some are underground. There are two major electric suppliers in Carter County (Oklahoma Gas & Electric (OG&E) and Red River Valley Rural Electric Association (REA)). Communications and power can be disrupted for days and weeks while utility companies work to repair the extensive damage. In extreme cases especially those involving elderly, handicapped or very young it is necessary to move them to shelters where they can stay until they return home. These shelters are typically operated by the American Red Cross, local churches and emergency response agencies (with support from the Red Cross). Most residents make arrangements with friends or relatives in unaffected areas to stay with them. This is not only inconvenient but the temporary loss of population along with inaccessible roads for essential services and shopping cause critical shortages to businesses that are able to open.

Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and the elderly are most susceptible. Freezing temperatures can cause severe damage to crops and other critical vegetation. Water pipes may freeze and burst in homes and businesses that are poorly insulated or without adequate heat leading to expensive repairs.

Structure fires occur more frequently in the winter due to lack of proper safety precautions and present a greater danger because water supplies may freeze and impede firefighting efforts. Icy roads may also impede firefighting leading to higher replacement or repair costs especially during more severe events.

People die of hypothermia because of prolonged exposure to the cold. Indigent and elderly people are most vulnerable to winter storms and account for the largest percentage of hypothermia victims largely due to improperly vented or unheated homes, but the leading cause of death during winter storms is from automobile or other transportation accidents. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians often leading to traffic accidents and major expense for medical bills and auto repairs.

Heavy snow usually immobilizes transportation facilities stranding travelers, stopping the flow of supplies, and disrupting emergency services. Accumulations of snow can collapse weaker buildings and knock down trees and power lines. In rural areas, homes may be isolated for days. The cost of snow removal, repairing damages, and loss of business can have large impacts on Carter County often delaying other important projects and plans.

	Vulnerability	Impact
Carter County	Several critical facilities within the county are lacking generators, including the county courthouse, several fire departments and others.	Winter Storm events can take out power lines and render the county without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.

City of Ardmore	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Dickson	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Gene Autry	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Healdton	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Lone Grove	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.

Town of Ratliff City	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Springer	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Town of Tatums	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
City of Wilson	Some critical facilities within the city do not have generators.	Winter Storm events can take out power lines and render the city without power. It is essential for critical facilities to be fully functional during a weather event so that vital services to the public are not delayed.
Ardmore PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Dickson PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.

Fox PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Healdton PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Lone Grove PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Plainview PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Springer PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Wilson PS	Not all buildings have shelters. Students have to shelter in place.	In the event of a Winter Storms, having a place to seek shelter is crucial. If not, it leaves the students vulnerable to injury or death.
	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
Zaneis PS	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.

Southern Tech	The school district does not have emergency generators.	Should a Winter Storm occur during school hours, the buildings need to be functional to safely accommodate kids until the event is over.
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Long Range Growth and Post Disaster Redevelopment:

Carter County is located in the south-central part of Oklahoma, and the population is equally split between urban and rural settings. Land uses within the county consist basically of agricultural, industrial, commercial, recreational and residential. Zoning ordinances only exist in the incorporated jurisdictions.

While Carter County continues to grow at a comfortable rate, Carter County does not anticipate any major changes in land use. New land that might be brought into the cities and towns will be zoned based on policies currently in place.

Analyzing Development Trends:

The Emergency Manager obtained the property assessment from the County Assessor in order to provide a building inventory. These properties were reviewed utilizing FEMA guidelines to estimate losses using the condensed inventory with cost estimates to provide a broad view of the extent of damages that could occur in any event. This methodology of estimating percentages for damage estimates was determined by the team members on expected damages for each disaster in a worst case scenario. (Appendix D—Critical Infrastructure)

Any post disaster redevelopment caused by an event would follow normal development procedures. The availability of utilities and roads and zoning policies would show very little permanent change in the redevelopment criteria. The stability of the historic data indicates redevelopment would occur in the same geographic locations.

The planning area has experienced some growth in retail stores thru-out the participating jurisdictions since the previous HMP Update. However, as shown in Section 2, the planning departments of the respective municipalities and the governing bodies regularly review ordinances, plans, and developments, to ensure that adequate planning for expanding populations mitigates the most common hazards of severe storms that cause extensive wind damage and localized flooding. This does not indicate an increase in vulnerability, but only that as infrastructure continues aging, larger, more extensive construction projects are necessary to improve resiliency and hazard mitigation.

Overall, the planning area has not seen an increase or decrease of the other hazards profiled. The main change surrounding the development of this HMP centered upon each respective jurisdiction's need for better planning on how to fund major projects related to replacing water supply lines, building up roads, and improving bridges.

Discussions with the schools centered upon how to better update and implement changes with schools' existing emergency plans, protocols, and requirements.

Section 4

Mitigation Strategies

SECTION FOUR

Mitigation Action Strategies:

The Carter County Hazard Mitigation Planning Team reviewed, analyzed and prioritized the risk assessment studies. The STAPLEE guide was used to prioritize the action items and insure that an appropriate Cost Benefit performance is maintained. The goals, SECTION 1, Page 1-3, and objectives listed below were determined to be those that would 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:

Prioritization and Review Criteria:

Evaluation Category	
Social	Based on the idea that community consensus is a necessary precondition for successful implementation of mitigation measures (i.e., measures should be supported and accepted by the entire community). This also means that measures should not affect adversely a particular segment of the population or a particular neighborhood, or adversely impact local cultural values or resources.
Technical	Addresses the technical feasibility of the proposed measures, in terms of effectiveness, secondary impacts, and the technical capabilities of a community to implement and sustain these measures.
Administrative	Addresses the administrative capabilities required to implement each mitigation measure. For example, does the jurisdiction have the necessary organization, staff, and funding sources to implement and sustain the mitigation process?
Political	Considers the need for political support for mitigation measures. This means that all stakeholders in the political process, especially political organizations and institutions both inside and outside of the community, should support the measure.
Legal	Used to determine the appropriate legal authority necessary to implement each mitigation measure and whether such an authority can be delegated. In addition, it will examine the mitigation measure from the standpoint of current statutes, codes, ordinances, and other regulations, as well as the possible legal ramifications of the measure's implementation.
Economic	Addresses the cost-effectiveness of the proposed measure and its economic impact on the community. It is only reasonable to expect that the benefits of implementation will exceed the costs incurred. Economic considerations also consider the economic impact on the community's future development. Special emphasis was placed on the need to consider the economic cost—benefit analysis of each project.
Environmental	Has become an important consideration in examining mitigation options. Although most mitigation measures are usually beneficial for the environment, some measures may have adverse effects, which must be considered and addressed.

Progress of 2017 Mitigation Strategy:

- All communities currently have their own warning devices. Carter County has installed 14 early warning devices throughout unincorporated areas of the county. (Action Item 1)
- Generators have been installed at all county barns and at Sneed Volunteer Fire Department. (Action Item 5)
- Carter County uses NIXLE for its emergency notification system. (Action Item 7)
- Several Individual Saferoom Rebate programs have been administered in Carter County allowing for the installation of 406 individual saferooms. (Action Item 14)
- The low water crossing on Radar Road has been replaced with a bridge. (Action Item 16)
- Two low water crossings on Buckskin Road have been replaced with bridges. (Action Item 19)
- Carter County has current flood mapping, both paper and digital. (Action Item 20)
- Carter County equipment is now sheltered. (Action Item 23)

While the above mitigation strategies have been completed, several will still be included in the updated plan as they are considered by the planning team to be important and valid. This would include warning devices, generators at critical facilities, and Individual Saferoom Rebates programs. Even though these strategies may have been completed, there are still many opportunities to increase the reach of these.

Several mitigation strategies have not been completed. This would be due to funding sources, time constraints, or other road block. The planning team discussed the continued need of these strategies and determined they are still vital and should be included in the plan update.

Mitigation Actions:

Action Item 1	Early Warning Devices
Hazards Addressed	Severe thunderstorms, tornadoes, hail storms.
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatum, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install early warning devices throughout the cities, towns, and county where needed to provide adequate advanced warning of a hazardous event.
Responsible Party	Local officials, County, Local Emergency Management, School Administrators
Potential Implementation Timeline	12 to 18 months once funded.
Cost	\$30,000.00 per unit.
Potential Funding Sources	HMPG, Local Budget, REAP

Action Item 2	Community/School Saferooms
Hazards Addressed	Severe Thunderstorms, tornadoes, hail storms.
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatum, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Build Safe Rooms to provide citizens living in mobile homes, substandard housing, or working in businesses without protected areas, citizens caught in a storm in their vehicle, school students and staff with a safe place to go.
Responsible Party	School Administrators, County and Local Emergency Management
Potential Implementation Timeline	12—18 months once funded.
Cost	\$250,000.00 - \$300,000.00 (Cost varies per individual saferoom location). \$170.00 per sq. ft. average.
Potential Funding Sources	HMPG, County and Local Budgets

Action Item 3 Firewise Program	
Hazards Addressed	Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Provide information on fire safety and the Firewise program to the public and to school children with materials to take home.
Responsible Party	County and Local Emergency Management, Local Fire Departments, School Administrators
Potential Implementation Timeline	Ongoing
Cost	\$25,000.00 annually
Potential Funding Sources	HMPG, County and Local Budgets, USDA, Forestry, AFG

Action Item 4 Weather Radio Program	
Hazards Addressed	Dam Failure, Earthquake, Extreme Heat, Flood, Hail Storm, Severe Thunderstorm, Tornadoes, Wildfire, Winter Storm
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. Only Gene Autry and Carter County are affected by Dam Failure.
Action	Purchase, program, and giveaway weather radios to individual households, schools, critical facilities, and other facilities that contain large number of people at any one given time.
Responsible Party	County and Local Emergency Management, School Administrators
Potential Implementation Timeline	6 months once funded.
Cost	\$40.00 per receiver.
Potential Funding Sources	HMPG, County and Local Budgets

Action Item 5	Generators for Critical Facilities
Hazards Addressed	Dam Failure, Earthquake, Extreme Heat, Flood, Hail Storm, Severe Thunderstorm, Tornadoes, Wildfire, Winter Storm
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. Only Gene Autry and Carter County are affected by Dam Failure.
Action	Purchase and install generators on critical facilities to ensure continuity of government and critical services during disaster events and long periods of power outages.
Responsible Party	Municipal jurisdictions, County Commissioners, Schools Districts, Rural Water Districts.
Potential Implementation Timeline	3-6 Months once funded.
Cost	\$40,000.00 - \$80,000.00 ea.
Potential Funding Sources	HMPG, County and Local Budgets

Action Item 6	Saferooms in Mobile Home Parks
Hazards Addressed	Severe Thunderstorms, Tornadoes.
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, and Wilson.
Action	Pass resolutions recommending mobile home parks to have a Community Saferoom within walking distance of all residents.
Responsible Party	County Commissioners, Mayors, Town Councils.
Potential Implementation Timeline	12 to 18 months once funded.
Cost	No anticipated cost to jurisdictions.
Potential Funding Sources	Local

Action Item 7 Emergency Notification System	
Hazards Addressed	All Hazards
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. Not all jurisdictions are affected by Dam Failure.
Action	Purchase and install an emergency notification system such as Reverse 911.
Responsible Party	Emergency Management and School Administrators
Potential Implementation Timeline	1 year.
Cost	\$75,000,00
Potential Funding Sources	HMPG, Local Budget

Action Item 8 Surge Protection in Critical Facilities	
Hazards Addressed	Severe Thunderstorms.
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install surge protection—battery backup devices on all electronic systems in critical facilities.
Responsible Party	Municipal Governments, County Governments, School Administrators
Potential Implementation Timeline	6 months once funded.
Cost	\$300.00 per installation.
Potential Funding Sources	HMPG, Local Budget

Action Item 9 Water Source Storage Towers	
Hazards Addressed	Drought, Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install new water storage towers in water system.
Responsible Party	Municipal Governments, Water Districts, School Administrators
Potential Implementation Timeline	12 to 24 months.
Cost	To be determined.
Potential Funding Sources	CDBG

Action Item 10 Lightning Detectors	
Hazards Addressed	Severe Thunderstorms
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Purchase Lightning Detectors for use at outdoor events and recreational areas.
Responsible Party	Municipal Governments, School Administrators, Emergency Management
Potential Implementation Timeline	One Year Once Funded
Cost	\$750 - \$10,000 depending on detection unit and type of installation.
Potential Funding Sources	HMPG, Local Budget

Action Item 11 Water Wells	
Hazards Addressed	Drought, Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Drill for additional water wells.
Responsible Party	Municipal Governments, Water Districts, School Administrators
Potential Implementation Timeline	3 months.
Cost	\$100,000 - \$150,000+
Potential Funding Sources	OWRB, CDBG

Action Item 12 Fan and Air Conditioning Program	
Hazards Addressed	Extreme Heat
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson.
Action	Provide fans and/or air conditioners to those in need; identify candidates.
Responsible Party	Local Volunteer Organizations
Potential Implementation Timeline	3 months once funded.
Cost	\$10,000 Annually
Potential Funding Sources	Senior Citizens Centers, VOAD Agencies

Action Item 13 Public Education Book	
Hazards Addressed	All Hazards
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. Only Gene Autry and Carter County are affected by Dam Failure.
Action	Design and produce a booklet for public distribution to provide information on all the different hazards Carter County, communities, and schools are at risk of. Provide information on how to prepare for and respond in the event a hazard should occur.
Responsible Party	All Jurisdictional Emergency Management, School Administrators
Potential Implementation Timeline	Ongoing
Cost	\$25,000 Annually
Potential Funding Sources	HMPG, Local Budget

Action Item 14 Individual Safe Rooms	
Hazards Addressed	Hail, Severe Thunderstorms and Tornadoes
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson.
Action	Provide a safe room rebate program for persons installing a safe room in or near their residence.
Responsible Party	County and Municipal Emergency Management
Potential Implementation Timeline	36 months once funded.
Cost	\$3,000 per individual safe room.
Potential Funding Sources	HMPG, Local Budget, Individual Homeowners

Action Item 15 Repetitive Flooding on Airport Road	
Hazards Addressed	Flood
Jurisdictions Affected	Carter County, Healdton, and the Public School districts of Healdton.
Action	Perform a study to determine whether raising the road surface or installing tin horns would resolve repetitive flooding problems along a two and one half mile area that involves thirty three structures in the Healdton area.
Responsible Party	Healdton Municipality, Carter County, School Administrators
Potential Implementation Timeline	3 years
Cost	3,000,000
Potential Funding Sources	RFC, PDM, SRL, HMGP, FMA, Local Budget

Action Item 16 Participation in the National Flood Insurance Program (NFIP)	
Hazards Addressed	Flood
Jurisdictions Affected	Dickson, Healdton, Ratliff City, Springer, and Tatums.
Action	Complete NFIP applications for jurisdictions that are not already members. Member jurisdictions will continue to participate in the NFIP program.
Responsible Party	Cities Councils, Towns Councils, and County Commissioners
Potential Implementation Timeline	Continuing Annually
Cost	\$0.00
Potential Funding Sources	N/A

Action Item 17 Bridge on Woodford Road	
Hazards Addressed	Dam Failure, Flood
Jurisdictions Affected	Carter County, Ardmore, and the Public School Districts of Lone Grove and Springer. Not all jurisdictions are affected by dam failure.
Action	Build a bridge on Woodford Road to allow access and egress during flooding events.
Responsible Party	DOT, Carter County, and the City of Ardmore, School Administrators
Potential Implementation Timeline	18 months once funded.
Cost	\$1,000,000
Potential Funding Sources	HMGP, RFC, SRL, DOT

Action Item 18 New Lake Water Source	
Hazards Addressed	Drought, Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Study to find best location for additional water supply. This water supply would be an additional 6,000 acre lake located in the area identified by the study would enhance water availability for both drinking water and firefighting capabilities.
Responsible Party	Carter County Commissioners, Municipalities, OWRB, School Administrators
Potential Implementation Timeline	2 Years
Cost	\$150,000 - \$300,000
Potential Funding Sources	OWRB, USACE, NRCS, CDBG

Action Item 19 Flooding homes on Memorial Road	
Hazards Addressed	Flooding
Jurisdictions Affected	Carter County, Lone Grove, Wilson and the Public School Districts of Lone Grove and Wilson.
Action	Perform a study to determine the best course of action to eliminate repetitive flooding of homes on Memorial Road. Citizens are stranded by flooded road. Two or more homes are affected by this flooding
Responsible Party	Municipal Governments, County Commissioners, School Administrators
Potential Implementation Timeline	3 years once funded.
Cost	To be Determined
Potential Funding Sources	RFC, SRL, Local Budget

Action Item 20 Stream Monitoring Gages	
Hazards Addressed	Dam Failure, Flooding
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatum, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. *Not all jurisdictions are affected by Dam Failure.
Action	Install water monitoring device down stream of local dams.
Responsible Party	Commissioners, Emergency Management, USACE, OWRB, NRCS, School Administrators
Potential Implementation Timeline	6 mos. With funding
Cost	\$300,000 ea.
Potential Funding Sources	HMPG, Local Budget, OWRB, NRCS

Action Item 21 Window Film	
Hazards Addressed	Extreme Heat, Hail, Severe Thunderstorm, Tornado
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install window film on new and existing critical facilities and school buildings. This would reduce the amount of damage from impacts of hail and small grade tornadoes. Therefore reducing the risk of flying glass within classrooms. The film could also help reduce heat buildup in classrooms thereby helping to lower energy costs.
Responsible Party	Municipal Governments, School Administrators, Emergency Management
Potential Implementation Timeline	6 mos. Once funded.
Cost	\$1,000 - \$10,000 depending on facility and # of windows.
Potential Funding Sources	HMPG, Local Budget

Action Item 22 Compliance with the Local Floodplain Ordinance	
Hazards Addressed	Dam Failure, Flood
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. School bus routes would be affected by flooding. *Not all jurisdictions are affected by Dam Failure.
Action	Encourage compliance with the existing regulations of the Carter County and Municipal Flood Hazard Area Ordinances for proper development in the flood prone areas.
Responsible Party	Flood Plain Managers, School Administrators
Potential Implementation Timeline	Ongoing
Cost	N/A
Potential Funding Sources	Local Budget

Action Item 23 Flood Erosion on Dead River Road	
Hazards Addressed	Dam Failure, Flooding
Jurisdictions Affected	Carter County, Springer and Dickson School Districts. Not all jurisdictions are affected by dam failure.
Action	Apply riprap materials to stabilize bank and prevent erosion during high water flood events. (
Responsible Party	County Commissioners, USACE, NRCS, School Administrators
Potential Implementation Timeline	One Year Once Funded
Cost	\$1,000,000
Potential Funding Sources	HMPG, Local Budget, NRCS

Action Item 24 Repetitive Flooding	
Hazards Addressed	Dam Failure, Flooding
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center. *Not all jurisdictions are affected by Dam Failure.
Action	Identify and reduce future repetitive flooded properties. Repetitive loss data only available for properties that have flood insurance. Action will help identify other properties that do not have flood insurance policies.
Responsible Party	Municipal Governments, County Commissioners, Floodplain Administrators, School Administrators
Potential Implementation Timeline	Ongoing
Cost	To be determined by actions taken.
Potential Funding Sources	HMPG, RFC, SRL, Local Budget

Action Item 25	Educate Insurance Agents, Realtors and Lenders Regarding Flood Insurance and the NFIP
Hazards Addressed	Dam Failure, Flooding
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson. *Not all jurisdictions are affected by Dam Failure.
Action	Host educational workshops regarding flood insurance and the NFIP for insurance agents, Realtors, and lenders in Carter County.
Responsible Party	All Jurisdictional Floodplain Administrators
Potential Implementation Timeline	Continuing Annually.
Cost	None anticipated.
Potential Funding Sources	Local Budget, OWRB

Action Item 26	Covered Bus Load/Unload Areas
Hazards Addressed	Extreme Heat, Hail Storm, Winter Storm
Jurisdictions Affected	The public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install covered walkways at school bus loading/unloading areas. (SoTech does bus students from area schools to their Ardmore campus.)
Responsible Party	School Administrators
Potential Implementation Timeline	3 years
Cost	To be determined.
Potential Funding Sources	HMPG, School budget

Action Item 27 Detention Pond/Drainage	
Hazards Addressed	Flood
Jurisdictions Affected	Ardmore Public School District
Action	Install a detention pond and increase the size of drainage channel at Ardmore Middle School to allow faster drainage
Responsible Party	Ardmore School Administrators
Potential Implementation Timeline	3-5 years
Cost	To be determined.
Potential Funding Sources	HMGP, school funds

Action Item 28 Low flow water fixtures	
Hazards Addressed	Drought
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install low flow/water saving fixtures in new critical facilities and when replacing existing water fixtures
Responsible Party	Local Jurisdictions Emergency Management School Administrators
Potential Implementation Timeline	As Needed
Cost	To be determined.
Potential Funding Sources	Local and school funds, HMGP

Action Item 29	Hail, Severe Thunderstorm/Winter Storm Study of City Facilities
Hazards Addressed	Hail, severe thunderstorms, winter storms, tornado
Jurisdictions Affected	City of Ardmore, Ardmore Public Schools, Plainview Public Schools
Action	Study to review city facilities and critical facilities and determine improvement for resistance for hail, heavy snow/ice loads, severe thunderstorms and tornadoes.
Responsible Party	Technical Services School Administrators
Potential Implementation Timeline	On-going
Cost	\$150,000.00
Potential Funding Sources	Local, Grant funding

Action Item 30	Digital Mapping of the County
Hazards Addressed	All Hazards
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Develop and distribute Digital Mapping of Carter County, to enhance Disaster Mitigation and Disaster Recovery
Responsible Party	County and City GIS Coordinators, School Administrators
Potential Implementation Timeline	On-going
Cost	100,000.00
Potential Funding Sources	Local and OWRB

Action Item 31		Develop and Implement tree trimming/removal program
Hazards Addressed	Winter Storm, Tornado, High Winds	
Jurisdictions Affected	City of Ardmore	
Action	A program would be developed and implemented regarding tree trimming/removal in the public right-of-ways	
Responsible Party	Ardmore Emergency Management, Street Dept., and Engineering Dept.	
Potential Implementation Timeline	On-going Annually	
Cost	250,000.00	
Potential Funding Sources	City Budget, Other grant programs	

Action Item 32		Debris Removal Plan
Hazards Addressed	Dam Failure, Earthquake, Flood, Hailstorm, High Winds, Tornado, Wildfire, Winter Storm	
Jurisdictions Affected	Carter County	
Action	Develop a formal debris management plan based on the FEMA Debris Removal Plan and contract with a private contractor for this service prior to a disaster occurring.	
Responsible Party	City of Ardmore, Carter County	
Potential Implementation Timeline	2 years	
Cost	TBD	
Potential Funding Sources	Local, HMGP	

Action Item 33 Red Cedar Removal	
Hazards Addressed	Drought, Wildfire
Jurisdictions Affected	City of Ardmore Plainview Public School District
Action	Reduce the evasive red cedar population on city owned and school property to reduce the threat of wildfire and to lessen the effects of drought on the city's water supply
Responsible Party	Ardmore Emergency Management, Parks Department Fire Department, School Administrators
Potential Implementation Timeline	On-going
Cost	100,000.00
Potential Funding Sources	Local

Action Item 34 Storm Water Holding Pond	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Install a storm water holding pond for sanitary sewage at lift Station A on Hedges Rd.
Responsible Party	Engineering Services
Potential Implementation Timeline	3 years
Cost	300,000.00
Potential Funding Sources	Local, HMGP

Action Item 35 Grey Water Usage	
Hazards Addressed	Drought
Jurisdictions Affected	City of Ardmore
Action	Investigate the possibility of recapturing and providing grey water for use by the Valero refinery as a substitute for the fresh water currently being used where grey water would suffice.
Responsible Party	City of Ardmore
Potential Implementation Timeline	3-5 years
Cost	100,000.00
Potential Funding Sources	HMGP, Valero, City Funds

Action Item 36 Alternate Airpark Water Source	
Hazards Addressed	Flood, Wildfire, Drought, Earthquake, Tornado, Winter Storm
Jurisdictions Affected	City of Ardmore
Action	Perform a study to determine the feasibility of running water line from Ardmore to the Airpark as compared with drilling for groundwater and installing water storage tanks.
Responsible Party	City Engineering
Potential Implementation Timeline	3-5 years
Cost	200,000.00
Potential Funding Sources	Local, HMGP

Action Item 37 Remove Trees and Brush from Dam's	
Hazards Addressed	Dam Failure, Flood
Jurisdictions Affected	City of Ardmore
Action	Tree and brush removal from dams. Even the concrete dam on Mountain Lake has brush growing out of it.
Responsible Party	City Parks and Utilities
Potential Implementation Timeline	3 years
Cost	100,000.00
Potential Funding Sources	Local, HMGP, Other grants

Action Item 38 Mt. Washington Project	
Hazards Addressed	Flood
Jurisdictions Affected	City Engineer, Utilities
Action	Build a regional detention pond or construct a storm water drainage system in the Brantley subdivision along the west side of Mt Washington to adequately handle water runoff from the areas around Cottonwood and Harris and by Charles Evans School
Responsible Party	City Engineer, Utilities
Potential Implementation Timeline	3-5 years
Cost	1,000,000.00
Potential Funding Sources	HMGP, Local Bond, Other grants

Action Item 39 Repair Spillway at City Lakes	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Repair the spillway at city lake
Responsible Party	City Engineering, Utilities
Potential Implementation Timeline	3-5 years
Cost	500,000.00
Potential Funding Sources	Local, HMGP

Action Item 40 Replace gates at Mountain Lake	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Replace the deteriorating gates at Mountain Lake
Responsible Party	City Parks, Utilities
Potential Implementation Timeline	1-3 years
Cost	5,000,000.00
Potential Funding Sources	Local Funds, HMGP

Action Item 41 Broadlawn Park Addition Flooding	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore Ardmore Public School District
Action	Install a storm sewer system in the Broadlawn Park Addition along the north side. Campbell street backs up to some property along behind the creek that could in the future be in danger of eroding out from under houses. There is not a life safety problem that the city is aware of but the potential could be alleviated some by a series of check dams.
Responsible Party	City Parks, Engineering Dept., School Administrators
Potential Implementation Timeline	3 years
Cost	2,500,000.00
Potential Funding Sources	Local Funds, HMPG

Action Item 42 Map Storm Water Drainage	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Map the Storm Water Drainage System for the City of Ardmore
Responsible Party	City Engineering
Potential Implementation Timeline	3-5 years
Cost	150,000.00
Potential Funding Sources	Local, HMGP, Other grants

Action Item 43 Drainage Channel Improvements	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Upgrade the cities drainage channels by widening, deepening, lining with riprap/concrete, and increase tin horn/culvert sizes to improve rainwater runoff
Responsible Party	City Engineering Services
Potential Implementation Timeline	As locations are identified
Cost	6,000,000.00
Potential Funding Sources	Local, HMGP

Action Item 44 Buyout Programs at Country Wood Estates	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Implement buyout program for Country Wood Estates and turn area into green space.
Responsible Party	City Floodplain Manager, Emergency Management, Development Services
Potential Implementation Timeline	On-going
Cost	\$1,125,000.00
Potential Funding Sources	HMPG, OWRB, FMA, Local

Action Item 45 Residential Roofing Program	
Hazards Addressed	Hail, Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson.
Action	Provide a rebate program for individuals installing a hail/fire resistant roof upon their residence.
Responsible Party	County and Municipal Emergency Management and individual home owners.
Potential Implementation Timeline	36 months once funded.
Cost	50,000.00
Potential Funding Sources	HMPG, Local Budget, Individual Homeowners

Action Item 46 Critical Facility Roofing Program	
Hazards Addressed	Hail, Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, Wilson and the public school districts of Ardmore, Dickson, Fox, Healdton, Lone Grove, Plainview, Springer, Wilson, Zaneis and Southern Oklahoma Technology Center.
Action	Install hail/fire resistant roofing on new and existing critical facilities and school buildings. This would reduce the amount of damage from impacts of hail and fire.
Responsible Party	County and Municipal Emergency Management, local municipalities, local school districts.
Potential Implementation Timeline	36 months once funded.
Cost	750,000.00
Potential Funding Sources	HMPG, Local Budget

Action Item 47 Intersection Marking Program	
Hazards Addressed	Severe Thunderstorms and Tornadoes, Wildfire
Jurisdictions Affected	Carter County, Ardmore, Dickson, Gene Autry, Healdton, Lone Grove, Ratliff City, Springer, Tatums, and Wilson.
Action	Install concrete markers with names at road intersections to aide first responders in faster identification of roads when other typical road identification means are destroyed or missing.
Responsible Party	County and Municipal Emergency Management, local municipalities.
Potential Implementation Timeline	36 months once funded.
Cost	200,000.00
Potential Funding Sources	HMPG, Local Budget

Action Item 48 Buyout Programs on 11th Street N.E.	
Hazards Addressed	Flood
Jurisdictions Affected	City of Ardmore
Action	Implement buyout program for 3 homes on 11 th N.E and turn area into green space.
Responsible Party	City Floodplain Manager, Emergency Management, Development Services
Potential Implementation Timeline	On-going
Cost	\$450,000.00
Potential Funding Sources	HMPG, OWRB, FMA, Local

Action Item 49	Wildfire Records Retention
Hazards Addressed	Wildfire
Jurisdictions Affected	All Jurisdictions
Action	Create a method for reporting of wildfires to Planning Team for incorporation into planning mechanisms.
Responsible Party	Local Fire Departments, Emergency Managers, School Administrators
Potential Implementation Timeline	On-going
Cost	None Anticipated
Potential Funding Sources	Local

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