



# Hazard Mitigation Plan

Fort Sill-Chiricahua-Warm Springs  
Apache Tribe

2026 - 2031

Developed by:

**Fort Sill Apache Emergency Management Agency**

Prepared by:

**Hazard Mitigation Specialists L.L.C.**



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PLACE HOLDER

For

Fort Sill Apache Tribe

Adoption Resolution

**Once the plan has been reviewed and deemed “approvable pending adoption” by the Federal Emergency Management Agency (FEMA), The Fort Sill Apache Tribe intends to formally adopt The Fort Sill Apache Tribe Hazard Mitigation Plan and provide an adoption resolution for approval.**

# CHAPTER ONE

## INTRODUCTION

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Preventing the disaster-rebuild-disaster cycle is a major initiative of the Federal Emergency Management Agency (FEMA). Disasters cannot be controlled, but human activities can minimize damage and potential loss of life. One of the goals of FEMA is to reduce or prevent potential damage from various natural disasters through the implementation of hazard mitigation and preparedness programs. Hazard Mitigation focuses on risk reduction efforts with the processes to achieve mitigation outcomes outlined in a Hazard Mitigation Plan (HMP).

Tribal mitigation planning encourages coordination between tribal authorities and their partner agencies at all levels of government to include residents, businesses, and the non-profit sector participation in the mitigation planning and implementation process. This broad-based approach enables the development of mitigation actions that are supported by these various stakeholders and reflect the needs of the Indian tribal community.

Hazard Mitigation Planning provides a systematic, objective review of a tribal jurisdiction and describes what steps can be taken to reduce direct and indirect impacts from disasters via a proactive perspective. Maintaining a Hazard Mitigation Plan includes benefits that:

- Ensure that hazard mitigation activities are coordinated with other jurisdictions' goals, preventing conflicts and reducing the costs of implementation.
- Ensure that all alternatives are evaluated so that problems are addressed by the most appropriate and effective solutions; Justify public and political support for projects.
- Educate tribal elders and citizens as well as other planning participants on existing tribal hazard and protection measures.

The Hazard Mitigation Plan (HMP) is designed to fulfill the requirements of the following programs administered by the Federal Emergency Management Agency (FEMA):

- Pre-Disaster Mitigation Program (PDM)
- Flood Mitigation Assistance Program (FMA)
- Community Rating System Floodplain Management Planning (CRS)
- Post-disaster assistance through the Hazard Mitigation Grant Program (HMGP)
- Severe Repetitive Loss Program (SRL)
- Repetitive Flood Claims Program (RFC)

In the past, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5165, enacted under the Disaster Mitigation Act (DMA) of 1000 (P.L. 106-390), provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA 2000) has been updated to meet the growing concern and needs of natural hazard mitigation. Due to the increased frequency of disasters within the United States over time, the challenge to mitigate the impacts of natural disasters falls primarily to the local jurisdictions and its citizens. The escalating cost of emergency relief aid has prompted the Federal Emergency Management Agency (FEMA) to focus its priorities on mitigation. This is a dramatic shift from FEMA's traditional charter of responding to disasters and being prepared to respond. Section 322 of the Disaster Mitigation Act (DMA) of 2000 (P.L. 106-390), provides new and revitalized approaches to mitigation planning.

The Fort Sill Chiricahua Warm Springs Apache Tribe (Tribe) is a federally recognized Indian Tribal Government as defined in 44 CFR §201.2 and the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a. Based on the requirements of 44 CFR §201.7 this plan development was initiated under the May, 2019 FEMA Tribal Multi-Hazard Mitigation Planning Guidance but later revised under the Local Mitigation Planning Policy Guide FP-206-21-0002 (OMB Collection #1660-0062) April 2025. Tribal mitigation plans must be reviewed, updated and re-approved by FEMA every five years to remain eligible. This Mitigation Plan has been prepared to meet the requirements of the Act and the regulations established by FEMA.

This document may informally refer to the Tribe as The Fort Sill Apache Tribe for brevity. The Tribe will continue to comply with all applicable federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in tribal or federal laws and statutes as required in 44 CFR 13.11(d).

## **Funding**

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Funding for The Fort Sill Chiricahua Warm Springs Apache Tribe Hazard Mitigation Plan was provided by a grant from the Center for Disease Control (CDC) for tribal pandemic preparedness in 2020. Subsequently, The Tribe contracted with Hazard Mitigation Specialists, L.L.C., a hazard mitigation consulting firm, to assist Tribe in developing their plan.

## Purposes of the Plan

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The Tribe is headquartered in southwestern Oklahoma within Caddo County. This county experiences frequent natural hazards that cause damage to property with the potential to adversely affect tribal citizens. For several years, Caddo County was noted for having the most Federally declared disasters in the United States, with 44 declared disasters since 1953 (FEMA Disaster Declaration Summary Dataset, 2025). The Tribe is also over several properties in Comanche County (36 declared disasters) and Stephens County (33 declared disasters), Oklahoma (232 declared disasters overall). The Tribe's official Reservation is in Luna County, (7 declared emergencies since 1953) and Socorro County (no declarations), New Mexico, as well as Southeast Arizona (16 statewide declarations for Arizona, and 14 for Cochise County). This region is the original homeland of the Chiricahua-Warm Springs Apache. This Hazard Mitigation Plan provides a framework upon which to base comprehensive mitigation planning throughout the Tribe across Oklahoma, New Mexico, and Arizona lands. Hazard identification is the process that determines which hazards may threaten the Tribe and its citizens. Hazard mitigation is the process of eliminating or reducing the effects of natural or other disasters that may affect the Tribe.

This plan not only provides the framework and guidance for an all-hazard approach to mitigation, but it also identifies hazard mitigation goals, objectives, recommended actions and initiatives that will reduce or prevent injury and damage from those hazards. This plan points out hazards and measures to be implemented or continued to alleviate the suffering and damage caused by disasters within the Tribe. This process is further described in Chapter Two: The Planning Process.

## **Scope**

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The scope of Hazard Mitigation Plan is all inclusive of natural or other hazards that may threaten citizens of the Tribe. The Tribe is the only jurisdiction included in The Fort Sill Apache Tribe Hazard Mitigation Plan. The Tribe's Jurisdictional boundaries are fundamentally within all forms of "Indian Country" that pertain to the Tribe. This includes all private allotments, tribal government-owned lands, both trust and fee, as well as the Tribe's Federally Recognized Reservation in New Mexico. The jurisdiction is scattered throughout portions of Oklahoma, New Mexico, and Southeast Arizona. The Hazard Mitigation Plan includes all of parts of the Tribe's jurisdiction. Natural hazards identified for Oklahoma (southern Caddo County, Comanche County), New Mexico (Luna County), and Arizona (Cochise County) properties include Dam failure, drought, earthquake, extreme heat, floods, hail, high winds, lightning, tornado, wildfire, and winter storms. Other hazards are man-caused and include criminal trespassing, livestock intrusion, and major hazmat accidents. Proactive hazard mitigation will shape the community into a more resilient framework through partnerships focused on the protection of lives, property, and cultural assets within these three states.

## **Community Mitigation Planning Goals**

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To minimize the destruction and devastation resulting from disasters, the Tribe has developed this Hazard Mitigation Plan to guide all levels of government, business and the citizens. In addition to the general oversight of Pre-Disaster Mitigation that will be provided by The Fort Sill Apache Emergency Management Agency and the Tribal Government, The Fort Sill Apache Emergency Management Agency (FSAEMA) plays a key role relative to general oversight by reviewing goals and objectives, as well as developing Pre-Disaster Mitigation implementation plans. The strategy of the Tribe is to utilize the mitigation programs of the federal government to minimize the loss of life, minimize injury and, where possible, reduce damage to property of the Tribe. Each natural hazard that is identified to apply to any portion of the Tribe (including lands outside of Oklahoma) will be addressed where possible through the implementation of the HMGP, PDM, SRL, FMA and RFC programs and grants. Additionally, grants from other sources will be utilized when available to provide the best mitigation program possible. The approach of the strategy will be all-hazard as they relate to the Tribe, with a specific focus on prioritizing and mitigating those hazards. This plan is intended to promote increased coordination among officials and agencies from all levels of government and to integrate hazard mitigation management capabilities and programs.

The primary goals and objectives of The Fort Sill Apache Tribe Hazard Mitigation Plan include:

- Goal 1: Protect lives and property
- Goal 2: Increase resilience of tribal structures, communications, and infrastructure
- Goal 3: Improve partnership with associated non-tribal communities
- Goal 4 Secure alternative power sources for critical facilities/infrastructure
- Goal 5: Develop continuity of government capability
- Goal 6: Protect cultural and heritage artifacts/assets
- Goal 7: Protect the natural environment

## Plan Point of Contact

**Table 1-1: Hazard mitigation plan (HMP) point of contact**

**Primary:** Monte Scammahorn  
 Environmental Director / Emergency Manager  
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**Alternative:** Dr. Leah Snyder  
 Environmental Specialist / Deputy Emergency Manager  
 Apache Casino Hotel  
 2315 East Gore Blvd, Lawton, OK 73501  
 Office: 580-483-0130  
 Email: [leahsnyder@fortsillapache-nsn.gov](mailto:leahsnyder@fortsillapache-nsn.gov)

## Existing Plans / Programs

There are various tribal, local, state and federal government operational plans along with private organizations that 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 Fort Sill Apache Tribe Hazard Mitigation Plan:

**Emergency Operations Plan (EOP)** The Fort Sill Apache Tribe Emergency Operations Plan (EOP), Casino Hotel Emergency Operations Plan, and Reservation Emergency Operations Plan assign responsibilities to designated departments, agencies, and/or volunteers in the event of a disaster. These plans were reviewed and analyzed and provided information on the location of warning systems and community shelters. The plans direct departments, agencies and volunteers to best provide guidance, relief and assistance to citizens in response to the effects of a disaster.

These plans are written expressly for the welfare and safety of the people and visitors of The Fort Sill-Chiricahua-Warm Springs Apache Tribe and its entities.

### **Building Officials and Code Administrators (BOCA)**

The Tribe subscribes to the National Building Codes for structures within its jurisdiction. Appropriate parts of the Hazard Mitigation Plan will be utilized during the building process.

### **Emergency Response Plan**

The Fort Sill Apache Tribe Emergency Response Plan is an extension of the Emergency Operations Plan (EOP) by further detailing the operational procedures to enact it. This mitigation plan is integrated with the Emergency Response Plan (ERP) as guidance documents to identify and coordinate the most impactful mitigation activities.

## **Community Profile**

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The Fort Sill Chiricahua Warm Springs Apache Tribe is the legal successor of the Mogollon, Mimbres, Copper Mine, Warm Springs, and Chiricahua Apache tribes. The aboriginal territory, former reservations, and Indian title lands for these Apache tribes included approximately 14,802,387 acres of land in southeast Arizona and southwest New Mexico until the final surrender of the great Apache, Geronimo, and his war party to the United States military on September 4, 1886. *Id.*; *Fort Sill Apache Tribe of Oklahoma v. United States*, 34 Ind. Cl. Comm. 81 (May 10 1974); *Fort Sill Apache Tribe of Oklahoma v. United States*, 41 Ind. Cl. Comm. 37 (October 6, 1977).

The historical background and lineal connection of the Fort Sill Apache tribal members to the above tribes was established by the Indian Claims Commission (ICC) in *Fort Sill Apache Tribe of Oklahoma et al. v. United States*, 19 Ind. Cl. Comm. 212 (June 28, 1968). These decisions were affirmed by the United States Court of Claims. See *United States v. Fort Sill Apache Tribe*, 533 F.2d 531 (Ct. Cl. 1976), and *United States v. Fort Sill Apache Tribe*, 490 F.2d 819 (Ct. Cl. 1973). After the surrender of the Apaches in September 1886, tribal members achieved prisoner of war status since the Tribe was found to have surrendered as an “army in the field.” See *Scott v. United States and Apache Indians*, 33 Ct. Cl. 486, 1898. The federal government enacted a “final solution” to what it termed the hostile Apache problem. The entire Apache tribe, including men, elders, women, and children, were transported east to Fort Pickens and Fort Marion in Florida

and confined as prisoners of war. Most of the school-age children were involuntarily taken to the Carlisle Indian School in Pennsylvania. Because of the terrible health impact and mortality rate that resulted from moving high-desert dwelling people to a tropical, coastal region, tribal members were moved farther inland and consolidated at the Mount Vernon Barracks near Mobile, Alabama, in 1887 and 1888. However, at the Mount Vernon Barracks, health issues continued. In 1894, after objections from the western state congressional delegations to the transfer of the Apache prisoners of war back to their aboriginal territory, the Apache prisoners of war were transferred to the Fort Sill Military Reservation in Oklahoma where they were kept as prisoners of war until their final release in 1914. See *Fort Sill Apache Tribe of Oklahoma v. United States*, 477 F.2d 1360, 1362-3 (Ct. Cl. 1973).

Five Hundred and fifteen (515) Apaches entered captivity in 1886. When they were released in 1913 and 1914, only 265 survived captivity<sup>35</sup>. Two-thirds of the Apaches released from captivity were transferred to the Mescalero Apache Reservation and would eventually become members of that tribe. The Apaches who were released in Oklahoma became the Fort Sill Apache Tribe and were placed on individual allotments within the former Kiowa Comanche and Apache (KCA) Reservation. The Tribe's members continuously sought to repatriate to their aboriginal and former Indian title lands in New Mexico, which were different than those lands held in trust for the Mescalero Apache Tribe. This goal was supported by the State of New Mexico, and no reservation lands were established for the Tribe in Oklahoma. In 2005, a Federal Court in Oklahoma determined that the Tribe's placement on the former KCA Reservation in Oklahoma may have violated various treaties between the federal government and the tribes that originally occupied the KCA Reservation. In 2007, in the settlement of this litigation, the Tribe's rights in the former KCA Reservation were foreclosed and rights in its former territory in New Mexico were established through an agreement with the federal government.

In 1976, the Tribe was Federally Recognized as the Fort Sill Apache Tribe of Oklahoma, based north of Apache, OK on former Kiowa allotted trust land. It is governed by the General Council which elects a Business Committee to legislate according to the Tribe's Constitution. Today, the Tribe consists of approximately 800 members around the U.S. and owns numerous trust properties within the former KCA Reservation in Southwest OK. In 2011 the Tribe was granted a Federally Recognized Reservation status at the 30-acre site at Akela, NM along Interstate 10 in Southwest New Mexico. It also owns 4 acres of trust land in the Cochise Stronghold of the Dagoon Mountains in the Coronado National Forest in Cochise Co. in Southeast AZ, one 280-

acre fee property in Cochise Co., AZ, and one 20-acre fee property in Socorro Co., NM. Roughly 1,900 acres of rural fee land was recently purchased by the Tribe adjacent to its Akela Reservation.

The Tribe owns Chiricahua Industries, based in Albuquerque, NM. The Fort Sill Apache Economic Development Authority (EDA) runs all commercial ventures associated with the Tribe. This entity is responsible for the development of the Chiricahua Plaza at Akela, NM, as well as its Apache Markets in SW Oklahoma, the Casino Hotel in Lawton, OK, and the Warm Springs Casino near Anadarko, OK, as well as all marketing and economic planning. Emergency management projects for the Tribe and its entities are managed by the Fort Sill Apache Emergency Management Agency, a group of employees of various departments and organizations within the Tribe and the EDA. This Agency has two Emergency Managers: one for the Tribal Government and one for EDA. Included in this Agency are representatives of the Tribe's Finance, Environmental, Self-Governance, Family Services, and Casino Security Departments as well as the Business Committee.

## **Government**

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At the heart of our tribal governance is the General Council, the supreme governing body of the Fort Sill Chiricahua Warm Springs Apache Tribe. Comprised of all members aged eighteen and older, the General Council ensures that the voices and aspirations of our community are heard and respected. Through absentee ballot elections, the General Council exercises its power. Proposals for elections can be made through a majority vote at a General Council meeting, a petition signed by ten percent (10%) of the Tribe's General Council, or through the initiative of the Business Committee or Tribal Chairman.

Annually, the General Council votes to approve the tribal operations budget and to elect members of the Business Committee. Additionally, the General Council convenes as necessary and holds a significant meeting on the first Saturday of October, coinciding with the Business Committee elections. The Business Committee, composed of six members, including a Chairman, Vice-Chairman, Secretary-Treasurer, and three additional Committeemen, holds office for a period of two years. The officers of the Business Committee also serve as officers of the General Council.

Responsibilities of the Business Committee include overseeing the tribal membership application process, maintaining the tribal rolls, managing the tribal operations budget, and supervising tribal

government programs. Moreover, the Business Committee appoints board members who play vital roles in various aspects of the tribe's operations and, when applicable, approves their budgets. The Fort Sill Apache Tribe takes great pride in its tribal government structure, which upholds the values of transparency, representation, and accountability. Through the General Council and the dedicated members of the Business Committee, they strive to foster the growth and prosperity of the Tribe.

## **Population**

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The Tribe's population is 814 enrolled, as stated on the Tribe's official website (<https://fortsillapache-nsn.gov/about/>, accessed and updated (2026) with nearly 300 people residing within Oklahoma.

## **Academia**

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The Fort Sill Apache Tribe does not operate any public or Indian schools, so the children of the Tribe attend the regular public schools throughout Caddo, Comanche and Grady Counties in Oklahoma and various other parts of the U.S. It should be noted that these are public institutions open to all children.

## **Topography**

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The Tribe's land encompasses over 2,700 acres of total land area in 3 states: Oklahoma, New Mexico, and Arizona. Maps of land holdings within each state can be found in Appendix B: Fort Sill Apache Lands of Interest.

The Tribe's Oklahoma jurisdiction is characterized by rolling hills, shortgrass prairie and bottomlands of southwest Oklahoma. Streams in the area are relatively slow-running and flow among riparian vegetation.

The New Mexico and Arizona tribal jurisdiction is characterized by desert scrub and desert prairie. This describes lands in southwest New Mexico, southeast Arizona (Cochise County), as well as a 4-acre patch in the Dragoon Mountains within the Coronado National Forest, in an area known as the Cochise Stronghold.

## Economy

The Tribe has two casinos which help fund the tribal government: the Apache Casino Hotel and the Warm Springs Casino located within Oklahoma. The Tribe operates the Fort Sill Apache Gaming Commission (FSAGC) which functions as an independent tribal regulatory body under the leadership of the Tribal Chairman and the Business Committee. The mission of the FSAGC is to protect tribal assets, preserve the integrity of gaming and to protect the welfare and safety of the Tribe and of the public. The FSAGC ensures compliance with the Tribal Gaming Ordinance, Federal and State laws, Tribal Internal Control Standards (TICS), the National Indian Gaming Commission (NIGC) Minimum Internal Control Standards (MICS), and the Oklahoma State Compact.

In addition to the casinos, the Tribe operates three gas station convenience stores: the Fort Sill Apache Market #1 (Lawton, OK), the Fort Sill Apache Market #2 (Anadarko, OK), and the Chiricahua Apache Plaza Truck Stop (Akela, NM). The Apache Homelands Café is also part of the Chiricahua Apache Plaza Truck Stop Complex in Akela, NM. The Fort Sill Chiricahua Warm Springs Apache Tribal Complex is in Apache, OK and is the home for tribal government operations.

| <b>Table 1-2: Major Employers Within the Fort Sill Apache Tribe</b> |                                      |                                   |
|---------------------------------------------------------------------|--------------------------------------|-----------------------------------|
| <b>Business</b>                                                     | <b>Type of Business</b>              | <b>Approximate # of Employees</b> |
| <b>Apache Market 1</b>                                              | Convenience Store<br>Fueling Station | 16                                |
| <b>Apache Market 2</b>                                              | Convenience Store<br>Fueling Station | 13                                |
| <b>Chiricahua Apache Plaza</b>                                      | Convenience Store<br>Truck Stop      | 30                                |
| <b>Apache Hotel Casino</b>                                          | Casino<br>Hotel                      | 400                               |
| <b>Warm Springs Casino</b>                                          | Casino                               | 17                                |
| <b>Apache Homelands Café</b>                                        | Restaurant                           | 5                                 |
| <b>Fort Sill Apache Tribal Complex</b>                              | Tribal Government Operations         | 25                                |

## Climate: SW Oklahoma Division

The climate for southwestern Oklahoma is classified as the Southwest Division (Climate Division 7) and includes the following counties: Harmon, Greer, Kiowa, Caddo, Comanche, Cotton,

Tillman, Jackson. The climate for the SW Oklahoma Fort Sill Chiricahua Warm Springs Apache tribal holdings located in Caddo, Comanche, and Stephens Counties is classified as temperate with hot summers and cold winters. The distribution of temperatures by month for Caddo County are summarized in Table 1-3 (Oklahoma Climatological Survey).

| <b>Table 1-3:<br/>Average Temperature (°F) Distribution for Caddo County, OK</b> |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
|                                                                                  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sept | Oct  | Nov  | Dec  |
| <b>Avg</b>                                                                       | 37.7 | 41.7 | 50.1 | 58.9 | 68.8 | 77.9 | 82.3 | 81.2 | 72.7 | 61.1 | 49.0 | 39.6 |
| <b>Min</b>                                                                       | 25.4 | 29.0 | 37.1 | 46.2 | 58.0 | 67.7 | 71.7 | 70.0 | 60.9 | 48.2 | 36.8 | 27.8 |
| <b>Max</b>                                                                       | 49.9 | 54.5 | 63.0 | 71.6 | 79.7 | 88.0 | 92.9 | 92.5 | 84.5 | 73.9 | 61.1 | 51.5 |

Sources: Oklahoma Climatological Survey ([www.climate.ok.gov](http://www.climate.ok.gov)) and Oklahoma Mesonet ([www.mesonet.org](http://www.mesonet.org)) climate summary averaged from 1991-2020 dataset.

Some additional climate statistics for Caddo County include the following (1991-2020):

- Annual Number of days max temperature is greater than 90°F: 75
- Annual number of days max temperature is greater than 100°F: 13
- Annual number of days max temperature is less than 32°F: 8
- Annual number of days min temperature is less than 32°F: 96
- Annual length of growing season: 202 days
- Date of first fall freeze: October 30

Date of last spring freeze: April 8

Temperatures range from an average daytime high of 93 degrees in July and August to an average low of 25 degrees in January (Table 1-3). The Tribe averages a growing season of 202 days, but plants that can withstand short periods of colder temperatures may have an additional two to five weeks. Winds from the south are quite dominant, averaging just over nine miles-per-hour. Average relative humidity ranges from 40% to 94% daily as well as seasonally. Humidity is highest in June and lowest in March typically. Winter months tend to be cloudier than summer months. The percentage of possible sunshine ranges from an average of about 55% of days in winter to nearly 80% of days in summer.

Average annual precipitation for the climate of Southwestern Oklahoma (Climate Division 7) is approximately 30 inches/year with May and September as the wettest months, on average. Nearly every winter has at least two inches of snow, with one year in two having ten or more inches.

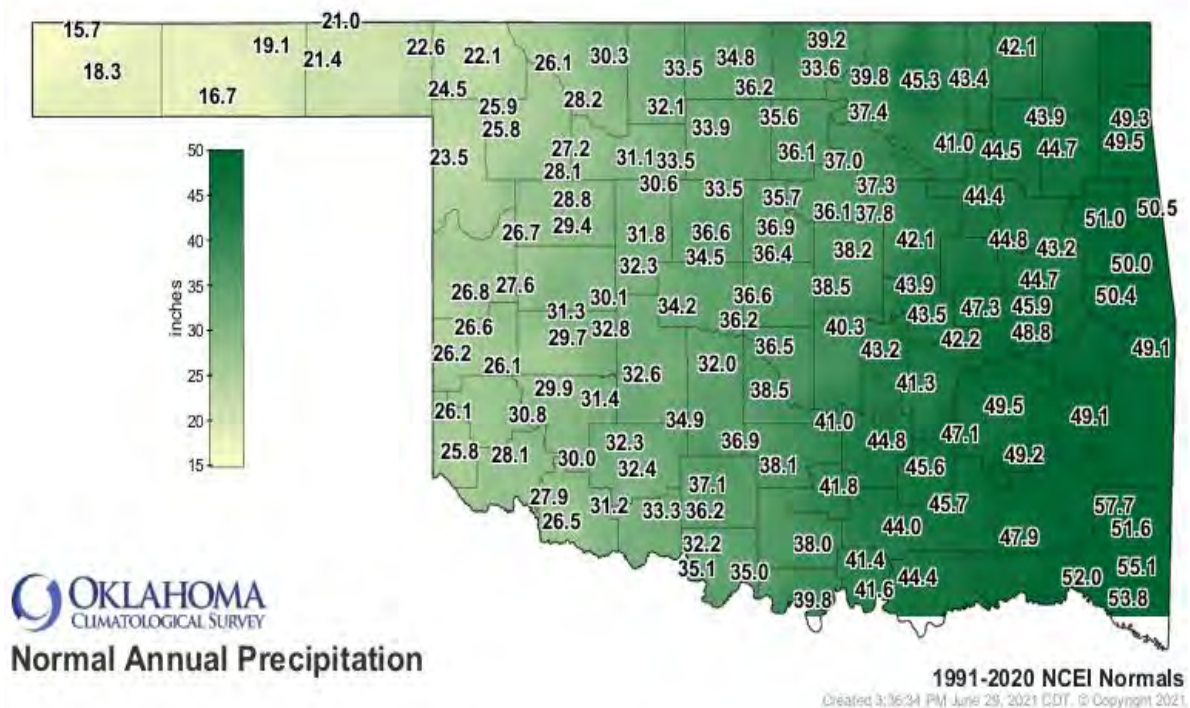


Figure 1-1: Map of normal annual precipitation for Oklahoma based on 1991-2020 climatological data (Oklahoma Climatological Survey). Note the wide distribution of rainfall across the state ranging from 16-57 inches of precipitation.

Wind in Apache, OK (Caddo County) is predominantly from the south, and can exceed 25 mph during storm events and/or seasonally (Figure 1-2). From 1986-2015, SW Oklahoma averaged 6-8 days of winds greater than 50 knots (approximately 58 mph) (Oklahoma Climatological Survey). Wind gusts can be significantly higher in velocity and more damaging than average windspeeds.

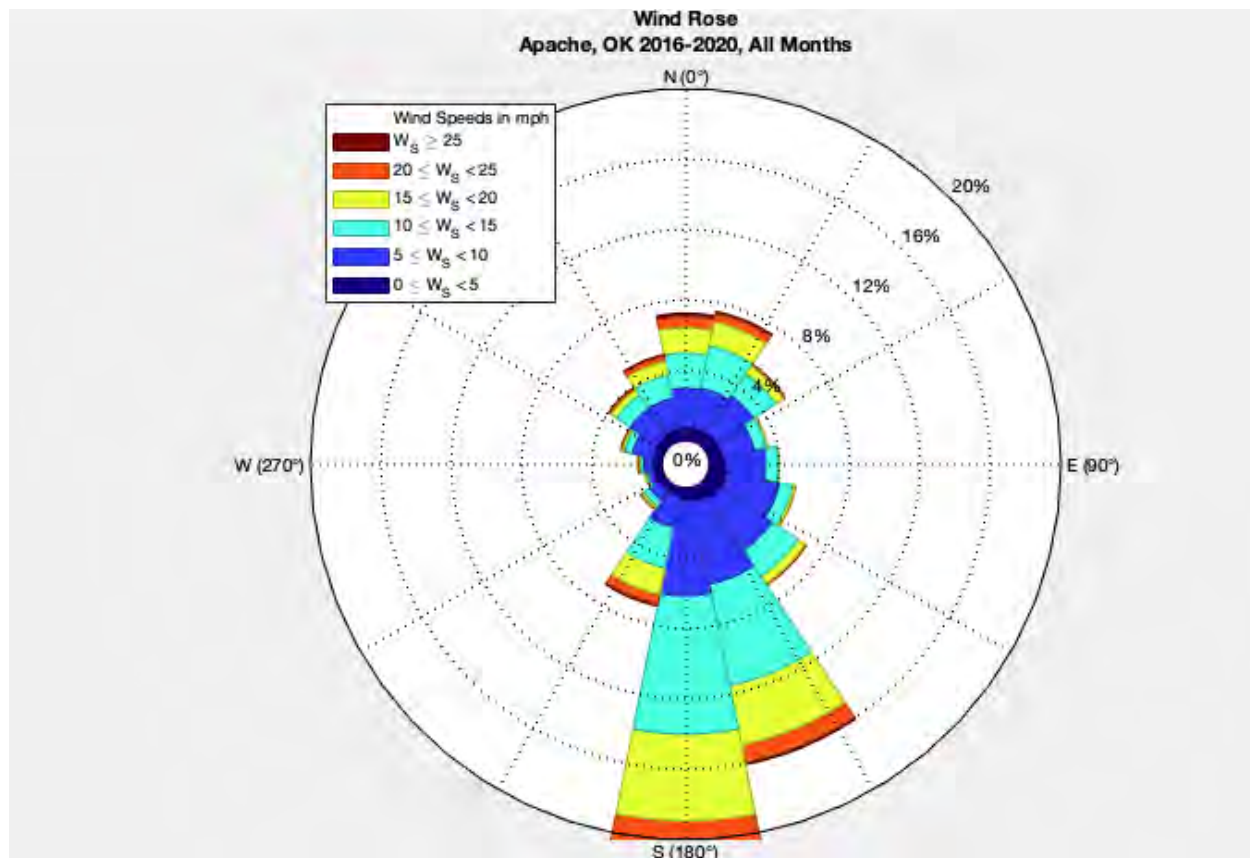


Figure 1-2: Wind Rose for Apache, OK (Caddo County) summarizing wind speed and directional data from 2016-2020.

Thunderstorms occur on about 45 days each year in southwestern Oklahoma, predominantly in the spring and summer. Thunderstorms under specific conditions can form tornadoes. The following tornado statistics were generated from the period 1950 – 2024 for Oklahoma:

- Oklahoma averages 53 tornadoes annually, with 75% occurring in April, May, June
- Tornadoes Recorded by County: Caddo (131), Comanche (68), Stephens (75)
- Peak time for tornadoes is between 12:00pm-8:00pm (80% of tornadoes occur)
- Rating of tornados in Caddo County are typically EF0-EF2
- The most recent, severe (EF3 or higher) tornado in Caddo County was EF3 in 05/24/2011

## Climate – SW New Mexico & SE Arizona

The climate for SW New Mexico and SE Arizona is classified as semi-arid to arid. These areas are dry, prone to wildfires, severe drought, as well as monsoon flooding. Each tribal property is remotely located, where high winds often create dust storms. In Luna County, New Mexico, the

Tribe's properties lie in the Akela Flats between the Florida Mountains and the Good Sight Mountains east of Deming along Interstate 10. This land is flat desert scrub with no surface water. In the remote areas of southwest Socorro County, New Mexico is another small 20-acre patch in the desert prairie that straddles a pristine spring-fed stream, Alamosa Creek. Table 1-4 summarizes average annual temperature data near Deming, New Mexico from 1991-2021. Table 1-5 summarizes the annual precipitation, humidity, and days of recorded rainfall near Deming, New Mexico from 1991-2021. Temperature and rainfall patterns by month support the arid climate classification and with less than nine inches of rainfall each year, but with nearly half of that total falling within the July-September season yielding flooding possibilities.

**Table 1-4: Average Temperature (°F) Distribution for Deming, New Mexico**

|            | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|------------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Avg</b> | 43.9 | 48.0 | 56.0 | 64.0 | 72.4 | 82.5 | 82.5 | 80.7 | 74.8 | 64.2 | 52.4 | 43.2 |
| <b>Min</b> | 33.4 | 36.3 | 42.5 | 49.8 | 58.1 | 68.8 | 71.6 | 69.8 | 63.6 | 52.4 | 41.3 | 33.7 |
| <b>Max</b> | 56.6 | 61.6 | 69.9 | 77.7 | 85.3 | 94.1 | 92.5 | 90.6 | 85.4 | 76.4 | 64.6 | 55.2 |

Source: Data 1991-2021 <https://en.climate-data.org/>

**Table 1-5: Average Precipitation (Inches) for Deming, New Mexico**

|                  | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>Rainfall</b>  | 0.7 | 0.6 | 0.4 | 0.2 | 0.3 | 0.4 | 1.4 | 1.4 | 1.4 | 0.9 | 0.8 | 1.0 |
| <b>Humidity</b>  | 41% | 34% | 24% | 17% | 15% | 16% | 33% | 36% | 36% | 35% | 38% | 45% |
| <b>Rain Days</b> | 2   | 2   | 2   | 1   | 1   | 1   | 5   | 5   | 3   | 3   | 2   | 3   |

Source: Climate Data 1991-2021 <https://en.climate-data.org/>

Snowfall is not common for the Deming, NM area. Although tornados are also not common for this region, high winds and dust storms can impact air quality seasonally. The average wind velocity and direction for Deming, NM is summarized in Figure 1-3. Winds are generally moving from west to east with velocities exceeding 20mph 6% of the time. Deming, NM experienced less than two days of sustained 50 knot winds (~58 mph) on average per year based on data from the National Oceanic and Atmospheric Administration (1986-2015).



Windrose Plot for [DMN] DEMING MUNICIPAL  
Obs Between: 31 Dec 1972 05:00 PM - 28 Nov 2024 12:53 AM America/Denver

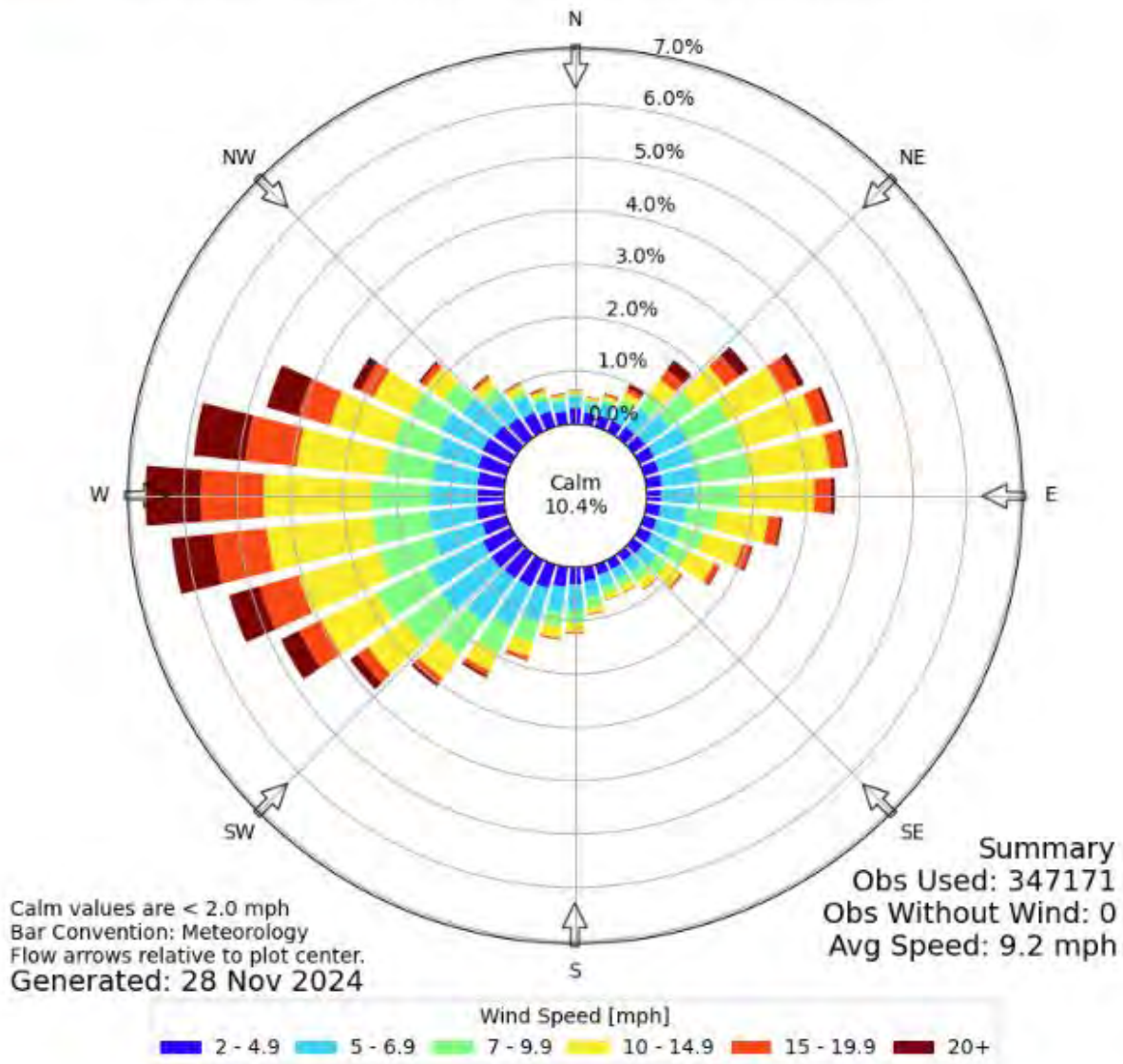


Figure 1-3: Wind rose for average wind velocity and direction from 1972-2024 for Deming, NM. Source: IEM (Iowa Environmental Mesonet, Iowa State University).

## Critical Facilities

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The Hazard Mitigation Plan for the Tribe identifies critical facilities located within the Tribe's jurisdiction. A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public in response to or recovery from a disaster situation, is otherwise necessary to preserve the welfare and quality of life in The Tribe, or fulfills important public safety, emergency response, and/or disaster recovery functions, including continuity of government. Due to security concerns, the critical facilities are listed in Appendix C but specifics are not available for public review.

## References

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FEMA. Disaster Declaration Summary Dataset. V2. Updated 04/29/2025  
National Oceanic and Atmospheric Administration (NOAA)  
National Centers for Environmental Information (NCEI)  
Climate Data <https://en.climate-data.org/>  
Oklahoma Climatological Survey ([www.climate.ok.gov](http://www.climate.ok.gov)) (OCS)  
Oklahoma Mesonet ([www.mesonet.org](http://www.mesonet.org))  
Fort Sill Apache Tribal Website <https://fortsillapache-nsn.gov/about/>

## **CHAPTER TWO THE PLANNING PROCESS**

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Development of this plan followed a ten-step process based on FEMA's guidance and requirements. This plan not only provides the framework and guidance for an all-hazard approach to mitigation, but it also identifies hazard mitigation goals, objectives and recommended actions and initiatives that will reduce or prevent injury and damage from natural hazards. This plan points out hazard problems and measures to be implemented or continued, to alleviate the suffering and damage caused by disasters affecting the Tribe. This process will include the following actions:

**Phase 1** – Organize resources

**Step 1** – Coordinate/involve all agencies and jurisdictions that want to participate

**Step 2** – Involve the public

**Step 3** – Organize to prepare the plan

**Phase 2** – Assess the Risks

**Step 4** – Identify and Classify Natural Hazards

**Step 5** – Assess Risk to Critical Resources via Natural Hazards

**Phase 3** – Develop the Mitigation Plan

**Step 6** – Develop a list of goals.

**Step 7** – Develop list of mitigation actions

**Step 8** – Draft an action plan

**Phase 4** – Implement and Monitor progress

**Step 9** – Adopt the Plan

**Step 10** – Implement, evaluate and revise the plan

The regulations found in 44 CFR 201.7 require that there be an open public involvement process in the formation of a tribal hazard mitigation plan. This process must include opportunities for the public to comment on the Plan at all stages of its formation, and the involvement of any neighboring communities, interested agencies, or private and non-profit organizations.

This chapter documents the planning process used to develop the Plan, including how the Plan was prepared, who was involved in the process, and how the public was involved. The Tribe has identified the “public” as members of the Tribe. Tribal community is defined as individuals and agencies within the tribal area of interest that are not explicitly tribally affiliated but support the community within.

## Organization

The process of preparing the Plan was initiated by the Tribe's Emergency Manager who: 1) procured funding through a Pandemic Preparedness Grant from the CDC for the hiring of a consultant to assist with Plan development; 2) hired the consultant, Hazard Mitigation Specialists, L.L.C., and 3) identified tribal government and business managers and professionals to serve on the Tribe's Hazard Mitigation Planning Team (FSAEMA).

| Table 2-1 Fort Sill Apache Tribe Hazard Mitigation Planning Team |                                                |                                   |
|------------------------------------------------------------------|------------------------------------------------|-----------------------------------|
| Name                                                             | Affiliation                                    | Position                          |
| Jennifer Heminokeky                                              | Fort Sill-Chiricahua-Warm Springs Apache Tribe | Chairwoman                        |
| Monte Scammahorn                                                 | Fort Sill-Chiricahua-Warm Springs Apache Tribe | Environmental Director/ Tribal EM |
| Dr. Leah Snyder                                                  | Fort Sill-Chiricahua-Warm Springs Apache Tribe | Env. Specialist/ Tribal Dep. EM   |
| Troy Johanntoberns                                               | Fort Sill-Chiricahua-Warm Springs Apache Tribe | Self-governance Director          |
| Melissa Vail                                                     | Fort Sill-Chiricahua-Warm Springs Apache Tribe | Finance Director                  |
| David Bennett                                                    | Apache Casino Hotel                            | Safety/ Risk Mgt. Coord. / EDA EM |
| Brady Jones                                                      | Mountain Management, LLC                       | Vice President of Construction    |
| Haylee Buckner                                                   | Fort Sill-Chiricahua-Warm Springs Apache Tribe | Community Health Representative   |

## Public Involvement

The Tribe identifies the "public" as the members of the Tribe; however, everyone within the tribal community has been welcome to attend the planning committee meetings, although most of the Tribe is spread throughout the United States. While the public did not attend the meetings, we did present the plan draft for review at the General Council Meeting on October 3. We also posted a link to the draft with a brief survey (see Appendix ) on the Tribe's website. We feel the Hazard Mitigation Team was diverse enough to represent the ideas of the citizens of the Tribe and the various areas of Tribal involvement.

The planning process was also announced in Caddo County Local Emergency Planning Commission meetings. The Caddo Nation provided hazard information sources in response to this announcement.

## Agency and Organization Coordination

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The input of various Fort Sill Apache Tribal offices, including economic development, was essential to the development of the Hazard Mitigation Plan, and thus many staff members were represented in the team's membership. Plan development relied on Tribal and Economic Development Authority personnel as well as data from the federal and state agencies listed in the following section. The Osage Nation's Plan was reviewed prior to draft development.

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### Agencies/ Resources

**National Flood Insurance Program (NFIP)** – The Fort Sill Apache Tribe is not a member of the NFIP; however, Caddo County and the Town of Apache and a few of the communities within the Fort Sill Apache Tribe area are members. Participation in the NFIP by municipalities, counties, and tribal organizations is voluntary. According to the NFIP list of participating communities in Oklahoma, there are 53 counties, 475 municipalities, and three tribal jurisdictions that are NFIP communities with several communities making application to join. Within the NFIP program, the Community Rating System (CRS) is a program whereby individual communities may reduce their flood insurance rates by performing certain specified activities to enhance flood mitigation.

**Oklahoma Emergency Management, Hazard Mitigation Division (OEM)** – For the preparation of this plan, the contractor utilized prior plans it produced by making close contact with OEM Mitigation Division personnel to maintain FEMA requirements necessary for tribal plans in Oklahoma. This plan was also made while consulting the current Oklahoma Hazard Mitigation Plan which was approved in January 2024.

**National Weather Service (NWS)- Norman** was utilized concerning weather data for the Fort Sill Apache Tribe. The NWS in Norman, OK has been a regular partner with the FSAT Emergency Management Office during severe weather events to get up to date warnings and information concerning potential hazards to the citizens.

**Oklahoma Climatological Survey (OCS)** - provided additional information concerning the climate in the Fort Sill Apache Tribe. Their research studies and information are useful in determining key climatological statistics.

**Oklahoma Geological Survey (OGS)** - provided information about earthquake potential in the Fort Sill Apache Tribe through statistical data concerning past earthquakes.

**Oklahoma Water Resources Board (OWRB)** - provided information regarding high- hazard dam sites in and near the Tribe's Oklahoma jurisdiction. They have also provided information concerning aquifers and underground water.

**National Center for Environmental Information (NCEI)** provided extensive information concerning history of storms in the Tribe's jurisdiction. Their information complimented or reinforced local and state data.

**Federal Emergency Management Agency (FEMA)** website provided information about Presidential Disaster Declarations in the Fort Sill Apache Tribe, and Flood Insurance Rate Maps (FIRM) maps

**Southern Climate Impacts Planning Program (SCIPP)** website provides categorical tools for assessing the probability of risk associated with natural disasters. (A NOAA CAP Team)

## **Hazard Identification**

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In April 2021, the FSAEMA began the process of reviewing the natural hazards that might affect the Tribe. Through several meetings and review periods, the team identified the potential hazards that could affect the Tribe. Eleven hazards were selected based on the historical record and expertise of the team indicating that these hazards had the greatest potential for significant impact on the Tribe and should be considered for mitigation actions.

It is important to emphasize that this Plan is a “living” document and will be revised/updated in the future to reflect any additional hazard concerns and mitigation strategies.

**Table 2-2: Natural Hazard Identification for The Fort Sill-Chiricahua-Warm Springs Apache Tribe**

| <b>Hazard</b>       | <b>Review Source</b>                                                                                                                                                                                        | <b>Basis for Identification</b>                                                                                                                                                                  |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dam Failure</b>  | <ul style="list-style-type: none"> <li>• Oklahoma Water Resources Board</li> <li>• FSAEMA Input</li> <li>• Public Input</li> </ul>                                                                          | Reservoir dams were identified from the OWRB Dam Inventory, listed as High or Significant based on hazard classification                                                                         |
| <b>Drought</b>      | <ul style="list-style-type: none"> <li>• Oklahoma Climatological Survey</li> <li>• Oklahoma Water Resources Board Historical Data</li> </ul>                                                                | Although sufficient water sources exist to ensure an adequate water supply during normal conditions, loss of infrastructure during drought conditions could have a negative impact on the Tribe. |
| <b>Earthquake</b>   | <ul style="list-style-type: none"> <li>• Information from Oklahoma Geological Survey</li> <li>• Past Historical Records</li> </ul>                                                                          | Past history and existing fault lines within Oklahoma and neighboring states place the Tribe at risk for earthquake.                                                                             |
| <b>Extreme Heat</b> | <ul style="list-style-type: none"> <li>• National Weather Service</li> <li>• Oklahoma Climatological Survey</li> </ul>                                                                                      | Oklahoma has prolonged periods of high temperatures exceeding 100° and is prone to wide temperature swings. The Tribe is also susceptible.                                                       |
| <b>Flood</b>        | <ul style="list-style-type: none"> <li>• Local Emergency Management Records</li> <li>• FSAEMA Input</li> <li>• FEMA Declarations</li> <li>• National Center for Environmental Information (NCEI)</li> </ul> | Frequent flooding in the Tribe is usually due to heavy rains.                                                                                                                                    |
| <b>Hailstorm</b>    | <ul style="list-style-type: none"> <li>• Local Input</li> <li>• National Center for Environmental Information (NCEI)</li> </ul>                                                                             | The Fort Sill Apache Tribe experiences hailstorms during severe thunderstorms.                                                                                                                   |
| <b>High Wind</b>    | <ul style="list-style-type: none"> <li>• NCDC data</li> <li>• FSAEMA Input</li> <li>• Oklahoma Climatological Survey</li> <li>• National Weather Service</li> <li>• Storm Prediction Center</li> </ul>      | High winds and downdrafts have damaged homes and buildings within the Fort Sill Apache FSAEMA Tribe.                                                                                             |
|                     |                                                                                                                                                                                                             |                                                                                                                                                                                                  |

**Table 2-2: Natural Hazard Identification for The Fort Sill-Chiricahua-Warm Springs Apache Tribe**

| <b>Hazard</b>       | <b>Review Source</b>                                                                                                                                        | <b>Basis for Identification</b>                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lightning</b>    | <ul style="list-style-type: none"><li>• Oklahoma Climatological Survey</li><li>• National Weather Service</li><li>• NCEI data</li></ul>                     | Lightning is a common occurrence with thunderstorms. The Fort Sill Apache Tribe annually experiences thunderstorms and occasional damage from lightning.          |
| <b>Tornado</b>      | <ul style="list-style-type: none"><li>• Local Emergency Management Records</li><li>• Public Input</li><li>• FEMA Declarations</li><li>• NCEI data</li></ul> | The Fort Sill Apache Tribe experienced its last damaging tornado in May 2011. Caddo County has had the most (131) tornadoes (1954-2024) of all Oklahoma counties. |
| <b>Wildfire</b>     | <ul style="list-style-type: none"><li>• Local Fire Department Records</li><li>• FSAEMA Input</li><li>• Public Input</li></ul>                               | Large areas within the Fort Sill Apache Tribe are wooded and have extensive grasslands which, if on fire, can be a threat to life and property.                   |
| <b>Winter Storm</b> | <ul style="list-style-type: none"><li>• Public Input</li><li>• National Weather Service</li><li>• FEMA Declarations</li></ul>                               | Severe ice storms occur seasonally in Oklahoma and the Fort Sill Apache Tribe is impacted when they occur.                                                        |

## **Hazard Assessment**

The FSAEMA used data from a variety of federal and state agencies as well as geographic information system applications and public information to estimate the potential impact of these hazards. Discussion of these hazards and their potential impact is presented in Chapter Three of this Plan.

## **Goal Setting**

Specific hazard mitigation goals were reviewed by the FSAEMA for their concurrence. The mitigation strategy and goals are further discussed in Chapters One and Four of this Plan.

## **Possible Mitigation Actions**

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The Team considered the hazard mitigation goals as they developed action plans to mitigate the natural hazards impacting the community. Mitigation actions were prioritized through the S.T.A.P.L.E.E. method of prioritization (FEMA) by the FSAEMA. A discussion of these mitigation actions is presented in Chapters Four of this Plan.

## **Action Plan**

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The FSAEMA developed an action plan for the mitigation project that discusses priorities, funding, and responsible entities for implementation. These are discussed in Chapters Four, Five and Six of this plan. A draft of the goals and action items discussed by the FSAEMA during several meetings was prepared by Hazard Mitigation Specialists, L.L.C. and presented to the FSAEMA through PowerPoint.

## **Plan Maintenance**

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Once adopted, the Fort Sill Apache Tribe Emergency Management Agency and the Tribe's Emergency Managers will be involved in the implementation, evaluation and revision of the Hazard Mitigation Plan. The Plan will be reviewed and updated on an annual basis with assistance from relevant local agencies and subcontractors. The Hazard Mitigation Plan will be submitted to the Federal Emergency Management Agency (FEMA) for their review. Further details regarding the maintenance of the Hazard Mitigation Plan are found in Chapter Six.

## **Plan Adoption**

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A Plan Adoption Resolution will be presented to the Tribal Council for adoption after it is reviewed and approved by the Federal Emergency Management Agency (FEMA). Pages at the beginning of this document have been reserved for that document and are discussed further in Chapter Six.

## CHAPTER THREE HAZARD ASSESSMENT

The regulations in 44 CFR 201.7 outline the specific information that local jurisdictions must consider when completing the hazard assessment portion of the Hazard Mitigation Plan. The hazard assessment must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Mostly natural hazards are profiled in this plan. Some manmade hazards are also profiled, as the nature of accidents and other hazards continues to evolve to become more relevant to the Tribe. The probability of occurrence ranking system is defined based on the likelihood of an event to occur at a defined frequency per year. Classification ranges from 1 (unlikely) to 4 (highly likely) and are detailed in Table 3-1.

| <b>Table 3-1: Probability of Occurrence - Definition</b> |                                                                                                    |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>4-HIGHLY LIKELY</b>                                   | Event is probable within the calendar year. Event has a “1 in 1-year” chance of occurring.         |
| <b>3-LIKELY</b>                                          | Event is probable within the next three years. Event has up to “1 in 3 years” chance of occurring. |
| <b>2-POSSIBLE</b>                                        | Event is probable within the next five years. Event has up to “1 in 5 years” chance of occurring.  |
| <b>1-UNLIKELY</b>                                        | Event is possible within the next 10 years. Event has up to “1 to 10 years” chance of occurring.   |

### Review of Natural Hazards

This chapter profiles each of the hazards identified during the planning process discussed in Chapter Two, Table 2-2 and then assesses the vulnerability and impact to life and property resulting from those hazards. A summary of the probability of hazard occurrence for each of the following hazard types is provided in Table 3-2. For detailed descriptions and supporting data for each hazard, 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 the Tribe 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 Tribe;
- **Probability of Future Occurrences** – Defines the calculated potential of future events occurring in The Fort Sill Apache Tribe based on history, geological or climatological potential.
- **Vulnerability and Impact** – Describes how vulnerable or susceptible to damage the citizens, infrastructure, economy and structures in the jurisdiction are to the profiled hazard and resulting consequences.
- **Conclusion** – summarizes the hazard findings.
- **References** – presents major reference sources used.

| Table 3-2: Summary of Probability of Natural Hazard Occurrence |                   |                                                                                                    |
|----------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------|
| Hazard                                                         | Probability       | Description                                                                                        |
| Dam Failure                                                    | 1 - Unlikely      | Event is possible within the next 10 years. Event has up to “1 to 10 years” chance of occurring    |
| Drought                                                        | 4 - Highly Likely | Event is probable within the calendar year. Event has a “1 in 1-year” chance of occurring.         |
| Earthquake                                                     | 2 - Possible      | Event is probable within the next five years. Event has up to “1 in 5 years” chance of occurring.  |
| Extreme Heat                                                   | 4 – Highly Likely | Event is probable within the calendar year. Event has a “1 in 1-year” chance of occurring          |
| Floods                                                         | 3 - Likely        | Event is probable within the next three years. Event has up to “1 in 3 years” chance of occurring. |
| Hail                                                           | 3 - Likely        | Event is probable within the next three years. Event has up to “1 in 3 years” chance of occurring. |
| High Winds                                                     | 4 - Highly Likely | Event is probable within the calendar year. Event has a “1 in 1-year” chance of occurring.         |
| Lightning                                                      | 4 - Highly Likely | Event is probable within the calendar year. Event has a “1 in 1-year” chance of occurring.         |
| Tornadoes                                                      | 2 - Possible      | Event is probable within the next five years. Event has up to “1 in 5 years” chance of occurring.  |
| Wildfires                                                      | 4 - Highly Likely | Event is probable within the calendar year. Event has a “1 in 1-year” chance of occurring.         |
| Winter Storms                                                  | 3 - Likely        | Event is probable within the next three years. Event has up to “1 in 3 years” chance of occurring. |

## 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 low 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.

The OWRB also coordinates periodic training sessions and workshops on dam safety issues and regulations for dam owners and engineers.

### Location

Although there are 449 high hazard dams in Oklahoma (NPR State Impact: Oklahoma 2014), only two are of significance to the Fort Sill Chiricahua Warm Springs Apache tribal lands and citizens in Southwestern OK. Aerial photographs showing the reservoirs with high hazard dams in or near the Tribe are shown in Appendix D. Table 3-3 summarizes how the Oklahoma Water Resources Board classifies hazard categories as low, significant, or high via loss. Table 3-4 summarizes the dams identified as hazard sources for the Fort Sill Apache Tribe.

| Table 3-3: OWRB Classification of Dam 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 flood floodplain; however, dam failure would not endanger lives. | 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. |

Source: Oklahoma Water Resources Board

| <b>Table 3-4: Dams in SW Oklahoma with High Hazard Rating</b> |                                                                  |                                                               |
|---------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------|
| <b>Reservoir</b>                                              | <b>Lake Lawtonka</b>                                             | <b>Lake Ellsworth</b>                                         |
| <b>GPS Coordinates (Lat/Long)</b>                             | 34.7361799<br>-98.5033913                                        | 34.8224154<br>-98.3537206                                     |
| <b>Location</b>                                               | Medicine Park, Comanche County                                   | 6 miles south of Apache, OK, Caddo and Comanche Counties,     |
| <b>Function</b>                                               | Water Supply for Fort Sill and Lawton Communities                | Secondary water supply for Lawton, OK, supplies Lake Lawtonka |
| <b>Year Built</b>                                             | 1939, modified 1953 owned by the city of Lawton, OK. Gravity dam | 1962, City of Lawton, OK, Earthen Embankment Dam              |
| <b>Dam Height (feet)</b>                                      | 90                                                               | 96                                                            |
| <b>Dam Length (feet)</b>                                      | 612                                                              | 3900                                                          |
| <b>Lake Depth (feet)</b>                                      | 23 feet (average)<br>60 feet (maximum)                           | 17 feet (average)<br>54.2 feet (maximum)                      |
| <b>Maximum Storage (acre-feet)</b>                            | 88,665                                                           | 81,224                                                        |
| <b>Normal Storage (acre-feet)</b>                             | 54,698                                                           | 59,470                                                        |
| <b>Surface Area (acres)</b>                                   | 2,375                                                            | 5,112                                                         |

Source: Oklahoma Water Resources Board, Oklahoma Department of Wildlife Conservation

## Extent

There are no known breaches of any of the dams in the areas of tribal interest ; however, the potential is present.

The Conservation District has indicated that, *“As a general rule in the absence of a formal breach inundation map, we consider the area five miles downstream at the top-of-dam elevation and below to be the potential area of risk.”* See the maps in Appendices D and E.

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 dam construction
- Cracking caused by movements such as an earthquake or the natural settling of a dam
- Inadequate maintenance and upkeep such as failure to remove trees or repair internal seepage problems
- Piping caused when seepage through a dam is not properly addressed, form sink holes in the dam.

Flood insurance rate maps (FIRMs) show floodplains with zone designations based on flooding type and geographic features. These are primarily used for insurance rating purposes, but the zone differentiation can be helpful for floodplain management purposes. Both Lake Lawtonka and Lake Ellsworth are formed from the impoundment of creek waters with outflows into Medicine Creek and Cache Creek respectively. Table 3-5 summarizes the flood insurance rate map zones that correspond to flood zone maps in Appendix D.

| Table 3-5: Flood Insurance Rate Map (FIRM) Zones                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Zone A</b></p> <p>The 100 year</p> <p>or</p> <p>Base Floodplain</p> | <p><b>A</b> The base floodplain mapped by approximate methods, <i>i.e.</i>, Base Flood Elevations (BFEs) are not determined. This is often called an unnumbered A Zone or an approximate A Zone.</p> <p><b>A1-30</b> These are known as numbered A Zones (<i>e.g.</i>, A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).</p> <p><b>AE</b> The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.</p> <p><b>AO</b> The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.</p> <p><b>AH</b> Shallow flooding base floodplain. BFEs are provided.</p> <p><b>A99</b> Area to be protected from base flood by levees or Federal Flood Protection Systems under construction. BFEs are not determined.</p> <p><b>AR</b> The base floodplain that results from the decertification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection.</p> |

**Table 3-5: Flood Insurance Rate Map (FIRM) Zones**

|                                     |                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Zone V and VE</b>                | <p><b>V</b> The coastal area subject to a velocity hazard (wave action) where BFEs are not determined on the FIRM.</p> <p><b>VE</b> The coastal area subject to a velocity hazard (wave action) where BFEs are provided on the FIRM.</p>                                                                                                                               |
| <b>Zone B and Zone X (shaded)</b>   | <p>Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods.</p> <p>B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.</p> |
| <b>Zone C and Zone X (unshaded)</b> | <p>Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level.</p> <p>Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain.</p> <p>Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.</p>                  |
| <b>Zone D</b>                       | Area of undetermined but possible flood hazards.                                                                                                                                                                                                                                                                                                                       |

## Previous Occurrences

There have been no known breaches of dams affecting the Tribe; however, the potential is present. There are two hazardous dams within the Tribe's area of interest that could pose a threat to the citizens as they are classified as high hazard by the Oklahoma Water Resource Board (Lake Lawtonka and Lake Ellsworth). Both dams were built over 50 years ago and retain water used to supply the city of Lawton, OK with drinking water, so a dam breach would not only cause acute damage to downstream areas, but also a loss of water supply to a city of nearly 100,000 people including tribal citizens.

## Probability of Future Events

The dams in the Tribe's area were built with a design life span of 50 years. Soil, concrete and metal components have deteriorated. Today some dams do not meet current dam safety regulations that have been enacted and revised with more stringent requirements than when the dams were built. The U.S. Natural Resources Conservation Service (NRCS) has undertaken rehabilitation of some of the dams in Oklahoma. Historically, the federal government provides 65 percent of the funding for rehabilitation projects and project sponsors provide 35 percent, but

funding availability varies over time and on a project-by-project basis. Projects are selected on a priority basis with those with high safety and health concerns receiving the highest priority. Dam failure affecting the Tribe is “**UNLIKELY**.” An event is possible within the next 10 years. Event has up to “1 to 10 years” chance of occurring (See Table 3-1).

## **Vulnerability and Impact**

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Dam failures are generally catastrophic if the structure is breached or significantly damaged. It often occurs with little warning. Intense storms may produce a flood in a few hours or even minutes for upstream locations. Flash floods occur within six hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breaching.

Vulnerability and Impact was assessed by considering the benefits to human society arising from the dam (i.e., agriculture, water, damage prevention and power) and the benefit to nature and wildlife. Assessment through the harm caused by dam failure is another way of determining vulnerability and impact. Analysis is then made of the disruption of human lives through relocation, the loss of employment due to business loss, the loss of life, loss of wildlife. The potential loss of Fort Sill Apache Tribe artifacts, cultural resources and historical data due to the flooding caused by dam failure are of great concern. The property losses of homes, vehicles, and businesses are all a major factor when considering the vulnerabilities and impacts of dam failure. Additionally, the loss of transportation routes force people to find alternate routes, the loss of communications facilities, loss of critical structures and facilities; massive economic loss can be devastating to the population. Additional vulnerabilities and impacts can be found in Appendix C - Critical Facilities

## **Conclusion**

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The dams in the Tribe’s area are controlled and regularly inspected by the Oklahoma Water Resources Board and the U.S. Bureau of Reclamation; however, there is still a threat of dam failure since many of the dams have passed their designed life span and are classified with a high hazard index rating (Table 3-2). Dam breach for Lake Ellsworth and Lake Lawtonka were determined to be “**UNLIKELY**” meaning that the event is possible within the next 10 years. Event has up to “1 to 10 years” chance of occurring (Table 3-1).

## References

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Oklahoma Water Resources Board  
U.S. Natural Resources Conservation Service (NRCS)  
U.S. Bureau of Reclamation

## 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.

- **Meteorological:** drought is usually based on long-term precipitation departures from normal, though high temperatures often play a role.
- **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.
- **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 a hydrological drought.

When there is insufficient precipitation, soil can dry out and plants die. When rainfall is less than normal for several weeks, months, or years the flow of streams and rivers declines, water levels in lakes, reservoirs, and aquifers decline, impacting water availability and recharge rates of wells. 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 the soil decreases. 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. Likewise, drought recovery based on surface and groundwater levels may also show delayed rebound with changing weather conditions.

The effects of a drought are economic, social and environmental. Lack of rainfall for an extended period is catastrophic to farmers and ranchers and may affect towns and cities. Acute impacts (seasonal) can lead to water shortages in dryer months and planned conservation strategies, while chronic impacts (year after year) require strategic planning for water use prioritization, sourcing, and conservation to maintain supply for anthropocentric and environmental functions.

At the state level, during drought emergencies Oklahoma Emergency Management issues regular updates of drought and wildfire conditions. If conditions are severe enough, updates are issued daily. 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. Drought intensity categories are determined from a precipitation/evapotranspiration index and are used in the US drought monitor mapping applications to create snapshots of current conditions nationally:

- D0 – Abnormally Dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme Drought
- D4 – Exceptional Drought

Meteorologists typically determine the onset and the end of a 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. For the Fort Sill Apache Hazard Mitigation Plan, the US Drought Monitor classification and mapping system were used to define drought scope and intensity across Oklahoma, New Mexico, and Arizona for tribal lands of interest.

## **Location:**

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Current drought conditions in Spring of 2025 are summarized in Figure 3-1 as a map including Oklahoma, New Mexico, and Arizona from the US Drought Monitor (US Department of Agriculture). Note that all three regions have moderate (OK) to extreme/exceptional drought (NM, AZ) as summer approaches.

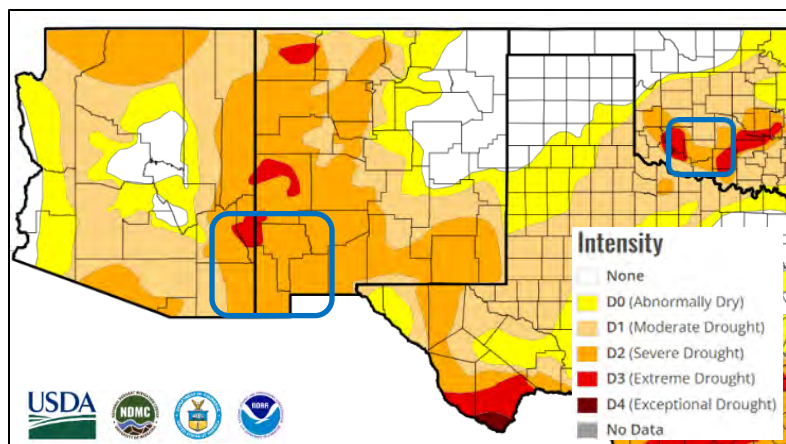


Figure 3-1: Map of US Drought Monitor classification for SW Oklahoma, SW New Mexico and SE Arizona as of December 30, 2025. Specific locations indicated via blue outlines.

## Extent

Historically, Oklahoma has had to deal with the impacts of extreme drought. The Dust Bowl of the 1930's affected 50,000,000 acres of land, rendering farmers helpless to cultivate subsistence or commercial crops. In the 1950's, the Great Plains suffered a severe water shortage from several years of rainfall well below normal in which crop yields failed, and the water supply was limited. The 1995-96 Oklahoma Drought was one of the most severe on record. Another severe drought reaching "Exceptional Level" began in 2005 and lasted into the early part of 2007. The entire Fort Sill Apache Tribe area in SW Oklahoma is equally at risk to the hazard of drought. Strategies to change agricultural practices have mitigated the impacts of drought through water conservation strategies, but the impacts of prolonged drought remain a significant concern to SW Oklahoma.

A review of the U.S. Drought Monitor from 2000-2025 indicates that Oklahoma experiences periodic droughts of increasingly severe ratings. Over the last 25 years, there are very few time periods indicated in Figure 3-2 in which there were no drought conditions reported with 2011-2015 being a long and consistent drought of extreme severity. Southern New Mexico and Southeastern Arizona are more sensitive to drought conditions as they are arid / semi-arid climates. The following figures indicate the drought classifications for New Mexico (Figure 3-3) and Arizona (Figure 3-4) from 2000-2025.

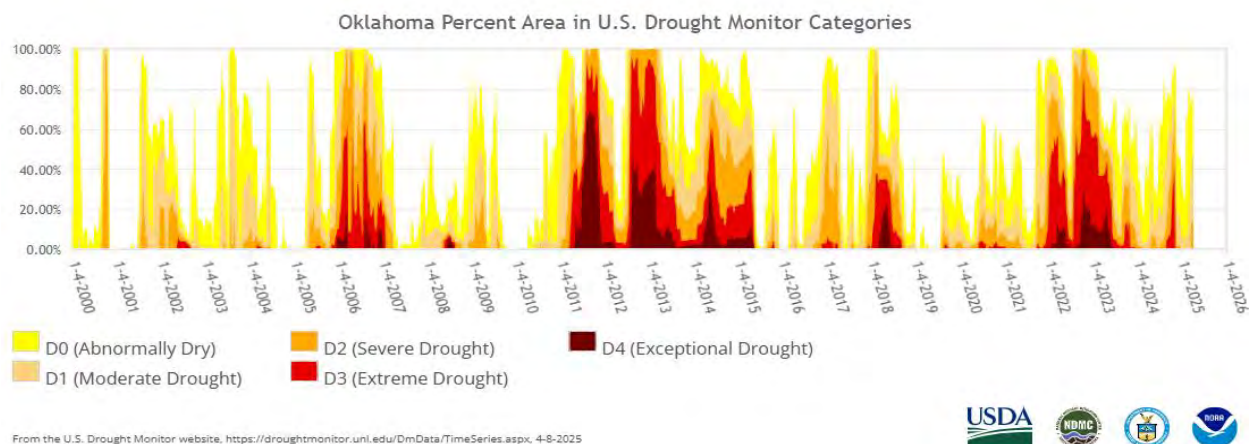


Figure 3-2: Oklahoma Drought Monitor classification time series from 2000-2025 based on percentage of time under drought conditions. Source: USDA, NOAA, NDMC 04/08/2025

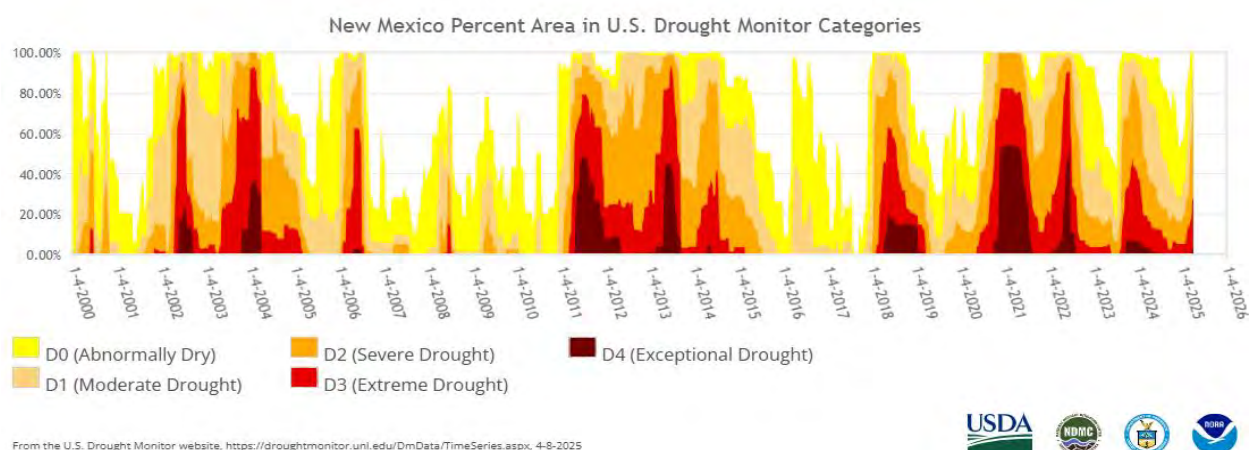


Figure 3-3: New Mexico Drought Monitor classification time series from 2000-2025 based on percentage of time under drought conditions. Source: USDA, NOAA, NDMC 04/08/2025

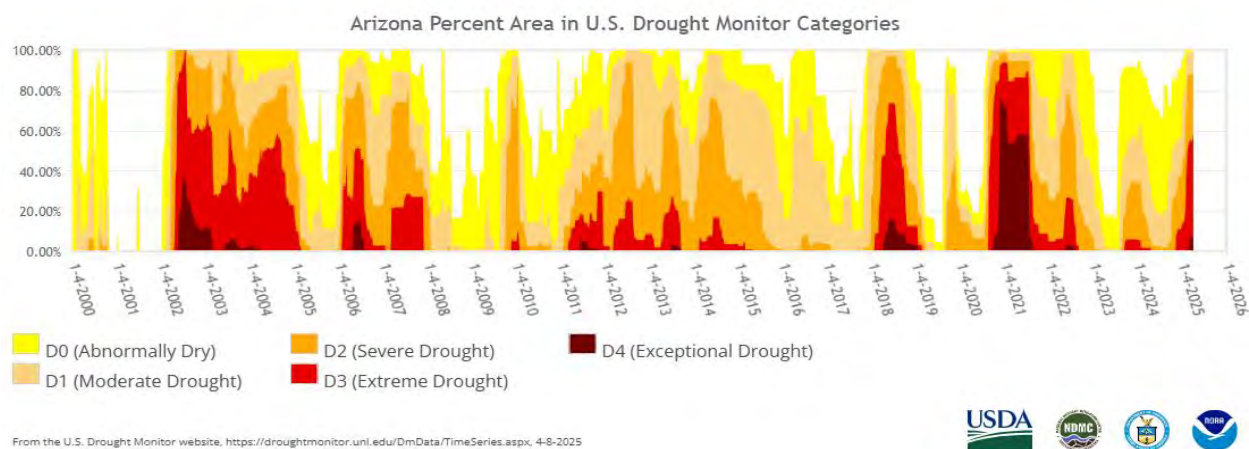


Figure 3-4: Arizona Drought Monitor classification time series from 2000-2025 based on percentage of time under drought conditions. Source: USDA, NOAA, NDMC 04/08/2025

The Fort Sill Apache Tribe considers anything above a moderate drought (D1) to be severe and reason to consider rationing of outside water uses. Common to all types of droughts is the fact that they originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple of months), the drought is considered *short-term*. But if the weather or atmospheric circulation pattern becomes entrenched and the precipitation deficits last for several months to several years, the drought is considered 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 result in short-term wet spells.

## Previous Occurrences

Southwestern Oklahoma experiences cyclical periods of wet and dry overtime based on precipitation data from the Oklahoma Climatological Survey from 1895 to 2024 (Figure 3-5). Extended periods of dryness lead to long term drought impacts (5 year tendency) that are summarized based on the Palmer Drought Severity Index in Table 3-5 with the January 1909-September 1918 being recognized as the “Drought of Record” for the region (meaning, the worst drought experienced based on duration).

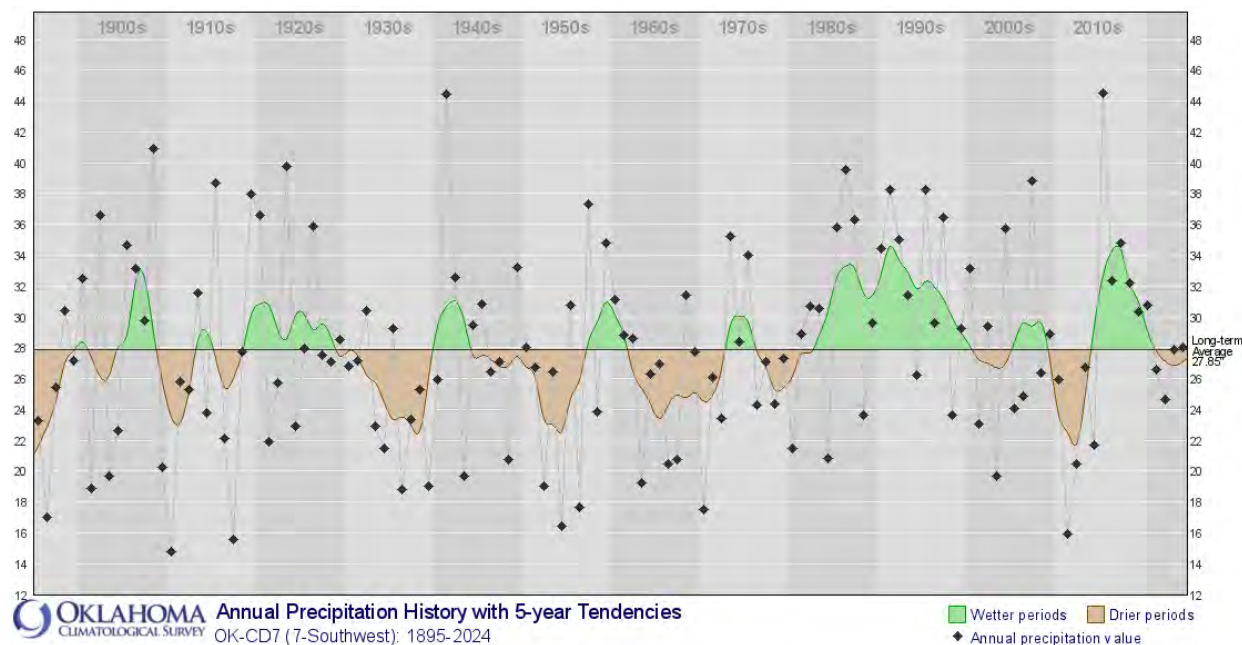


Figure 3-5: Annual precipitation history for southwestern Oklahoma. Periods of dryer conditions are indicated by negative deviation from the horizontal axis (beige).

| <b>Table 3-6: Summary of Historic Droughts Affecting SW Oklahoma</b> |                                                 |                                                                      |
|----------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------|
| <b>Time Period</b>                                                   | <b>Months Classified as Moderate Drought D2</b> | <b>Months Classified as Extreme Drought D4</b>                       |
| <b>January 1909-September 1918</b>                                   | 66 (of 117 months)                              | 15 consecutive months, plus, four additional months                  |
| <b>April 1933-October 1940</b>                                       | 70 (of 91 months)                               | 3 consecutive months, plus, two additional months                    |
| <b>March 1950-February 1957</b>                                      | 63 (of 84 months)                               | 3 consecutive months occurring twice, plus, one more month           |
| <b>January 1963-September 1972</b>                                   | 70 (of 106 months)                              | 8 consecutive months, plus 6 consecutive months, plus one more month |
| <b>September 2007-May 2015</b>                                       | 62 (of 188 months)                              | 12 consecutive months, plus, five additional months                  |
| <b>September 2021-November 2024</b>                                  | 30 (of 38 months*)                              | 2 consecutive months, plus, five additional months*                  |

Source: South Central Climate Science Center (Norman, OK), US Drought Monitor (USDA)

\*Data set ends, but drought conditions likely continue

Major drought events for Luna County, New Mexico were summarized based on the number of consecutive months classified as at least a Moderate Drought (D2) and the number of consecutive months classified as Extreme Drought (D4) in Table 3-7. Note that the number of consecutive months in moderate to extreme drought conditions has increased in the last five years. Also, the frequency of extreme drought classification has increased in the last five years. Cochise County, Arizona shows a similar pattern of drought frequency and duration (Table 3-8).

| <b>Table 3-7: Summary of Droughts Affecting Luna County, NM</b> |                                                               |                                                              |
|-----------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| <b>Time Period of Start of Drought</b>                          | <b>Consecutive Months Classified as Moderate Drought (D2)</b> | <b>Consecutive Months Classified as Extreme Drought (D4)</b> |
| <b>2000-2005</b>                                                | 4 (2000)<br>3, 1 (2002)<br>2 (2003)<br>11 (2004-2005)         | 6 (2003-2004)                                                |
| <b>2006-2010</b>                                                | 8 (2006)<br>2 (2008)<br>1 (2009)                              | None                                                         |
| <b>2011-2015</b>                                                | 2 (2011)<br>18 (2011-2013)<br>2 (2013)                        | 6 (2011)<br>3 (2013)                                         |

| <b>Table 3-7: Summary of Droughts Affecting Luna County, NM</b> |                                                               |                                                              |
|-----------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| <b>Time Period of Start of Drought</b>                          | <b>Consecutive Months Classified as Moderate Drought (D2)</b> | <b>Consecutive Months Classified as Extreme Drought (D4)</b> |
|                                                                 | 9 (2014)                                                      |                                                              |
| <b>2016-2020</b>                                                | 4, 1 (2018)<br>6 (2020)                                       | 2 (2020)                                                     |
| <b>2021-2025</b>                                                | 25 (2021-2022)<br>21 (2023-2025*)                             | 8 (2021)<br>2 (2022)<br>5 (2023-2024)<br>1 (2025*)           |

Source: US Drought Monitor (USDA) 2000-2025\* (2025 data only completed through 04/07/2025)

| <b>Table 3-8: Summary of Droughts Affecting Cochise County, AZ</b> |                                                               |                                                              |
|--------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|
| <b>Time Period of Start of Drought</b>                             | <b>Consecutive Months Classified as Moderate Drought (D2)</b> | <b>Consecutive Months Classified as Extreme Drought (D4)</b> |
| <b>2000-2005</b>                                                   | 2 (2000)<br>2 (2002)<br>8 (2002-2003)<br>23 (2003-2005)       | 5 (2003-2004)                                                |
| <b>2006-2010</b>                                                   | 1, 2, 1 (2006)<br>1 (2007)<br>1 (2008)<br>4 (2009)            | 3 (2006)                                                     |
| <b>2011-2015</b>                                                   | 2, 3 (2011)<br>10 (2011-2012)<br>31 (2013-2015)               | 6 (2011)                                                     |
| <b>2016-2020</b>                                                   | 4 (2016)<br>13 (2017-2018)<br>3 (2019)<br>4 (2020)            | 3 (2020)                                                     |
| <b>2021-2025</b>                                                   | 18 (2021-2022)<br>21 (2023-2025*)                             | 8 (2021)                                                     |

Source: US Drought Monitor (USDA) 2000-2025\* (2025 data only completed through 04/07/2025)

## Probability of Future Events

The US Drought Outlook Map (Figure 3-6) indicates that drought is likely to persist in 2025. The frequency and duration of past drought events in Oklahoma, New Mexico, and Arizona, sets a precedent for sustained and cyclical droughts historically. Current conditions (temperature and precipitation) used to classify drought further support that the Tribe will continue to experience drought events of varying degrees. The probability of future drought events for the Tribe is “**HIGHLY LIKELY**” meaning that drought is probable within the calendar year with a “1 in 1-year” chance of occurring. (See Table 3-1.)

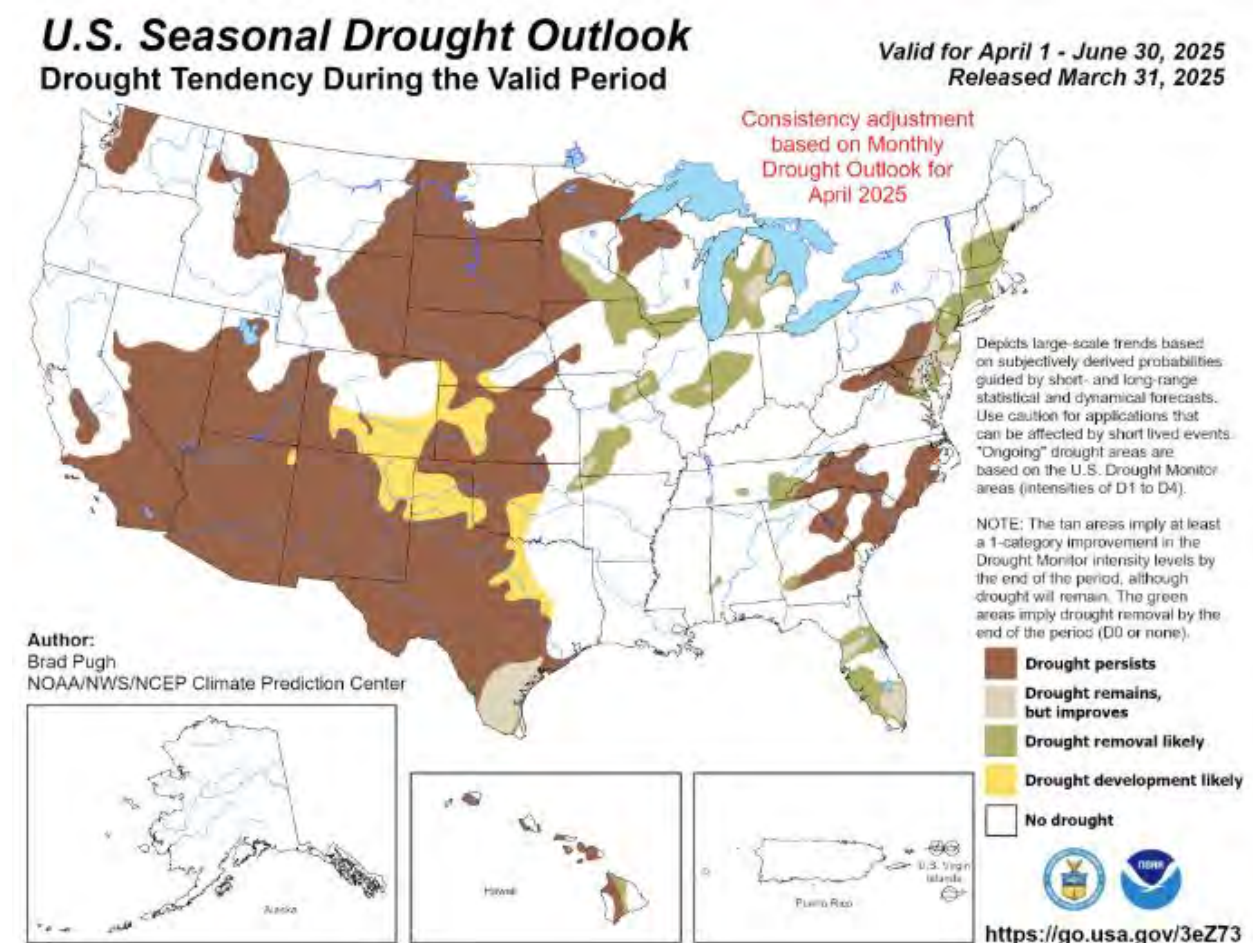


Figure 3-6: US Drought Monitor Seasonal Outlook Map Valid through June 2025. Source: NOAA / NWS/NCEP Climate Prediction Center

## **Vulnerability and Impact**

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The Tribe is susceptible to the effects of drought in all three states that contain tribal lands of interest (Oklahoma, New Mexico, and Arizona). Drought directly impacts surface water and groundwater resource management, soil moisture for agricultural farming and ranching activities, as well as economic development to include infrastructure and transportation. Drought indirectly impacts wildland fire risk and the resultant air quality issues associated with blowing dust and smoke. Impacts are significant for tribal citizens, tribal lands of interest, and tribal economic interests present day as well as development in the future within all three states (OK, NM, AZ). Additional vulnerabilities and impacts for drought can be found in Appendix C - Critical Facilities.

## **Conclusion**

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Drought is a concern for the Tribe because it is primarily in rural areas that rely on groundwater resources and soil moisture/precipitation to support agricultural practices. The impact of increasingly lengthy and severe droughts is major concern for agricultural activity in Oklahoma and groundwater availability in the Southwest. Populations within the Tribal community face both direct and indirect impacts from sustained drought that range from health, environmental, and economic spheres.

## **References**

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*Oklahoma Water Resources Board (OWRB)*  
*National Climatic Data Center Storm Event Database (NCDC)*  
*U.S. Drought Monitor*

## **HAZARD PROFILE:**

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### **EARTHQUAKE**

Earthquakes are one of nature's most damaging hazards. An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of Earth's tectonic plates. The severity of an earthquake is dependent on the amount of energy released from the fault or epicenter. An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface.

For thousands of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates. More than 930,000 earthquakes occur throughout the world each year. Approximately 95% of these have a magnitude of <2.5 and usually are not felt by humans. Earthquakes strike suddenly, without warning. Earthquakes can occur at any time.

### **Location**

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According to the Oklahoma Geological Survey, Oklahoma experiences 30 – 167 earthquakes a year, though most are not felt. The nearest fault to the Fort Sill Apache Tribe is the ~180-km-long Meers-Willow fault system in Figure 3-7. Southeastern Arizona (Cochise County) and Southwestern New Mexico (Luna County) have a variety of quaternary faults pictured in Figure 3-8. The proximity of faults to Tribal lands of interest supports that earthquakes are a hazard of concern for tribal properties and citizens.



Figure 3-7: United States Geological Survey (USGS) Map of Quaternary Faults in SW Oklahoma (Meers-Willow Fault pictured south of the Fort Sill Apache Tribal Government Complex (star).

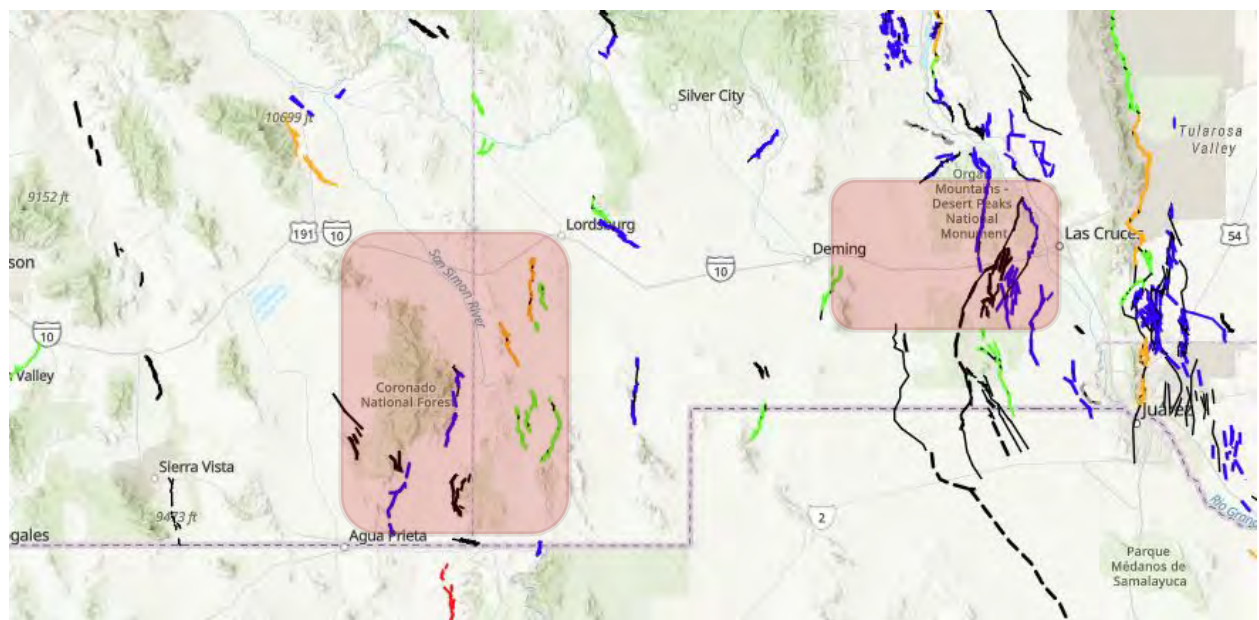


Figure 3-8: USGS Map of Quaternary Faults in SW New Mexico and SE Arizona. Areas of Tribal interest are indicated in highlighted areas.

## Extent

The hazard classification for SW OK is relatively high, while the earthquake hazard for SE [Arizona](#) and SW New Mexico is relatively low according to the National Seismic Hazard Model Project from the US Geological Survey (2023) Figure 3-9.

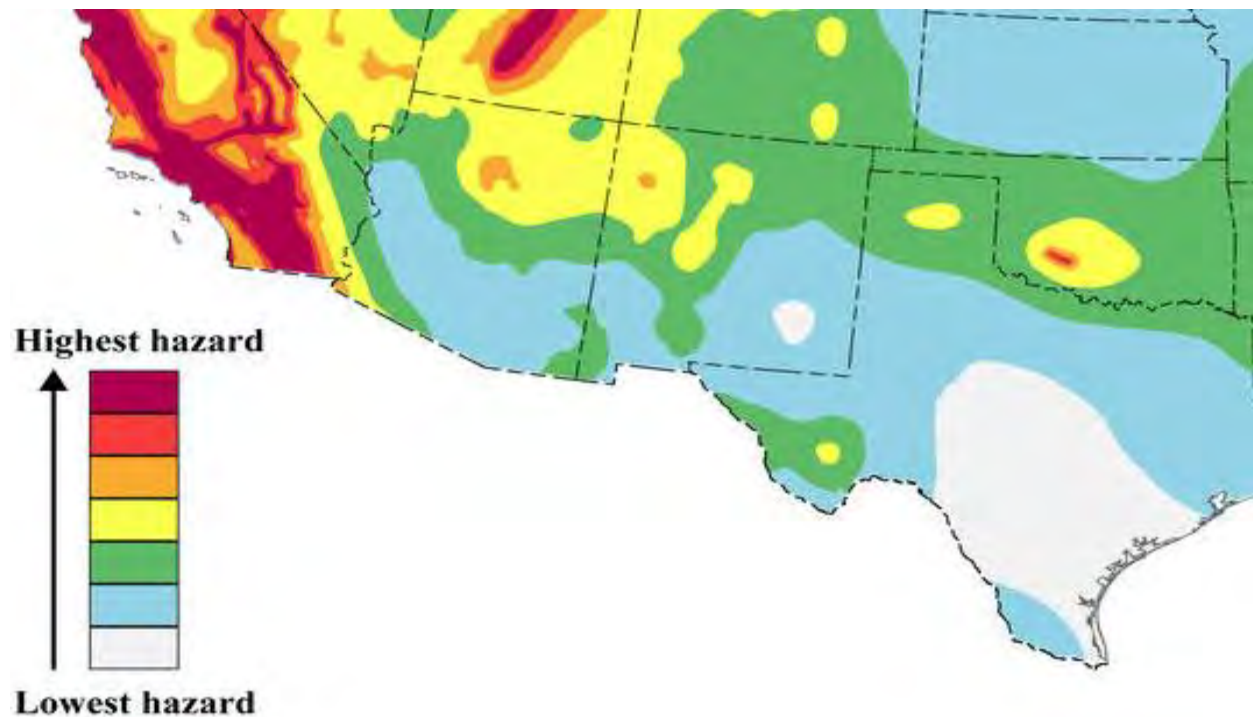


Figure 3-9: National Seismic Hazard Model Project 2023 Hazard Map (USGS).

For this plan, the Peak Ground Acceleration (PGA) is the measure used to determine that earthquakes were a potential hazard for the Tribe. Based on information from the United States Geological Survey, the peak ground acceleration with a 10% probability of exceedance in a 50-year return period for the Tribe is 3.27. Based on the FEMA Guide “Understanding Your Risks”, a community should proceed to profile their earthquake risk if the PGA for the area is 3%g peak acceleration or more (10% probability of exceedance in 50 years). This PGA of 4 -6 equates to a Modified Mercalli Intensity (MMI) scale of IV or VII. This MMI intensity would indicate that a future earthquake affecting the Fort Sill Apache Tribe will cause light to moderate ground shaking. This MMI scale of IV or VII would result in slight building damage such as falling loose bricks, falling plaster and cracks in walls. The history of impact of earthquake incidents falls in the category of slight to moderate impact in the community. State officials consider any earthquake activity above MMI of VI or 4.9 on the Richter scale as a significant event due to the slight damage

and fear and concern of citizens. Housing in the Tribe is generally not built to “earthquake standards” and could receive damage at these levels and above. The earthquakes in and around the Tribe in the past have been slight to mid-range but have done little or no damage to the Tribe.

The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. This scale is usually the one referred to by news media when making public reports. The Richter Scale is most familiar to citizens. The diagram below shows how to use Richter’s original method or the Mercalli Scale to measure a magnitude estimate. Any earthquake above VIII on the Mercalli or 6.0 on the Richter scales would be considered approaching a severe level for the Tribe.

| <b>Table 3-9: Earthquake: Mercalli/Richter Scale Comparison</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mercalli Scale</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Richter Scale</b> | <b>Full Description</b>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>I.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>0 – 1.9</b>       | Not felt. Marginal and long period effects of large earthquakes.                                                                                                                                                                                                                                                                                                                                                |
| <b>II.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>2.0 -2.9</b>      | Felt by persons at rest, on upper floors, or favorably placed.                                                                                                                                                                                                                                                                                                                                                  |
| <b>III.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>3.0 – 3.9</b>     | Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.                                                                                                                                                                                                                                                                        |
| <b>IV.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>4.0 - 4.3</b>     | Hanging objects swing. Vibration like passing of heavy trucks. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink the upper range of IV, wooden walls and frame creak.                                                                                                                                                                                                                      |
| <b>V.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>4.4 - 4.8</b>     | Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Pendulum clocks stop, start.                                                                                                                                                                                                                        |
| <b>VI.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>4.9 - 5.4</b>     | Felt by all. Many frightened and ran outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Books, etc., off shelves. Pictures off walls. Furniture moved. Weak plaster and masonry D cracked. Small bells ring. Trees, bushes shaken.                                                                                                                                                           |
| <b>VII.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>5.5 - 6.1</b>     | Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture is broken. Damage to masonry D, including cracks. Weak chimneys are broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Waves on ponds. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.                |
| <b>VIII.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>6.2 - 6.5</b>     | Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations. Decayed piling broken off. Branches broke from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes. |
| <b>IX.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>6.6 - 6.9</b>     | General panic. Masonry D was destroyed; Masonry C was heavily damaged, sometimes with complete collapse; Masonry B seriously damaged. (General damage to foundations.) Serious damage to reservoirs. Underground pipes broke. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.                                                                         |
| <b>X.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>7.0 - 7.3</b>     | Most masonry and frame structures were destroyed with their foundations. Some well-built wooden structures and bridges were destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.                                                                      |
| <b>XI.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>7.4 - 8.1</b>     | Rails bent greatly. Underground pipelines completely out of service.                                                                                                                                                                                                                                                                                                                                            |
| <b>XII.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>&gt; 8.1</b>      | Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.                                                                                                                                                                                                                                                                                              |
| Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.<br>Masonry B: Good workmanship and mortar; reinforced but not designed in detail to resist lateral forces.<br>Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.<br>Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally. |                      |                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Previous Occurrences

Earthquakes occurrences have increased over time within Oklahoma. Figure 3-10 summarizes the total number of earthquakes from 1978 to 2018 with a 3.0 or greater magnitude on the Richter Scale (USGS, Oklahoma Geological Survey).

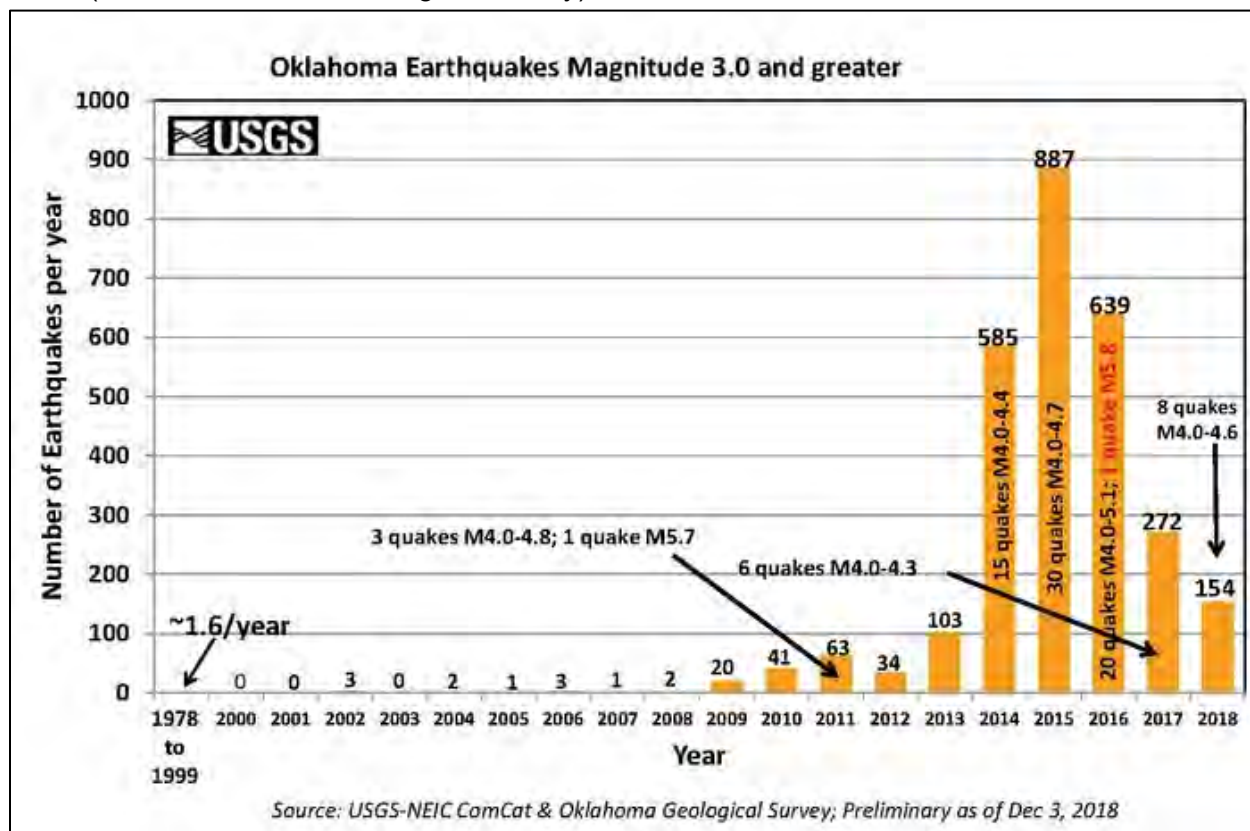


Figure 3-10: Oklahoma Earthquakes Magnitude 3.0 or Greater from 1978-2018

According to the National Earthquake Information Center, the largest earthquake recorded in Oklahoma was on September 3, 2016, in Pawnee. This earthquake caused moderate damage in northern and central Oklahoma, including toppled chimneys and smokestacks, cracked and loosened bricks on buildings, and broken windows. That earthquake was 5.8 on the Richter Scale. The Tribe has experienced earthquakes in the past, although they have mostly not been felt by the population. The most significant was a 3.3M quake on August 20, 2020, just west of Apache, OK. The increase in earthquake frequency and magnitude from 2009-2018 has been correlated with wastewater disposal wells associated with hydraulic fracturing activities leading to induced seismic activity. Changes in policy regarding “traffic light” permitting as well as a decline in statewide hydraulic fracturing activities and associated waste generation has led to a decline in seismic activity when compared to 2014-2016 (State Impact Oklahoma, NPR).

New Mexico has had 2,557 earthquakes over the past year (April 2024-2025). No earthquake larger than magnitude (M) 6.2 has occurred within the New Mexico part of the rift since 1849, and no damaging event occurred in the previous few hundred years, based on oral history. New Mexico is unlikely to ever see a truly massive quake, but smaller ones are common all along the Rio Grande Valley (Earthquake Track, <https://earthquaketrack.com/>). Figure 3-11 is a map of the largest earthquakes over the past 100 years in New Mexico and Arizona. The magnitude of the listed earthquakes for New Mexico and Arizona are consistent with the earthquakes in Oklahoma.



Figure 3-11: Map of Largest Documented earthquakes for SE Arizona and SW New Mexico.

## Probability of Future Occurrences

The future probability of an earthquake for the Fort Sill Apache Tribe is difficult to predict. There have been few earthquakes near the Tribe in Oklahoma. Since quakes in this part of the state are less influenced by injection wells, there is less control and predictability, although they tend to be rarer. Regardless, the Fort Sill Apache Tribe would rather be prepared than to be caught unprepared for a more serious earthquake. Figure 3-12 is a map of recent earthquakes within SW Oklahoma (Oklahoma Geological Survey, 2025) and thus indicates that seismic activity is ongoing within areas adjacent to the Fort Sill Apache lands of interest.

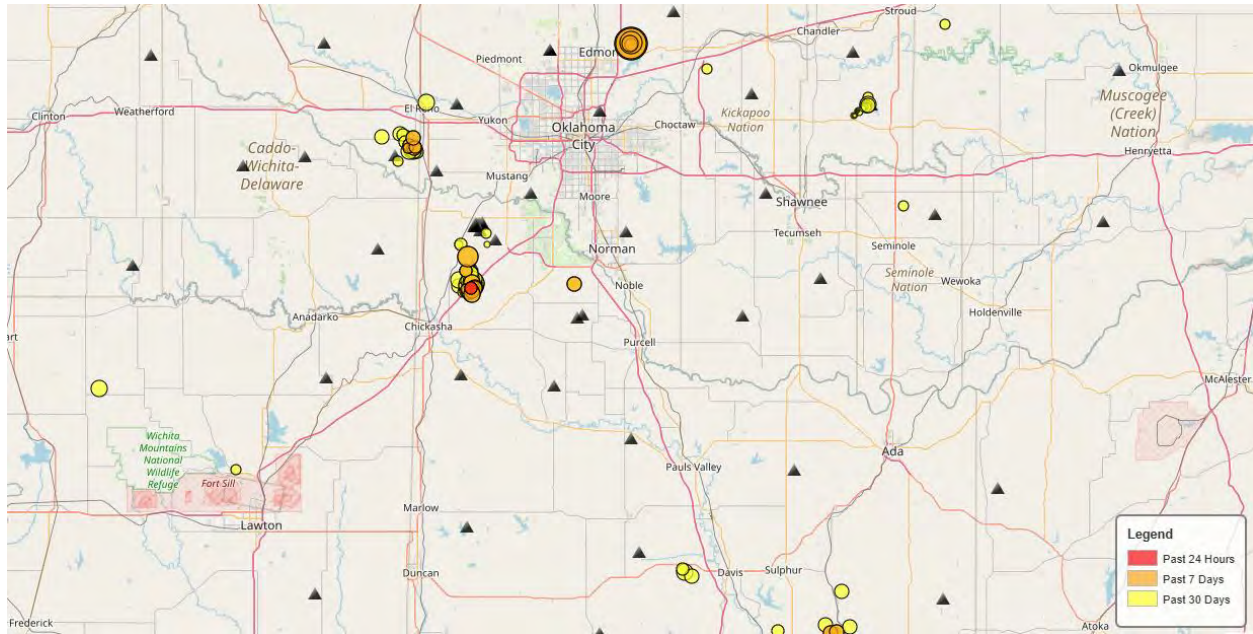


Figure 3-12: Map of recent earthquake in SW Oklahoma as of April 2025 (OGS)

The Fort Sill Apache Tribe Hazard Mitigation Planning Team rated the probability of a future felt earthquake as **“POSSIBLE.”** Meaning that a seismic event is probable within the next five years. (Event has up to “1 in 5 years” chance of occurring) (See Table 3-1.)

## Vulnerability and Impact

When an earthquake occurs in a populated area, it may cause deaths and injuries to citizens as well as extensive property damage (magnitude dependent). Ground shaking from severe earthquakes can collapse buildings and bridges; disrupt gas, electricity, water and phone service; and may sometimes trigger flash floods or fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil, as well as trailers and homes not tied to their foundations, are at risk because they can be shaken off their mountings during an earthquake. These events may force residents or businesses to relocate. Risk from an earthquake is generally from structural failure of either buildings and/or infrastructure, i.e., pipelines, gas lines, roads and bridges, and dams, etc., and the resultant possibility of fire or flooding although fissures can sometimes open below buildings or highways causing damage. Damaged bridges and highways force people to find alternate routes to travel and limit first responder’s ability to provide a quick response to the emergency. The loss of pipelines, water lines, and electrical power lead to major hardships for people, especially the sick, young, and elderly. Additional earthquake vulnerabilities and impacts can be found in Appendix C - Critical Facilities.

## Conclusion

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Based on available information, the potential impact of earthquakes on the Fort Sill Apache Tribe is minimal. The Fort Sill Apache Tribe is in a relatively inactive earthquake area and appears to have very limited potential for severe earthquake damage based on historical occurrences of earthquakes in the surrounding area.

## References

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US Geological Survey (USGS)  
Oklahoma Geological Survey (OGS)  
Earthquake Track, <https://earthquaketrack.com/>

## Hazard Profile:

### EXTREME HEAT

As part of the Southern Great Plains, Oklahoma 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 can 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” of 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. According to the Oklahoma Climatological Survey, the Fort Sill Apache Tribe averages 14 - 20 days over 100 degrees during the summer. New Mexico and Arizona also experience periods of extreme heat.

### Location

The Fort Sill Apache Tribe and the State of Oklahoma are at risk for extreme heat. In The Tribe the humidity is higher because of its location in relation to the Gulf of Mexico which causes temperatures to feel more intense. The Tribe experiences from 14-20 days of temperatures greater than 100° in Oklahoma. All the Tribe is at risk of extreme heat.

**Table 3-10:  
Comparison of Extreme Heat by Location for Fort Sill Apache Areas  
of Interest (Oklahoma, New Mexico, and Arizona)**

|                               | <b>Lawton, OK</b>             | <b>Deming, NM</b>            | <b>Wilcox, AZ</b>          |
|-------------------------------|-------------------------------|------------------------------|----------------------------|
| Highest Temp Ever Recorded    | 115 °F (1936)                 | 110 °F (1951)                | 112 °F (2017)              |
| Earliest Day of ≥ 100°F       | April 15 <sup>th</sup> (2006) | May 3 <sup>rd</sup> (1947)   | May 3 <sup>rd</sup> (1947) |
| Latest Day of ≥ 100°F         | Oct 16 <sup>th</sup> (1917)   | Sept 16 <sup>th</sup> (1956) | Oct 1 <sup>st</sup> (2010) |
| Most Days in a Year ≥ 100°F   | 89 (2011)                     | 49 (2023)                    | 57 (2020)                  |
| Most Consecutive Days ≥ 100°F | 50 (2011)                     | 21 (2023)                    | 21 (2002)                  |

Lawton, OK data from 1912-2025 from NOAA (City of Lawton, Lawton Municipal Airport)

Deming, NM data from 1892-2025 from NOAA (City of Deming, Deming Municipal Airport)

Wilcox, AZ data from 1898-2025 from NOAA (City of Wilcox)

## Extent

It is often quite hot and humid during the summer in Oklahoma and extremely hot and dry in SW New Mexico and SE Arizona. When prolonged higher than normal temperatures result, the heat becomes a hazard to life and property.

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. The Tribe considers any extended period with temperatures above 90 degrees and 60% humidity hazardous and cause for concern. Periodic health checks of the elderly and other at-risk populations are encouraged.

**Table 3-11: Heat Index based on Temperature and Relative Humidity**

| % Relative Humidity                                 |     |                                                                                                                                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                                     |     | 15                                                                                                                               | 20  | 25  | 30  | 35  | 40  | 45  | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90  |
| T<br>e<br>m<br>p<br>e<br>r<br>a<br>t<br>u<br>r<br>e | 110 | 108                                                                                                                              | 112 | 117 | 123 | 130 |     |     |     |     |     |     |     |     |     |     |     |
|                                                     | 105 | 102                                                                                                                              | 105 | 108 | 113 | 117 | 122 | 130 |     |     |     |     |     |     |     |     |     |
|                                                     | 100 | 97                                                                                                                               | 98  | 102 | 104 | 107 | 110 | 115 | 120 | 126 | 132 |     |     |     |     |     |     |
|                                                     | 95  | 91                                                                                                                               | 93  | 95  | 96  | 98  | 100 | 104 | 106 | 109 | 113 | 119 | 124 | 130 |     |     |     |
|                                                     | 90  | 86                                                                                                                               | 87  | 88  | 90  | 91  | 92  | 95  | 97  | 98  | 100 | 103 | 106 | 110 | 114 | 117 | 121 |
|                                                     | 85  | 81                                                                                                                               | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 92  | 94  | 96  | 97  | 100 | 102 |
|                                                     | 80  | 76                                                                                                                               | 77  | 78  | 78  | 79  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  |
|                                                     |     |                                                                                                                                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 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                                        |     | Heatstroke/sunstroke is highly likely with continued exposure.                                                                   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

## Previous Occurrences

According to the National Center for Environmental Information (NCEI), The Tribe has experienced three prolonged excessive heat events over the last 10 years with excessively high temperatures causing significant problems for citizens. Table 3-11 is a summary of National Weather Service Excessive Heat Warnings for SW Oklahoma, SW New Mexico, and SE Arizona. The criteria for excessive heat warning are based on several factors and varies across the country. Typically, a high heat warning is issued when the heat index is greater than 105°F for at least two days with nighttime temperatures remaining above 75°F. Other criteria considered include the difference between the observed temperature and the average temperature for the area and if predicted temperatures pose an elevated risk for heat-related illnesses such as heat stroke or heat exhaustion. Data for SW Oklahoma was available from the National Weather Service from 2006-2024, while only 2017-2024 was available for New Mexico based on the Albuquerque and El Paso reporting offices). The SE Arizona dataset included heat warnings from 2013-2024 based on the Tucson reporting office.

| <b>Table 3-12: Excessive Heat Warnings by NWS Forecast Offices for SW Oklahoma, New Mexico, and SE Arizona</b> |                                                                                                                                                                              |                                                        |                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                | <b>SW Oklahoma</b>                                                                                                                                                           | <b>New Mexico</b>                                      | <b>SE Arizona</b>                                                                                                                                                                                                            |
| <b>Reporting Office(s)</b>                                                                                     | <b>Norman (2006-2024)</b>                                                                                                                                                    | <b>Albuquerque (2017-2024)<br/>El Paso (2020-2024)</b> | <b>Tucson (2013-2024)</b>                                                                                                                                                                                                    |
| 2005-2010                                                                                                      | 7/18-22/2006<br>7/14-16/2010                                                                                                                                                 | Data unavailable                                       | Data unavailable                                                                                                                                                                                                             |
| 2011-2015                                                                                                      | 8/01-09/2011<br>7/30-31/2012<br>7/14-15/2015<br>7/24-25/2015<br>8/07-09/2015                                                                                                 | Data unavailable                                       | 6/28-07/01/2013<br>6/02-05/2014<br>6/19-21/2015<br>8/14-17/2015                                                                                                                                                              |
| 2016-2020                                                                                                      | 6/15-18/2016<br>7/06-08/2016<br>8/11-12/2016<br>6/17-18/2017<br>7/23-24/2017<br>7/19-22/2018<br>7/10-11/2019<br>7/17-19/2019<br>8/11-13/2019<br>8/19-21/2019<br>8/26-27/2019 | 6/17-18/2017<br><br>8/26-27/2019                       | 6/03-07/2016<br>6/19-21/2016<br>6/06-08/2017<br>6/17-26/2017<br>7/06-09/2017<br>6/13-14/2018<br>6/22-23/2018<br>7/05-07/2018<br>7/23-26/2018<br>8/05-08/2018<br>7/15-17/2019<br>8/05-06/2019<br>8/14-17/2019<br>8/20-22/2019 |

**Table 3-12: Excessive Heat Warnings by NWS Forecast Offices for SW Oklahoma, New Mexico, and SE Arizona**

|                                      | SW Oklahoma                                                                                                                                                                                                                                      | New Mexico                                                                                                               | SE Arizona                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reporting Office(s)                  | Norman (2006-2024)                                                                                                                                                                                                                               | Albuquerque (2017-2024)<br>El Paso (2020-2024)                                                                           | Tucson (2013-2024)                                                                                                                                                                                                                                                                                                           |
| 2016-2020<br>(continued)             | 7/11-14/2020<br>8/29-30/2020                                                                                                                                                                                                                     | 7/10-15/2020                                                                                                             | 4/30-5/01/2020<br>5/06-08/2020<br>5/28-6/01/2020<br>6/03-06/2020<br>7/10-14/2020<br>7/29-8/02/2020<br>8/13-20/2020<br>8/24-28/2020<br>09/04-08/2020                                                                                                                                                                          |
| 2021-2024                            | 6/12-13/2022<br>7/18-21/2022<br>7/25-28/2022<br><br>6/20-21/2023<br>6/28-29/2023<br>7/12-15/2023<br>7/18-21/2023<br>8/01-07/2023<br>8/11-14/2023<br>8/18-26/2023<br>6/26-30/2024<br>7/04-05/2024<br>8/01-02/2024<br>8/13-20/2024<br>8/22-25/2024 | 6/18-21/2021<br>7/10-11/2021<br><br>6/11-12/2022<br><br>6/24-28/2023<br>7/09-21/2023<br>8/06-08/2023<br><br>6/13-15/2024 | 6/12-21/2021<br>8/03-05/2021<br>8/25-28/2021<br>9/12-14/2021<br>6/09-13/2022<br>6/16-17/2022<br>7/11-12/2022<br>7/22-23/2022<br>6/26-28/2023<br>7/01-10/2023<br>7/15-29/2023<br>8/04-07/2023<br>8/27-31/2023<br>9/09-11/2023<br>6/06-08/2024<br>6/11-17/2024<br>6/20-21/2024<br>7/05-13/2024<br>9/04-07/2024<br>9/27-29/2024 |
| Frequency of Heat Warnings Over Time |                                                                                                                                                                                                                                                  |                                                                                                                          |                                                                                                                                                                                                                                                                                                                              |

**Table 3-12: Excessive Heat Warnings by NWS Forecast Offices for SW Oklahoma, New Mexico, and SE Arizona**

|                                            | SW Oklahoma        | New Mexico                                     | SE Arizona         |
|--------------------------------------------|--------------------|------------------------------------------------|--------------------|
| Reporting Office(s)                        | Norman (2006-2024) | Albuquerque (2017-2024)<br>El Paso (2020-2024) | Tucson (2013-2024) |
| Duration of Heat Warnings Over Time (Days) |                    |                                                |                    |

Sources: National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA)

The frequency of heat warnings issues for SW Oklahoma, New Mexico, and SE Arizona is increasing over time. The duration (in days) of heat warnings in New Mexico and SE Arizona are also increasing over time from two to six days (New Mexico) and from three to five days (SE Arizona). Although the frequency of heat warnings for Oklahoma has increased from 2006-2004, the average duration of heat warnings remains consistently around four days.

## Probability of Future Events

While Extreme Heat is a hazard for Oklahomans and the Fort Sill Apache Tribe, efforts are being made throughout the state to notify the public of the Extreme Heat hazard. The National Weather Service is now issuing “Excessive Heat” warnings by county NOAA Weather Radio, and through online weather applications to reach a broader audience. The Fort Sill Apache Tribal citizens and the Tribal Lands of Interest are at risk for extreme heat across SW Oklahoma, SW New Mexico, and SE Arizona. The Fort Sill Apache Tribe Emergency Management Agency determined, based on history and public input, that the probability of a future extreme heat event is **“HIGHLY LIKELY”** meaning that high heat is probable within the next year with up to a “1 in 1 year’s” chance of occurring.

## **Vulnerability and Impact**

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The Fort Sill Apache Tribe 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-90s and generally less than three inches of rain in July and August (OK Mesonet, based on 1991-2020 NCEI Normal).

Power supplies throughout the Fort Sill Apache Tribe (SW Oklahoma) are often affected by Extreme Heat due to high use for indoor climate control leading to power “brownouts” or outages. Vulnerable citizens such as the elderly, chronically ill, children, or pregnant may not have functional air conditioners or fans for adequate cooling. Furthermore, vulnerable populations may not use air conditioners or fans, because of electric cost concerns. People working outside are vulnerable to extreme temperatures and need to know how to mitigate the impacts through work/rest cycles, hydration, and emergency cooling techniques once the signs of heat exhaustion or heat stroke have been recognized. Public education programs can help people avoid extreme heat medical crises; however, additional efforts are needed to address extreme heat in communities before one experiences a medical crisis. Animals and crops are also vulnerable to extreme heat when adequate shade and water are not available.

In addition to Tribal Citizens, asphalt roads also experience damage; many of these roads are used by school buses, emergency vehicles, and mail carriers. The damaged roads often cause the citizens to find alternate transportation routes which, in rural areas, can often be lengthy and even dangerous. Additional vulnerabilities and impacts can be found in Appendix C - Critical Facilities

## **Conclusion**

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According to the Oklahoma Climatological Survey the Fort Sill Apache Tribe averages 15-25 days over 100 degrees during the summer. Public education is the most effective and successful way to ensure public safety during periods of extreme heat. Emergency cooling centers have also been utilized by communities to provide refuge for vulnerable citizens. Extreme heat is expected to continue to be of concern for Oklahoma, New Mexico, and Arizona.

## Resources

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National Weather Service (NWS) Norman, Albuquerque, El Paso, Tucson  
Oklahoma Climatological Survey (OCS)  
National Climatic Data Center (NCDC)  
National Centers for Environmental Information (NCEI)

## **Hazard Profile:**

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### **FLOODS**

Sources of flooding can include pre-existing water bodies, ephemeral streams, or from poor drainage as surface runoff from storm events pool in undesirable areas. Lakes and ponds may exceed their capacity during periods of high rainfall or storm surge from areas higher in the watershed flowing downstream. Flooding impact from rivers may be direct as the river exceeds its channel and floods the adjacent areas. Indirect flood damage from rivers is associated with the force of water moving through the area and the impact it has as it scours surfaces and structures. Finally, flooding may also result from poor drainage due to tight clay soils or inadequate surface storm water management as water may pool or flow across rural/urban landscapes based on topography. A flash flood rapidly floods geomorphic low-lying areas - washes, rivers and streams. It is caused by heavy rain associated with thunderstorms, winter snow thaws or tropical storms. Flash floods can also occur after an emergency release from an impoundment or collapse of a dam. Flash flooding from heavy rains is particularly dangerous due to the acute and intense nature of the flow over a previously dry area.

### **Location**

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The Fort Sill Chiricahua Warm Springs Apache Tribe has the risk of flooding for its SW Oklahoma, SW New Mexico, and SE Arizona properties. Most of the known floodplains in the United States 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 of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community and includes 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 that has a 1% chance of occurring annually, or the 100-year flood. Current FIRM maps are shown in Appendix F of this plan.

## Extent

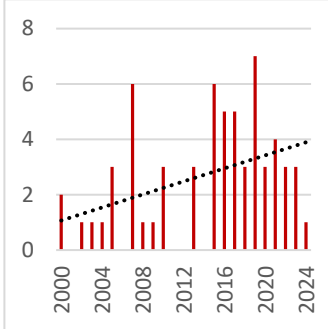
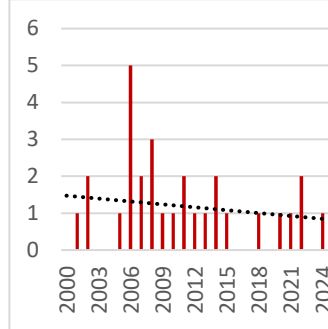
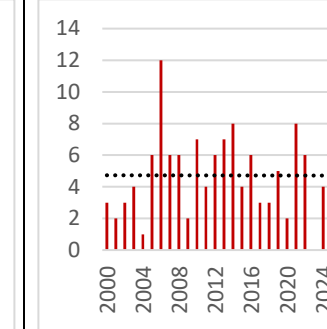
Flooding events are typically localized within a community or at the county level resulting in select property damage and road/bridge closures. There are no known repetitive flood loss claims for the Tribe. Tribal officials consider water entering homes as the beginning of a severe event as flooding.

## Previous Occurrences

The Fort Sill Apache Tribe has a history of flashfloods with flooding primarily affecting streets and low-lying areas. Table 3-13 is a summary of flood events documented by the National Center of Environmental Information via the National Oceanic and Atmospheric Administration from 2000-2024. A more detailed listing of event narratives for particularly severe floods is available in Appendix G. The frequency of floods/flashfloods in SW Oklahoma is increasing over time, while the frequency of floods in SW New Mexico is decreasing over time. Flood frequency in SE Arizona is constant and demonstrated the most floods (118) between 2000-2024 when compared to SW Oklahoma (62 floods) and SW New Mexico (29 floods).

| <b>Table 3-13: Summary of Reported Flooding Events for SW Oklahoma, New Mexico, and SE Arizona</b> |                                                              |                                                                      |                                                                       |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------|
|                                                                                                    | <b>SW Oklahoma</b>                                           | <b>New Mexico</b>                                                    | <b>SE Arizona</b>                                                     |
| <b>Reporting Office(s)</b>                                                                         | <b>Southern Caddo County<br/>Comanche County</b>             | <b>Luna County</b>                                                   | <b>Cochise County</b>                                                 |
| 2000-2004                                                                                          | 4 (2000)<br><br>1 (2002)<br>1 (2003)<br>2 (2004)             | 1 (2001)<br>2 (2002)                                                 | 3 (2000)<br>2 (2001)<br>3 (2002)<br>4 (2003)<br>1 (2004)              |
| 2005-2010                                                                                          | 3 (2005)<br><br>6 (2007)<br>1 (2008)<br>1 (2009)<br>3 (2010) | 1 (2005)<br>5 (2006)<br>2 (2007)<br>3 (2008)<br>1 (2009)<br>1 (2010) | 6 (2005)<br>12 (2006)<br>6 (2007)<br>6 (2008)<br>2 (2009)<br>7 (2010) |
| 2011-2015                                                                                          | 3 (2013)<br><br>6 (2015)                                     | 2 (2011)<br>1 (2012)<br>1 (2013)<br>2 (2014)<br>1 (2015)             | 4 (2011)<br>6 (2012)<br>7 (2013)<br>8 (2014)<br>4 (2015)              |

**Table 3-13: Summary of Reported Flooding Events for SW Oklahoma, New Mexico, and SE Arizona**

|                                     | SW Oklahoma                                                                        | New Mexico                                                                          | SE Arizona                                                                           |
|-------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Reporting Office(s)                 | Southern Caddo County<br>Comanche County                                           | Luna County                                                                         | Cochise County                                                                       |
| 2016-2020                           | 5 (2016)<br>5 (2017)<br>3 (2018)<br>7 (2019)<br>3 (2020)                           | 1 (2018)<br><br>1 (2020)                                                            | 6 (2016)<br>3 (2017)<br>3 (2018)<br>5 (2019)<br>2 (2020)                             |
| 2021-2024                           | 4 (2021)<br>3 (2022)<br>3 (2023)<br>1 (2024)                                       | 1 (2021)<br>2 (2022)<br><br>1 (2024)                                                | 8 (2021)<br>6 (2022)<br><br>4 (2024)                                                 |
| Total Events                        | 62 Reported Floods                                                                 | 29 Reported Floods                                                                  | 118 Reported Floods                                                                  |
| Frequency of Flood Events Over Time |  |  |  |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

## Probability of Future Events

The terrain within the Fort Sill Apache Tribe is rolling hills with valleys and ravines along with numerous small streams. This tends to cause heavy rain to accumulate in the valleys and ravines quickly along with inadequate drainage areas and often causes flash floods and eventually problems for some areas within the Fort Sill Apache Tribe, especially along East Cache Creek. Based on the flood history of the past, information from tribal member input, and FSAEMA input the potential of future flooding in the Fort Sill Apache Tribe is **“LIKELY”** meaning that flooding is probable within the next three years. Damaging floods have up to “1 in 3 years” chance of occurring (See Table 3-1.)

## **Vulnerability and Impact**

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Flooding, whether from rivers and streams, or from dam failure or from the flash flooding that occurs from overtaxed water drainage systems, is a major destructive force in Oklahoma and the Fort Sill Chiricahua Warm Springs Apache Tribe (Tribe). In the Tribe's surrounding area, people have driven their vehicles into flooded roadways and been swept, which has resulted in the vehicle floating or running into eroded roadways by the heavy currents and even death. It takes only 12 inches of floodwater to float most vehicles, though as little as two inches of water can cause the driver to lose control of a vehicle. Flooded roadways often force people to find alternate transportation routes. Severe flooding on rivers and streams could overrun into homes and businesses destroying floors, walls and contents causing people to have to relocate. Some become unemployed when businesses fail because of the damage. Farmers and ranchers, including those on the Tribe's land, could lose thousands of dollars of crops or hay as well as livestock when floodwaters overrun their fields.

Some roads in the Tribe's vicinity have some low water bridges that are not maintained by the Tribe that flood when heavy rain occurs. These flooded low water bridges block the only access in or out of some rural properties. Flooded roadways often force people to find alternate transportation routes or remain for several hours or days with an inability to get in or out of the area. Flooding rivers and streams invade homes and businesses and destroy floors, walls, and contents forcing residents to relocate, which often results in unemployment. Area farmers and ranchers lose thousands of dollars' worth of crops and livestock when floodwaters overrun their fields. The impact of their losses negatively affects the economy. See Appendix C (Critical Facilities) for specific critical facilities that could be affected by a flood and Appendix H for detailed descriptions of floods and associated property damage for Southern Caddo County, Comanche County, New Mexico (Luna County), and Arizona (Cochise County).

## **Conclusion**

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Flooding in the Fort Sill Apache Tribe is a concern, although the most common occurrence is flash flooding when rainfall is exceedingly heavy and drainage, both manmade and natural is unable to handle the runoff from the event. Exceedingly heavy rainfall could damage or destroy tribal property. Local businesses and schools (both private and public) attended by tribal members may

also be susceptible to flooding, depending on location. Exceedingly heavy rainfall can also damage or destroy crops which are the livelihood for many FSAT members. Of special concern is the protection of cultural and historical documents and items important to the Tribe, its citizens and government.

## References

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National Oceanic and Atmospheric Administration (NOAA)  
National Center for Environmental Information (NCEI)  
Oklahoma Climatological Survey (OCS)

## **Hazard Profile:**

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### **HAIL**

Hail forms in storm clouds 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, back into the updraft, and are lifted 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 sometimes 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 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.

### **Location**

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The entire area of The Fort Sill Apache Tribe is subject to hailstorms. Usually associated with severe thunderstorms, all structures, wildlife, livestock and the entire population are subject to hail damage. This includes tribal lands and citizens in Oklahoma, New Mexico, and Arizona.

### **Extent**

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Hailstorms usually last an average of 10 to 20 minutes but may last much longer in some storms and are usually in a relatively small coverage area. 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 hailstorms is late spring and early summer, which also correlates to the thunderstorm season in Oklahoma. The peak period in the Southwest is monsoon season, which occurs in mid to late summer. The Torro Hail Scale describes the levels of hail possible and damage that results. The Fort Sill Apache Tribe considers hailstones greater than 1" in diameter to be significant due to crop losses and the economic hardship it creates for their citizens. Once the size of hail rises to H3-H4 magnitude it becomes disastrous to equipment that is parked outside due to insufficient cover as well.

**Table 3-14: Combined NOAA/TORRO Hailstorm Intensity Scales**

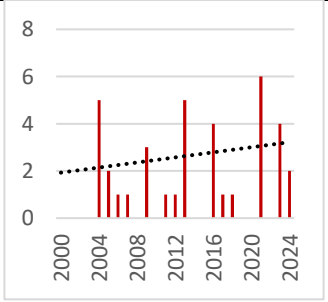
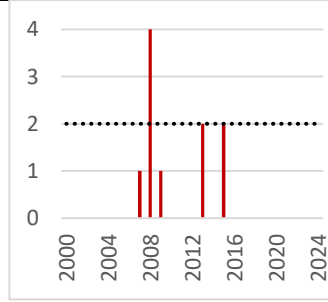
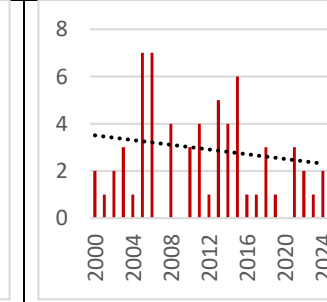
| Size Code | Intensity Category   | Typical Hail Diameter (inches) | Approximate Size              | Typical Damage Impacts                                                                           |
|-----------|----------------------|--------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------|
| H0        | Hard Hail            | up to 0.33                     | Pea                           | No damage                                                                                        |
| H1        | Potentially Damaging | 0.33-0.60                      | 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               | 1.2-1.6                        | Half Dollar to Ping Pong Ball | Widespread glass damage, vehicle bodywork damage                                                 |
| H5        | Destructive          | 1.6-2.0                        | Silver dollar to Golf Ball    | Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries              |
| H6        | Destructive          | 2.0-2.4                        | Lime or Egg                   | Aircraft bodywork dented; brick walls pitted                                                     |
| H7        | Very destructive     | 2.4-3.0                        | Tennis ball                   | Severe roof damage, risk of serious injuries                                                     |
| H8        | Very destructive     | 3.0-3.5                        | Baseball to Orange            | Severe damage to aircraft bodywork                                                               |
| H9        | Super Hailstorms     | 3.5-4.0                        | Grapefruit                    | Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open |
| H10       | Super Hailstorms     | 4+                             | Softball and up               | Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open |

## Previous Occurrences

Hail occurs seasonally in all three states (OK, NM, and AZ) that include lands of interest to the Tribe. Table 3-15 summarizes documented hailstorms with stones greater than 1” in diameter for all three regions. Appendix I contains detailed descriptions of each hailstorm. SW Oklahoma (southern Caddo County and Comanche County) have had 171 hailstorms greater than 1” in diameter from 2000-2024 with an average of nearly 7 storms a year. The overall hailstorm frequency for SW Oklahoma is increasing. Luna County, New Mexico 11 hailstorms reported over the same 24-year period but not storms with hail stones greater than 1” in the last eight years.

Southeastern Arizona (Cochise County) reported 64 hailstorms with stones greater than 1” over the same 24-year period. Large stone yielding hailstorms are decreasing in frequency over time in Cochise County.

**Table 3-15: Summary of Reported Hail Events (>1”) for SW Oklahoma, New Mexico, and SE Arizona**

|                                     | SW Oklahoma                                                                         | New Mexico                                                                           | SE Arizona                                                                            |
|-------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Reporting Office(s)                 | Southern Caddo County<br>Comanche County                                            | Luna County                                                                          | Cochise County                                                                        |
| 2000-2004                           | 5 (2000)<br>4 (2001)<br>4 (2002)<br>8 (2003)<br>4 (2004)                            | 1 (2003)                                                                             | 2 (2000)<br>1 (2001)<br>2 (2002)<br>3 (2003)<br>1 (2004)                              |
| 2005-2010                           | 5 (2005)<br>5 (2006)<br>6 (2007)<br>8 (2008)<br>8 (2009)<br>4 (2010)                | 3 (2006)<br>3 (2007)                                                                 | 7 (2005)<br>7 (2006)<br>4 (2008)<br>3 (2010)                                          |
| 2011-2015                           | 8 (2011)<br>6 (2012)<br>14 (2013)<br>4 (2014)<br>11 (2015)                          | 3 (2015)<br>1 (2016)                                                                 | 4 (2011)<br>1 (2012)<br>5 (2013)<br>4 (2014)<br>6 (2015)                              |
| 2016-2020                           | 8 (2016)<br>6 (2017)<br>6 (2018)<br>7 (2019)<br>11 (2020)                           | None reported greater than<br>1” in diameter                                         | 1 (2016)<br>1 (2017)<br>3 (2018)<br>1 (2019)                                          |
| 2021-2024                           | 4 (2021)<br>7 (2022)<br>10 (2023)<br>8 (2024)                                       | None reported greater than<br>1” in diameter                                         | 3 (2021)<br>2 (2022)<br>1 (2023)<br>2 (2024)                                          |
| Total Events                        | 171 Hail Storms                                                                     | 11 Hail Storms                                                                       | 64 Hail Storms                                                                        |
| Frequency of Flood Events Over Time |  |  |  |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

## Probability of Future Events

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The Fort Sill Apache Tribe 's property and its citizens are susceptible to hailstorms and will continue to be at risk. Based on past experiences, severe hailstorms cause damage affecting the citizens of the Fort Sill Apache Tribe. Damage usually occurs to structural glass, roofs and vehicles. The FSAEMA considered the probability of future events based on experience and concluded that severe thunderstorms including hail could occur in the future. The entire Nation is at risk from hail and the probability of future events is **“LIKELY” meaning** a damaging hail event is probable within the next three years and thus has up to “1 in 3 years” chance of occurring.

## Vulnerability and Impact

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The entire area of the Fort Sill Apache Tribe has significant exposure to hail events. While stronger hail events tend to be associated with severe thunderstorms and often do extensive damage to structures vehicles and crops, smaller less intense thunderstorms frequently produce smaller hail, (based on the NOAA/TORRO Hailstorm Intensity scale, H2 size - dime or grape size hail) which often causes even slight damage especially to crops or vegetation. Either situation can cause an economic loss to the community and farmers and ranchers in the area, including those leasing tribal and allotted land. Hail from H-3 to H-5 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 than H-8 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 (NOAA) and the Oklahoma Climatological Survey to improve warning and threat information for the public. Despite this research and the warning system currently available to the public, people are often injured, usually while trying to reach adequate shelter. Hail damage, generally to roofs of structures, causes roofs to be replaced more frequently than the normal life of roofs costing insurance companies and property owners millions of dollars. Property owners on occasion must 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. Hailstorm damage to vehicles, plants, crops, livestock, and wildlife causes major economic losses. See Appendix C (Critical Facilities) for specific critical facilities that could be affected by hail.

## Conclusion

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The Fort Sill Apache Tribe has significant exposure to Hail events. Government owned property and critical facilities, public and private, are vulnerable to hail as is any other property. The Tribe's Emergency Youth Shelter is equally vulnerable to hail damage, especially to the roof and windows. Residents and staff are vulnerable to injury from broken windows or if they are caught outside, they can be injured while trying to get to better shelter. Tribal artifacts and properties can be damaged when buildings housing them or on the property are damaged. Damage usually occurs to vegetation, vehicles and structures. Early warning research is ongoing through the National Weather Service (NOAA) and other private organizations to improve warning and threat information for the public. Public information is critical to minimize the effects of hail. An informed public can prevent some damage and in particular injuries or deaths.

## References

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Oklahoma Climatological Survey (OCS)  
National Weather Service (NWS)  
National Oceanic and Atmospheric Administration (NOAA)  
National Center for Environmental Information (NCEI)

## **HAZARD PROFILE:**

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### **HIGH WINDS**

High Winds are a common feature of thunderstorms, particularly severe thunderstorms. The National Weather Service uses winds of more than 58 mph (50 knots) as one of the measurements in determining a thunderstorm as severe. The definition of wind is the motion of air relative to the earth's surface. High winds can result from thunderstorm inflow and outflow, downburst winds when a storm cloud collapses, strong frontal systems, and gradient winds with high- or low-pressure systems moving across Oklahoma. High winds have sustaining or gusting speeds reaching 50 mph or greater.

Strong winds can come without thunderstorm activity; however, the energy in thunderstorms produces the most damaging winds. Damage usually occurs to power transmission lines and communications towers; however, occasional damage can occur to structures during downburst or microburst events, which occur as a thunderstorm collapses. Wind speeds in these events can quickly reach over 100 mph.

### **Location**

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The entire Tribe is susceptible to and has experienced high winds exposing virtually all structures, infrastructure, and individuals in the area to their effects. High winds exceeding 70 mph (60 knots) and produced by severe thunderstorms heavily affect power systems. The Fort Sill Apache Tribe has significant high winds producing thunderstorms due to its location. Thunderstorms, many producing high winds, are common in Oklahoma because it is situated southeast of the Rocky Mountains and their cool air; north of the moisture-rich Gulf of Mexico; and northeast of the arid Southwest with its dry, hot air. High winds are also common in the Southwest, causing dust storms.

### **Extent**

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The Fort Sill Apache Tribe officials consider high wind dangerous if the wind exceeds 70 mph (60 knots). Mobile homes are often negatively affected by winds of this speed. Winds in excess of 80 mph can cause damage to buildings and power service. The Fort Sill Apache Tribe considers winds higher than a Force 10 on the Beaufort scale as excessive and warrants high wind

precautions. The map (Figure 3-13) of average winds days great than 50 knots for Oklahoma indicates that SW Oklahoma experiences 6-8 50knot wind days/year while New Mexico and Arizona are less than two 50 knot wind days/year on average.

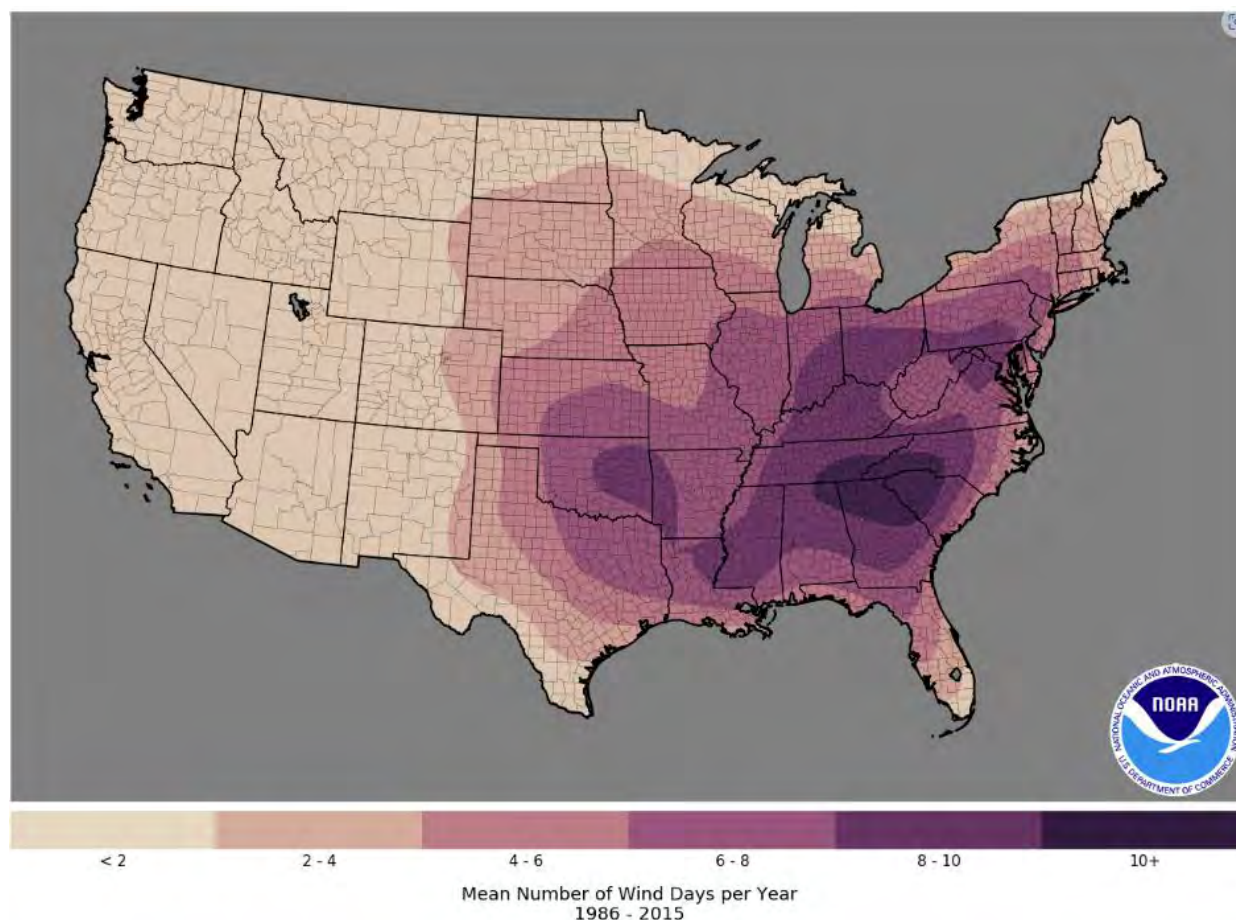
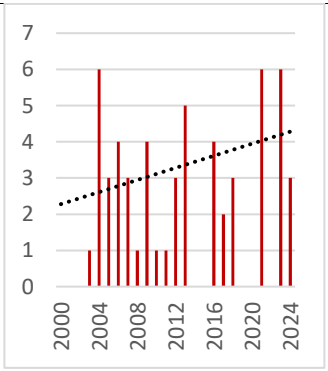
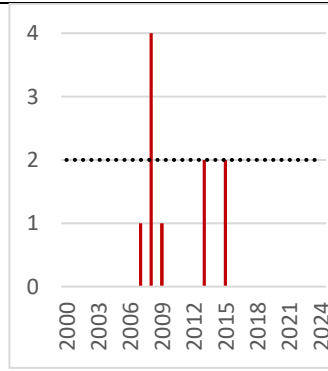
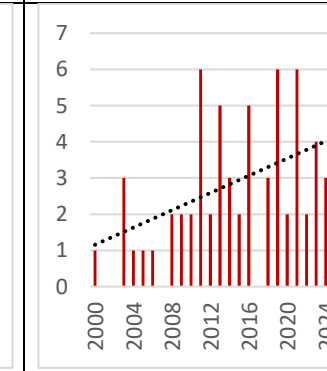


Figure 3-13: Map of average 50 knot wind days across the US from 1986-2015. Source: NOAA

## Previous Occurrences

Hundreds of thunderstorms move across Oklahoma each year. Most bring welcome precipitation. However, high winds accompanying thunderstorms are occasionally responsible for injuries, death, and property damage. Table 3-16 is a summary of high wind events for southern Caddo County, Comanche County, Luna County (NM), and Cochise County (AZ) based on at least \$5,000 in reported property damage.

**Table 3-16:  
Summary of Reported High Wind Events with more than \$5,000 in  
property damage for SW Oklahoma, SW New Mexico, and SE Arizona**

|                                   | SW Oklahoma                                                                         |                      | New Mexico                                                                           |                      | SE Arizona                                                                            |                      |
|-----------------------------------|-------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------|----------------------|
| Reporting Office(s)               | Southern Caddo County<br>Comanche County                                            |                      | Luna County                                                                          |                      | Cochise County                                                                        |                      |
| Year                              | Average Velocity (knots)                                                            | Property Damage (\$) | Average Velocity (knots)                                                             | Property Damage (\$) | Average Velocity (knots)                                                              | Property Damage (\$) |
| 2000                              |                                                                                     |                      |                                                                                      |                      | 55                                                                                    | \$10,000             |
| 2003                              | 56                                                                                  | \$5,000              |                                                                                      |                      | 71                                                                                    | \$730,000            |
| 2004                              | 65                                                                                  | \$465,000            |                                                                                      |                      | 52                                                                                    | \$20,000             |
| 2005                              | 60                                                                                  | \$120,000            |                                                                                      |                      | 52                                                                                    | \$23,000             |
| 2006                              | 56                                                                                  | \$30,000             |                                                                                      |                      | 56                                                                                    | \$8,000              |
| 2007                              | 58                                                                                  | \$61,500             | 52                                                                                   | \$10,000             |                                                                                       |                      |
| 2008                              | 56                                                                                  | \$15,000             | 55                                                                                   | \$75,000             | 56                                                                                    | \$60,000             |
| 2009                              | 60                                                                                  | \$55,000             | 52                                                                                   | \$7,000              | 57                                                                                    | \$50,000             |
| 2010                              | 56                                                                                  | \$7,000              |                                                                                      |                      | 60                                                                                    | \$1,050,000          |
| 2011                              | 61                                                                                  | \$20,000             |                                                                                      |                      | 50                                                                                    | \$11,410,000         |
| 2012                              | 59                                                                                  | \$245,000            |                                                                                      |                      | 54                                                                                    | \$55,000             |
| 2013                              | 60                                                                                  | \$377,000            | 67                                                                                   | \$15,000             | 65                                                                                    | \$280,000            |
| 2014                              |                                                                                     |                      |                                                                                      |                      | 56                                                                                    | \$50,000             |
| 2015                              |                                                                                     |                      | 54                                                                                   | \$15,000             | 57                                                                                    | \$47,000             |
| 2016                              | 62                                                                                  | \$165,000            |                                                                                      |                      | 49                                                                                    | \$110,000            |
| 2017                              | 59                                                                                  | \$10,000             |                                                                                      |                      |                                                                                       |                      |
| 2018                              | 58                                                                                  | \$25,000             |                                                                                      |                      | 61                                                                                    | \$91,000             |
| 2019                              |                                                                                     |                      |                                                                                      |                      | 54                                                                                    | \$122,000            |
| 2020                              |                                                                                     |                      |                                                                                      |                      | 61                                                                                    | \$30,000             |
| 2021                              | 68                                                                                  | \$90,000             |                                                                                      |                      | 61                                                                                    | \$310,000            |
| 2023                              | 61                                                                                  | \$95,000             |                                                                                      |                      | 62                                                                                    | \$55,000             |
| 2024                              | 58                                                                                  | \$20,000             |                                                                                      |                      | 53                                                                                    | \$30,000             |
| Total                             | 56 events, for<br>\$1,783,000 damage                                                |                      | 10 events, for<br>\$122,000 of damage                                                |                      | 62 events for<br>\$15,141,000 of damage                                               |                      |
| Frequency of High Winds Over Time |  |                      |  |                      |  |                      |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

## Probability of Future Events

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Considering history and the location of Oklahoma between the dry, arid southwest and the moist air from the Gulf of Mexico, The Fort Sill Apache Tribe has significant exposure to high wind events. Damage usually occurs to infrastructure, such as power transmission lines and communications towers; however, occasional damage can occur to structures. Early warning research is ongoing through the National Weather Service (NWS) and private organizations to improve notification and threat information for the public. Property damage from high wind events is expected for the Fort Sill Apache Tribe, especially during thunderstorms. The probability of future high wind events is “**HIGHLY LIKELY**” (see Table 3-1).

## Vulnerability and Impact

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High winds can cause death or injury to humans when mobile homes and buildings collapse under winds of 80 – 100 mph. Economic losses to communities arise when high winds damage crops and structures. Business owners experience financial loss which may jeopardize staff employment until the building can be repaired. Homes damaged by high winds are often uninhabitable and the occupants must relocate. Other damages can occur including downed trees and power lines, blocked traffic lanes, and power outages causing loss of electricity to critical facilities and the general population and forcing commuters and first responders to find alternate routes to travel. Power outages that occur during severe winter or summer temperatures are especially critical due to the extreme heat hazard from loss of air conditioning and fans, and frigid temperatures from lack of heat in facilities and homes. High winds frequently cause downed power lines, triggering power outages. When these outages occur, many businesses are forced to close for security reasons and as a result lose business.

## Conclusion

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Oklahoma and the Fort Sill Apache Tribe have significant exposure to high wind events. Infrastructure damage most often occurs to power transmission lines and communications facilities; however, occasional damage to structures can arise during downbursts. Early warning research is ongoing through the National Weather Service (NWS) and other private organizations to improve notification time and threat information for the public.

## References

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The National Weather Service (NWS)

National Oceanic and Atmospheric Administration (NOAA)

National Center for Environmental Information (NCEI)

## HAZARD PROFILE:

### LIGHTNING

Lightning is a result of electrical charges accumulating at the base of the clouds until it discharges. Air in the path of lightning expands from heating and causes thunder, which is produced by the electricity passing rapidly through the atmosphere. All lightning is dangerous to people and property.

### Location

All the Fort Sill Apache Tribe lands of interest are vulnerable to lightning in Oklahoma, New Mexico, and Arizona. Figure 3-14 details total lightning density for SW New Mexico and SE Arizona. Figure 3-15 is a map of total lightning density of events/sq km/year from 2016-2023. Note that SW Oklahoma (48-64 events/sq km/year), SW New Mexico (6-8 events/sq km/year), and SW Arizona range between 4-12 events/sq kilometer/year.

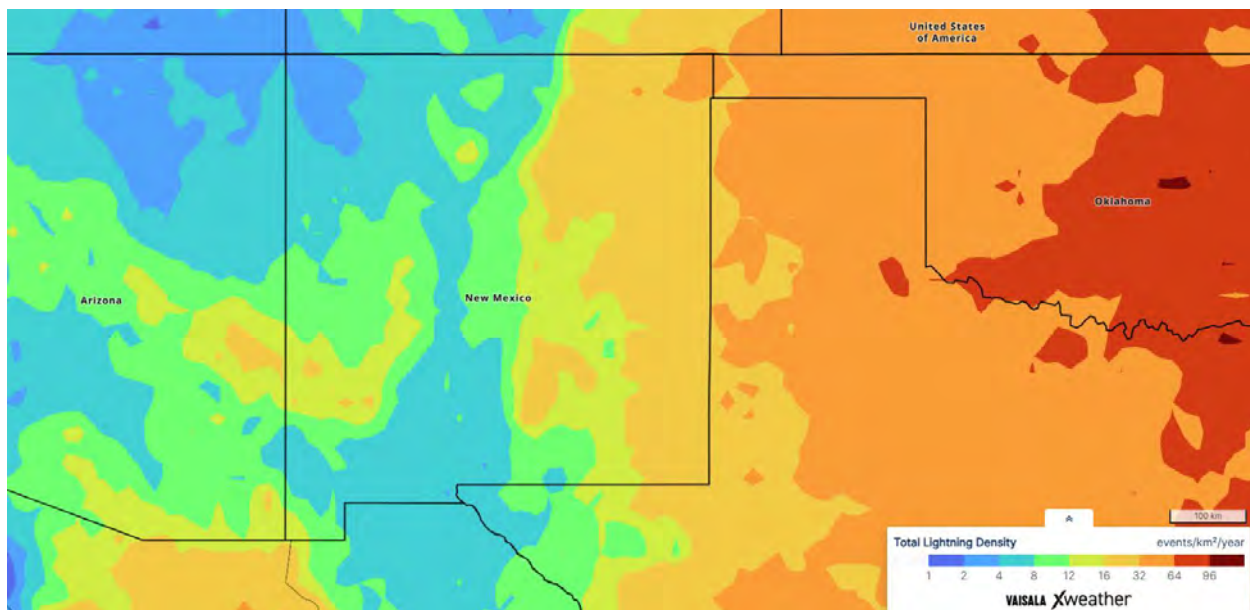


Figure 3-14: Contour map from Vaisala Weather for Total Lightning Density (2016-2023)

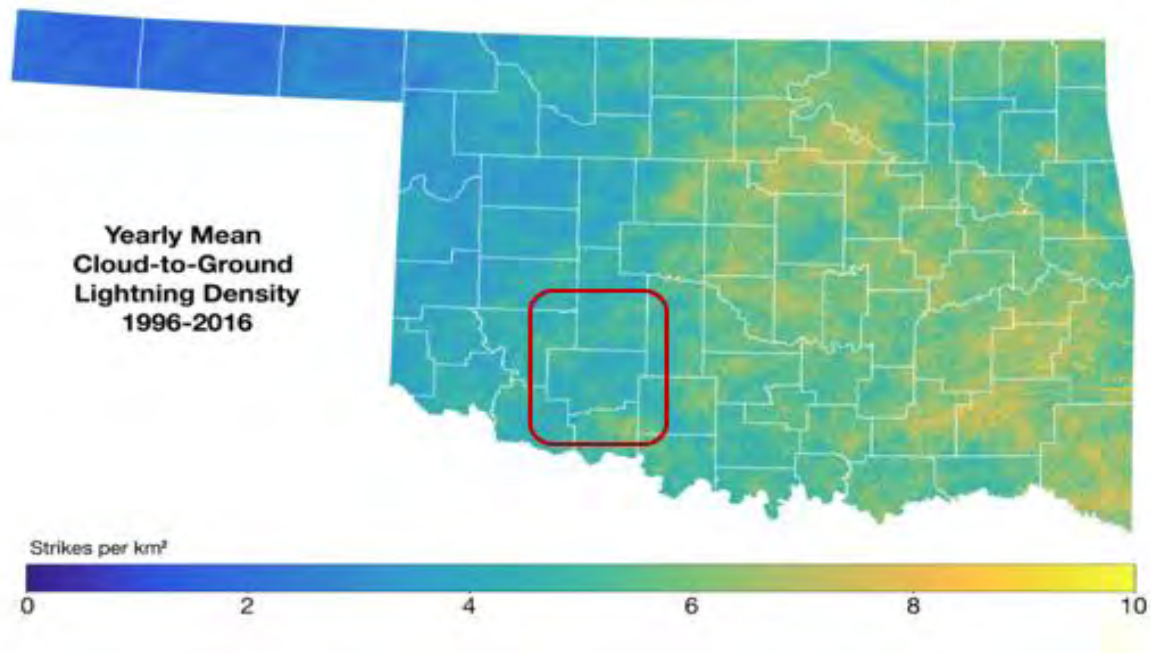


Figure 3-15: Annual Mean Cloud to Ground Lightning Density 1996-2016 (Source: National Severe Storms Laboratory, Dr. Kristin Calhoun, Data from the Vaisala National Lightning Detection Network).

## Extent

Thunderstorms with lightning can cause wildfires and down power lines. Consequently, major crop damage and power outages may occur. Lightning causes thousands of dollars in damage each year to homes, businesses, churches, barns, and other structures. Businesses often are forced to close during power outages and as a result lose business. Thunderstorms with lightning have damaged buildings and power supplies, and downed electrical lines causing power outages. Large trees often succumb to lightning strikes. Each year, lightning causes thousands of dollars in damage to homes, businesses, churches, barns, and other structures in Oklahoma. Businesses forced to close from power outages lose business. Because of the deadly and destructive force of lightning, the Fort Sill Apache Tribe officials consider all lightning events serious and cause for added protective measures. Secondary effects from lightning are many. Examples include forest and grass fires, explosive steam conditions in masonry, trees, and other water-bearing objects, and consequences from a thunderclap startling a person who then may drop a wrench or inadvertently throw a switch.

Records are not kept in any agency on every lightning event in the Fort Sill Apache Tribe unless it causes major damage to structures or starts major fires. Officials consider all events which contain lightning to be severe events and warrant evasive actions.

## Previous Occurrences

Hundreds of thunderstorm events take place across the Tribal lands of interest in Oklahoma, New Mexico, and Arizona each year. Most bring welcome precipitation, but the lightning that accompanies them can occasionally cause significant damage and injury. There are lightning events with virtually every thunderstorm that occurs in the Tribe although only a few causes damage to property. Tables 3-17 and Table 3-18 summarize documented lightning events that caused property damage, injuries, or loss of life. Luna County, New Mexico did not have any documented lightning events with property or personal damages reported for 2000-2024.

**Table 3-17:  
Lightning Events of Significance in SW Oklahoma (Southern Caddo County and Comanche County)**

| Location | Date       | Property Damage (\$) | Source    | Description                                                                                                                                      |
|----------|------------|----------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| LAWTON   | 10/22/2000 | \$25,000             | NEWSPAPER | Lightning struck an insulator on West Gore Blvd. and 67th Street causing a power outage to about 1100 homes.                                     |
| LAWTON   | 10/22/2000 | \$13,000             | NEWSPAPER | Lightning struck an air conditioning unit causing some curtains to catch fire. Significant fire and smoke damage occurred to the master bedroom. |
| LAWTON   | 1/16/2001  | 5 injured            | NEWSPAPER | Lightning struck the ground near a group of 34 soldiers training at the East Range, sending 5 of them to the hospital for treatment.             |
| APACHE   | 9/3/2001   | \$300,000            | NEWSPAPER | Lightning struck a storage facility complex at Sexton Office Supplies, causing a fire that consumed four buildings.                              |
| APACHE   | 8/19/2007  | \$80,000             | NEWSPAPER | A home was struck by lightning and burned to the ground. Monetary damages were estimated.                                                        |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

**Table 3-18:  
Lightning Events of Significance in SE Arizona (Cochise County)**

| Location     | Date      | Property Damage (\$) | Source          | Description                                                                       |
|--------------|-----------|----------------------|-----------------|-----------------------------------------------------------------------------------|
| DOUGLAS      | 7/28/2000 | 2 injured            | NEWSPAPER       | 2 boys, aged 13 years, injured by a lightning strike.                             |
| DOUGLAS      | 6/24/2008 | 2 injured            | Newspaper       | Two children were struck by lightning in Douglas.                                 |
| SIERRA VISTA | 7/17/2010 | \$5,000              | Broadcast Media | Lightning struck a home in Sierra Vista and caused a fire near the kitchen stove. |

**Table 3-18:  
Lightning Events of Significance in SE Arizona (Cochise County)**

| Location                  | Date      | Property Damage (\$) | Source          | Description                                                                                                                                                                                                                                                                                        |
|---------------------------|-----------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SIERRA VISTA</b>       | 7/17/2010 | \$20,000             | Broadcast Media | Lightning struck a home, causing a fire in the attic. The home was unoccupied at the time, and there were no injuries.                                                                                                                                                                             |
| <b>BENSON</b>             | 8/24/2010 | \$50,000             | Newspaper       | The Benson News-Sun reported several lightning strikes causing damage and fires in and around Benson. The most extensive lightning damage was done to two motors at the wastewater treatment facility. Lightning also damaged numerous transformers.                                               |
| <b>SUNNYSIDE</b>          | 8/11/2011 | 2 injured            | Broadcast Media | Two illegal immigrants were struck by lightning near Sierra Vista and transported to a hospital. The Border Patrol reported that the injuries sustained by the two illegal immigrants was consistent with a lightning strike.                                                                      |
| <b>DOUGLAS</b>            | 6/22/2012 | \$15,000             | Newspaper       | Lightning struck a two-story house at 11th Street and C Avenue in Douglas causing the house to catch fire. Firefighters extinguished the fire in 20 minutes. Smoke damage was confined to the second story.                                                                                        |
| <b>HUACHUCA VLG</b>       | 7/30/2012 | \$3,000              | Newspaper       | Lightning struck and destroyed a generator that provided power for Huachuca City Police Department telephone lines.                                                                                                                                                                                |
| <b>BENSON</b>             | 6/30/2015 | 1 death              | Broadcast Media | Lightning struck and killed a man who was walking along a dirt road.                                                                                                                                                                                                                               |
| <b>PANTANO</b>            | 8/25/2015 | \$500                | Law Enforcement | Local police report a tree was struck by lightning near Benson.                                                                                                                                                                                                                                    |
| <b>HUACHUCA CITY ARPT</b> | 5/30/2017 | \$5,000              | Broadcast Media | Lightning started a vacant structure on fire in Dagoon Estates. The building was destroyed and the fire spread into adjacent grass and brush, scorching 120 acres. Twelve nearby residents were evacuated before the fire was contained the next day. At least two other brush fires were ignited. |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

## Probability of Future Events

Considering history and the location of Oklahoma between the dry, arid southwest and the moist air from the Gulf of Mexico, as well as the monsoons in the Southwest, the Fort Sill Apache Tribe

has significant exposure to lightning events. Damage usually occurs to infrastructure, such as power transmission lines and communications towers; however, occasional damage can occur to structures also due to fire. Early warning research is ongoing through the National Weather Service and private organizations to improve notification and threat information for the public. Property damage and possibly deaths from lightning are possible for the Fort Sill Apache Tribe, especially during severe thunderstorms. The probability of future lightning events in the Fort Sill Apache Tribe is “**HIGHLY LIKELY**” (see Table 3-1).

## Vulnerability and Impact

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During thunderstorms and particularly severe thunderstorms, people are often injured or killed by lightning. They are either struck directly or a nearby lightning strike causes injuries to people close by. The National Lightning Safety Council released a study in from 2006-2019 concerning statistics for lightning strikes causing injuries or death

**1. Lightning Fatalities by Activity**

- 62% Leisure
- 18% Work
- 16% Daily Routine
- 4% Unknown

**2. Location of Incident:**

- 40% unreported
- 27% Open fields & recreation areas (not golf)
- 14% under trees (not golf)
- 8% Water-related (boating, fishing, swimming...)
- 5% Golf/golf under trees
- 3% Heavy equipment and machinery-related
- 2.4% Telephone-related
- 0.7% Radio, transmitter & antenna-related

**3. Gender of victims** = 80% male; 20% female

**4. Months of most incidents** = June, July, August

**5. Days of week of most incidents** = No trend, strikes occur seven days a week.  
People are more likely to be engaging in leisure on Sat and Sun.

**7. Number of victims** = One (91%), two or more (9%)

Lightning is an underrated killer and second only to flood regarding the number of weather-related deaths in the United States each year. National Weather Service publication *Storm Data*, recorded six deaths from lightning strikes between 1998 and 2008 and ranks Oklahoma in 27<sup>th</sup> place nationally. According to the National Weather Service, lightning causes an average of 23 deaths in the United States each year (based on data from 2014-2023, NWS).

In the Fort Sill Apache Tribe, lightning has been responsible for setting fires to fields, causing loss of crop revenue and threatening structures and livestock. Electrical appliances and electronics often are destroyed by lightning causing costly repairs or replacement. Additional vulnerabilities and impacts can be found in Appendix C - Critical Facilities. Public education is important in lessening the effects of lightning through safety practices to avoid lightning strikes.

## **Conclusion**

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Thunderstorms cause millions of dollars of damage throughout the United States every year. At particular risk of thunderstorms are outdoor activities such as sporting events, bicycling, fishing, and walking, all of which are plentiful among the Fort Sill Apache Tribe. Mitigation projects exist in this plan (see Chapter 4) that can help protect and reduce the effects of lightning on citizens and visitors to the Tribe.

## **References**

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National Lightning Safety Institute (NSLI)  
National Lightning Safety Council (NLSC)  
National Weather Service (NWS)  
National Center for Environmental Information (NCEI)  
Dr. Kristin Calhoun, National Severe Storms Laboratory  
Vaisala National Lightning Detection Network

## **Hazard Profile:**

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### **Tornado**

Tornadoes 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 tornadoes can occur at any time of year. The most violent tornadoes are capable of tremendous destruction, with wind speeds more than 300 miles per hour (Moore, Oklahoma, May 3, 1999). Damage paths can exceed one mile wide and several hundred miles long. According to the National Weather Service, about 86 people were killed nationally by tornadoes in 2023.

### **Location**

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The entire state of Oklahoma is at risk for tornadoes including The Fort Sill Apache Tribe (Figure 3-16). The lands of tribal interest within Oklahoma are included in the infamous Tornado Alley. In addition, this area has a consistent season each year – from April through mid-June, with the most tornadoes normally occurring in May, although some may occur in the fall. These two facts – the conjunction of high frequency of strong and violent tornadoes and the relative consistency of the season from year to year– make the Tribe’s Oklahoma location a prime risk for tornado hazards (Figure 3-17)

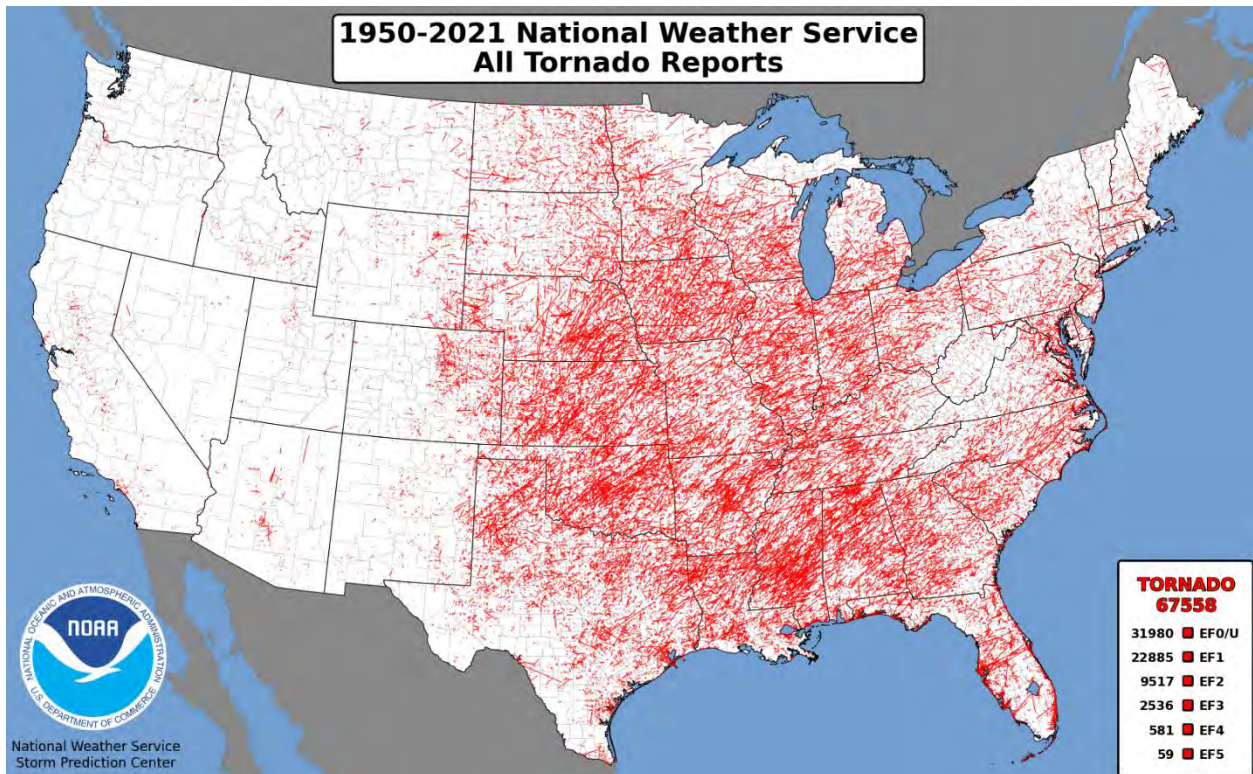


Figure 3-16: National Weather Service Tornado Reports/Tracks from 1950-2021. Source: NOAA, NWS Storm Prediction Center.

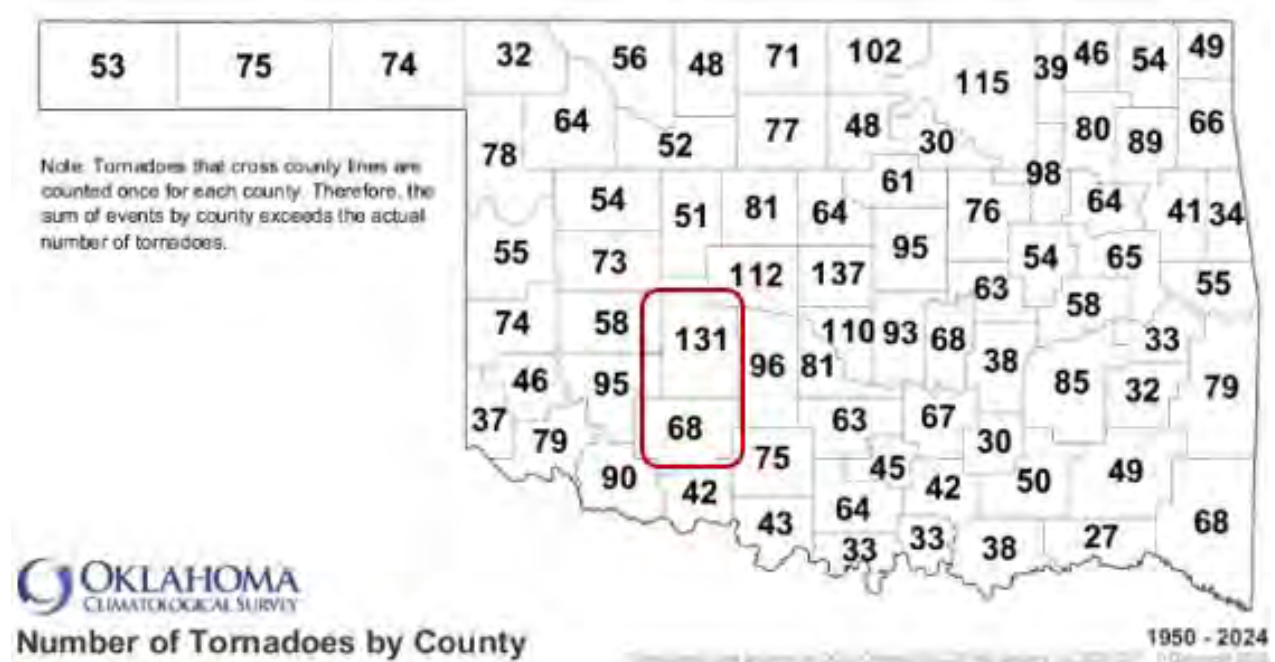


Figure 3-17: Number of tornadoes in Oklahoma by County from 1950-2024. Red box indicates Caddo and Comanche County (Source: Oklahoma Climatological Survey OCS)

## 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. tornados 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 tornados, 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 that date are estimated using the Enhanced Fujita Scale (EF). References to older storms will still rely on the original scale.

**Table 3-19: Enhanced Fujita (EF) Scale for Assessing Tornado Strength based on wind speed and damage**

| Category   | Wind Speed (mph) | Potential Damage                                                                                                                                                                                                                                                                |
|------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EF0</b> | 65-85            | <b>Light damage</b> - Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.                                                                                                                              |
| <b>EF1</b> | 86-110           | <b>Moderate damage</b> - Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.                                                                                                                             |
| <b>EF2</b> | 111-135          | <b>Considerable damage</b> - Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.                                                      |
| <b>EF3</b> | 136-165          | <b>Severe damage</b> - Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance. |
| <b>EF4</b> | 166-200          | <b>Devastating damage</b> - Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.                                                                                                                                        |
| <b>EF5</b> | >200             | <b>Incredible damage</b> - Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly in excess of 100 m (109 yd.); high-rise buildings have significant structural deformation; incredible phenomena will occur.                                |

Source: [http://en.wikipedia.org/wiki/Enhanced\\_Fujita\\_Scale](http://en.wikipedia.org/wiki/Enhanced_Fujita_Scale)

Tornado wind speeds are estimated after the fact based on the damage they produce. Tornados are categorized on a scale of EF0 (weakest) to EF5 (strongest) according to the Enhanced Fujita Scale. The Fort Sill Apache Tribe may experience any of these levels at any time during the year. EF2 tornadoes and above are considered severe in the Fort Sill Apache Tribe. The following

**Table 3-20:  
Tornadoes for SW Oklahoma (Southern Caddo County, Comanche County) with at  
least \$5,000 in Property Damage (2000-2024)**

| Date       | Rating | Property Damage | Source           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------|--------|-----------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10/9/2001  | F1     | \$75,000        | NWS Storm Survey | E5. This multiple-vortex tornado developed about 1/2 mile west of where E4 dissipated and resulted in minor damage to a mobile home and a nearby storage building. Major damage, rated F1, was also sustained to a large area of trees. Straight-line winds are believed to have unroofed a home and destroyed a barn, about 1/2 mile west of US 281.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 9/30/2005  | F1     | \$5,000         | NWS Storm Survey | A tornado occurred within the Wichita Mountains National Wildlife Refuge which was surveyed by a National Weather Service meteorologist and the deputy refuge manager. The tornado touched down to the west of the Boulder Camp area in the southwest part of the refuge. Significant tree damage occurred in the area just to the north of Boulder Camp and along the road that leads to Boulder Camp as the tornado moved east and east-northeast. Several eight-to-twelve-inch diameter trees were snapped or uprooted. The tornado continued to veer to the left, moving north-northeast crossing the main highway just one mile west of the main campground and Quanah Parker Lake. It continued to create light tree damage as it moved northeast and before dissipating on the south or east face of Bushman Mountain. No structures were hit, and there were no known injuries to wildlife in the refuge. |
| 4/17/2013  | EF0    | \$200,000       | NWS Employee     | The tornado was reported on the west side of Lawton. Minor damage was done to the Goodyear Tire Plant at southwest Lee and Goodyear Boulevards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4/29/2016  | EF1    | \$10,000        | NWS Storm Survey | A tornado developed just northwest of Elgin. It initially moved north, then turned east-northeast dissipating just before reaching Fletcher. Mobile homes were damaged along the path as well as trees, power lines, and outbuildings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 10/21/2017 | EF1    | \$5,000         | NWS Storm Survey | This tornado snapped trees and produced roof damage to a home near the intersection of County Roads 2660 and 1440.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 10/21/2017 | EF1    | \$15,000        | NWS Storm Survey | This tornado took a 6-mile path through Caddo County northwest of Cyril and Cement. Damage was confined to snapped or uprooted trees along the path.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 10/21/2017 | EF1    | \$10,000        | NWS Storm Survey | This tornado developed just west of County Road 2660 near County Road 1420 and moved northeast. Barns were significantly damaged along County Road 2660 and another along State Highway 8. Trees were snapped along the entire path. The tornado moved northeast to near County Road 1400 east of State Highway 8 and then turned east-southeast and dissipated soon after snapping more trees along County Road 2680.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 5/18/2019  | EF2    | \$150,000       | NWS Storm Survey | A QLCS tornado destroyed two homes about three miles east of Geronimo. One home had most exterior walls collapsed while another house just across the street to the north had its roof removed and many of the exterior walls collapsed. A few power poles were snapped, and a tree was uprooted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 10/10/2021 | EF1    | \$40,000        | Storm Chaser     | Numerous storm chasers observed a tornado that developed about 9 miles west of Boone near the Kiowa-Caddo County line. The tornado moved northeast crossing State Highways 58 and 19 causing significant roof damage to a home and breaking power poles. Although this tornado became wrapped in rain and was generally not visible after crossing the highway, additional tree damage was reported east of the highway, and it is believed to have continued northeast approximately three miles.                                                                                                                                                                                                                                                                                                                                                                                                                |
| 10/10/2021 | EF2    | \$60,000        | Storm Chaser     | Storm chasers initially observed a tornado that developed southwest of Anadarko and moved east-northeast. Damage was reported to a hangar at the Anadarko airport just south of town. The most significant damage was about 5 miles east of Anadarko where the roof was removed from a home. Although the tornado itself passed just south of Anadarko, the storm produced widespread wind damage within the town of Anadarko (see separate entry).                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Table 3-20:  
Tornadoes for SW Oklahoma (Southern Caddo County, Comanche County) with at least \$5,000 in Property Damage (2000-2024)**

| Date          | Rating       | Property Damage | Source                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|--------------|-----------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10/12/2021    | EF0          | \$10,000        | NWS Storm Survey       | This tornado moved into Comanche County from Kiowa County approximately three miles north of U.S. Highway 62 and moved northeast and then due north. At least one home suffered some shingle damage, a mobile home received roof damage, and a barn door was blown in. Tree damage was also observed along the path. None of the damage in Comanche County was observed to be greater than EF0, although the tornado was likely stronger as there were few damage indicators encountered along the path. |
| 5/2/2022      | EF1          | \$100,000       | NWS Storm Survey       | An NWS storm survey team found evidence of a brief tornado that caused EF-1 damage to homes, trees and outbuildings near State Highway 8 and County Road 1450.                                                                                                                                                                                                                                                                                                                                           |
| 6/15/2023     | EF0          | \$10,000        | NWS Employee           | This tornado developed near State Highway 36 and Deyo Mission Road and produced tree and shingle damage as it moved southeast. It dissipated just north of the Cotton County line.                                                                                                                                                                                                                                                                                                                       |
| <b>Total:</b> | 13 Tornadoes | \$690,000       | \$53,077 Average/Event |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

pictures are examples of the damage experienced in the various levels of tornadic winds.

### Previous Occurrences

Tornados occur in SW Oklahoma with seasonal frequency. Tornadoes in SW New Mexico are rare, and only a few low strength tornadoes have been documented in SE Arizona (Cochise County) from 2000-2024 based on the National Center for Environmental Information Storm Events Database. Tables 3-20 and 3-21 summarize details of the tornadic histories for southern Caddo County and Comanche County (Oklahoma) as well as Cochise Country (Arizona). Summary tables include reported tornadoes with greater than \$5,000 property damage. An EF3 tornado did destroy one occupied home (no casualties reported) May 3, 1999 in Stecker, OK (NE of Apache, OK) but is not included in the summary table as the range is from 2000-2024.

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

| Table 3-21: Tornadoes for SE Arizona (Cochise County) 2000-2024 |        |                 |                 |                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------|--------|-----------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date                                                            | Rating | Property Damage | Source          | Description                                                                                                                                                                                                                                                                                                                                                                            |
| 11/29/2009                                                      | EF0    | ---             | Trained Spotter | A trained spotter reported a funnel cloud from a thunderstorm between Douglas and McNeal in Cochise County. After obtaining pictures of this funnel cloud from the broadcast media, it was determined that this funnel was briefly in contact with the ground. Therefore, the funnel was classified as a brief tornado touchdown. There was no apparent damage from this EF-0 tornado. |

**Table 3-21: Tornadoes for SE Arizona (Cochise County) 2000-2024**

| Date      | Rating | Property Damage | Source       | Description                                                                                                                                                                                                                                                                                             |
|-----------|--------|-----------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8/15/2014 | EF0    | ---             | Social media | Photos were received of a landspout tornado which occurred just northwest of Willcox. It was on the ground for 6 minutes. No damage or injuries occurred. EF rating, path length, and path width are estimated based off radar data and information from a photographer. No storm survey was conducted. |
| 9/22/2015 | EF0    | ---             | Public       | A brief tornado touched down north of St. David.                                                                                                                                                                                                                                                        |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

## Probability of Future Events

Based on the location of Oklahoma between the warm humid air from the Gulf of Mexico, the arid hot air from New Mexico and the cool air from the Rocky Mountains, conditions are right as proven by the history of tornadoes in Oklahoma and threaten the Fort Sill Apache Tribe that additional tornadoes will occur.

Fortunately, better construction practices can limit the potential damage from all but the most violent tornadoes. The residences and businesses of today are more likely to withstand the damaging winds of weaker tornadoes than those structures built fifty years ago. Thanks to past FEMA funding programs for safe rooms, the inclusion of safe rooms, below ground storm shelters, hurricane straps, and foundation anchor bolts in current construction has helped reduce the hazard to both life and property.

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.

Public input and review by the Fort Sill Apache Tribe Hazard Mitigation Planning Team agree that the potential for future tornadoes in the Fort Sill Apache Tribe is **“POSSIBLE.”** (Table 3 -1)

## Vulnerability and Impact

Sixty-nine percent of all tornadoes are considered weak; over 82% of all tornado deaths are due to violent tornadoes (EF4-EF5), even though only 2% of tornadoes fall into that category. Tornado

deaths by county are dominated by singular events, and largely a result of significant (F2-F4) tornadoes (Fricker, 2020). Although wind energy and population density are two direct contributors to tornado casualty rates, socioeconomic factors regarding density of mobile homes and the number of elderly individuals (over 65 years of age) result in an increase in the number of tornadoes and other natural hazard casualties.

The greatest vulnerability would be in the event of an EF-3 or larger tornado directly hitting the Fort Sill Apache Tribal Assets to include center for economic development and the governmental headquarters in SW Oklahoma. Apache is one of several communities with numerous FSAT members living and working in the area. People could be killed or injured. Substantial damage would be incurred to the economy of The Fort Sill Apache Tribe as well as the loss of cultural and historical artifacts important to the Tribe. The damage to infrastructure would be large with lost power, water, sewer, gas, and communications. Many key businesses around the area near the complex and important to the citizens of the Tribe would be destroyed or damaged. The major north/ south artery U.S. Highway 281 is the connection between Anadarko area and the Lawton/ Ft. Sill area, which make up most of the Fort Sill Apache Tribe in Oklahoma. Lawton/ Ft. Sill is the major commerce and industrial area in the Fort Sill Apache Tribe (Comanche County). This route could be blocked for possibly weeks. This would interfere not only with the flow of commerce to other counties in Oklahoma, but it would also create major problems for public school bus routes which many in the Tribe depend on to deliver students to schools throughout the area. Other citizens doing business in the Lawton/ Ft. Sill area could be re-routed around the main cityscape. Alternate transportation routes would have to be found. Schools, hospitals, grocery stores and other critical and economically important facilities could be damaged and/or closed for extended periods. Many businesses would be damaged or destroyed and must be closed until repairs or replacements could occur. Employment would be affected because of businesses closing and laying off employees due to the loss of business. It should also be noted that following a major tornado some businesses never re-open.

Roads and bridges might suffer damage or at least be blocked with debris. Plans for Continuity of Operations are currently in need of updating in the Tribe, and the government could be severely impaired. Governmental response could easily become overwhelmed. Some FSAT citizens could lose their homes and be displaced from their primary residence with injuries and fatalities possible. Mobile homes and frame structures are the most vulnerable even with preventative actions. Many of the buildings in the Tribe could not withstand the winds of a major tornado. Past tornado experience has shown that when a major tornado occurs, some people leave and never return leaving damaged and empty buildings or debris riddled lots for someone else to deal with. Power and water outages occur with most tornadoes, whether in urban or rural areas. That often causes food spoilage and sanitation problems for residents, even those not directly affected by the tornado strike. Additional vulnerabilities and impacts can be found in Appendix C - Critical Facilities.

Some residents within the Tribe have already built safe rooms or underground tornado shelters. The Tribal Complex hosts events and regular elder meals, for which there is no emergency protection from storms. The Fort Sill Apache Tribal Government does not have adequate shelter within its facilities for guests, nor do they currently have an Emergency Operations Center to coordinate response and recovery activities throughout the jurisdiction of the Fort Sill Apache Tribe. The Tribe's unique geography is spread out among 3 states, necessitating a strong communications network, which it currently lacks. The Tribal Complex hosts events and regular elder meals, for which there is no emergency protection from storms.

## Conclusion

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The Climatological records for Oklahoma indicate that a real danger to both life and property is faced by residents in Oklahoma from tornadic activity. The tornado casualty trend shows a reduction in tornado casualties in the last 20 years, and while the number of reported tornadoes has been increasing, probably due to better detection equipment and spotter training, deaths and injuries caused by tornadoes are decreasing. The Fort Sill Apache Tribe has only had 2 deaths from tornadoes since 1950 (F3 Tornado in Lawton, OK in 1979 resulting in 3 deaths and over \$25,000,000 in property damage). The Fort Sill Apache Tribal Properties, and the lives of their citizens are vulnerable to severe weather the same as all other properties and citizens in Oklahoma. Special considerations need to be developed for critical facilities important to survival and response to emergencies in the community.

## Resources

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Oklahoma Climatological Survey (OCS)  
National Weather Service (NWS)  
National Oceanic and Atmospheric Administration (NOAA)  
National Center for Environmental Information (NCEI)  
Fricker, Tyler. 2020. *Evaluating tornado casualty rates in the United States*. International Journal of Risk Reduction. Vol 47: 101535

## **HAZARD PROFILE:**

### **WILDFIRES**

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 recreational fire that was not doused properly, a tossed cigarette, burning debris, lightning or arson.

Wildfire is a natural part of Oklahoma's ecosystem. Before the area in the Tribe 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 and structures are at-risk from flames spreading across the Tribe. Today, the Tribe is intermingled along prairies and wooded lands, creating an urban-wild land interface that is at risk of uncontrolled burns.

The development of such urban-wildland 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.

### **Location**

The entire Fort Sill Apache Tribe has the potential of wildfire and has experienced wildfires within their boundaries across SW Oklahoma, SW New Mexico, and SE Arizona. Apache, OK is a rural community serviced by a volunteer fire department with mutual aid agreements with other volunteer fire departments within the surrounding communities. Luna County has fire services in Deming, NM, but the Fort Sill Apache Reservation in Akela, NM is over 20 miles east of those locations making response times lengthy. This area contains elements of economic, cultural, and residential interest to the Fort Sill Chiricahua Warm Springs Apache that would be a significant loss if damaged in a wildfire. Tribal lands of interest in Cochise County, AZ are remote and surrounded by National Forest Service lands. Both the New Mexico and the Arizona properties do not have on-site firefighting capabilities and are reliant on their surrounding communities for assistance. The Fort Sill Apache Tribe does receive fire service from the BIA (Bureau of Indian Affairs). Since the citizens of the Fort Sill Apache Tribe are intermingled with the population of its

counties, the fire departments of jurisdictions within the counties are still the primary responders for the Fort Sill Apache Tribe although they are not participants in this plan. The U.S. Forest Service has an agreement with the Tribe to respond to fires on tribal land within the Coronado National Forest.

## Extent

Figure 3-18 maps the risk of wildland fire near Apache, OK and surrounding lands of tribal interest from Wildfirerisk.org. They report that Apache, OK has a wildfire likelihood greater than 85% of communities in the United States, and greater than 31% of communities within Oklahoma. This rural landscape is serviced by volunteer firefighting companies. Several areas in the Fort Sill Apache Tribe are more susceptible to wildfire because of trees, grass and heavy vegetation. Some residential areas are located on the outer limits of communities and are more vulnerable to wildland fire. The property in the Coronado National Forest is managed for brush removal but is covered by juniper trees in a very dry area. The other properties in Cochise, Socorro, and Luna Counties (AZ and NM) are covered in brush in very dry areas with very little or no local firefighting capacity. Luna County, NM (Figure 3-19) is rated medium for wildland fire risk with a likelihood greater than 9% of other counties in NM, and greater than 48% of counties within the United States. Cochise County, AZ (Figure 3-20) is classified as “Very High” wildland fire likelihood with risk higher than 86% of other counties in Arizona, and greater than 97% of the United States (wildfirerisk.org).

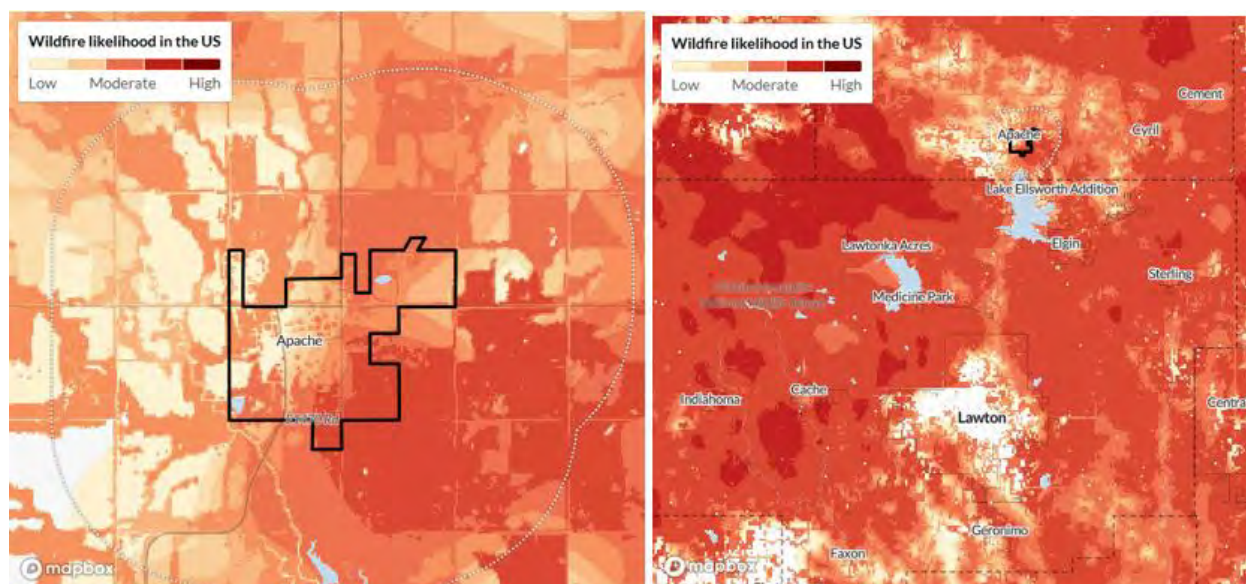


Figure 3-18: Risk of wildland fires in and near Apache, OK and surrounding lands of tribal interest (southern Caddo County, Comanche County OK. (Source: wildfirerisk.org)

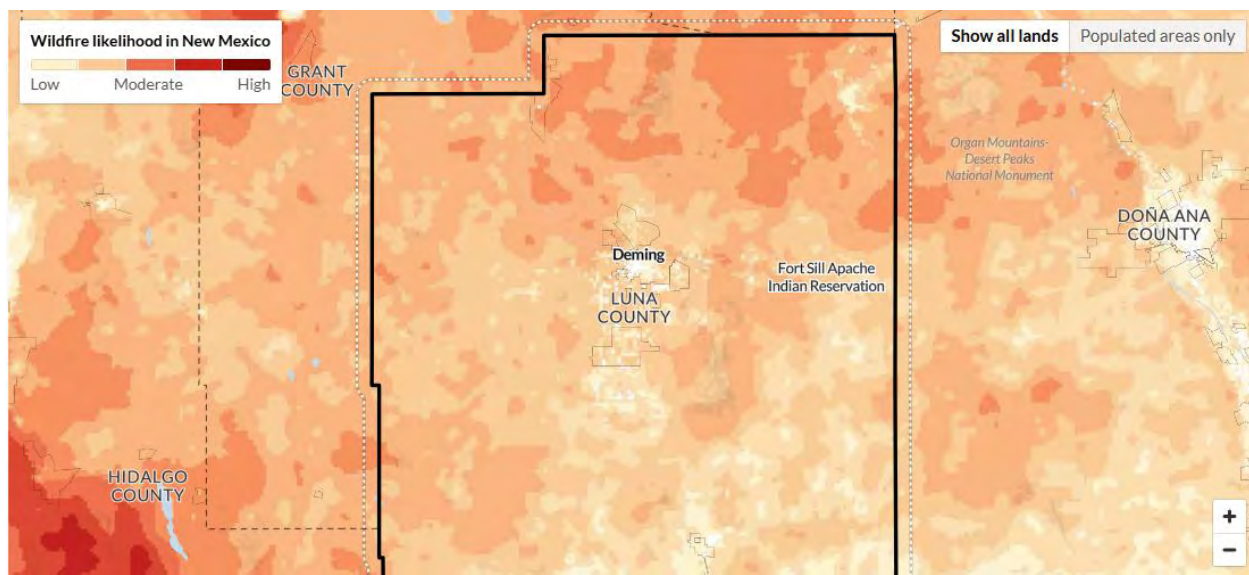


Figure 3-19: Risk of wildland fires in Luna County, NM near the Fort Sill Apache Reservation and surrounding lands of tribal interest (Source: wildfirerisk.org).

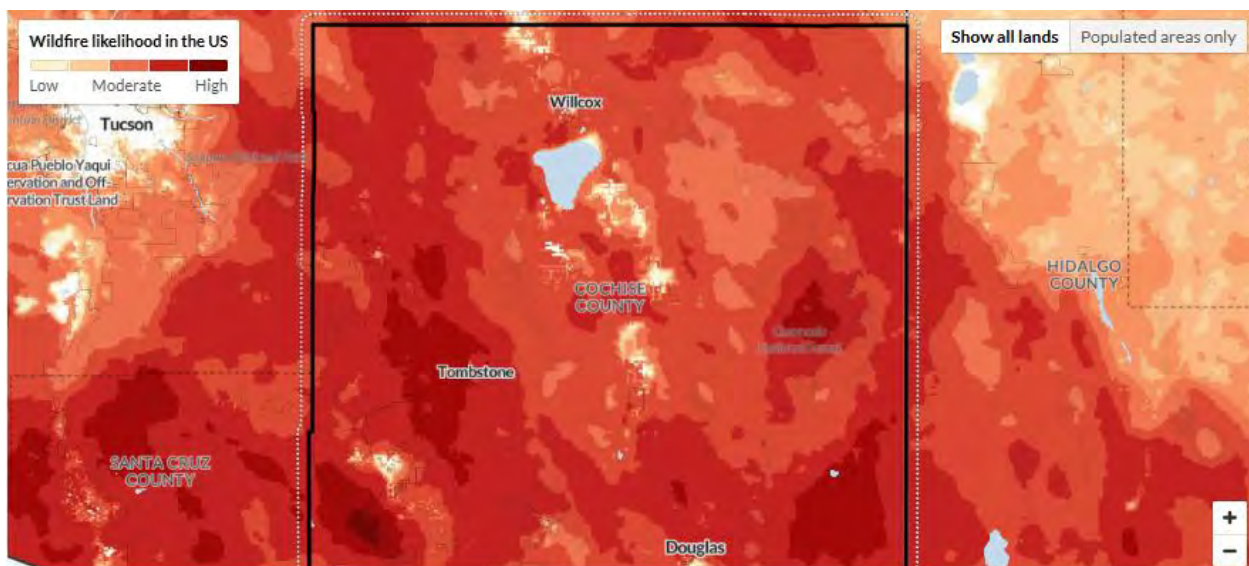


Figure 3-20: Risk of wildland fires in Cochise County, AZ and surrounding lands of tribal interest (Source: wildfirerisk.org).

## Previous Occurrences

Southern Caddo County and Comanche County have an established history of wildland fires. Table 3-22 summarizes a selection of wildfires from 2000-2025 with descriptions for SW Oklahoma, while Table 3-23 includes a selection of wildfires from Cochise County, AZ with documented property damage.

**Table 3-22:  
Select Wildland Fires for Southern Caddo and Comanche Counties  
OK (2018-2024)**

| Location (County)      | Date       | Description                                                                                                                                                                                                                                       |
|------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CADDO (ZONE)</b>    | 4/13/2018  | On the 13th, the Dollar Pond fire burned 257 acres and destroyed 1 structure in Caddo county. On the 14th, the Martha fire burned 33 acres, caused 2 injuries, and destroyed 24 structures in Jackson County.                                     |
| <b>COMANCHE (ZONE)</b> | 7/2/2018   | Grass fires burned approximately 4196 acres in Comanche county.                                                                                                                                                                                   |
| <b>CADDO (ZONE)</b>    | 1/9/2020   | A wildfire burned roughly 650 acres about 7 miles west of Anadarko on the 9th, with no damage being reported.                                                                                                                                     |
| <b>COMANCHE (ZONE)</b> | 12/10/2021 | The Coombs fire burned roughly 1464 acres and destroyed at least 19 structures, including 5 homes and 14 barns. Nine vehicles were also reported destroyed. >\$500,000 in damage.                                                                 |
| <b>COMANCHE (ZONE)</b> | 3/20/2022  | The Kings Road Fire burned 120 acres, with one fatality reported as firefighters responded to the fire (after she was separated from her vehicle).                                                                                                |
| <b>CADDO (ZONE)</b>    | 5/19/2022  | The Hog Farm Fire burned roughly 842 acres during the afternoon and evening of the 19th. No injuries or damage was reported.                                                                                                                      |
| <b>COMANCHE (ZONE)</b> | 7/28/2022  | The 115 Wildfire burned roughly 7,542 acres near Meers, OK on the 28th. No structures were damaged, and no injuries or fatalities were reported, but roughly 85 people were evacuated in advance of the fire.                                     |
| <b>CADDO (ZONE)</b>    | 8/15/2022  | The 58 Fire burned roughly 4,761 acres across portions of Caddo county to the west of Apache, OK. No injuries or major damage was reported, but minor damage was reported to a utility pole.                                                      |
| <b>COMANCHE (ZONE)</b> | 9/20/2024  | The Post Oak and Rogers Lane Fire burned 973 acres in western Comanche County, just west of the community of Cache. >\$161,900 in damage reported                                                                                                 |
| <b>COMANCHE (ZONE)</b> | 10/24/2024 | The Rush Fire burned 12,488 acres in west-central Comanche County, within the Wichita Mountains National Wildlife Refuge. The fire continued to burn into November 2024 and was reported to be contained on November 8th. >\$10,000,000 in damage |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

**Table 3-23:  
Select Wildland Fires for Cochise County, AZ with Property Damage  
(2011-2024)**

| Date            | Property Damage | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6/1/2011</b> | \$1,000,000     | The Horseshoe 2 fire continued to burn through much of the month of June as extremely dry conditions and fuels, and strong winds aided in the fire's growth. As the fire continued to grow to the northwest, the communities of Cave Creek Canyon, Paradise, Whitetail Canyon, West Turkey Creek, and West Pinery Canyon were evacuated. Crews were put in place to protect the communities, but some structures were lost. In all, 9 homes and 14 outbuildings burned, including the historic Barfoot fire lookout. Chiricahua National Monument in the northern portion of the fire was closed on June 3 and remained closed through the summer.   One firefighter was injured when he and another lookout were caught between two burnouts. The firefighter required several stitches in his hand after using it to break a window for access to a rock shelter to escape the rapidly approaching flames. The fire passed over and into the shelter, but no injuries directly attributed to the fire occurred. |

**Table 3-23:  
Select Wildland Fires for Cochise County, AZ with Property Damage  
(2011-2024)**

| <b>Date</b>      | <b>Property Damage</b> | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                        | However, this indirect injury, when added to the 12 suffered in May, brought the total to 13 firefighters indirectly injured fighting the Horseshoe 2 Fire.                                                                                                                                                                                                                                                                                                                                                                               |
| <b>7/1/2011</b>  | \$15,000,000           | The Monument Fire was contained on July 7, after charring 30,526 acres (nearly 47 square miles). The fire destroyed 62 homes, four businesses, 18 outbuildings, and damaged seven homes. Nearly 10,000 people were evacuated from areas south of Sierra Vista at the peak of the fire.                                                                                                                                                                                                                                                    |
| <b>5/21/2013</b> | \$2,000                | The human-caused Benson 1 Fire started near Interstate 10, just west of Pomerene, AZ along the dry San Pedro Riverbed and spread through timber and brush near the river bottom. Since it was difficult to access, moderate winds caused this fire to spread up the banks where it destroyed a small trailer at an RV park. As a precautionary measure, a two-mile stretch of Interstate 10 was closed briefly on the day the fire started, and about 25 mobile homes were evacuated.                                                     |
| <b>6/7/2017</b>  | \$100,000              | The lightning caused Lizard Fire started in the Dragoon Mountains on June 7th and quickly spread due to strong winds. The fire merged with the Dragoon Fire which caused an increase in acreage to nearly 15,000 acres. The communities of Dragoon and Cochise Stronghold were evacuated. One home and two outbuildings were destroyed in Dragoon. The fire continued into July before it was fully contained but the overall acreage did not grow much beyond 15,000 acres.                                                              |
| <b>6/7/2017</b>  | \$50,000               | Lightning sparked the Frye Fire on June 7th. The fire began to spread rapidly on June 19th as the result of strong winds from a thunderstorm outflow boundary. On that day, the Webb Peak Lookout Tower was damaged and the water chlorination shed at Old Columbine was destroyed. The observatory on Mount Graham was threatened but spared from the wildfire through suppression. By the end of June, the fire had consumed 42,755 acres but was only 45% contained.                                                                   |
| <b>6/20/2017</b> | \$750,000              | The lightning caused Encino Fire to ignite on June 20th south of Sonoita and spread rapidly north due to thunderstorm outflowing winds. At least five homes and 30 power poles were destroyed by the fire. Many residents of Sonoita were evacuated and State Routes 82 and 83 were both closed temporarily. A firefighter was injured when he broke his ankle. The fire was fully contained by June 25th after burning 1289 acres.                                                                                                       |
| <b>4/2/2018</b>  | \$50,000               | The human caused Adobe Fire started on April 2nd in southeast Cochise County and quickly spread through 261 acres of grass and dry brush by southwest winds gusting to between 30 and 35 mph. Ten residents were evacuated and several roads were closed after the onset of the fire due to the threat to nearby structures. A small shed and a larger barn were lost as the fire jumped Double Adobe Road, but no injuries occurred. The fire was largely contained after dark that evening but was not fully contained until April 4th. |
| <b>2/23/2022</b> | \$150,000              | The human caused Hope Fire was spread across 25 acres of grass and brush by wind gusts over 50 mph. One house and one mobile home were destroyed by the fire in the community of Cochise near the intersection of Apache Way and Quarterhorse Lane.                                                                                                                                                                                                                                                                                       |
| <b>4/20/2022</b> | \$25,000               | The human caused Camino Fire started on April 20 near Sunizona in Cochise County as the result of a vehicle dragging tow chains along a roadway. The wildfire was driven by wind gusts to 45 mph at times and 750 acres were quickly burned before forward progression was stopped. The fire caused evacuations of around 40 residences, the closure of State Route 181, damage to utility infrastructure and the destruction of one structure. Fire suppression costs tallied \$600,000.                                                 |
| <b>4/3/2023</b>  | \$500,000              | The human-caused Williams Fire started on April 3 in the Hereford area in Cochise County. The wildfire was driven by wind gusts of 45 mph, spread northeast in dry grass, and destroyed two residences and three outbuildings near the intersection of Williams and Waters Rds. The fire caused evacuations of several residences and the closure of State Route 92. A total of 1320 acres were burned. Forward progression was stopped on April 4. Fire suppression costs tallied \$90,000.                                              |
| <b>6/22/2023</b> | \$20,000               | On June 22, three fires were started along State Route 92 between Sierra Vista and Palominas by a vehicle dragging a loose chain. The fires spread rapidly due to gusty                                                                                                                                                                                                                                                                                                                                                                   |

**Table 3-23:  
Select Wildland Fires for Cochise County, AZ with Property Damage  
(2011-2024)**

| Date             | Property Damage | Description                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                 | winds with two fires combining to form the Wildhorse Fire. State Route 92 was closed for a time, and residents of Three Canyons development were temporarily evacuated. While burning in a residential area, no houses were damaged, although four small outbuildings were destroyed. The fire consumed a total of 747 acres before becoming fully contained June 24. Fire suppression costs tallied \$350,000.                              |
| <b>6/27/2023</b> | \$10,000        | The human-caused West Hemp Fire started June 27 on the grounds of Fort Huachuca when the blades of a lawn mower struck a rock. The fire quickly spread to more than 1,000 acres in gusty winds and dry conditions. The fire damaged power poles, causing the base to temporarily switch to backup power sources. The fire consumed a total of 1,098 acres before becoming fully contained June 28. Fire suppression costs tallied \$750,000. |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

The Akela Flats of Luna County New Mexico has a history of small grass fires near I-10, with larger wildfires being documented to the North in the Organ Mountains. Figure 3-21 is a map featuring New Mexico Fires from 1950 to present, with an adjoining table summarizing dates and acres burned along I-10 not included in the fire map due to size (source: New Mexico Fire Viewer, New Mexico Wildfire History Dashboard, updated 2024).

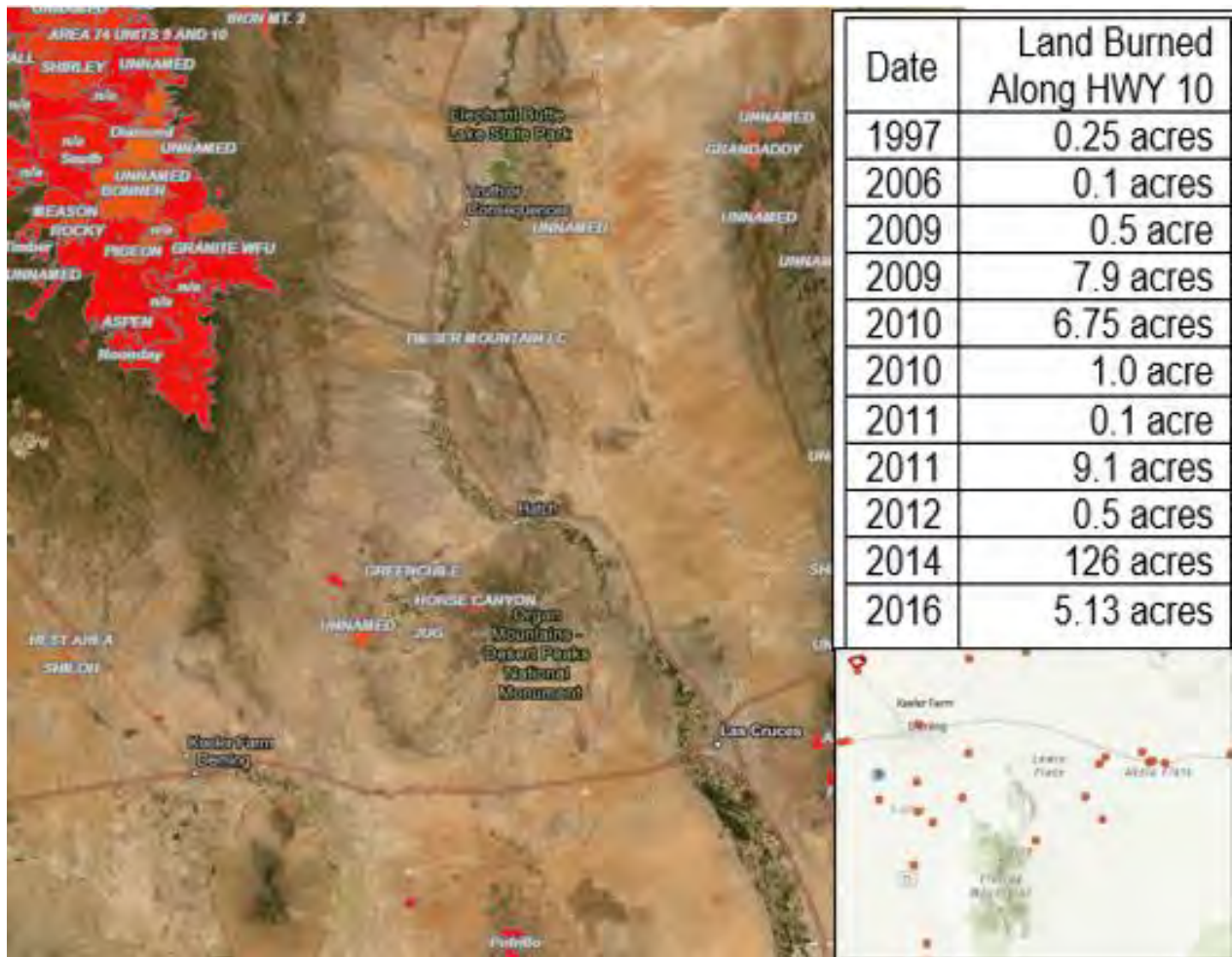


Figure 3-21: Subsection of the New Mexico Wildfire History Dashboard (1911-2024) and the New Mexico Fire Viewer - New Mexico Forest and Watershed Restoration Institute (2024)

## Probability of Future Events

The State of Oklahoma, New Mexico, and Arizona which include The Fort Sill Apache Tribe have a significant wildfire threat due to long term weather patterns, drought, the types of fuels present, and the cultural practices used. The areas are south of the Snow Belt, leaving its fuels exposed and vulnerable to fire in the dormant season. Oklahoma 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 four 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 years with low amounts of rainfall, grass and wild land fire is more likely. Most at risk are those people who make their homes in woodland settings or in expansive prairie lands. citizens own homes and

businesses located in woodland and grassy areas as well as with urban interface. Adding to the natural problem is an abundance of cedar trees which along with the natural winds cause fires to spread quickly in OK, and mesquite trees in AZ and NM. Figures 3-22 thru 3-24 include maps of wildfire risk to homes in all three selected areas of interest. The associated charts indicate clustering based on wildfire likelihood, wildfire consequences, with the point size indicating population, and the color indicating risk in a visual way.

The probability of future grass and wildfires for the Fort Sill Chiricahua Warm Springs Apache tribal lands is “**HIGHLY LIKELY.**” (See Table 3-1.)

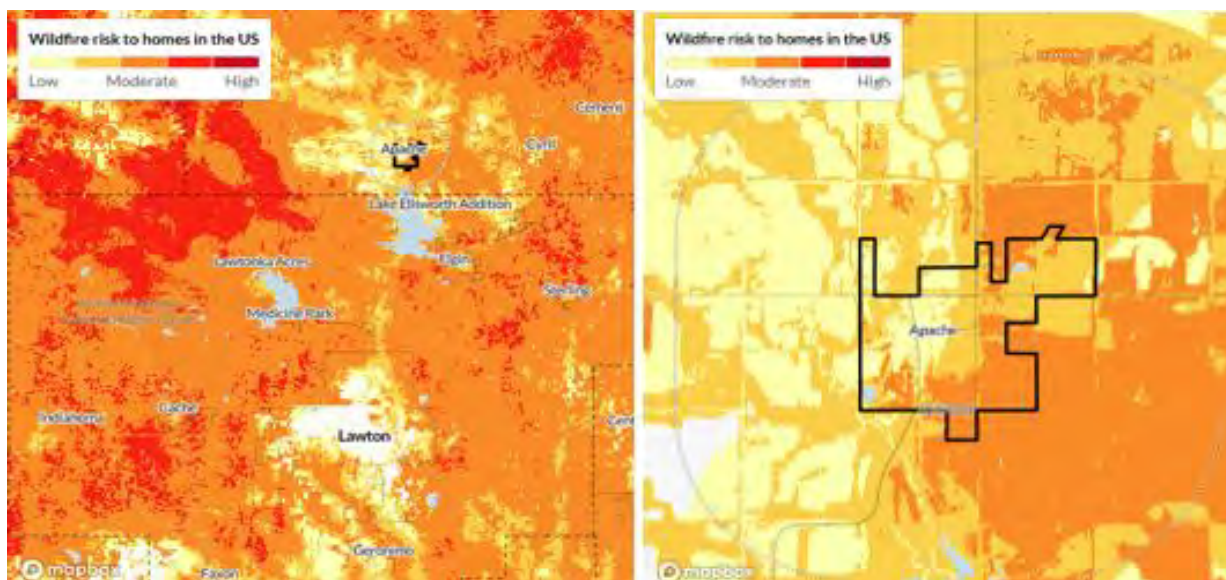


Figure 3-22: Wildfire risks to homes in and near Apache, OK (Source: [www.wildfirerisk.org](http://www.wildfirerisk.org))

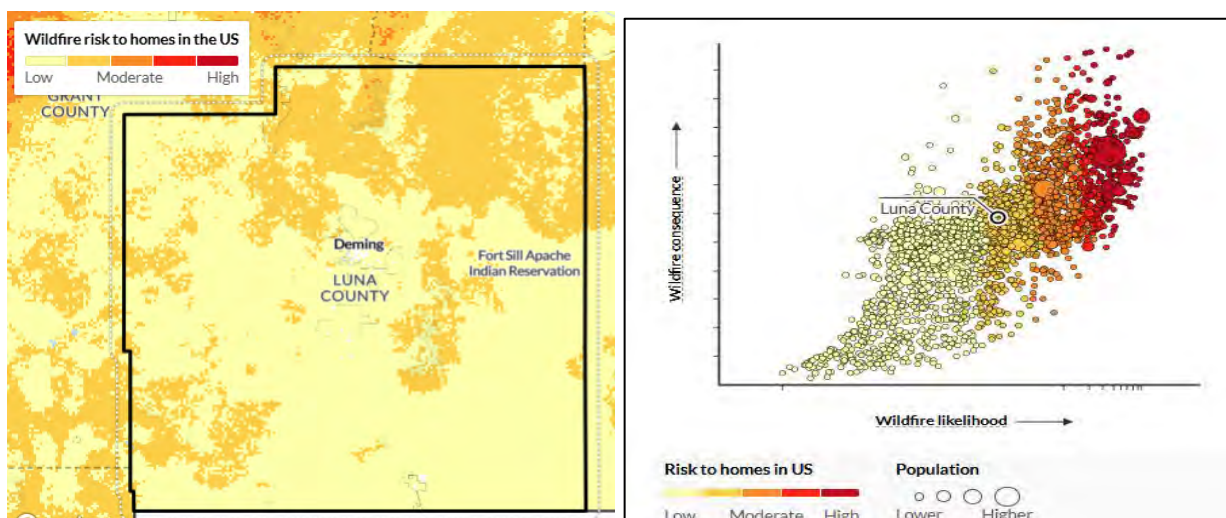


Figure 3-23 Wildfire risks to homes in and near the Fort Sill Apache Reservation in Luna County, NM (Source: [www.wildfirerisk.org](http://www.wildfirerisk.org)). Wildfire risk to homes is moderate due to low population density.

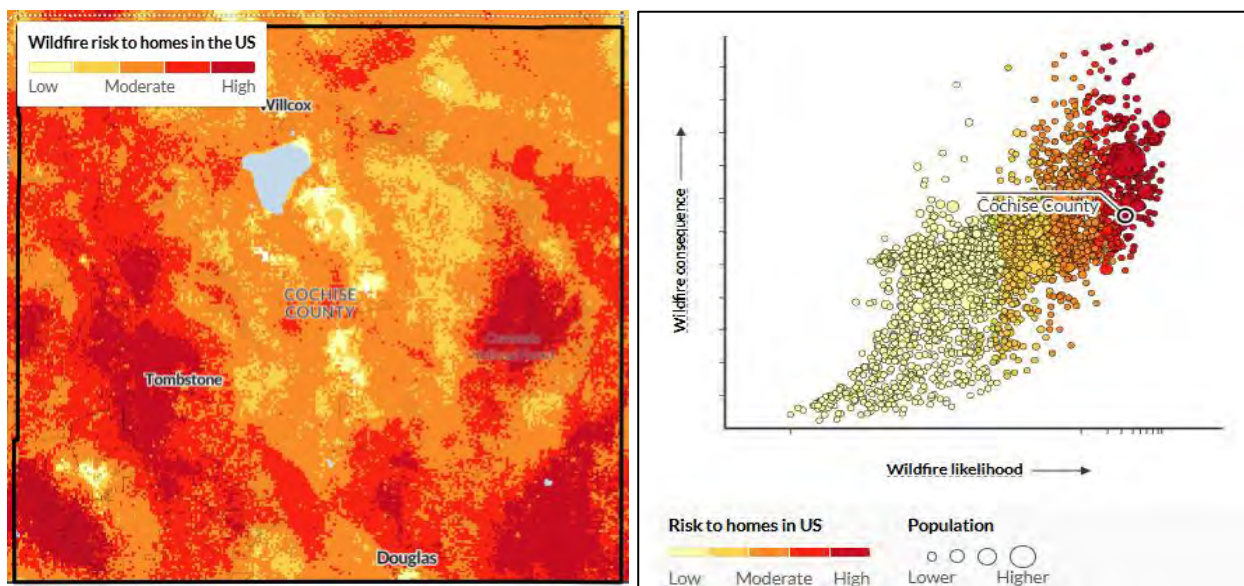


Figure 3-24: Wildfire risks to homes in and near the Coronado National Forest in Cochise County, (Source: [www.wildfirerisk.org](http://www.wildfirerisk.org)). Wildfire risk to homes is high due to dense trees and dry conditions.

## Vulnerability and Impact

Throughout the Fort Sill Apache Tribe some critical facilities including cultural artifacts, transportation routes, pipelines, and electrical transmission lines are vulnerable to wildfire. Loss of any of these facilities could result in a critical drain on the resources, response and recovery capabilities of the Fort Sill Apache FSAEMA. In the Fort Sill Apache Tribe, many residents and some businesses are in wooded or high grass areas that may have to be evacuated and possibly relocated for a longer period due to Wildfire. Businesses damaged or lost due to fires might be forced to close until repairs could be made or the building rebuilt or until customers return. This situation could result in the loss of employees and loss of income for both employees and owners. At times smoke from wildfires could affect patients in healthcare facilities and nursing homes or who suffer from asthma emphysema or other respiratory ailments and may be forced to evacuate if the smoke becomes extreme. Loss of transportation routes in The Fort Sill Apache Tribe due to heavy smoke could severely affect mail delivery, school bus access, local, state and intrastate commerce and tourism and could negatively affect the nation's economy. Wildlife and livestock could suffer losses since some ranches and farms within the Fort Sill Apache Tribe are in rural wooded and grassy areas. Additional vulnerabilities and impacts can be found in Appendix C - Critical Facilities. Table 3-24 summarizes the vulnerable populations of the Fort Sill Chiricahua Warm Springs Apache area of tribal interest based on poverty indicators for at risk individuals.

Due to differences in area size and total populations between Southern Caddo County (OK), Luna County (NM), and Cochise County (AZ). Population values are for the defined region, not for FSA lands specifically.

**Table 3-24: Comparison of Vulnerable Populations in Fort Sill Apache Areas of Tribal Land Interest based on 2020 US Census**

|                          | Southern Caddo County, OK |         | Luna County, NM |         | Cochise County, AZ |         |
|--------------------------|---------------------------|---------|-----------------|---------|--------------------|---------|
| Indicator                | Number                    | Percent | Number          | Percent | Number             | Percent |
| Families in Poverty      | 78                        | 15%     | 1,001           | 19%     | 3,047              | 10%     |
| People with Disabilities | 473                       | 23%     | 5,669           | 23%     | 21,116             | 18%     |
| People over 65 years     | 417                       | 20%     | 5,214           | 21%     | 29,105             | 23%     |
| People under 5 years     | 47                        | 2%      | 2,001           | 8%      | 6,731              | 6%      |
| People of Color          | 966                       | 46%     | 18,569          | 73%     | 58,136             | 46%     |
| Native American          | 830                       | 40%     | 215             | 1%      | 1,170              | 1%      |
| Difficulty with English  | 0 (±49)                   | 0 (±2%) | 2,847           | 12%     | 4,444              | 4%      |
| Household without Car    | 55                        | 7%      | 727             | 8%      | 2,956              | 6%      |
| Mobile Homes             | 117                       | 15%     | 2,750           | 31%     | 8,866              | 18%     |

Sources: US Census Bureau (2020), American Community Survey (2018-2022)

## Conclusion

The Fort Sill Apache Tribe has a significant wildfire hazard due to its climate, and the types of fuels present at all three tribal land areas of interest to include Oklahoma, New Mexico, and Arizona. 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. Only May and June are not considered “fire season”. Vulnerable populations within all three states may make evacuations due to wildfires difficult and will impact individuals with respiratory concerns as dust and smoke persist after a wildfire.

## References

USDA (Department of Agriculture) and the Forest Service. Wildfirerisk.org (Updated 2024)  
 New Mexico Forest and Watershed Restoration Institute nmfireviewer.org (1911-2024)  
 National Oceanic and Atmospheric Administration (NOAA)  
 National Center for Environmental Information (NCEI)  
 U.S Census Bureau Data (2020)  
 American Community Survey ACS at Census.gov (2018-2022)

## HAZARD PROFILE

### WINTER STORMS:

A winter storm is an event in which the dominant variety of precipitation is either snow or sleet, or a rainstorm where ground temperatures are cold enough to allow ice to form. A winter storm can range in intensity and duration with impacts ranging from hours to days directly impacting safety for transportation for residential, commercial, and industrial purposes. Winter storms can be localized or systemic in scope and can occur multiple times per year. Indirect impacts of winter storms include wind chill, visibility, and loss of access to utilities (frozen pipes, downed power lines).

### Location

The Fort Sill Chiricahua Warm Springs Apache Tribe experiences seasonal winter in all three locations for tribal lands of interest (SW Oklahoma, SW New Mexico, and SE Arizona). Winter weather in SW Oklahoma includes both ice storms and snowfall. Figure 3-25 is a map of average normal snowfall for Oklahoma based on data from 1991-2020 (30-year average). Ice storm/freezing rain data are limited due to the complexity of observational accounts (e.g., rain, freezing rain, and snow can occur at a single station during a single event), and thus it is difficult to find long term records specific for ice storms beyond National Weather Service warnings.

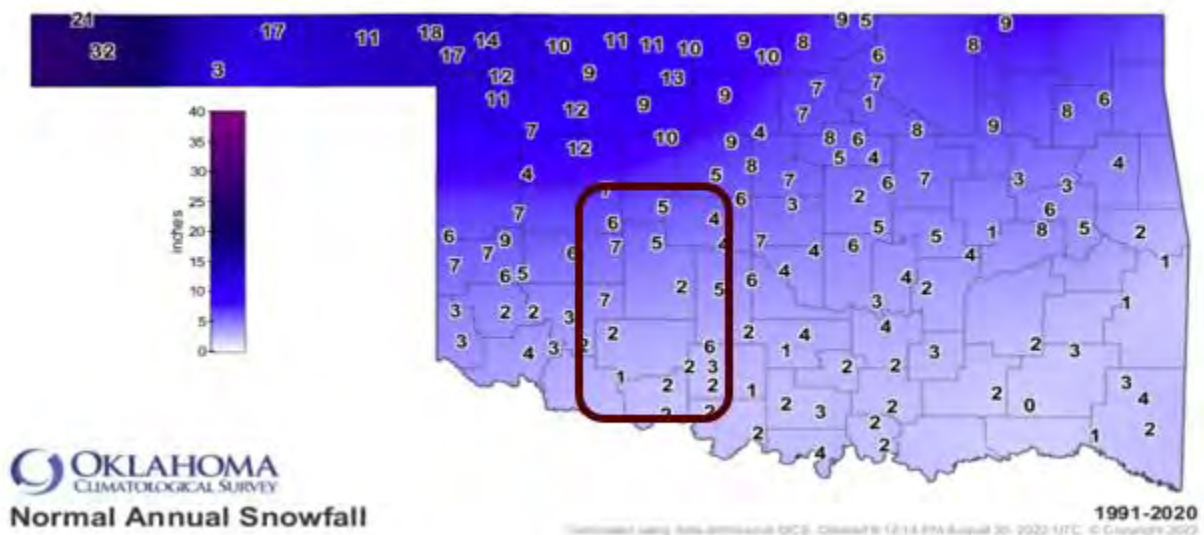


Figure 3-25: Average annual snowfall based on data from the Oklahoma Climatological Survey (1991-2020).

Winter weather in SW New Mexico and SE Arizona vary wildly based on elevation, with mountainous areas having snow accumulation while low laying areas may see issues with wind-blown snow impacting visibility and road conditions. All three states have roads used by residential, commercial, and industrial entities including interstate connectivity in which winter weather can cause delays and closures. However, Cochise County AZ averages less than one inch in snowfall each year based on a 30 year dataset (1991-2020) from the Regional Climate Center funded by NOAA and the Department of Commerce. The closest historical snowfall records for the region were collected in the Tucson Area with less than one inch of snow per year designated as “normal”.

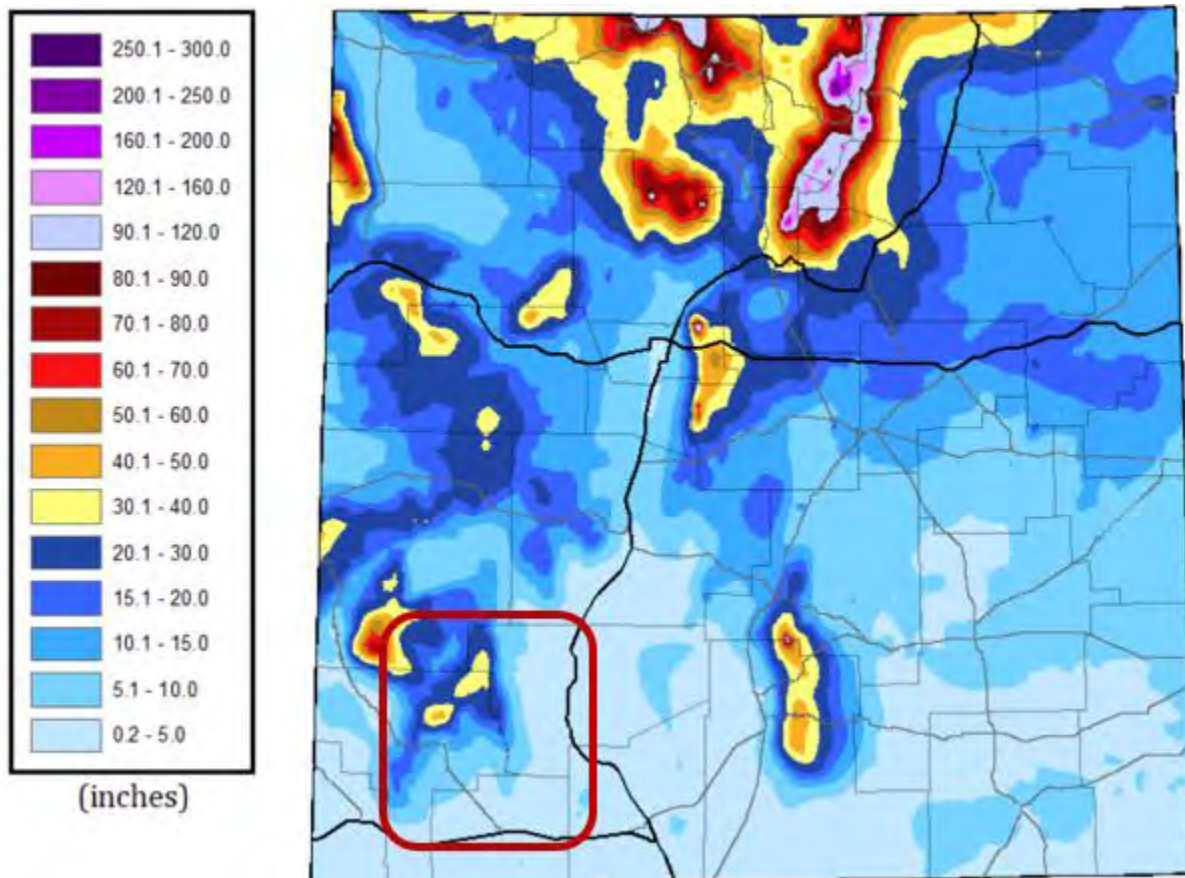


Figure 3-26: New Mexico Snow Climatology based on 2008-2009 thru 2018-2019 seasons. Source: National Operational Hydrologic Remote Sensing Center (NOHRSC) and National Weather Service (NWS).

## Extent

Areas that experience snow infrequently are often less prepared for significant snowfall events leading to strain on emergency response and department of transportation equipment/staff. Figure 3-27 is a summary of snow days over time for all three Fort Sill Apache Areas of Interest. Data was not available in Caddo County, OK; Luna County, NM; nor Cochise County, AZ so the nearest neighbor monitoring location at a similar elevation was used for number of snow days comparison (Marlow, OK; Las Cruces, NM; and Tucson, AZ). Table 3-25 is a summary of snowfall statistics for SW Oklahoma, SW New Mexico, and SE Arizona.

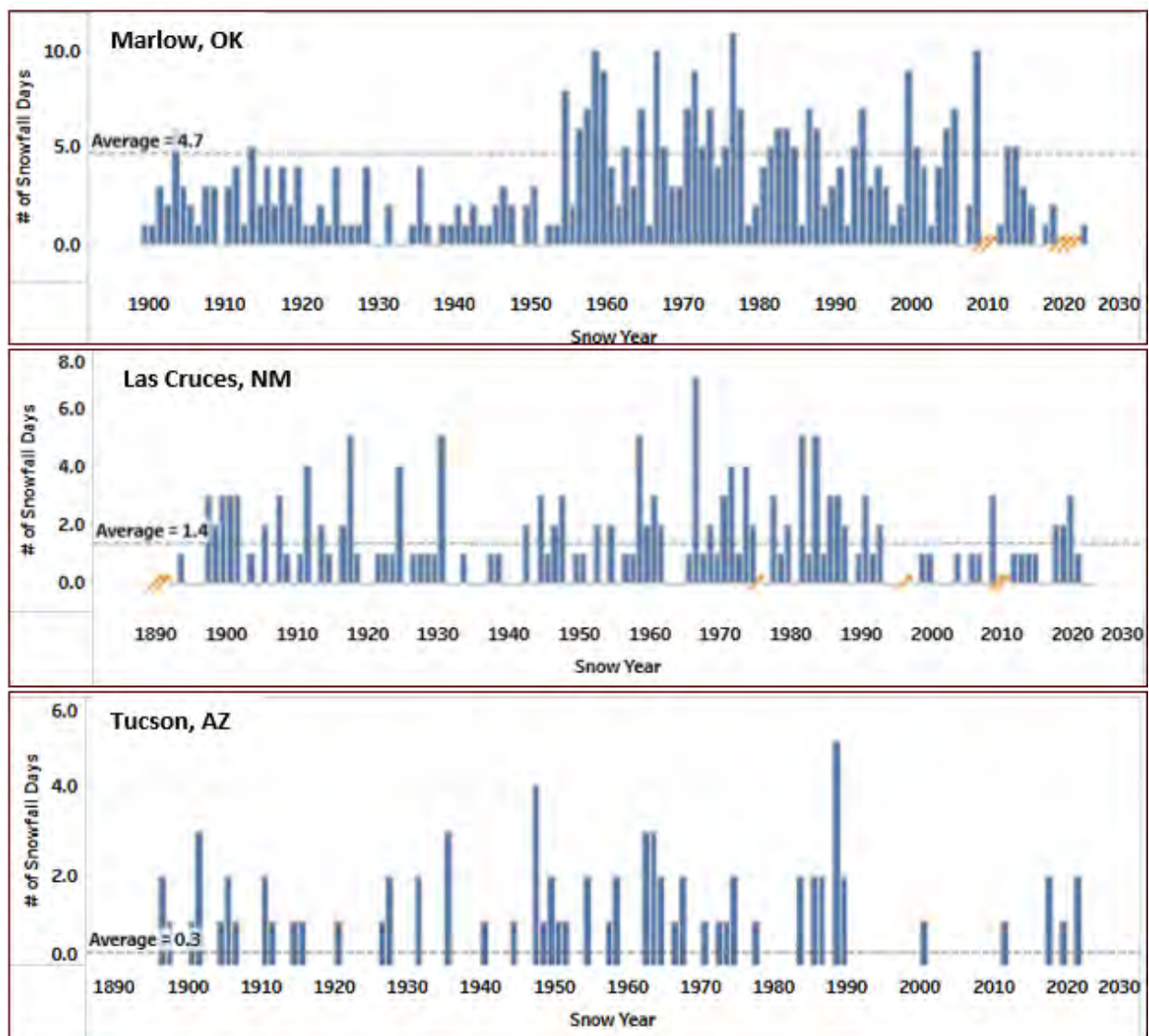


Figure 3-27: Comparison of reported snow days for SW Oklahoma, SW New Mexico, and SE Arizona over time with average (line). Arrows indicate that a measurement was not reported, blank spaces indicate that the number of snow days was zero for that year. Source: Midwestern Regional Climate Center (MRCC) via NOAA and Department of Commerce.

**Table 3-25: Comparison of Snowfall Statistics by Region of Fort Sill Apache Areas of Interest (1991-2020)**

|                     | <b>SW Oklahoma<br/>(Marlow, OK)</b>                                                                      | <b>SW New Mexico<br/>(Las Cruces, NM)</b>                                                               | <b>SE Arizona<br/>(Tucson, AZ)</b>                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Annual Snowfall     | 5.13 Inches Average<br>(min = 0, max = 29)                                                               | 0.7 Inch Average<br>(min = 0, max = 16.3)                                                               | 0.1 Inch Average<br>(min = 0, max = 6.8)                                                                |
| Number of Snow days | 4.7 Days Average<br>(min = 0, max = 11)                                                                  | 1.4 Days Average<br>(min = 0, max = 7)                                                                  | 0.3 Days Average<br>(min = 0, max = 5)                                                                  |
| First Snow Date     | October 30 <sup>th</sup> Earliest<br>January 2 <sup>nd</sup> Average<br>April 7 <sup>th</sup> Latest     | October 27 <sup>th</sup> Earliest<br>December 27 <sup>th</sup> Average<br>March 11 <sup>th</sup> Latest | November 15 <sup>th</sup> Earliest<br>January 17 <sup>th</sup> Average<br>March 24 <sup>th</sup> Latest |
| Last Snow Date      | November 27 <sup>th</sup> Earliest<br>February 12 <sup>th</sup> Average<br>April 14 <sup>th</sup> Latest | November 17 <sup>th</sup> Earliest<br>January 21 <sup>st</sup> Average<br>April 17 <sup>th</sup> Latest | November 16 <sup>th</sup> Earliest<br>February 2 <sup>nd</sup> Average<br>April 16 <sup>th</sup> Latest |
| Record 1 Day Snow   | 10 inches (1920, 2010)                                                                                   | 9.0 inches (1985)                                                                                       | 6.8 inches (1971)                                                                                       |

Although ice storm data is historically difficult to compile due to the range in how it is measured and classified, the impacts of ice storms on utilities supplying power to tribal citizens can be predicted based on the Sperry-Piltz Utility Ice Damage Index which uses the thickness of ice coatings and windspeed to predict damage to above ground utility lines (Table 3-26).

**Table 3-26: Sperry-Piltz Utility Ice Damage Index for prediction and assessment of damage to power supply lines during an ice storm**

| <b>Ice Index</b> | <b>Radial Ice (inches)</b> | <b>Wind (mph)</b> | <b>Damage and Impact Descriptions</b>                                                                                                                            |
|------------------|----------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>         | <0.25                      | 15-25             | Some localized utility interruptions possible, typically lasting only 1-2 hours maximum                                                                          |
|                  | 0.25-0.50                  | <15               |                                                                                                                                                                  |
| <b>2</b>         | <0.25                      | ≥ 25              | Scattered utility interruptions expected, typically lasting less than 8-12 hours maximum.                                                                        |
|                  | 0.25-0.50                  | 15-25             |                                                                                                                                                                  |
|                  | 0.50-1.00                  | <15               |                                                                                                                                                                  |
| <b>3</b>         | 0.25-0.50                  | ≥ 25              | Numerous utility interruptions with some damage to main feeder lines, expected with outages lasting 1-3 days.                                                    |
|                  | 0.50-0.75                  | 15-25             |                                                                                                                                                                  |
|                  | 0.75-1.00                  | < 15              |                                                                                                                                                                  |
| <b>4</b>         | 0.50-0.75                  | ≥ 25              | Prolonged and widespread utility interruptions, with extensive damage to main distribution lines and high voltage transmission lines. Outages expected 3-5 days. |
|                  | 0.75-1.00                  | 15-25             |                                                                                                                                                                  |
|                  | 1.00-1.50                  | < 15              |                                                                                                                                                                  |
| <b>5</b>         | 0.75-1.00                  | ≥ 25              | Catastrophic damage to entire utility systems. Outages could last from one week to several weeks in some areas.                                                  |
|                  | 1.00-1.50                  | 15-25             |                                                                                                                                                                  |
|                  | >1.50                      | < 15              |                                                                                                                                                                  |

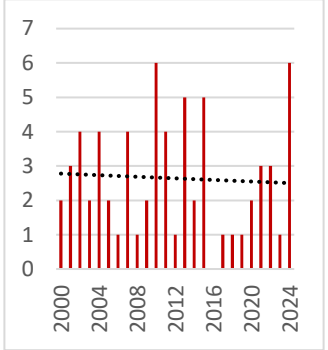
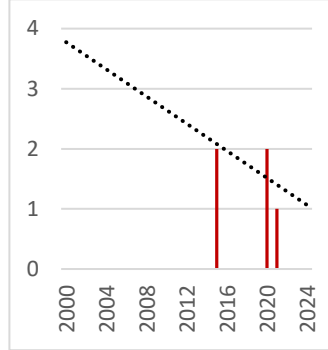
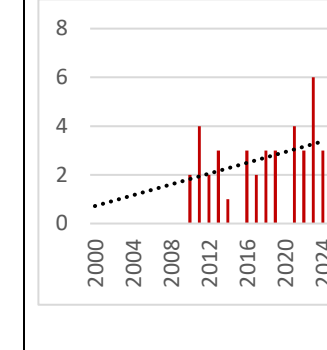
Source: National Weather Service (NWS), Federal Emergency Management Agency (FEMA)

Light to heavy snow can immobilize an area and paralyze communities, strand commuters, stop the flow of supplies, and disrupt emergency services. Accumulations of snow, in rare instances, can collapse buildings and frequently topple trees and power lines. The cost of snow removal, repairing damages, and loss of business can have large economic impacts on cities and towns. Snow and ice can cause damage over a wide area. The ice damage Index (Table X) illustrates damage that may be caused to utilities based on ice thickness and wind speed. Snow and ice frequently cover the area causing road closures and limited travel during winter storm events and ice storms specifically.

## Previous Occurrences

The Fort Sill Apache Tribe has been affected by major ice storms and snowstorms across Oklahoma, New Mexico and Arizona. Table 3-27 documents storms for SW Oklahoma (Caddo and Comanche Counties) from 2000-2024, Luna County, NM (2015-2024), and Cochise County, AZ from 2010-2024. Documented ice storms are present in Oklahoma only, with New Mexico and Arizona reporting heavy snowfall for winter storm events. Records not being found indicates that the data was incomplete, rather than no storms having occurred.

| <b>Table 3-27: Summary of Reported Winter Weather Events for SW Oklahoma, New Mexico, and SE Arizona (* indicates ice storm)</b> |                                                                        |                                    |                                              |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------|----------------------------------------------|
|                                                                                                                                  | <b>SW Oklahoma</b>                                                     | <b>New Mexico</b>                  | <b>SE Arizona</b>                            |
| <b>Reporting Office(s)</b>                                                                                                       | <b>Southern Caddo County<br/>Comanche County</b>                       | <b>Luna County<br/>(2015-2024)</b> | <b>Cochise County<br/>(2010-2024)</b>        |
| 2000-2004                                                                                                                        | 2 (2000)*<br>3 (2001)*<br>4 (2002)**<br>2 (2003)<br>4 (2004)           | Records not found                  | Records not found                            |
| 2005-2010                                                                                                                        | 2 (2005)<br>1 (2006)<br>4 (2007)*<br>1 (2008)<br>2 (2009)<br>6 (2010)* | Records not found                  | 2 (2010)                                     |
| 2011-2015                                                                                                                        | 4 (2011)<br>1 (2012)<br>5 (2013)*<br>2 (2014)<br>5 (2015)*             | 2 (2015)                           | 4 (2011)<br>2 (2012)<br>3 (2013)<br>1 (2014) |

| Table 3-27: Summary of Reported Winter Weather Events for SW Oklahoma, New Mexico, and SE Arizona (* indicates ice storm) |                                                                                    |                                                                                     |                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                                                                                                                           | SW Oklahoma                                                                        | New Mexico                                                                          | SE Arizona                                                                           |
| Reporting Office(s)                                                                                                       | Southern Caddo County<br>Comanche County                                           | Luna County<br>(2015-2024)                                                          | Cochise County<br>(2010-2024)                                                        |
| 2016-2020                                                                                                                 | 1 (2017)*<br>1 (2018)*<br>1 (2019)<br>2 (2020)*                                    | 2 (2020)                                                                            | 3 (2016)<br>2 (2017)<br>3 (2018)<br>3 (2019)                                         |
| 2021-2024                                                                                                                 | 3 (2021)<br>3 (2022)<br>1 (2023)<br>6 (2024)                                       | 1 (2021)                                                                            | 4 (2021)<br>3 (2022)<br>6 (2023)<br>3 (2024)                                         |
| Total Events                                                                                                              | 66 Winter Storms<br>11 Ice Storms                                                  | 5 Winter Storms<br>No documented ice storms                                         | 39 Winter Storms<br>No documented ice storms                                         |
| Frequency of Winter Storms Over Time                                                                                      |  |  |  |

Sources: National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI)

## Probability of Future Events

In Oklahoma, the Fort Sill Chiricahua Warm Springs Apache Tribe has been impacted by winter weather every year since 2000 except for 2016, and there have been 17 years in which there was more than one significant storm per season. 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 seasonally, over time. In recent years there has been more damage from ice storms than from snowfall. Winter Storm (Ice, Sleet, Snow)

Years consisting of many snowfall days declined significantly across the southern United States between 1930 and 2007. Models suggest that although the number of snowfall events will likely continue to decrease given overall atmospheric warming, when snow does occur, accumulations will be greater due to increases in atmospheric moisture (Krasting et al. 2013). There is significant

uncertainty surrounding the future of ice storms in Oklahoma. Observational data limitations and the complexity of the events themselves make it difficult to determine with much specificity whether patterns have and/or will change. Models show that by mid-century there will generally be a northward shift of the rain, sleet and snow dividing line across the central United States. This shift will add to the complexity of determining precipitation type for winter events (rain, ice, or snow) in Oklahoma, however, the increase in atmospheric moisture may bring an increase to the amount of precipitation that does fall (Easterling et al. 2017). The probability of future winter storms in the Fort Sill Apache Tribe is **“LIKELY.”** (See Table 3-1)

## **Vulnerability and Impact**

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Citizens of the Fort Sill Apache Tribe have been plagued with a series of major ice and snowstorms during the last decade. Ice storms typically last several hours to days with heavy ice accumulations. The icy cover can down power lines and limbs, causing millions of dollars in damage and widespread power outages. These events which generally last several days are extremely paralyzing to communities and the citizens affected. Table X summarizes examples of winter storms that resulted in property damage in SW Oklahoma.

Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chill. Strong winds with these intense storms can knock down trees, utility poles, and power lines. Heavy accumulations of ice can also bring down trees, electrical wires, telephone poles and lines, and communication towers. Electric and telephone lines in The Fort Sill Apache Tribe are above ground. 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 the elderly, handicapped or very young, it is necessary to move them to shelters where they can stay until they return home. Even though shelters are made available, most plan 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.

**Table 3-28: Summary of Severe Winter Weather Events in SW Oklahoma (Caddo/Comanche Counties) with reported property damage greater than \$40,000**

| Type         | Date (source)                                  | Property Damage                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------|------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ice Storm    | 12/26/2000<br>Emergency Manager                | \$400,000<br>6 indirect fatalities | The worst ice storm in decades affected much of south central and southeast Oklahoma with a mixture of freezing rain and sleet accumulating to a depth of 1 to 2 inches. Where the precipitation fell as mainly freezing rain, ice accumulations were about 1 inch. Damage to property was extensive. Thousands of homes and vehicles were damaged by falling trees and ice, while thousands of additional trees and utility poles were damaged or destroyed. Tens of thousands of residents were left without electricity for nearly a week, while thousands of residents were without water or phone service for several days. Statewide, nearly 170,000 residents were without electricity on the 26th and 27th. |
| Winter Storm | 1/12/2007<br>Emergency Manager / Amateur Radio | \$45,000<br>14 indirect fatalities | A strong winter storm crippled much of Oklahoma from January 12th through the 14th, spreading snow, freezing rain and sleet across the state. Many trees and powers lines were downed with thousands of residents without power. The severe cold that accompanied this storm also allowed for water main breaks in Clinton and Lawton. The prolonged period of wintry precipitation closed airports, schools, malls, and other places of business. The slick and hazardous roads caused many schools to remain closed for several days after the winter precipitation had ended.                                                                                                                                    |
| Ice Storm    | 11/27/2015<br>Utility Company / Mesonet        | \$2,153,000                        | An upper low moving in combined with abundant moisture from the gulf to produce a four-day rain event from the 26th through the 29th. When strong front came down Thursday night (11/26), temperatures began to drop below freezing and the rain shifted to freezing rain. Freezing rain continued into early Sunday morning as temperatures continued to hover in the 20s to lower 30s. Ice knocked out power for 14,397 customers. Observed 1.25 inches of ice accumulation. Damage estimates are from local power cooperatives.                                                                                                                                                                                  |
| Ice Storm    | 12/27/2015<br>Utility Company                  | \$5,578,000                        | A cold front moved through the area that night, gradually bringing the area below freezing. The 27th saw precipitation transition to sleet and freezing rain. Combined with high winds, this caused extensive damage to trees and power lines. By the 28th, all of the precipitation had turned to snow. Damage estimates reported by local power companies                                                                                                                                                                                                                                                                                                                                                         |

Source: National Weather Service (NWS), National Center for Environmental Information (NCEI)

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 elderly people are most susceptible. Freezing temperatures can cause severe damage to crop and other critical vegetation. Water pipes may freeze and burst in homes or 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 from 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. When schools are forced to close due to road conditions or building shortfalls, it often creates hardship for single parents or parents who work outside the home to get childcare at the last minute. In some cases, parents must take off work which can cause loss of income. Additional vulnerabilities and impacts can be found in Appendix C - Critical Facilities.

## **Conclusion**

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Although the frequency of winter storms including ice storms has declined over time, the severity of these storms to impact sensitive systems and populations has increased. Both direct and indirect impacts put Fort Sill Apache Tribal citizens at risk through the loss of power, communications, transportation, and loss of heat during prolonged winter storms. There are direct and indirect economic impacts associated with the rising reported property damage caused by these storms to power distribution systems as well as loss of income due to closures and travel restrictions.

## **References**

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National Weather Service (NWS)  
National Center for Environmental Information (NCEI)  
Trajectory sensitivity of the transient climate response to carbon emission (JP Kastring et al 2013)  
Climate Science Special Report: Forth National Climate Assessment (D.R. Easterling et al 2017)

# Summary of Impacts of Hazardous Weather by State

The Fort Sill Apache Tribe is in southwestern Oklahoma, southwestern New Mexico, and southeastern Arizona. The population live in a variety of settings, ranging from urban, suburban, and rural areas. There have been 5,028 disaster declarations nationally from May 1953 to April 2025, but no tribal nations within Oklahoma have made a formal disaster declaration. Rather, disaster declarations in Oklahoma (232 thus far) have been made on a county or state-wise basis.

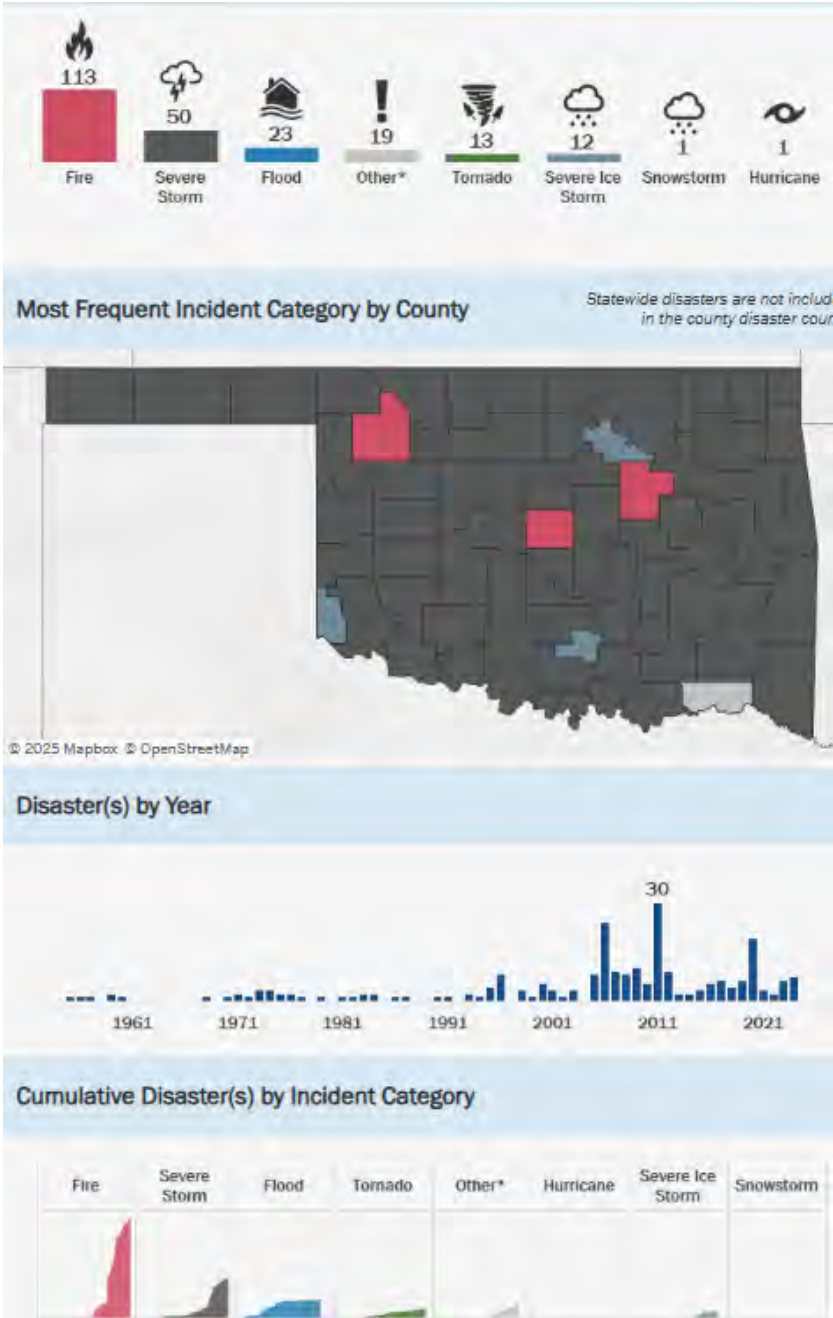


Figure 3-28: FEMA disaster declaration trends by state: Oklahoma 1953-2025

New Mexico reported 119 disaster declarations between May 1953 and April 2025, and they are summarized in Figure 3-29.

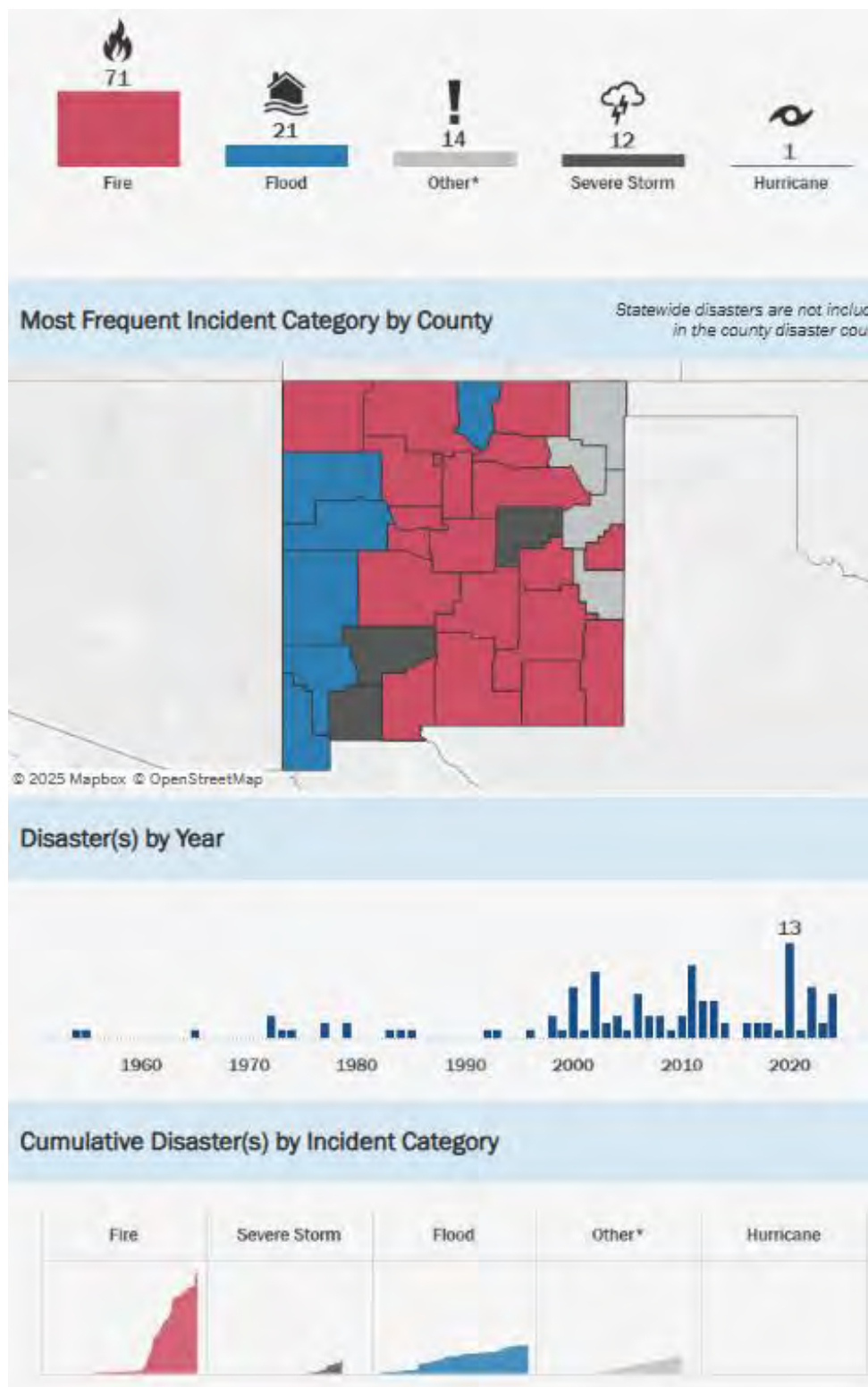


Figure 3-29: FEMA disaster declaration trends by state: New Mexico 1953-2025

Arizona has 117 declared disasters from May 1953 to April 2025, and they are summarized in Figure 3-30.

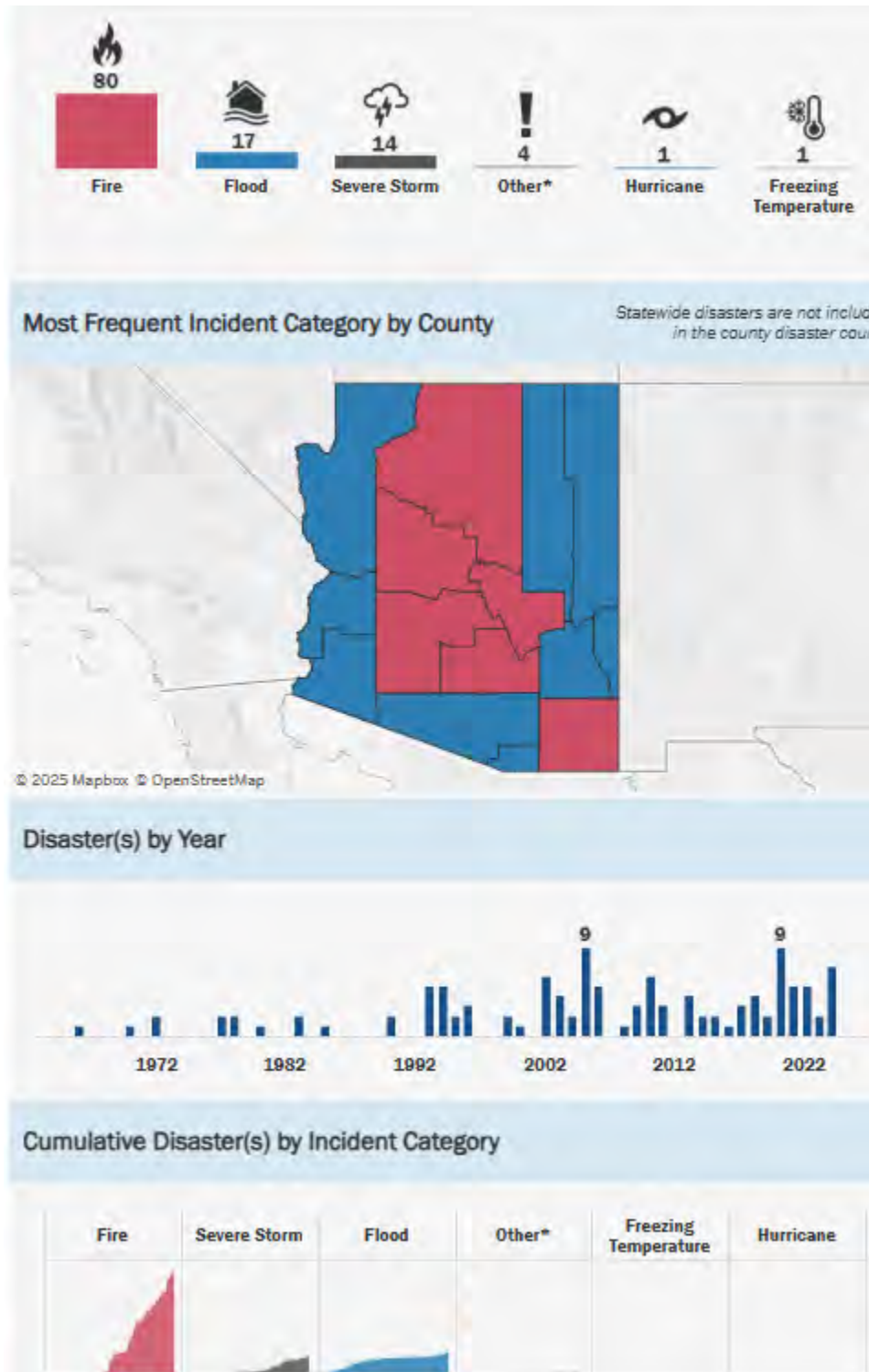


Figure 3-30: FEMA disaster declaration trends by state: Arizona 1953-2025

**Table 3-29: Summary of FEMA Declared Disasters for SW Oklahoma, SW New Mexico, and SE Arizona by County (5/1953 – 4/2025)**

|                                    | <b>SW Oklahoma</b>               | <b>SW New Mexico</b> | <b>SE Arizona</b>     |
|------------------------------------|----------------------------------|----------------------|-----------------------|
|                                    | <b>Caddo and Comanche County</b> | <b>Luna County</b>   | <b>Cochise County</b> |
| Severe Storms                      | 23                               | 3                    | 2                     |
| Severe Ice Storms                  | 11                               |                      |                       |
| Fire                               | 7                                | 1                    | 5                     |
| Flood                              | 6                                |                      | 3                     |
| Tornado                            | 3                                |                      |                       |
| Biological                         | 2                                | 2                    |                       |
| Hurricane                          | 1                                | 1                    | 1                     |
| Other (Drought)                    |                                  |                      | 3                     |
| <b>Total Disaster Declarations</b> | <b>53 Total</b>                  | <b>7 Total</b>       | <b>14 Total</b>       |

Note: Statewide disasters are not included in the county disaster count. (Source: FEMA)

For all three states, disaster declarations are increasing over time. Fire, Severe Storms, and floods are disaster categories that all three states with tribal lands of interest have in common. Oklahoma also includes tornadoes and severe ice storms within its summary, both showing trends with increasing disaster declarations over time. Disaster declarations by county show similar trends to disaster declaration by state. Oklahoma has most disaster declarations (53) when compared with Luna County, NM (7 declarations) and Cochise County, AZ (14 declarations).

## **Long range growth and post disaster redevelopment**

The Fort Sill Apache Tribe is in southwestern Oklahoma, southwestern New Mexico, and southeastern Arizona. The population live in a variety of settings, ranging from urban, suburban, and rural areas. The Tribal membership is slowly growing and does not expect much change in residential geographic footprint. The potential growth of tribal properties is anticipated mainly in Luna County, NM at the Fort Sill Chiricahua Warm Springs Apache homelands, with tribal investment and eventual housing developments in Akela, NM and in the Apache, OK housing district. The Cochise County property is forested and undeveloped. There are plans for habitat and wildlife projects in this area and increasing communication with Wi-Fi for remote monitoring.

## **Analyzing development trends**

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Review of past development and growth in the Fort Sill Apache Tribe, it is likely that the growth pattern during the foreseeable future will be slow over time. Residential growth for the area is affected by the availability of sewer, water, electric utilities and roads. Many tribal members live in urban areas although some live in rural areas.

Any post disaster redevelopment caused by an event would follow normal development procedures. The availability of utilities would show very little permanent change in the redevelopment criteria although loss of businesses and homes in the area could be affected negatively by a significant event. Following a disaster people often leave and do not return but the effects of this would not be anticipated to be long lasting. The availability of tribal property would also influence redevelopment which would occur in the same geographic locations.

## **MANMADE HAZARDS**

### **HAZARD PROFILE**

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#### **UNAUTHORIZED ENTRY:**

Unauthorized entry onto tribal property can be the gateway for a number of potentially harmful activities, including criminal elements evading authorities or seeking to engage in criminal activity or unwelcome individuals or groups encroaching onto tribal property unannounced. Physical barriers, surveillance, and alarm systems can enable the Tribe to maintain some sovereign control over its properties and activities. These measures can also prevent stray livestock from encroaching and causing traffic hazards, which has been observed at the Tribe's Reservation recently with cattle from nearby grazing leases. The Tribe's properties near the Mexican border are in rural areas, where facilities can be used to hide people, drugs, or other unwanted items. These sites can also be used to pass through undetected if proper measures aren't used. Any accidents could place the Tribe in a liable position. The ability for tribal facilities to close gates or fix cameras on a single entry can also aid in the apprehension of escaping fugitives or kidnappers or to keep them out. This is especially relevant along major highways, such as Interstate 10.

## **HAZARD PROFILE**

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### **HAZARDOUS MATERIAL ACCIDENTS:**

Hazardous material accidents are manmade hazards that has the potential to cause harm to lives and property at the Tribe. Tribal employees have the responsibility to respond competently to such emergencies as they occur. Training and exercises guide emergency managers on proper safety measures. Onsite uses of hazardous materials must follow regulations for storage and use that protect occupants and workers. Maintaining stocks of PPE and cleanup materials is essential, as well as Safety Data Sheets. Both our Reservation and Tribal Complex are situated along highways and railroads which serve as hazmat transportation routes.

### **CONCLUSION:**

Unauthorized entry is a vehicle for various manmade hazards that can be avoided by asserting tribal sovereignty with access control and surveillance measures. This is especially true at regularly populated facilities, two of which have public water treatment systems.

While nearby hazardous materials accidents on roads or railway are unavoidable by the Tribe, the Tribe's decision to mitigate severity through training and other measures can save lives and property.

## **CHAPTER FOUR - MITIGATION STRATEGIES**

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### **LOCAL HAZARD MITIGATION GOALS**

The Fort Sill Apache Tribe Hazard Mitigation Plan goals were defined at the first team meeting and reviewed following the risk assessment studies. The goals listed below were determined to reflect the objectives of The Fort Sill Apache Tribe in reducing the impact of hazards throughout The Fort Sill Apache Tribe. The goals and suggested actions were developed by the Hazard Mitigation Planning Team with the assistance of representatives of each entity. The selected projects should address these listed goals:

Goal 1: Protection of lives and property

Goal 2: Improve partnership with the counties and non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.

- Goal 3: Alternative power for critical facilities/infrastructure
- Goal 4: Develop Continuity of Government capability
- Goal 5: Protection of cultural and heritage artifacts/assets

During the risk assessment phase of the planning process The Fort Sill Apache Emergency Management Agency (FSAEMA) evaluated various mitigation strategies that could be feasible for use throughout The Fort Sill Apache Tribal lands of interest in Oklahoma, New Mexico, and Arizona. Historical references from residents concerning flooding and specific locations were discussed. Other reliable local historical information available was provided through the members of FSAEMA, federally declared disasters and National Center for Environmental Information (NCEI) records. The selection of the projects was based on the cost effectiveness of the action and what could be done in The Fort Sill Apache Tribe.

### **FSA EXISTING POLICIES, PROGRAMS, AND RESOURCES**

No mitigation aid plans have been developed to date prior to this one for the Fort Sill Apache Tribe.

The Fort Sill Apache Emergency Management Agency (FSAEMA) exists to develop and seek funding for the implementation of hazard mitigation efforts for all entities under the Tribe's umbrella. There is one Emergency Manager for the Economic Development Authority properties (currently vacant/ TBD) and one Emergency Manager and Deputy Emergency Manager for the Tribal Government properties. FSAEMA also includes the Tribal Chairperson, Finance Director, Self Governance Director, Environmental Programs, and Community Health Representative.

Current resources available to the Fort Sill Apache Tribe for mitigation include its Emergency Operations Plans for the Tribal Complex, the Apache Casino Hotel, and the Chiricahua Apache Plaza at the Reservation at Akela, NM. The Tribal Government's COOP is currently in need of updating.

### **NFIP PARTICIPATION AND PERMITTING IN FLOODPLAIN**

The Fort Sill Apache Tribe itself has never been mapped although the counties in which The Fort Sill Apache Tribe lands are located have. FSAT County is a member in good standing in the NFIP. The Fort Sill Apache Tribe has no permitting process to restrict building on tribal lands.

Although The Fort Sill Apache Tribe is not a member of the NFIP, some action projects are geared towards the reduction of flooding and early warning throughout The Fort Sill Apache Tribe and surrounding communities. The action items designed to reduce impacts due to flooding within The Fort Sill Apache Tribal Lands are:

- Regular Stream Monitoring (quarterly)
- Drought & Flood Mitigation Planning (ongoing)

## **MITIGATION ACTION PLAN**

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The Fort Sill Apache Emergency Management Agency (FSAEMA) is charged with determining action goals and funding direction. Tribal leaders are included in this entity. As funding becomes available, whether through FEMA or other sources, FSAEMA will ask emergency managers to apply for appropriate project assistance. This assistance would be managed by the emergency manager in conjunction with FSAEMA parties, such as finance, property management, IT, or other representatives. FSAEMA will monitor project progress and address issues that may arise. This allows for flexibility, where parties that are not involved in a project do not have to be present to address all issues that arise, yet it keeps the whole organization informed on progress. Projects that involve property disturbance will require NEPA documentation. The Environmental Programs office will be responsible for addressing this requirement. Funding accounts will be managed by the Tribe's Finance Department and/or Mountain Management, LLC, the construction arm of the Economic Development Authority. This is dependent on the application of the funding and which area of the Tribe's umbrella benefits from the mitigation. The funding source stipulations and the Tribe's executive plans will determine the time schedule for project initiation and completion.

## **MITIGATION PROJECTS**

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The Mitigation Projects for The Fort Sill Apache Tribe are projects identified by the Fort Sill Apache Emergency Management Agency (FSAEMA). The discussion and ultimate decision on which projects to include considered the number of people affected, cost, and safety concerns. The priorities shown reflect the desires of The Fort Sill Apache Tribe. When funds become available, the order of implementation will depend upon the amount of funds available and category from which the funds are designated by the funding source. Also, the chief elected officials will greatly influence these decisions.

Many of the mitigation projects identified would offer multiple hazard relief. Outdoor warning devices most certainly would be significant during tornado warning periods. They could also be used for flash flood alerts if so designated and planned for. Mass notification systems can be used

for communicating alerts and warnings for all hazards. Impact resistant window film while designed to prevent objects from penetrating can also protect against extreme heat. Above ground storm shelter at the Tribe's headquarters would protect vulnerable individuals, such as elders and the handicapped, during events. Fencing and access control measures will protect properties and personnel. Communications systems would connect rural employees to needed authorities and responders. Many of the proposed actions provide multiple hazard protection and prevention uses.

All mitigation actions are listed in the order they were prioritized. FSAEMA used the STAPLEE method as described in the FEMA 386 How-to-Guides and is shown in detail in Chapter Five. It should be noted that some mitigation actions received the same score on the STAPLEE scale and are further prioritized according to the score received on the economic criteria. The numbers shown on action items are BOTH priority rankings and project numbers.

**Table 4-1: Action Project 1 – Community Safe Rooms**

|                               |                                                                                                                                                                                                                     |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install community safe rooms throughout the Fort Sill Apache Tribe to provide protection for First responders and citizens of the Fort Sill Apache Tribe during severe weather events.                              |
| <b>Hazards Addressed</b>      | High Winds, Tornado                                                                                                                                                                                                 |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                              |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                                |
| <b>Scheduled Completion</b>   | 36 months per facility with approved funding                                                                                                                                                                        |
| <b>Cost Estimate</b>          | \$250,000 - \$1,000,000 per location                                                                                                                                                                                |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                        |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with the counties and non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Protection of cultural and heritage artifacts/assets |

**Table 4-2: Action Project 2 – Permanent Fencing**

|                               |                                                                                                                                                        |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install permanent property fencing with automatic gate to keep out stray livestock, criminal activity, control access, and assert sovereign boundaries |
| <b>Hazards Addressed</b>      | Unauthorized Entry                                                                                                                                     |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                 |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                   |
| <b>Scheduled Completion</b>   | 10 months with approved funding                                                                                                                        |
| <b>Cost Estimate</b>          | \$300,000                                                                                                                                              |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                           |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Protection of cultural and heritage artifacts/assets                                                               |

| <b>Table 4-3: Action Project 3 – Mass Notification System</b> |                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>                                            | Acquire and make use of a mass notification system to provide a means to contact citizens and others in a very short period of an impending emergency or hazardous condition.                                                                                          |
| <b>Hazards Addressed</b>                                      | Dam Failure, Drought, Earthquake, Extreme Heat, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                                                                                   |
| <b>Jurisdictions Affected</b>                                 | Fort Sill Apache Tribe                                                                                                                                                                                                                                                 |
| <b>Responsible Party</b>                                      | Emergency Management                                                                                                                                                                                                                                                   |
| <b>Scheduled Completion</b>                                   | 12-month subscriptions with funding                                                                                                                                                                                                                                    |
| <b>Cost Estimate</b>                                          | \$90,000                                                                                                                                                                                                                                                               |
| <b>Funding Sources</b>                                        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                                                           |
| <b>Goal Addressed</b>                                         | Protection of lives and property<br>Improve partnership with the counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

| <b>Table 4-4: Action Project 4 – Surge Protector/UPS</b> |                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>                                       | Install surge protection – battery backup devices on all electronic systems in critical facilities to protect computers and critical information from loss during lightning and other power outage events where power may be lost for extended periods of time or flicker on and off repeatedly. |
| <b>Hazards Addressed</b>                                 | Dam Failure, Earthquake, Extreme Heat, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                                                                                                                      |
| <b>Jurisdictions Affected</b>                            | Fort Sill Apache Tribe                                                                                                                                                                                                                                                                           |
| <b>Responsible Party</b>                                 | Emergency Management                                                                                                                                                                                                                                                                             |
| <b>Scheduled Completion</b>                              | As locations are identified                                                                                                                                                                                                                                                                      |
| <b>Cost Estimate</b>                                     | \$800 per location                                                                                                                                                                                                                                                                               |
| <b>Funding Sources</b>                                   | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                                                                                     |
| <b>Goal Addressed</b>                                    | Protection of lives and property<br>Alternative power for critical facilities/infrastructure<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets                                                                                              |

**Table 4-5: Action Project 5 – Radio Communication Systems**

|                               |                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install radio communication systems to provide adequate response capability for employees at sites within the Fort Sill Apache Tribe.   |
| <b>Hazards Addressed</b>      | Dam Failure, Drought, Earthquake, Extreme Heat, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm, Criminal activity |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe and associated homes nationwide                                                                                  |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                    |
| <b>Scheduled Completion</b>   | 9 months to purchase, install, and train, with approved funding                                                                         |

**Table 4-6: Action Project 6 – Water Wells**

|                               |                                                                                                                                                                                                                                                                    |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Drill new water wells to provide an adequate source of water for wildland firefighting and as an additional source of water where needed.                                                                                                                          |
| <b>Hazards Addressed</b>      | Dam Failure, Drought, Earthquake, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                                                                                             |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                                                                             |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                                                                               |
| <b>Scheduled Completion</b>   | 18 months with approved funding                                                                                                                                                                                                                                    |
| <b>Cost Estimate</b>          | Cost will vary with well location                                                                                                                                                                                                                                  |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                                                       |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-7: Action Project 7 – Water Towers**

|                               |                                                                                                                                                                                                                  |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install water towers in water system to provide continued short time water flow during power outages and to serve as a filling station for firefighting apparatus lessening the burden on overtaxed water lines. |
| <b>Hazards Addressed</b>      | Dam Failure, Drought, Earthquake, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                                           |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                           |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                             |
| <b>Scheduled Completion</b>   | 30 months with approved funding                                                                                                                                                                                  |

|                        |                                                                                                                                                                                                                                                                    |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cost Estimate</b>   | Cost will vary with location and water supply needs and capabilities                                                                                                                                                                                               |
| <b>Funding Sources</b> | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                                                       |
| <b>Goal Addressed</b>  | Protection of lives and property<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-8: Action Project 8 – Alternate Power Supply**

|                               |                                                                                                                                                                                                     |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install backup generators on critical facilities to facilitate normal operations during periods of power outages.                                                                                   |
| <b>Hazards Addressed</b>      | Dam Failure, Earthquake, Extreme Heat, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                         |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                              |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                |
| <b>Scheduled Completion</b>   | 18 months with approved funding                                                                                                                                                                     |
| <b>Cost Estimate</b>          | \$25,000 - \$90,000 depending on facility and power needs                                                                                                                                           |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe, BIA                                                                                                                                                                   |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Alternative power for critical facilities/infrastructure<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-9: Action Project 9 – NIMS/HAZWOPER TRAINING**

|                               |                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Provide training for employees of the Fort Sill Apache Tribe and its entities, precautions to take, and the proper response to a hazard event. |
| <b>Hazards Addressed</b>      | Dam Failure, Drought, Earthquake, Extreme Heat, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm, Manmade Hazards          |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                         |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                           |
| <b>Scheduled Completion</b>   | 12 months with funding                                                                                                                         |
| <b>Cost Estimate</b>          | \$50,000                                                                                                                                       |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                   |

|                       |                                                                                                                                                                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Goal Addressed</b> | Protection of lives and property<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 4-10: Action Project 10 – Safe Room / EOC**

|                               |                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Construct a safe room to house the emergency operations center to provide safety for personnel and continued operations during a high wind/tornado event. |
| <b>Hazards Addressed</b>      | High Winds, Tornado                                                                                                                                       |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                    |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                      |
| <b>Scheduled Completion</b>   | 30 months with approved funding                                                                                                                           |
| <b>Cost Estimate</b>          | \$200,000                                                                                                                                                 |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                              |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Develop Continuity of Government capability                                                                           |

**Table 4-11: Action Project 11 – Scene Lighting**

|                               |                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Purchase telescoping scene lighting to provide a source of lighting for emergency operations during and following a hazard event.                                                                                                                                                                                              |
| <b>Hazards Addressed</b>      | Dam Failure, Earthquake, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                                                                                                                                                                  |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                                                                                                                                         |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                                                                                                                                           |
| <b>Scheduled Completion</b>   | Three months with funding                                                                                                                                                                                                                                                                                                      |
| <b>Cost Estimate</b>          | \$1500 ea.                                                                                                                                                                                                                                                                                                                     |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                                                                                                                   |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Alternative power for critical facilities/infrastructure<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-12: Action Project 12 – Outdoor Warning Devices**

|                               |                                                                                                                                                                                                                  |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Outdoor warning system at complex and appropriate populated areas throughout the Nation. Upgrade current devices to newer, technologically advanced systems.                                                     |
| <b>Hazards Addressed</b>      | Dam Failure, Floods, High Winds, Tornado, Wildfire                                                                                                                                                               |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                           |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                             |
| <b>Scheduled Completion</b>   | 24 months with approved funding                                                                                                                                                                                  |
| <b>Cost Estimate</b>          | \$30,000 per device                                                                                                                                                                                              |
| <b>Funding Sources</b>        | HMGP and Fort Sill Apache Tribe                                                                                                                                                                                  |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with the counties and non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas. Protection of cultural and heritage artifacts/assets |

**Table 4-13: Action Project 13– Safe Room Rebate Program**

|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| <b>Description</b>            | Implement a safe room rebate program for Fort Sill Apache Tribe members.                 |
| <b>Hazards Addressed</b>      | High Winds, Tornado                                                                      |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                   |
| <b>Responsible Party</b>      | Emergency Management                                                                     |
| <b>Scheduled Completion</b>   | 36 months per installation                                                               |
| <b>Cost Estimate</b>          | \$2000 - \$3000 per safe room                                                            |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                             |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Protection of cultural and heritage artifacts/assets |

**Table 4-14: Action Project 14 – Retrofitting Structures to Strengthen Resiliency**

|                          |                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Description</b>       | Conduct retrofitting measures on existing facilities to increase resistance to damage from natural hazards. |
| <b>Hazards Addressed</b> | Earthquake, Hail, High Winds, Tornado, Winter Storm                                                         |

|                               |                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                  |
| <b>Responsible Party</b>      | Tribal Construction Company                                                                                                             |
| <b>Scheduled Completion</b>   | As needed with approved funding                                                                                                         |
| <b>Cost Estimate</b>          | Unknown                                                                                                                                 |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe, Local utility providers                                                                                   |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-15: Action Project 15 – Brush Removal**

|                               |                                                        |
|-------------------------------|--------------------------------------------------------|
| <b>Description</b>            | Remove brush and trees as fuel reduction for wildfires |
| <b>Hazards Addressed</b>      | Wildfire                                               |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                 |
| <b>Responsible Party</b>      | Emergency Management                                   |
| <b>Scheduled Completion</b>   | On-going and continuing                                |
| <b>Cost Estimate</b>          | \$10,000 per year with approved funding                |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                           |
| <b>Goal Addressed</b>         | Protection of lives and property                       |

**Table 4-16: Action Project 16 – Remote Communications Devices**

|                               |                                                                                                                                        |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Purchase hotspots, PTT systems with GPS, and satellite phones with service subscriptions for emergency communications in remote areas. |
| <b>Hazards Addressed</b>      | Wildfire; Flooding; Winter Storms                                                                                                      |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                 |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                   |
| <b>Scheduled Completion</b>   | As needed                                                                                                                              |
| <b>Cost Estimate</b>          | Cost will vary depending on type of device and subscription                                                                            |

|                        |                                                                                                                                                |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Funding Sources</b> | HMGP, Fort Sill Apache Tribe                                                                                                                   |
| <b>Goal Addressed</b>  | Protection of lives and property<br>Development of Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-17: Action Project 17 – Low Water Crossing/ Drainage Device**

|                               |                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install/replace tin horns and bridges as needed to reduce flooding, road wash outs, and other damages.                                  |
| <b>Hazards Addressed</b>      | Dam Failure, Floods                                                                                                                     |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                  |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                    |
| <b>Scheduled Completion</b>   | As needed                                                                                                                               |
| <b>Cost Estimate</b>          | Cost will vary with location and needs                                                                                                  |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                            |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-18: Action Project 18 – Emergency Cultural Item Shelter**

|                               |                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install a safe room to store sensitive cultural items during hazardous events to protect from loss or damage. |
| <b>Hazards Addressed</b>      | Floods, Tornado, Wildfire, Winter Storm                                                                       |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                        |
| <b>Responsible Party</b>      | Emergency Management; Cultural                                                                                |
| <b>Scheduled Completion</b>   | Three months with funding                                                                                     |
| <b>Cost Estimate</b>          | \$75,000 ea.                                                                                                  |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                  |

**Table 4-19: Action Project 19 – Stream Flow Monitoring Devices**

|                               |                                                                                                                                                                                                                         |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install water level monitoring devices in waterways as needed to provide early flood warnings in the event of a dam breach or imminent flooding from upstream water runoff.                                             |
| <b>Hazards Addressed</b>      | Dam Failure, Floods                                                                                                                                                                                                     |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                                  |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                                    |
| <b>Scheduled Completion</b>   | As locations are identified                                                                                                                                                                                             |
| <b>Cost Estimate</b>          | Unknown                                                                                                                                                                                                                 |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                            |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with the counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Protection of cultural and heritage artifacts/assets |

**Table 4-20: Action Project 20 – Traveler Message Boards**

|                               |                                                                                                                                                                                                    |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Acquire stationary and portable electronic information signs for warning the motoring public of hazardous or impending hazard conditions such as flooding, wildfire, winter storm conditions, etc. |
| <b>Hazards Addressed</b>      | Dam Failure, Extreme Heat, Floods, Hail, High Winds, Tornado, Wildfire, Winter Storm                                                                                                               |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                             |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                               |
| <b>Scheduled Completion</b>   | 18 months per identified location with approved funding                                                                                                                                            |
| <b>Cost Estimate</b>          | \$500 - \$15,000 per location depending on method chosen                                                                                                                                           |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                       |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.                                        |

**Table 4-21: Action Project 21 –Xeriscaping**

|                               |                                                                                                                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Use of native plants for landscaping. These plants are better suited to withstand Oklahoma weather extremes and/or desert Southwest conditions and reduce the need for watering during drought periods.                                 |
| <b>Hazards Addressed</b>      | Drought, Extreme Heat, Hail, Winter Storm                                                                                                                                                                                               |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                                                  |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                                                    |
| <b>Scheduled Completion</b>   | Ongoing                                                                                                                                                                                                                                 |
| <b>Cost Estimate</b>          | Minimal, Unknown                                                                                                                                                                                                                        |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                            |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Conserve moisture<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas<br>Protection of cultural and heritage artifacts/assets |

**Table 4-22: Action Project 22 – Lightning Detection Equipment**

|                               |                                                                                                                                                                            |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Install lightning detection systems at locations throughout the Fort Sill Apache Tribe where outdoor activities occur to provide protection to participants and attendees. |
| <b>Hazards Addressed</b>      | Lightning                                                                                                                                                                  |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                     |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                       |
| <b>Scheduled Completion</b>   | Continuing as funding becomes available and need arises                                                                                                                    |
| <b>Cost Estimate</b>          | \$7500 per location                                                                                                                                                        |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                               |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.                |

**Table 4-23: Action Project 23 – Damage Resistant Glass**

|                               |                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Provide damage-resistant glass replacements and/or install impact resistant window film on critical facilities.                         |
| <b>Hazards Addressed</b>      | Earthquake, Extreme Heat, Hail, High Winds, Tornado                                                                                     |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                  |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                    |
| <b>Scheduled Completion</b>   | 18 months per facility with approved funding                                                                                            |
| <b>Cost Estimate</b>          | \$2500 - \$20,000 depending on facility                                                                                                 |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                            |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

**Table 4-24: Action Project 24 – NOAA Weather Radio Program**

|                               |                                                                                                                                                                                                                                                                        |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>            | Purchase, program and distribute NOAA weather radios to citizens of the Fort Sill Apache Tribe.                                                                                                                                                                        |
| <b>Hazards Addressed</b>      | Dam Failure, Drought, Earthquake, Extreme Heat, Floods, Hail, High Winds, Lightning, Tornado, Wildfire, Winter Storm                                                                                                                                                   |
| <b>Jurisdictions Affected</b> | Fort Sill Apache Tribe                                                                                                                                                                                                                                                 |
| <b>Responsible Party</b>      | Emergency Management                                                                                                                                                                                                                                                   |
| <b>Scheduled Completion</b>   | Ongoing and continuing as funding becomes available                                                                                                                                                                                                                    |
| <b>Cost Estimate</b>          | \$50.00 per radio                                                                                                                                                                                                                                                      |
| <b>Funding Sources</b>        | HMGP, Fort Sill Apache Tribe                                                                                                                                                                                                                                           |
| <b>Goal Addressed</b>         | Protection of lives and property<br>Improve partnership with the counties and the non-tribal communities among the Fort Sill Apache Tribe jurisdictional areas.<br>Develop Continuity of Government capability<br>Protection of cultural and heritage artifacts/assets |

## CHAPTER FIVE

### Prioritization

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The Fort Sill Apache Tribe Hazard Mitigation Planning Team identified several hazard mitigation projects for the Hazard Mitigation Plan. These projects, along with the responsible agency, the funding source, and their expected impact are listed in Chapter Four.

The Team recognizes that its unique geographic footprint and limited size place high importance on connectedness via communication. It also recognizes its interdependence on surrounding jurisdictions and responders, making it essential to be capable of coordinating with them. The rural nature of our locations justifies hardening soft targets and asserting boundaries. The public the Tribe hosts relies on the Tribe to provide protection from hazards that arise. This scenario is the guiding hand behind the selection and prioritization of these projects.

The following tables show the method in which the mitigation action items were prioritized. The FSAEMA used the STAPLEE method as described in FEMA 386 How-To-Guides to prioritize mitigation action items for The Fort Sill Apache Tribe.

The team members used a scoring system under each category for social, technical, administrative, political, legal, economical, and environmental concerns. Each category is graded on a scale of zero through three, zero being not favorable, one being not applicable, and three being the most favorable. All projects were tallied and given a score. The highest number is listed as priority number one and on down the line; however, there are several projects that have the same overall score and are further prioritized by their emphasis from leadership in FSAEMA meeting discussions. The projects will be chosen later by fund availability, public interest, and political interest and other deciding factors at the time. A mitigation action of a lower ranking may be completed sooner due to available funding, political pressure, and public input.

**Table 5-1: Sources of STAPLEE Evaluation for Ranking Hazard Mitigation Projects**

| <b>Evaluation Category</b> | <b>Sources of Information<br/>S.T.A.P.L.E.E.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Social                     | Directors and other members of key departments within The Fort Sill Apache Tribe and its Economic Development Authority comprised the Fort Sill Apache Emergency Management Agency (FSAEMA) and had input throughout the planning process. Many serving on the team are also business or professional people.                                                                                                                                                                                                                                                                                                                                                     |
| Technical                  | The following Persons/Agencies were consulted as to the technical feasibility of the various projects: Fort Sill Apache Environmental Programs and members of the Caddo County (OK) Local Emergency Planning Committee, which includes: Oklahoma Health Department, Oklahoma Department of Emergency Management, Caddo County Emergency Management, City of Anadarko Emergency Management, Kiowa Tribe Fire Service, and Caddo Nation Emergency Management.                                                                                                                                                                                                       |
| Administrative             | Staff for proper implementation of the plan currently will rely on existing members of the FSAEMA. Department heads will be responsible for the implementation of any mitigation items that pertain to their field of expertise and will have input into project funding appropriations.                                                                                                                                                                                                                                                                                                                                                                          |
| Political                  | Members of the Business Committee of The Fort Sill Apache Tribe that are involved in planning and disaster response were part of the planning team. This includes the Tribal Chair and the Executive Director of Community Services.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Legal                      | Members of FSAEMA discussed legal issues, and it appears that no significant legal issues were involved in the projects that were selected by FSAEMA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Economic                   | Economic issues are of great concern and were discussed by FSAEMA. All entities felt that the projects selected would have a positive effect on the communities; however, funding for all projects is not available at this time. Each mitigation item will have to be addressed when funding becomes available or possible grant sources open. All involved believed that the mitigation items will help the Fort Sill Apache Tribe be better prepared for a disaster. Funding for the various projects was a major concern as tribal budgets could not fulfill the needs. Grant funds will be relied on heavily for completion of most of the mitigation items. |
| Environmental              | The Fort Sill Apache Environmental Programs staff highlighted environmental controls needed as mitigation projects to prevent wildfire and weather damage, including the use of vegetative control and proper fencing.                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Table 5-2: STAPLEE Evaluation Ranking Matrix and Scores**

| Mitigation Items                      | Social | Technical | Administrative | Political | Legal | Economic | Environmental | Totals | Priority | New Buildings /Infrastructure | Exist Bldgs. / Infrastructure |
|---------------------------------------|--------|-----------|----------------|-----------|-------|----------|---------------|--------|----------|-------------------------------|-------------------------------|
| Community Safe Rooms                  | 3      | 2         | 3              | 3         | 3     | 2        | 1             | 17     | 1        | X                             |                               |
| Permanent Fencing                     | 2      | 2         | 3              | 3         | 3     | 3        | 1             | 17     | 2        | X                             |                               |
| Mass Communication System             | 3      | 2         | 2              | 3         | 2     | 3        | 1             | 16     | 3        |                               | X                             |
| Surge Protectors/ Uninterruptible P/S | 2      | 3         | 3              | 2         | 2     | 3        | 1             | 16     | 4        |                               | X                             |
| Radio Comm. System                    | 3      | 2         | 3              | 3         | 2     | 2        | 1             | 16     | 5        |                               | X                             |
| Drill New Water Wells                 | 2      | 2         | 2              | 2         | 2     | 3        | 2             | 15     | 6        | X                             |                               |
| Water Storage Tower                   | 2      | 3         | 2              | 2         | 1     | 3        | 2             | 15     | 7        | X                             |                               |
| Alternate Power Source (Generators)   | 2      | 2         | 2              | 3         | 2     | 3        | 1             | 15     | 8        | X                             |                               |
| NIMS/ HAZWOPER Training               | 2      | 2         | 3              | 2         | 3     | 2        | 1             | 15     | 9        |                               |                               |
| Safe Room/ EOC                        | 2      | 3         | 3              | 3         | 1     | 2        | 1             | 15     | 10       | X                             |                               |
| Scene Lighting                        | 3      | 3         | 2              | 2         | 2     | 2        | 1             | 15     | 11       | X                             |                               |
| Outdoor Warning Devices (Sirens)      | 3      | 2         | 2              | 3         | 1     | 2        | 1             | 14     | 12       | X                             |                               |
| Safe Room Rebate Program              | 3      | 2         | 2              | 3         | 2     | 1        | 1             | 14     | 13       |                               |                               |
| Retrofitting Structures               | 2      | 2         | 2              | 3         | 3     | 1        | 1             | 14     | 14       |                               | X                             |
| Brush Removal                         | 2      | 2         | 1              | 1         | 2     | 3        | 3             | 14     | 15       |                               |                               |
| Remote Comm. Devices                  | 1      | 3         | 3              | 1         | 2     | 2        | 2             | 14     | 16       |                               |                               |
| Low Water Crossing/ Drainage Device   | 3      | 2         | 2              | 2         | 1     | 2        | 2             | 14     | 17       | X                             | X                             |
| Emergency Cultural Item Shelter       | 3      | 2         | 2              | 3         | 2     | 1        | 1             | 14     | 18       | X                             |                               |
| Stream Monitoring Devices             | 2      | 2         | 2              | 1         | 1     | 2        | 3             | 13     | 19       |                               |                               |
| Traveler Message Boards               | 2      | 2         | 2              | 2         | 2     | 2        | 1             | 13     | 20       |                               |                               |
| Xeriscaping                           | 2      | 1         | 1              | 2         | 1     | 2        | 3             | 12     | 21       |                               |                               |
| Lightning Detection Equipment         | 2      | 1         | 2              | 2         | 2     | 2        | 1             | 12     | 22       |                               |                               |
| Damage Resistant Glass                | 2      | 2         | 2              | 1         | 2     | 2        | 1             | 12     | 23       |                               | X                             |
| NOAA Weather Radio Program            | 2      | 2         | 2              | 2         | 1     | 1        | 1             | 11     | 24       |                               |                               |

**3 = Very Favorable; 2 = Beneficial; 1 = None/ Not Applicable; 0 = Not Favorable**

## CHAPTER SIX

### PLAN MAINTENANCE

#### Other Planning Mechanisms

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The Fort Sill Apache Tribe has designated a part-time emergency manager and deputy manager, whose responsibilities include preparing various response and recovery plans as well as additional mitigation plans and project activities for the Tribal government properties. The Tribe's Economic Development Authority has designated a part-time emergency manager with the same responsibilities for its business properties. These plans will coordinate with the activities found in this Hazard Mitigation Plan. The current EOPs are undergoing updates to reflect the activities and information found in the Hazard Mitigation Plan. All these new and/or updated plans will coordinate consistently with other planning mechanisms for the Fort Sill Apache Tribe. The Fort Sill Apache Emergency Management Agency (FSAEMA), which includes representatives from the Tribe's environmental, finance, health, self-governance, executive, and property development divisions, as well as all emergency managers, will meet on a regularly scheduled basis as well as following any emergency or disaster which affects the Fort Sill Apache Tribe. At those meetings FSAEMA will review and, if necessary, update these planning documents.

Following the final FEMA approval of this hazard mitigation plan, FSAEMA will meet on an annual basis (the anniversary of the approval) to discuss and prepare any updates or changes to the plan regarding events that occurred during the previous year. The Fort Sill Apache Tribe's and the Economic Development Authority's emergency managers will be responsible for hosting the meetings and ensuring that the associated plans are updated.

These update sessions will also occur following any disaster or emergency which affects the Fort Sill Apache Tribe as well as the jurisdictions / schools included within the Fort Sill Apache Tribe jurisdictional boundaries. Should any of these events create the need to incorporate new hazards, risk data or mitigation projects not previously identified, the Fort Sill Apache Tribe's Emergency Manager and the HM contractor will ensure that this information is incorporated into the HM plan as well as in any other strategic plan. As other strategic plans come up for revision for their regularly scheduled updates, they must align with the information found in the HM plan. At that time, pertinent information will then be incorporated into these plans (EAP, EOP, SOPs, CIP, etc.).

## **Tribal Capability Assessment**

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The Fort Sill Apache Emergency Management Agency (FSAEMA) acknowledges that at the onset of the planning process for the Hazard Mitigation Plan, the pre-disaster hazard management capacity of the Tribe was not developed to the level necessary to address the scope of the Tribe and its increased risk from property and staffing development. FSAEMA has evaluated the current policies, programs and capabilities of the Fort Sill Apache Tribe and has agreed to seek more capacity funding to institute more inclusive programs for recommendation to the Tribal Chairwoman and Executive Director for adoption by the Business Committee. Planning has already begun for funding security and response capacity projects, which is, in part, dependent upon this plan's approval.

This Tribe is committed to the National Emergency Framework, the NIMS process, and to interagency emergency coordination. We continue to receive training in this area and specifically work to maintain proficiency in emergency communications and response. This plan will direct the emphasis of future agency development. Our unique footprint, as seen in this plan, has placed an immediate need on reliable communication connections and protocols for emergency messaging.

The evaluation process for this plan will include (a) internal discussions and recommendations, as well as (b) interaction with external resources: local jurisdictions, VOAD agencies, other tribes, Oklahoma Emergency Management, New Mexico Homeland Security and Emergency Management, and the Federal Emergency Management Agency. This will provide a broad spectrum of input for recommended changes and improvements.

In addition, FSAEMA has committed to updated documentation and training efforts related to the Emergency Operations Plan, the Incident Command System, clearly defined chain of command for disaster situations, and a comprehensive set of protocols for these activities. The training for these events should include various types of exercises to evaluate the tribe's readiness to aid and respond in disaster situations. FSAEMA is committed to the National Emergency Response Framework, including utilizing National Incident Management System principles in all emergency training and operations.

Local authorities establish most of the laws and regulations related to development in hazard prone areas with responsibility for codes and code enforcement. The Fort Sill Apache Tribe acknowledges that jurisdictional criteria. However, the Fort Sill Apache Tribe does have existing standards related to their development of tribal holdings located on trust land. Because that

development is most often controlled by federal regulation, the Tribe will continue to adhere to the prescribed criteria for development of tribal holdings.

As a result of the Hazard Mitigation Planning process, the team has now identified specific projects which should commence upon receiving federal funds. The team believes that by utilizing tribal contributions as matching funds for other grant programs, it can accomplish a great deal to enhance identified mitigation projects.

## **Cultural and Sacred Sites**

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FSAEMA assessed the various tribal holdings and determined that the significant cultural and sacred sites of the Fort Sill-Chiricahua-Warm Springs Apache Tribe (Tribe) are located throughout the Southwest New Mexico and Southeast Arizona. The Tribe operates its Cultural Office at the Tribal Complex north of Apache, Oklahoma. It also has a cultural office at its Reservation at Akela, New Mexico, where the Tribe will construct a new cultural center. In addition to Tribe's cultural activities, the Administration Building houses the Tribal Library. The library is home to a variety of research and literary references, which consists of more than 1,100 books and magazines. It also holds a diverse collection of oral history recordings, pictures, Carlisle Indian School records, and is continually growing.

The Tribe also has funding and plans to construct a new cultural center in 2025 at its complex at Apache, Oklahoma.

The Mission for the Fort Sill Apache Cultural Office is to preserve, maintain, and revitalize the culture and traditions of the Fort Sill-Chiricahua-Warm Springs Apache Tribe. The Office ensures the identification, protection, and preservation of archaeological and historic sites within the boundaries of the Tribe's Reservation, Tribal properties, and on lands throughout our traditional territories and ancestral homelands. A critical mission of the Office is to participate in the mandated procedures of the Native American Graves Protection and Repatriation Act (NAGPRA) to allow 1) the identification and repatriation of objects sacred to the Tribe, 2) the repatriation and reburial of ancestral remains, and 3) the protection of contemporary and ancestral burials. The overarching mission of the Office is to help meet the cultural preservation needs voiced by the Tribe's General Council.

## **Tribal Funding Sources**

The Fort Sill Apache Emergency Management Agency (FSAEMA) has identified a comprehensive listing of potential hazard mitigation projects along with identifying current and potential sources of federal, tribal and private funding to implement mitigation activities. These identified resources are located concurrently with the identified projects elsewhere in the HM Plan (Chapter 4). Funding for these projects would include any of the following: FEMA BRIC grants, state set-aside funds, other federal agency grants, or non-governmental sources.

## **Monitoring Progress of Mitigation Activities**

The FSAEMA as well as the Hazard Mitigation Plan contractor have evaluated the potential need for implementing mitigation measures as well as updating the HM Plan after approval. As the Fort Sill Apache Tribe develops its Emergency Management program, the responsibility for coordinating these meetings and activities will be the responsibility of the Tribal Emergency Manager. At the regularly scheduled or as-needed meetings, the group will evaluate:

- a. Potential for beginning new mitigation activities;
- b. Status of on-going mitigation measures;
- c. Monitoring the closeout process of completed mitigation actions; and
- d. Review of mitigation measures identified within the HM Plan and the potential need for adding new measures because of events which may have occurred since the last status meeting.

The Tribal Emergency Manager is responsible for reporting funding source/ project needs and status to the FSAEMA.

## **Incorporation into Existing Planning Mechanisms**

The FSAEMA and its mitigation planning contractor have evaluated other tribal planning mechanisms into which should integrate the mitigation plan. Because of the commitment of the Fort Sill Apache Tribe to begin developing plans, programs, laws, regulations, and other mitigation efforts referenced herein, the FSAEMA will participate in the development of those plans and programs. The involvement of the FSAEMA will help to assure that the goals and strategies identified in the HM Plan find their way into other newly developed plans. This methodology will also help to ensure the incorporation of successive updates of the HM Plan into the mitigation strategies found in newly developed plans.

Following the final FEMA approval of this hazard mitigation plan, the FSAEMA will meet on a regular basis to direct mitigation action steps. The Fort Sill Apache Tribe's Emergency Manager will be responsible for hosting the meetings and insuring the updating of this and associated plans.

Mitigation action will include training and exercises for tribal personnel, establishing/enhancing partnerships with other jurisdictions, as well as installing physical and operational enhancements and procedures. Update sessions will involve a step-by-step evaluation of any measures from this mitigation strategy that have been undertaken. Once projects have been completed, they will be noted as such and removed from the HM plan.

These update sessions will also occur following any disaster or emergency which affects the Fort Sill Apache Tribe as well as the jurisdictions/ schools included among the Fort Sill Apache Tribe jurisdictional areas. Should any of these events create the need to incorporate new hazard risk data or mitigation projects not previously identified, the Fort Sill Apache Tribe's Emergency Manager and Deputy Emergency Manager will ensure that this information is incorporated into the HM plan as well as in any other strategic plan. Other strategic plans which come up for revision for their regularly scheduled updates will reference and correspond to the information found in the HM plan. These plans (EAP, EOP, SOPs, CIP, etc.) will then include the HM Plan's pertinent information. If FSAEMA feels that new legislation is needed, that will be presented to the Business Committee. All updates will comply with federal statutes and regulations, including the rules of funding received, and the plan will be amended when required to comply with any changes in new tribal or federal statutes or regulations.

## **Continued Public Participation and Involvement**

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Public participation is an important part of the planning process and public input or the lack thereof can be instrumental in the success or failure of the plan. FSAEMA will inform and encourage public participation in annual open forum meetings. Public input will be reviewed and, where appropriate, incorporated in the Hazard Mitigation Plan, consistent with the update schedule.

# APPENDICES

## Appendices

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### **Appendix A – Fort Sill Apache Tribe Plan Organization**

- ♦ Mailing List
- ♦ Letter of Invitation
- ♦ Meeting minutes

### **Appendix B – Fort Sill Apache Tribal Lands of Interest**

- ♦ Oklahoma
- ♦ New Mexico
- ♦ Arizona

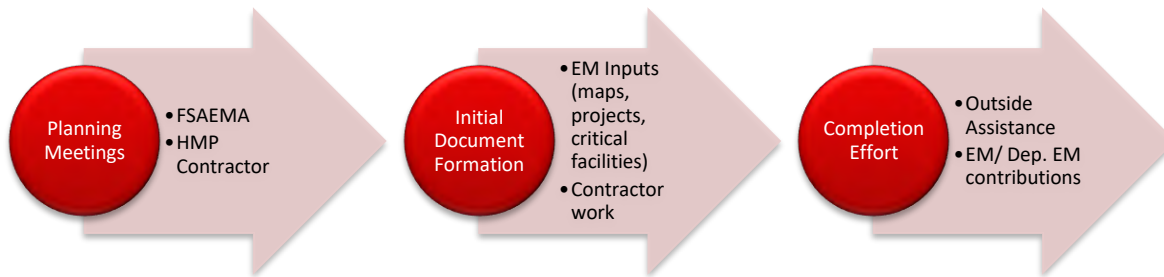
### **Appendix C - Critical Facilities - Not for public Review**

### **Appendix D – High Hazard Dams**

### **Appendix E – Inundation Zones**

### **Appendix F – FIRM Flood Insurance Maps / Flooding Zone Maps**

## Appendix A – Fort Sill Apache Tribe Plan Organization



### ◆ FSAEMA Meeting Invitation List

Jennifer Heminokeky, Env. Director/ EM: [jennifer.heminokeky@fortsillapache-nsn.gov](mailto:jennifer.heminokeky@fortsillapache-nsn.gov)

Lori Gooday Ware, Tribal Chairwoman: [lori.g.ware@fortsillapache-nsn.gov](mailto:lori.g.ware@fortsillapache-nsn.gov)

Jeanette Mann, Executive Dir. Community Services: [jeanette.mann@fortsillapache-nsn.gov](mailto:jeanette.mann@fortsillapache-nsn.gov)

Troy Johanntoberns, Self Governance Director: [troy.johanntoberns@fortsillapache-nsn.gov](mailto:troy.johanntoberns@fortsillapache-nsn.gov)

Melissa Vail, Finance Director: [melissa.vail@fortsillapache-nsn.gov](mailto:melissa.vail@fortsillapache-nsn.gov)

Monte Scammahorn, Env. Specialist, Dep. EM: [monte.scammahorn@fortsillapache-nsn.gov](mailto:monte.scammahorn@fortsillapache-nsn.gov)

Josh Worcester, Env. Monitoring Coordinator: [josh.worcester@fortsillapache-nsn.gov](mailto:josh.worcester@fortsillapache-nsn.gov)

Brady Jones, VP of Development and Design: [bjones@mountainmanagementltd.com](mailto:bjones@mountainmanagementltd.com)

David Bennet, EDA Security Manager/ EM: [dbennett@apachecasinothotel.com](mailto:dbennett@apachecasinothotel.com)

Judy Soos, Contractor/ Emergency Planner: [associatedprofsvcs@gmail.com](mailto:associatedprofsvcs@gmail.com)

## Meeting Minutes

|                              |                                                                      |
|------------------------------|----------------------------------------------------------------------|
| <b>NAME OF ORGANIZATION:</b> | FORT SILL APACHE EMERGENCY MANAGEMENT AGENCY                         |
| <b>PURPOSE OF MEETING:</b>   | INTRODUCTION AND HAZARD ASSESSMENT                                   |
| <b>DATE/TIME:</b>            | JULY 15, 2021 2:00 P.M.                                              |
| <b>LOCATION:</b>             | FORT SILL APACHE TRIBAL ADMINISTRATION BUILDING                      |
| <b>CHAIRPERSON:</b>          | MONTE SCAMMAHORN, FORT SILL APACHE TRIBE<br>DEPUTY EMERGENCY MANAGER |

| Topics        | Meeting Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Participants                                                                                                                                                                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Introductions |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Jennifer Heminokey, Fort Sill Apache Tribe EM/ Env. Dir.; Monte Scammahorn, Fort Sill Apache Tribe DEM/ Env. Spc.; Troy Johanntoberns, Self Gov. Dir.; Melissa Vail, Finance Dir.; Josh Worcester, Env. Coordinator; Lori Gooday Ware, Chairwoman |
|               | <ul style="list-style-type: none"> <li>• Explanation of Natural; Hazard; Mitigation and why a HM plan is important.</li> <li>• Asked for input on Natural Hazards that may impact the Fort Sill Apache Tribe. Eleven hazards were identified as possible: Dam Failure; Drought; Earthquake; Excessive Heat; Flood; Hail; High Winds; Lightning; Tornado; Wildfire; Winter Storms.</li> <li>• Reviewed the 4 Phases and 10 Steps process that will be used to develop the plan; Organize the Resources; Assess Risks; Develop the Mitigation Plan; and Implement and Monitor the Plan.</li> </ul> | Judy Soos, Hazard Mitigation Specialists, L.L.C.                                                                                                                                                                                                  |

## Meeting Minutes

|                              |                                                                      |
|------------------------------|----------------------------------------------------------------------|
| <b>NAME OF ORGANIZATION:</b> | FORT SILL APACHE TRIBE                                               |
| <b>PURPOSE OF MEETING:</b>   | HAZARD MITIGATION PLAN DEVELOPMENT                                   |
| <b>DATE/TIME:</b>            | APRIL 28, 2022 2:00 P.M.                                             |
| <b>LOCATION:</b>             | FORT SILL APACHE TRIBE ADMINISTRATION BUILDING                       |
| <b>CHAIRPERSON:</b>          | MONTE SCAMMAHORN, FORT SILL APACHE TRIBE<br>DEPUTY EMERGENCY MANAGER |

| Topics                   | Meeting Content                                                                                                                                          | Participants                                                                                                                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Introductions            |                                                                                                                                                          | Jennifer Heminokeky, Fort Sill Apache Tribe EM/ Env. Dir.;<br>Monte Scammahorn, Fort Sill Apache Tribe DEM/ Env. Spc.;<br>Troy Johanntoberns, Self Gov. Dir.;<br>Melissa Vail, Finance Dir.;<br>Brady Jones, VP of Dev.;<br>David Bennet, EDA EM/ Security Mgr. |
| Introduction to Projects | Reviewed basics of Hazard Mitigation Plans. Ms. Soos explained critical facilities. We discussed which facilities of ours and near us count as critical. | Judy Soos,<br>Hazard Mitigation Specialists,<br>L.L.C.                                                                                                                                                                                                          |

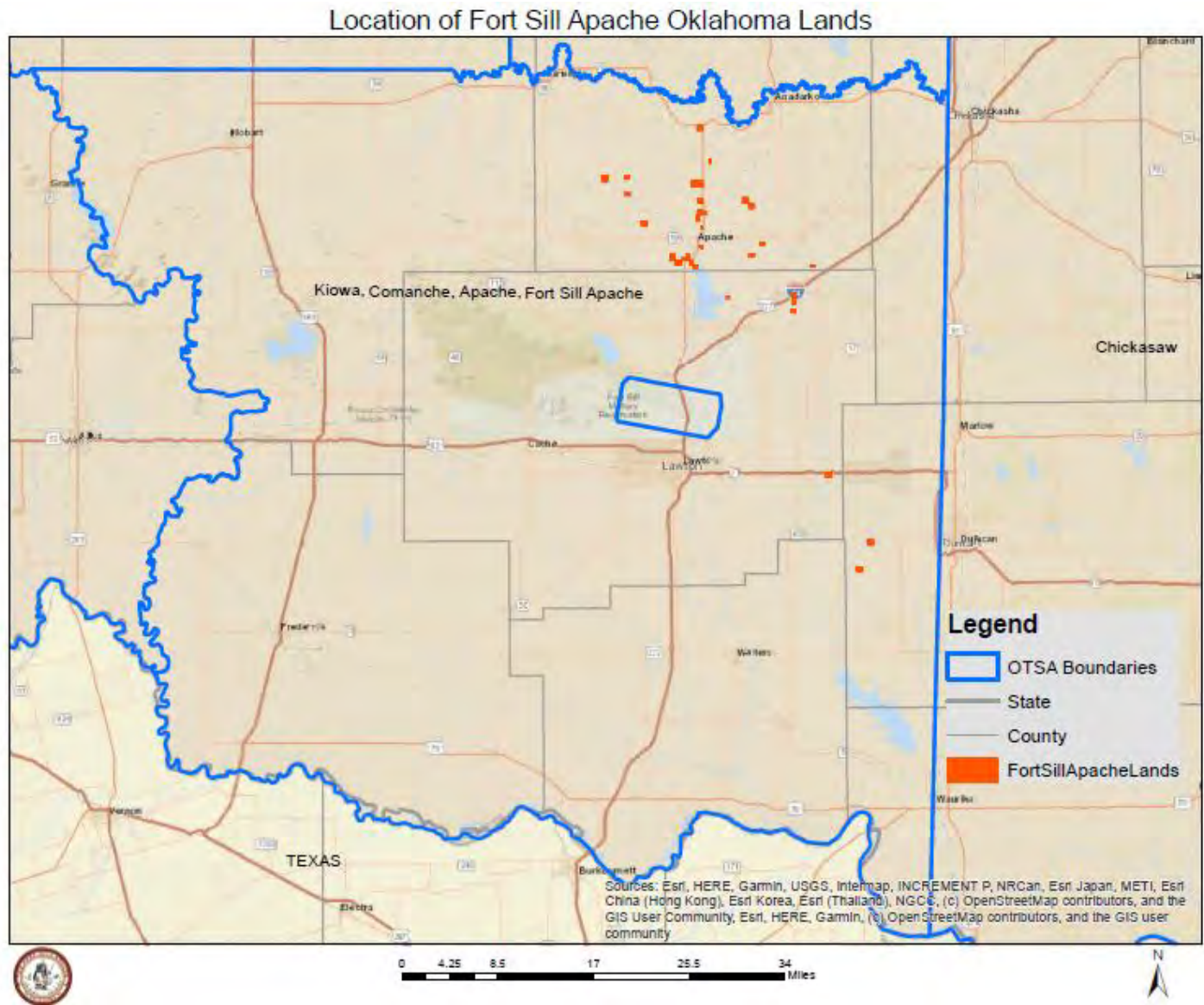
| Meeting Minutes                                             |                                                                                                                                                                                          |                                                                                                                                                                                                                                                |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAME OF ORGANIZATION:</b>                                | FORT SILL APACHE TRIBE                                                                                                                                                                   |                                                                                                                                                                                                                                                |
| <b>PURPOSE OF MEETING:</b>                                  | PROJECT PRIORITIZATION                                                                                                                                                                   |                                                                                                                                                                                                                                                |
| <b>DATE/TIME:</b>                                           | MARCH 30, 2023 2:00 P.M.                                                                                                                                                                 |                                                                                                                                                                                                                                                |
| <b>LOCATION:</b>                                            | FORT SILL APACHE TRIBE ADMINISTRATION BUILDING                                                                                                                                           |                                                                                                                                                                                                                                                |
| <b>CHAIRPERSON:</b>                                         | Monte Scammahorn, Deputy Emergency Manager                                                                                                                                               |                                                                                                                                                                                                                                                |
| Topics                                                      | Meeting Content                                                                                                                                                                          | Participants                                                                                                                                                                                                                                   |
| Introductions                                               |                                                                                                                                                                                          | Jennifer Heminokeky, Fort Sill Apache Tribe EM/ Env. Dir.; Monte Scammahorn, Fort Sill Apache Tribe DEM/ Env. Spc.; Troy Johantobers, Self Gov. Dir.; Melissa Vail, Finance Dir.; Brady Jones, VP of Dev.; David Bennet, EDA EM/ Security Mgr. |
| Review previous discussions.<br>Determine specific projects | Ms. Soos covered the types of projects that can be included and the need to be thorough. We discussed those projects relevant to our needs. We discussed next steps in plan development. | Judy Soos,<br>Hazard Mitigation Specialists, L.L.C.                                                                                                                                                                                            |

## Outside Assistance

Jerome McCalvin, Caddo Nation Deputy Emergency Manager

## Appendix B - Maps

### ◆ Fort Sill Apache Tribe Boundaries



## FSA Oklahoma Tribal Trust Lands



# New Mexico Properties

Haozous  
Fee Land (20 ac.)



## Akela, NM FSA Land



Located in Luna County, New Mexico, the Tribe's properties lie in the Akela Flats between the Florida Mountains and the Good Sight Mountains east of Deming along Interstate 10. This land is flat desert scrub with no surface water. Commercial facilities on the property are run by the Economic Development Authority and use groundwater for drinking water.

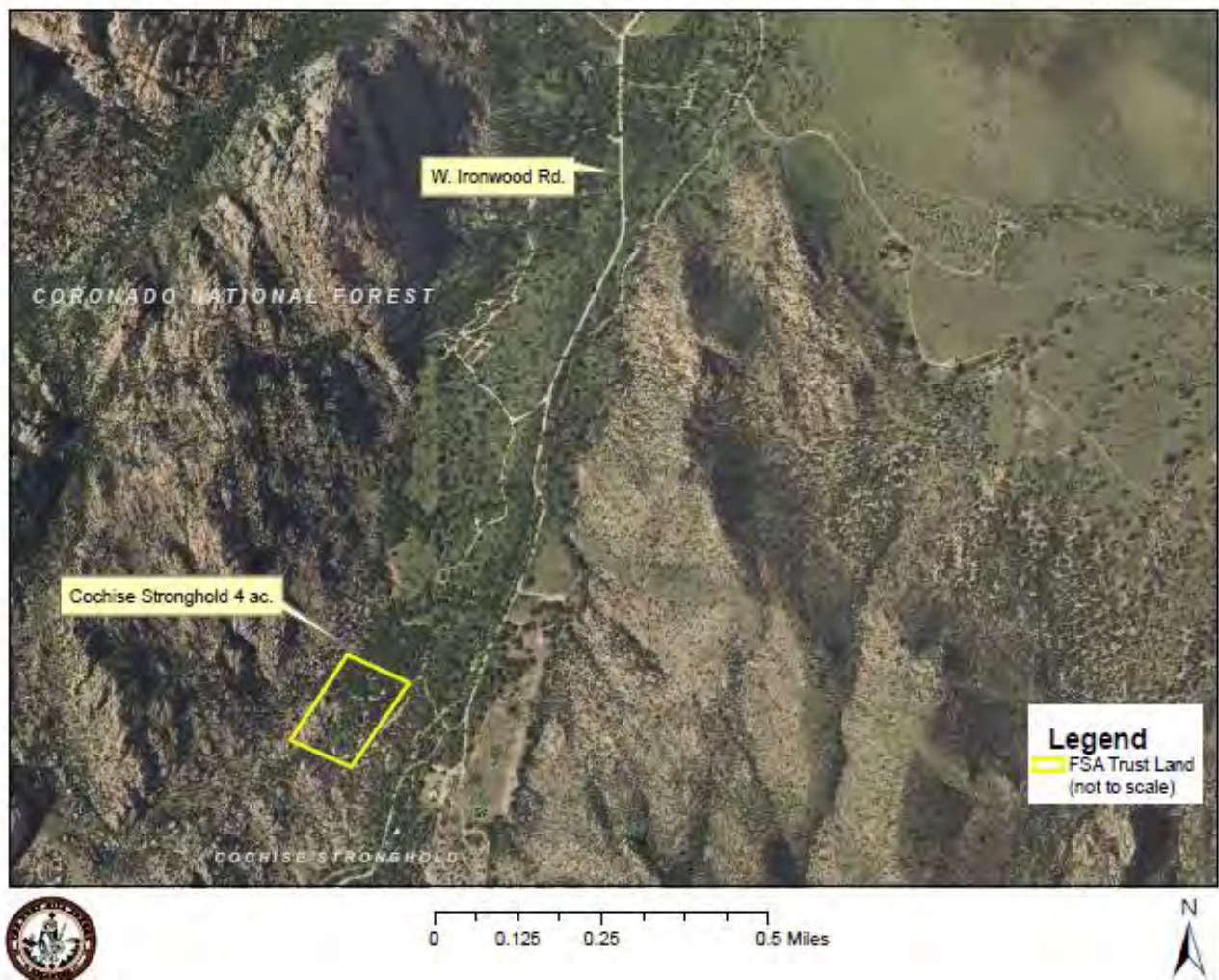
These 1,880 acres of fee land lies adjacent to the Reservation (30 ac.) just to the north. Funding, MOUs, and designs are secured for a firefighting watering station to be constructed on the Reservation for local volunteer firefighters to utilize in emergencies.



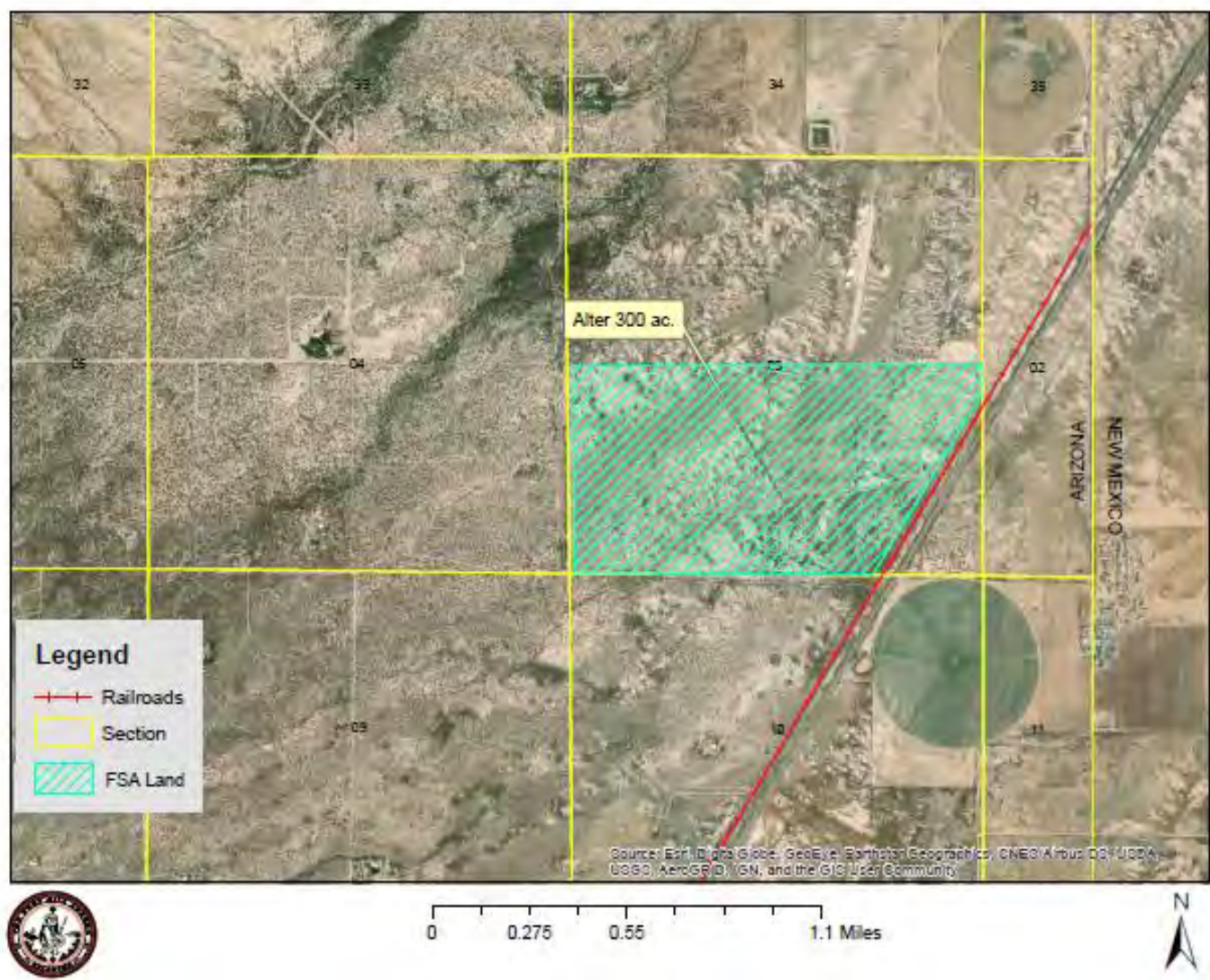
# Arizona Properties (Cochise County)

Dragoon Mountains, Coronado National Forest

Cochise Stronghold - FSA Trust Land



Arizona Fee Land near NM Border



## APPENDIX C – HOLDINGS

### ◆ Fort Sill Apache Tribe Holdings

#### Apache, OK – Tribal Complex



## Apache Wye (Anadarko, OK) – Apache Market 2 & Warm Springs Casino



## Lawton, OK – Apache Market 1 & Apache Casino Hotel



## Akela, NM – Reservation & Chiricahua Apache Plaza



**Trailer & Shed, Cochise Stronghold, Coronado National Forest – Dragoon Mtns. AZ**



**280-acres Alter Dwelling – Cochise Co., AZ**



## APPENDIX D - HIGH HAZARD DAMS

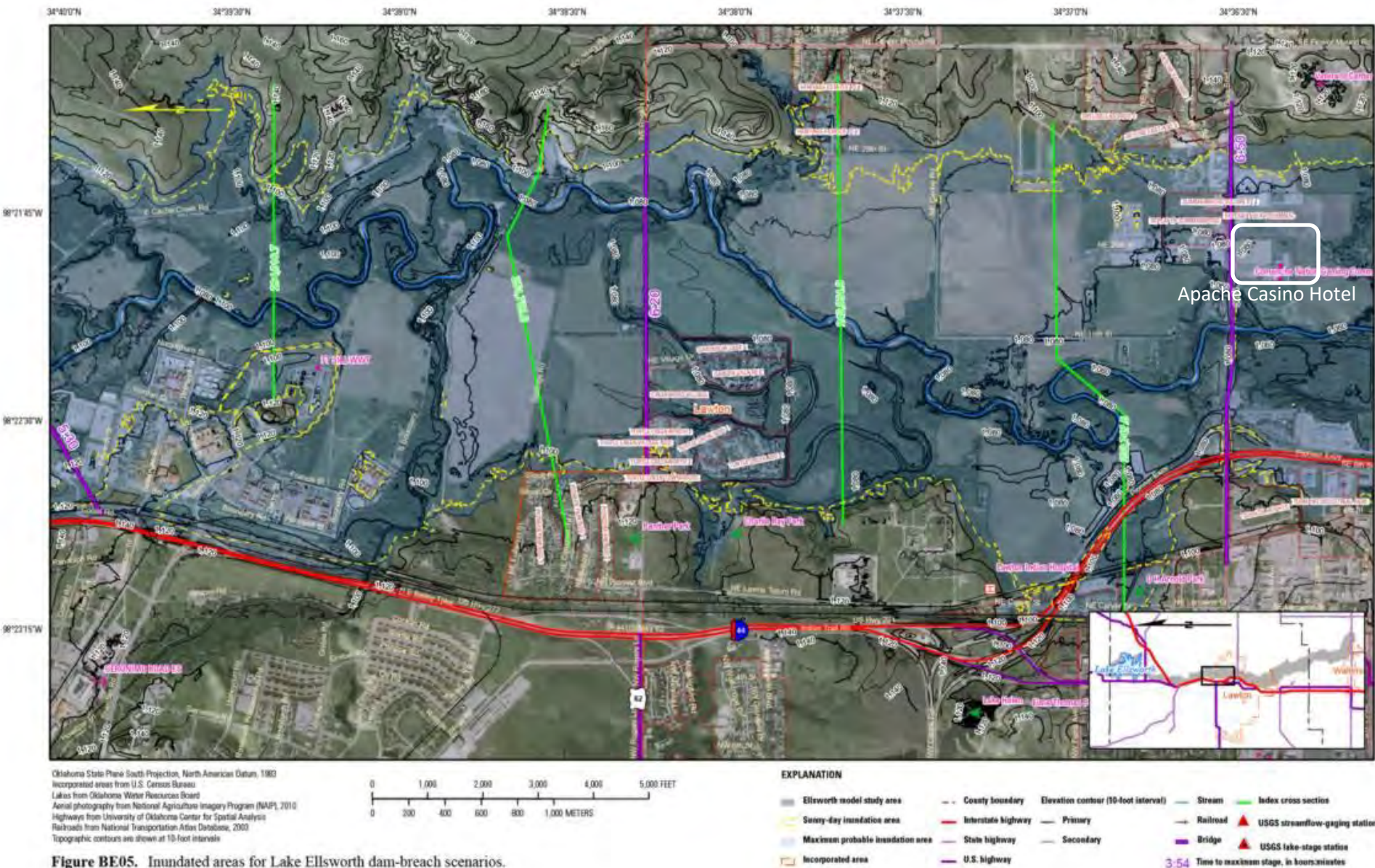
### Lake Lawtonka - Medicine Park, OK



## Lake Ellsworth – Elgin, OK



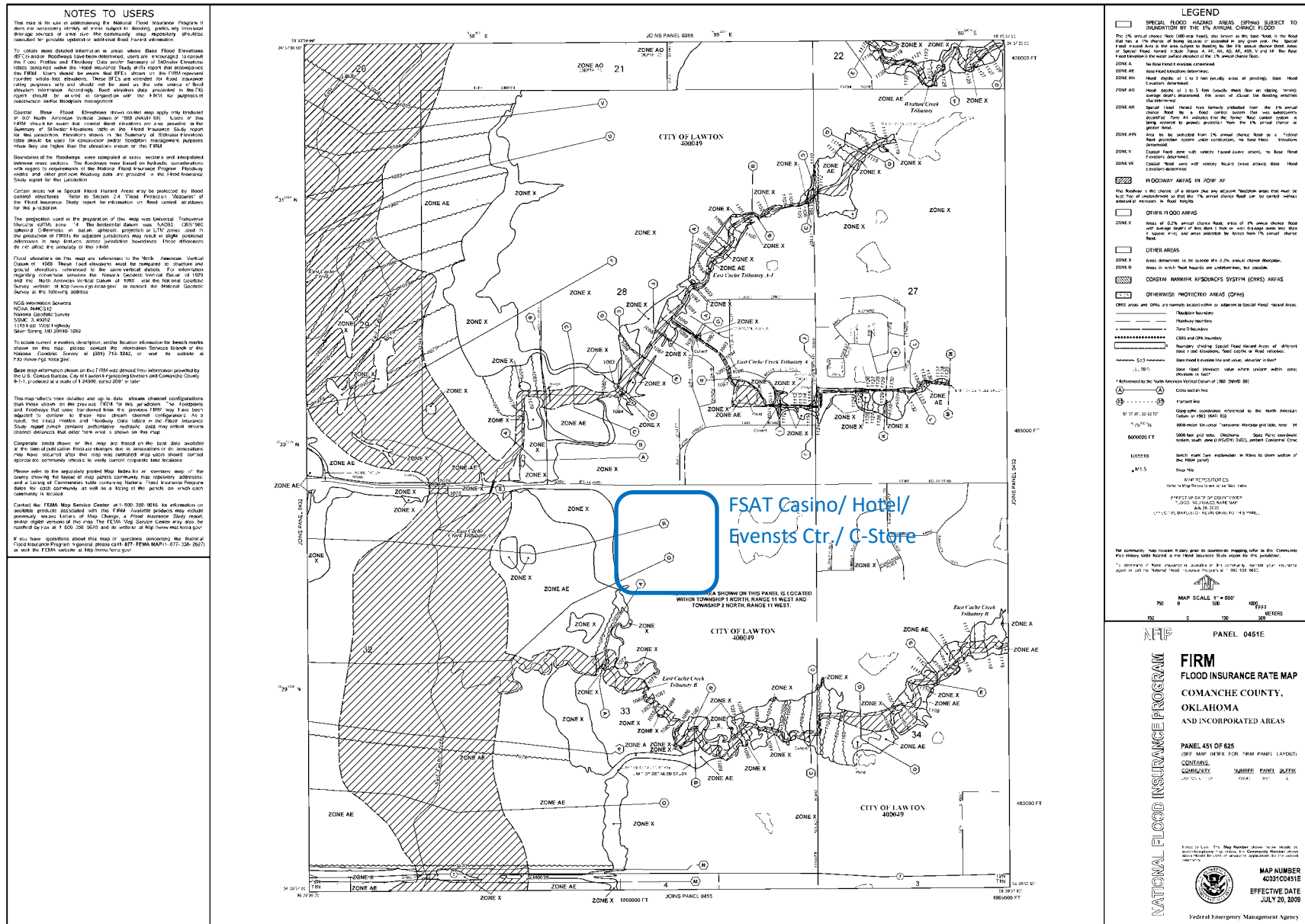
# APPENDIX E – INNUNDATION ZONES LAKE ELLSWORTH – LAWTON, OK



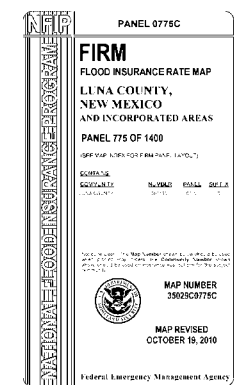
## Fort Sill Apache Tribe Hazard Mitigation Plan-2026 152

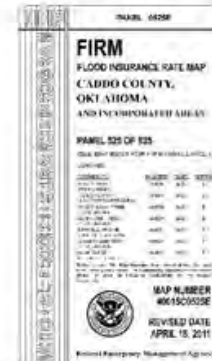


Lawton, OK











## National Flood Hazard Layer FIRMette



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

|                             |                                                                                                                                                                   |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIAL FLOOD HAZARD AREAS  | Without Base Flood Elevation (BFE)<br>Zone A, V, A99                                                                                                              |
|                             | With BFE or Depth Zone AE, AO, AH, VE, AR                                                                                                                         |
|                             | Regulatory Floodway                                                                                                                                               |
| OTHER AREAS OF FLOOD HAZARD | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
|                             | Future Conditions 1% Annual Chance Flood Hazard Zone X                                                                                                            |
|                             | Area with Reduced Flood Risk due to Levee. See Notes, Zone X                                                                                                      |
|                             | Area with Flood Risk due to Levee Zone D                                                                                                                          |
| OTHER AREAS                 | NO SCREEN Area of Minimal Flood Hazard Zone X                                                                                                                     |
|                             | Effective LOMRs                                                                                                                                                   |
| GENERAL STRUCTURES          | Area of Undetermined Flood Hazard Zone D                                                                                                                          |
|                             | Channel, Culvert, or Storm Sewer                                                                                                                                  |
| OTHER FEATURES              | Levee, Dike, or Floodwall                                                                                                                                         |
|                             | Cross Sections with 1% Annual Chance Water Surface Elevation                                                                                                      |
| MAP PANELS                  | Coastal Transect                                                                                                                                                  |
|                             | Base Flood Elevation Line (BFE)                                                                                                                                   |
|                             | Limit of Study                                                                                                                                                    |
|                             | Jurisdiction Boundary                                                                                                                                             |
|                             | Coastal Transect Baseline                                                                                                                                         |
|                             | Profile Baseline                                                                                                                                                  |
|                             | Hydrographic Feature                                                                                                                                              |
|                             | Digital Data Available                                                                                                                                            |
|                             | No Digital Data Available                                                                                                                                         |
|                             | Unmapped                                                                                                                                                          |

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/8/2025 at 3:57 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



For

Basemap Imagery Source: USGS National Map 2023

## Akela, NM

