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CHEROKEE NATION®



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# Tribal Hazard Mitigation Plan



**Cherokee Nation Emergency Management  
September 2010**

# Cherokee Nation Hazard Mitigation Plan

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## **LIST OF ACRONYMS**

BIA – Bureau of Indian Affairs  
CAFR – Comprehensive Annual Financial Report  
CFR – Code of Federal Regulations  
CIP – Capital Improvement Plan  
CN – Cherokee Nation  
CNEM – Cherokee Nation Emergency Management  
COTTA – Community Organization Training and Technical Assistance  
DOT – Department of Transportation  
EF Scale – Enhanced Fajita Scale  
EOP – Emergency Operations Plan  
EPA – Environmental Protection Agency  
FEMA – Federal Emergency Management Agency  
FMA – Flood Mitigation Assistance  
HMP – Hazard Mitigation Plan  
HMPG – Hazard Mitigation Planning Grant  
IRMP – Integrated Resources Management Plan  
ITEMC – Inter-Tribal Emergency Management Coalition  
NCDC – National Climatological Data Center  
NOAA – National Oceanic and Atmospheric Administration  
OMB – Office of Management and Budget (Federal)  
PDM – Pre-Disaster Mitigation  
PNP – Private Non-Profit  
SRL – Severe Repetitive Loss  
TJSA – Tribal Jurisdictional Service Area  
TORRO – Tornado and Storm Research Organization  
USDA – United States Department of Agriculture

# CHEROKEE NATION

## HAZARD MITIGATION PLAN

### Introduction

The Cherokee Nation is a federally recognized tribe with a tripartite form of government. Cherokee Nation, located in northeastern Oklahoma, has more than 280,847 tribal citizens. Cherokee Nation Tribal Jurisdictional Service Area (TJSA) covers approximately 7,700 square miles. Our government headquarters are located south of the City Of Tahlequah, the *historical capitol* of the Cherokee Nation.

The vision of the Cherokee Nation is, “To achieve and maintain an enriching cultural identity, economic self-reliance and a strong government”. The mission of Cherokee Nation is “Ga-du-gi”; “Working together as individuals, families and communities for a quality of life for this and future generations by promoting confidence, the tribal culture and an effective sovereign government”.

Cherokee is a distinct culture with its own geography, language, social organization, spiritual beliefs and practices. There are seven (7) Cherokee clans including: Bird, Paint, Wild Potato, Wolf, Blue, Deer and Long Hair. The Cherokee language is not only spoken, but also written using a unique syllabary with 84 characters developed by Sequoyah and continues to be spoken fluently across generations. On the campuses of *Tsalagi Tsunadeloquasdo* (Cherokee School) only our native tongue is spoken. Many Cherokees continue to engage in traditional Cherokee practices, stomp dances and prayer ceremonies. There are many places of cultural significance within our TJSA.

Cherokee culture thrived for thousands of years in what is now the southeastern United States prior to European contact. In the 1800’s, gold was discovered in Georgia and a period of Indian removals began to make way for more white settlement. In 1838, thousands of Cherokee men, women and children were rounded up and marched 1,000 miles to Indian Territory which later became Oklahoma. This devastating event in our history is known as the *Trail of Tears*. Thousands died in the internment camps, on the trail from exposure and disease, and after arrival from the effects of the many traumas they suffered. After relocation the Cherokee soon rebuilt a democratic form of government along with

churches, schools, newspapers and businesses. After the Civil War, what remained of Cherokee tribal land was divided into individual allotments, which were given to Cherokees listed in the census compiled by the Dawes Commission in the late 1890s. Descendants of those original Dawes enrollees make up today's Cherokee Nation tribal citizenship.

In 1990, the Cherokee Nation became one of six tribes to enter into a self-governance agreement with the federal government. This historic agreement authorized the Tribe to assume responsibility for Bureau of Indian Affairs (BIA) funds that had previously been spent on its behalf by the agency, area, and central BIA office levels. The Cherokee Nation is one of the tribes referred to as the Five Civilized Tribes. According to the 2000 U.S. Census, our tribe has the most people or responses of the 563 federally recognized Native American Tribes in the United States.

Our tripartite form of government includes a judicial, executive and legislative branch. The Judicial Branch includes the District Court and the Supreme Court. The Legislative Branch is composed of 17 Tribal Council Members who are elected to four-year terms. Fifteen of these Council Members represent the nine Cherokee districts within the TJSA. Two Council Members represent those Cherokee citizens who live outside the TJSA. The Executive Branch is vested in the Office of the Principal Chief. The Principal Chief is responsible for executing the laws of the Cherokee Nation and administering the daily operations of all programs and enterprises of the Tribe. The Deputy Chief is empowered to act in the absence of the Principal Chief. The Principal Chief and Deputy Chief are elected to four-year terms by a popular vote of registered Cherokee voters. The Cherokee Nation Executive Branch is divided into the Tribal Administration Office and two major teams: the *Resource Team* and the *Service Team*. Various programs fall under the direction of these teams, and each work together to promote Cherokee confidence, the tribal culture and an effective sovereign government.

The Cherokee Nation jurisdiction is comprised of nine Districts known as: Cherokee, Trail of Tears, Sequoyah, Three Rivers, Delaware, Mayes, Will Rogers, Keeler and Craig.

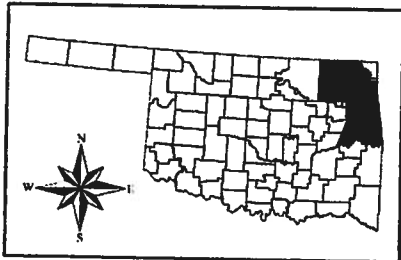
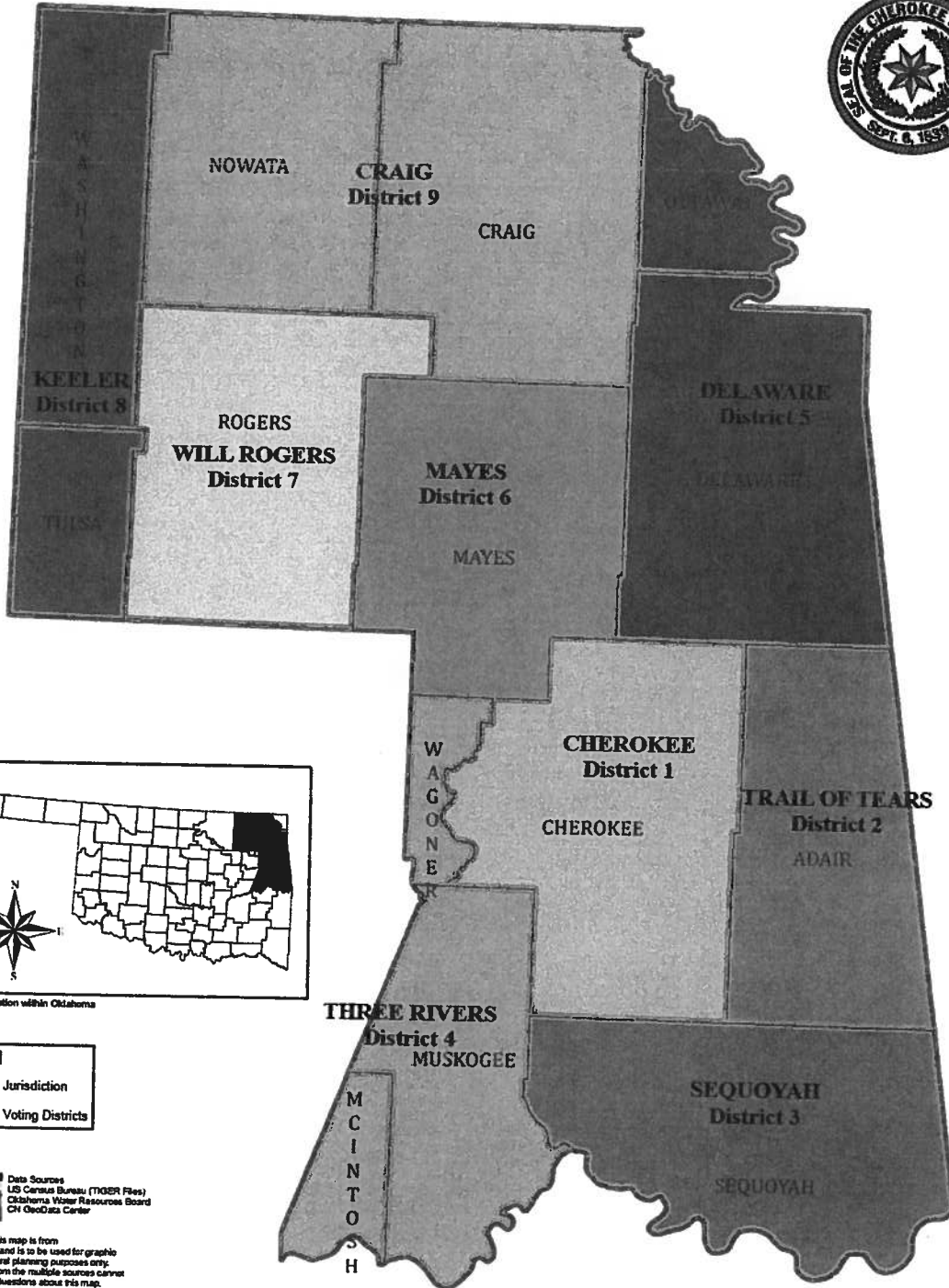
The Tribal Districts consist of 14 counties in northeast Oklahoma:

- District 1 - Cherokee = Cherokee County
- District 2 - Trail of Tears = Adair County
- District 3 - Sequoyah = Sequoyah County

- District 4 - Three Rivers = McIntosh, Muskogee, Wagoner County
- District 5 - Delaware = Delaware and Ottawa County
- District 6 - Mayes = Mayes County
- District 7 - Will Rogers = Rogers County
- District 8 - Keeler = Tulsa, Washington County
- District 9 - Craig = Craig and Nowata County



**Jurisdiction Boundaries map on following page.**

# Cherokee Nation Districts



Cherokee Nation within Oklahoma

**Legend**

-  CN Jurisdiction
-  CN Voting Districts

**Data Sources**  
 US Census Bureau (TIGER Files)  
 Oklahoma Voter Resources Board  
 CN GeoData Center

**Map Disclaimer:**  
 Information on this map is from multiple sources and is to be used for graphic display and general planning purposes only. Data accuracy from the multiple sources cannot be guaranteed. Questions about this map, its sources, and intended use should be directed to the Cherokee Nation GeoData Center.

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## PLANNING PROCESS

The planning process for the Cherokee Nation Hazard Mitigation Plan followed the Tribal Mitigation Guidance provided by Federal Emergency Management Agency (FEMA). The Cherokee Nation Office of Risk/Emergency Management was tasked with obtaining authorization for and coordinating the drafting of the Cherokee Nation Hazard Mitigation Plan. This included following the administrative processes for Resolutions. Tribal council members Curtis Snell and Cara Cowan sponsored the proposed Resolution. A copy of Resolution No. 90-08 adopted November 10, 2008 can be found in Appendix A, Article 1. In order to compile the necessary plan data in a timely fashion, a technical advisory planning committee was established to assist.

The planning committee was formed by appointment by the policy group. Each committee member listed below provided information on their department, potential sources, in-kind match sources, reviewed hazard information and provided input on mitigation actions and goals for the plan period.

Committee Members

Tamara Copeland	Chair
Lillian Pratt	Secretary
Norma Merriman	Human Services
Tim Kidd	Food Distribution
Sharon Wright	Marshal Service
Tamsye Dreadfulwater-Leake	Financial Resources
Suzan Morang	Environmental Programs
Gina Olaya	CNE
Ginger Glory	Health Services
Tracy Glory	EMS

The Advisory Committee had representation from across CN Government, political subdivisions and tribal enterprises representing a variety of stakeholders. Areas represented include: Human Services, Food Distribution, Marshal Service, Emergency Medical Services, Health Services, WW Hastings Hospital, Information Systems, Geo Data, Community Services, Administration, Financial Resources, Public Health Nursing, Natural Resources, Environmental Programs, Communications, Attorney General's Office, Risk Management, Emergency Management, and Roads. Also representatives from tribal enterprises such as Cherokee Nation Enterprises, Home Health and Comprehensive Care participated. The team met monthly on the 3<sup>rd</sup> Thursday of each month in either the Government

Resources Conference Room of the Tsa-la-gi Annex in Tahlequah, Oklahoma or in the Tribal Complex in the Tribal Services conference room. Many of the committee's verbal comments were incorporated into this document. This team will continue to meet at least annually to review and evaluate the performance of this plan. Updated loss information will be received annually from the tribe's Risk Management office. The identified hazards and mitigation actions will be reviewed during the post-disaster evaluation of each disaster resulting in death or property losses in excess of \$100,000.00.

Efforts were made to include tribal and non-tribal members of the public. A community meeting was held in District 5, Delaware County, at the beginning of the planning process. Our target audience was the tribal public, meaning tribal employees and tribal members; and the general public, meaning all Native Americans in the community with other tribal affiliations and non-native Americans living in the community. All residents living in District 5 were invited. Surveys were completed by several participants. Positive feedback was received regarding the need for the development of a tribal plan.

On July 30 – August 2, 2009 CNEM participated in the annual Community Organization Training and Technical Assistance (COTTA) three day conference. Individuals living in the various districts were able to stop at our information booth to complete a hazard mitigation questionnaire and receive booklets and handouts. Short presentations were conducted in the lecture hall. See Appendix B, Article 1 for a copy of questionnaire. CNEM will strive to participate annually.

On August 15, 2009 CNEM held a community meeting/workshop at our Resort Conference Center in Catoosa, Oklahoma. The target audience was the Tribal Emergency Managers of Oklahoma tribes. No surveys/questionnaires were completed. Very few comments on content were received. However, we did receive and answer many questions about how to apply for Hazard Mitigation Planning Grant (HMPG) funds and the process of writing a Hazard Mitigation plan. Attendees shared ideas on how tribes could jointly plan mitigation goals and actions. Some of these ideas were incorporated into this document. The below listed tribes and/or tribal agencies participated in community meeting(s)/workshop:

- Caddo Nation
- Cherokee Nation
- Cherokee Nation Entertainment
- Cheyenne-Arapaho Tribe
- Choctaw Nation

- Citizen Potawatomi Nation
- Comanche Nation
- Creek Nation
- Eastern Shawnee Tribe
- Kaw Nation
- Miami Tribe
- Osage Nation
- Ponca Tribe
- Seminole Nation

Some useable feedback was received. The Tribal Emergency Managers did request an annual meeting.

On November 3, 2009, CNEM hosted a community meeting with the County Emergency Managers from the Counties within our TJSA. All 14 County Emergency Managers were invited to a meeting held at our West Siloam Springs Casino and Conference Center. Invitees and attendees included representatives from:

- Participating Agencies:
  - Adair County Emergency Management
  - Cherokee County Emergency Management
  - Cherokee Nation Emergency Management
  - Craig County Emergency Management
  - Delaware County Emergency Management
  - Mayes County Emergency Management
  - McIntosh County Emergency Management
  - Muskogee County Emergency Management
  - Nowata County Emergency Management
  - Ottawa County Emergency Management
  - Rogers County Emergency Management
  - Sequoyah County Emergency Management
  - Tulsa County Emergency Management
  - Wagoner County Emergency Management
  - Washington County Emergency Management
  - Area Coordinator for Oklahoma Emergency Management

Concern was expressed regarding the lack of tornado sirens outside city limits of

the county seat, lack of funding, communications, and trained personnel. Some of the county emergency managers provided copies of their respective hazard mitigation goals and actions items from their approved or expired plans. There was much discussion about the possibility of partnering on Hazard Mitigation projects to best leverage local resources and capitalize on receipt of federal/state funding. The concern expressed repeatedly was the lack of severe weather advanced warning systems for rural areas. It was also noted that many of these counties did not have a current Hazard Mitigation Plan.

On July 23 – July 25, 2010 CNEM participated in the annual COTTA three day conference. Individuals living in the various districts were able to stop at our information booth to complete a Hazard Identification Questionnaire and receive booklets and handouts. Short presentations were conducted in the lecture hall.

On July 30, 2010 CNEM participated in the Employee Health Fair in Tahlequah. An information booth was available and attendees were encouraged to complete a questionnaire regarding possible mitigation actions. Sign-In sheets, questionnaires, graphs, and other documentation from these meetings can be found in Appendix B.

In addition, the below agencies participated by providing technical assistance via phone conversation or email:

- Oklahoma Emergency Management Area Coordinator
- State Deputy Hazard Mitigation Officer
- State Tribal Liaison
- State Plan Reviewer

Respective FEMA training was attended by CN Emergency Management staff or members of Technical Advisory Planning Committee on the application process, the planning process and how to write a plan.

There was only one external academia institution that participated in the planning process. OU Climatology was involved in the beginning of the process. Although information was exchanged, none of the information was incorporated into this plan. The CN Group Leader of Education is a member of the Emergency Management Policy committee, and as such was invited to review and comment on the Plan document.

The only potential PNP (Private Non-Profit) that participated were the ITEMC (Inter-tribal Emergency Management Coalition) member tribes. NOTE: at the time this document was drafted, ITEMC had not yet been awarded PNP status.

Follow-up meetings will be held with both the tribal and non-tribal (county) emergency management communities during the administrative review process after receiving FEMA approval of plan but before plan is adopted. The tribal council members that originally sponsored the Resolution to apply for the HMPG funds, agreed to sponsor the Resolution to adopt the CHEROKEE NATION HAZARD MITIGATION PLAN. An Administrative Clearance/Routing Form was completed and the appropriate signatures of the EM Director, Group Leader of Management Resources, and sponsoring Tribal Council members Cara Cowan and Curtis Snell were obtained. Once FEMA has approved the CHEROKEE NATION HAZARD MITIGATION PLAN, the respective Legislative Submittal packet will be submitted to the Principal Chief's office for approval and forwarding to Resources Committee. The respective sponsoring Tribal Council members will address the Resources Committee regarding the proposed adoption of the CHEROKEE NATION HAZARD MITIGATION PLAN. Once approved by the Resources Committee, the Resolution will be brought forth to full Tribal Council. A detailed summary of the Legislative Submittal Process can be found in Appendix A, Article 2. A copy of the final and signed legislation will be placed Appendix A, Article 3.

## **ASSURANCES**

Cherokee Nation complies with A-87 and OMB A133 Single Audit Requirements. CFR 44 part 13, clearly states that tribes are subject to A-87 cost principles and to OMB A133 Single Audit requirements.

The Cherokee Nation Accounting Department has received the Comprehensive Annual Financial Report (CAFR) award consistently since 1984. The award has been received the past 25 years as Certificate of Achievement for Excellence in Financial Reporting issued by the Governmental Financial Officer of the United States. It is the highest standard in governmental accounting and financial reporting.

Cherokee Nation has demonstrated its capability and will continue to comply with all applicable state and federal statutes and regulations relating to FEMA -1678-DR-OK, Project #20.

**Following are the requirements and assurances for the above referenced FEMA grant:**

**Financial Reports:** Reports are submitted quarterly to Oklahoma Department of Emergency Management. Reporting dates are April 30, July 30, September 30 and January 30. Final financial reports are due 90 days after the close of the grant.

**Performance Reports:** The Nation has submitted quarterly performance reports detailing financial and overall progress of the referenced grant to the Oklahoma Department of Emergency Management.

**Budget:** Budget requirements are found in Emergency Management and Assistance Regulations 44 CFR Part 13. The Nation understands that transfer of funds between total direct cost categories in the approved budget, on non-construction grants, shall receive prior approval of FEMA when such transfers exceed ten percent of the total budget. Written approval must be received for any budget revision which would result in the need for additional funds.

**Audit Requirements:** The Nation agrees to comply with the audit requirements of OMB Circular No. A-133, OMB Circular A-87, and OMB Circular A-102.

The following are hereby incorporated into this agreement by reference:

- 44 CFR, Emergency Management and Assistance Regulations
- Part 10-Environmental Considerations
- Part 13-Uniform administrative requirements for grants and cooperative agreements to state and local governments
- Part 7-Nondiscrimination in Federally-Assisted Programs (FEMA)
- Part 17-Government wide debarment and suspension (no procurement) and government wide requirements for drug-free workplace (grants)
- Part 18-new restrictions on lobbying
- Subchapter B-Insurance and Hazard Mitigation
- Subchapter C-Fire Prevention and control
- Subchapter D-Disaster Assistance
- Subchapter E-Preparedness
- 31 CFR 205.6-funding techniques
- P.L. 101-336-The Americans with Disabilities Act

- OMB Circular A-102-Uniform Administrative Requirements for grants and Cooperative Agreements with State and Local Governments
- OMB Circular A-87- Cost Principles for State and Local Governments
- OMB Circular A-133, Audits of States, Local Governments and Non-Profits Organizations.

Cherokee Nation has identified limited resources that may be committed to the completion of these projects and appropriate funding through tribal enterprises, as well as, various grants and in kind contributions. Cherokee Nation has, over the last 20 years, grown and expanded. Responsible personnel will be utilized in the implementation of this plan and the strategies identified within.

Amendments Requirements: The Nation will amend this plan whenever necessary to reflect changes in Tribal or Federal laws and statutes as required in 44 CFR 13.11(d).

**General Compliance Assurance Statement**

Because of inherent limitations in any grant management program, errors may occur; however, as referenced throughout this plan, it is Cherokee Nation's intent to comply with all administrative requirements outlined in 44 CFR Parts 13 and 206 in their entirety and to monitor all sub-grant supported activities to ensure compliance with 44 CFR Parts 13 and 206 in their entirety.

## **Hazard Identification and Vulnerability Assessment**

The Cherokee Nation Technical Advisory Planning Team identified natural hazards that affect the Cherokee Nation Tribal Jurisdictional Service Area (TJSA). An effort was made to identify and describe past and possible hazard occurrences to which Cherokee Nation citizens, property, and tribally owned or operated facilities, and culturally significant sites were most vulnerable.

The entire Cherokee Nation TJSA is considered one unit in our Hazard Mitigation Plan with identification of hazards, methods, strategies and needs applied uniformly throughout the TJSA.

Each natural hazard has its own characteristics such as, time of year, geographic area of probable occurrence, severity, and risk level. Although natural hazards may be individually identified and categorized, many are interrelated, and a natural hazard event may involve multiple hazards. For example, severe thunderstorms may spawn high winds, lightning, hailstorms, tornados, and flooding.

According to National Climatological Data Center (NCDC) records, between 01/01/1950 and 08/31/09 there were 7,927 severe weather events reported in the Cherokee Nation TJSA. NCDC Storm Event database can be found at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>. The following is a breakdown of specific events.

- 0 Dam Failure
- 130 Drought
- 0 Earthquake
- 103 Extreme Temperatures
- 670 Flood/Flash Flood events
- 6,111 Severe Storms – Hail/Lightning/High Winds
- 490 Tornados
- 32 Wildfires
- 381 Winter Storms (Snow/Ice)
- 10 Other Events Not Listed Above

Based upon an extensive process utilizing input from the public, research of past disasters, risk assessments compiled by Oklahoma Climatological Survey and Cherokee Nation's capability for mitigation; the threat posed by the following 9



hazards (and their components) were considered significant enough to warrant formal risk assessments in this plan.

- 1) Dam Failure
- 2) Drought
- 3) Earthquake
- 4) Extreme Temperatures
- 5) Flooding/Flash Floods
- 6) Hail/Lightning/High Winds (Severe Storms)
- 7) Tornados
- 8) Wildfires
- 9) Winter Storms (Snow/Ice)

Probability is defined as: High - one or more event occurring every year  
Medium - one event occurring every three years  
Low - one event occurring every five years  
Unlikely - one event occurring every ten years

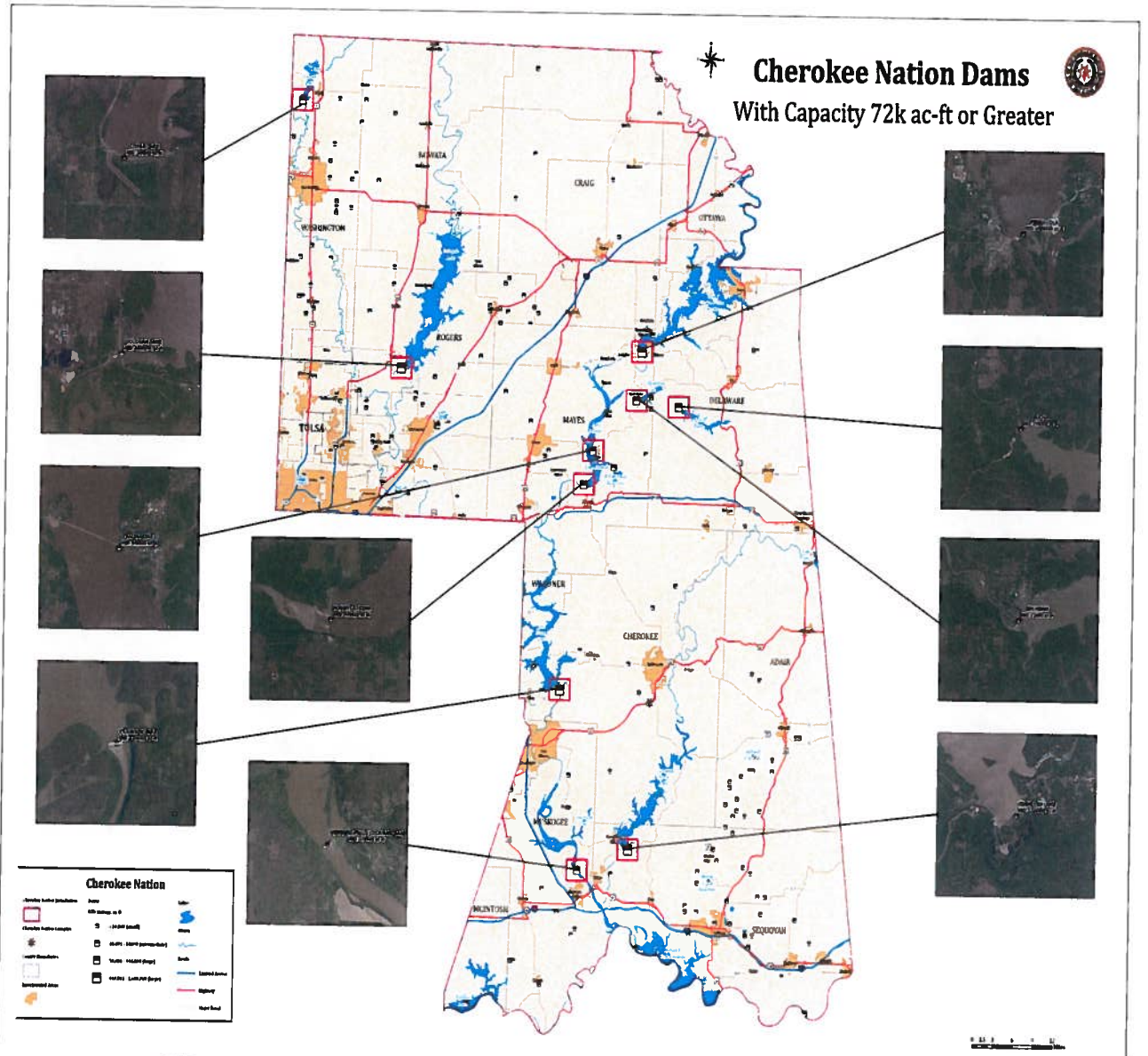
## **DAM FAILURE**

### **DESCRIPTION**

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 resulting in downstream flooding. A dam impounded is measured in acre-feet. An acre-foot is the volume of water that covers an acre of land to a depth of one foot. As a function of upstream topography, even a very small dam may impound or detain many acre-feet of water. Two factors influence the potential severity of a full or partial dam failure; the amount of water impounded and the density, type and value of development and infrastructure located downstream.

### **LOCATION**

The following map of dams was provided by Cherokee Nation Geo Data:



Throughout Cherokee Nation there are 152 dams with capacity of 72 ac-ft or greater. The Cherokee Nation has tribal members, communities, schools, and critical facilities located downstream from many of these dams. Tribal population has grown, residential and commercial development has occurred both upstream and downstream from dams.

A dam is designated as high hazard if there are occupied dwellings immediately downstream. Although dams are not a natural hazard, the flooding that could occur from a dam breach would be.

## EXTENT

Dam failure occurring with inundation of three feet (3') of water above base flood elevation would be considered a severe event. Any collapse of a dam is considered a severe event. As with any location in which man-made structures exist, potential failure of the structure could place lives and property at risk. The high-hazard 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 the following causes:

- Prolonged periods of rainfall and flooding, this is the most common;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, or replace lost material from the cross section of the dam and abutments;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway;
- Landslides into reservoirs, causing surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion;
- Earthquakes, which typically cause longitudinal cracks at the top of embankments, weakening structures.

Each dam in the inventory is assigned a downstream hazard classification based on the potential loss of life and damage to property should the dam fail. The three classifications are high, significant and low. With changing demographics and land development in downstream areas, hazard classifications should be updated continually. Due to security concerns, the list of hazard classifications and dams could not be obtained for inclusion in this plan.

## PREVIOUS OCCURRENCES

There are high hazard dams within the Cherokee Nation TJSA. There is no history of failure of these dams, making dam failure uncommon.

## **PROBABILITY OF FUTURE OCCURRENCES**

Since no dam breaks have occurred within Cherokee Nation, probability of a dam break is rated as low. Recently a number of levees have lost certification. The impact of a levee breach would be devastating to communities, cultural sites, critical infrastructure, and citizens in the immediate area.

## **SUMMARY:**

### **OVERALL VULNERABILITY**

Cherokee Nation TJSA has 152 dams with capacity of 72 ac-ft or greater. According to the Oklahoma Conservation Commission many of the older flood control dams were built with a designed 50-year life span. There are 41 dams within Cherokee Nation that will surpass the 50-year life span within the next nine years with five exceeding the life span within the next three years. Tribal agencies/facilities located in high hazard dam areas include medical clinics, dental clinics, optometry clinics, food distribution warehouses, head start centers, culturally significant sites, and tribal tag agencies are vulnerable to dam failure.

### **IMPACT**

There are cities, towns, communities, critical tribal government buildings, tribal businesses, and tribal citizens located in the inundation zone of many older dams within Cherokee Nation. In the event of dam failure, tribal properties, cultural sites and tribal members would have severe damages, be destroyed and loss of life could occur.

## **DROUGHT**

### **DESCRIPTION**

A drought is a period of time when there is not enough precipitation to support agricultural, urban, human, or environmental water needs. A drought usually refers to an extended period of below-normal rainfall, but can also be caused by drying bores or lakes, or anything that reduces the amount of liquid water available. Drought is usually difficult to recognize at the onset. Drought analysis is more subjective than that for floods, because droughts do not occur suddenly. A drought evolves over time and is spread over a large geographical area. Drought severity depends on its duration, intensity, geographic extent, and the regional water supply demands of human activities and vegetation. This multi-dimensional nature event makes it difficult to define a drought and to perform comprehensive risk

assessments. Some secondary hazards associated with drought are locusts and grasshoppers which can cause severe crop damage.

## LOCATION

Cherokee Nation TJSA has experienced an average of two (2) drought events per year. All areas of the Cherokee Nation TJSA have seasonal crops such as peaches, strawberries, blueberries, blackberries, vegetables, etc. Cherokee Nation owns over 24,000 acres of agricultural lands which are used for grazing, hay and crops. Plants used for cultural purposes are also affected by drought, as is our forest lands.

## EXTENT

A drought can happen anywhere within the Cherokee Nation TJSA and can have serious health, social, economic and political impacts with far-reaching consequences. Water is the most essential commodities for human survival, second only to breathable air. When there is a drought, conditions can become difficult or dangerous very quickly. The consequences of drought may include water rationing, hunger/famine, thirst, disease, wildfires, social conflict/war, migration/relocation, loss of recreational and cultural activities/areas and loss of income. Drought also has a significant effect on our cultural grounds and traditional activities. The loss of natural foliage and herbs used for traditional and medicinal practices can impact tribal citizens that depend on its many uses.

Agriculture within the Cherokee Nation TJSA feels the impact of drought, especially in non-irrigated areas such as dry-land farms and rangelands. Drought can affect crops which could result in loss of income and loss of food. Each district has seasonal crop festivals which some tribal citizens depend on for income. Some of the seasonal crops include strawberries, peaches, huckleberries, blueberries, blackberries, grapes and a wide range of vegetables.

The most commonly used indicator of drought is the Palmer Drought Severity Index. The Palmer Index is a soil moisture algorithm calibrated for relatively homogeneous regions. Based on precipitation and temperature, the Palmer Index can be applied to any area where sufficient data is available. Cherokee Nation can expect to experience the entire scale.

The Palmer Classification Scale can be found in Appendix B, Table 1.

## **PREVIOUS OCCURRENCES**

According to NCDC there were 130 reports of drought events within the Cherokee Nation TJSA over the past 15 years. The Cherokee Nation TJSA has experienced drought events every year. With these events, there were injuries, millions of dollars in property and crop damages recorded. The Cherokee Nation has tribal land, tribal structures and tribal citizens in all counties listed with statistical data. The latest drought while lasting only from October 1995 through May 1996 affected agriculture, natural resources, cultural activities and fruit harvests.

## **PROBABILITY OF FUTURE OCCURRENCES**

Historical data and the climatic location indicate a high probability of experiencing some level of drought conditions annually anywhere within the Cherokee Nation TJSA.

## **SUMMARY:**

### **OVERALL VULNERABILITY**

Cherokee Nation's two golf courses are heavy water users and are also negatively impacted. Water related activities of residential users and tourist might be restricted. Droughts also cause power shortages as much of the Tribe's power comes from hydroelectric plants. The lack of water results in less power/electric being supplied and an increase in price. Cherokee Nation's clinics, enterprises and government buildings are heavy electricity users and can be affected, usually by having to purchase more expensive replacement power.

During droughts, crops do not mature, wildlife and livestock are undernourished, land values decrease and unemployment increases. Tribal citizens affected will turn to the Cherokee Nation for assistance during times of drought. However, Cherokee Nation and Federal assistance covers only a small portion of the economic losses. The average yearly loss to drought in the US is \$6 - \$8 million and the total losses attributed to the 1987-89 droughts were between \$39 and \$40 billion.

The risk of serious environmental damage, particularly through vegetation loss and soil erosion, has long term implications for the sustainability of agricultural industries. Water quality suffers, and toxic algae outbreaks may occur; plants and animals are also threatened. Bushfires and dust storms often increase during dry times. Traditional and medicinal plant may become extinct.

Drought episodes can last from a few months to several years. Those that last a few months can elevate wildfire danger and impact municipal water use. Seasonal droughts can occur at any time of the year, and those that occur with crop production cycles can cause billions of dollars of damage to the farm and agricultural economy. Multi-season and multi-year episodes can severely impact large reservoirs, stream flow and groundwater.

## **IMPACT**

The lack of fresh water is damaging to livestock, crops and the public. During the summer months, temperatures in the Cherokee Nation TJSA can easily reach over 100 degrees Fahrenheit. Often these high temperatures will persist for weeks. Drought conditions increase fire hazards and reduces water supply. Low water levels do result in loss of income generated from lake and river users such as floating, fishing, camping, canoe building, rafting, etc. Heat and drought also effect local workforce capabilities. Workers exposed to these elements must be monitored for heat exhaustion and heat stroke.

Other problem associated with drought and heat is stale water. Areas of stale water are known to produce deadly bacteria and mosquito infestation which is a major contributor to West Nile Virus. Many tribal citizens living in rural areas rely on their gardens and wild plants for food and other cultural uses. These losses can negatively impact tribal citizen's health and economic resources.

## **EARTHQUAKE**

### **DESCRIPTION**

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth, huge plates that form the Earth's surface move slowly over, under and past each other. Sometimes the movement is gradual, but 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. Earthquakes strike suddenly and without warning.

### **LOCATION**

The Northern and Northwestern portion of Cherokee Nation TJSA is located on a branch of the New Madrid fault line. Critical facilities such as health clinics, government offices, large gaming facilities, hotels, tourism venues, and tribal

citizens are located in the Northern portion of TJSA

## EXTENT

Cherokee Nation TJSA has experienced up to III on the Modified Mercalli Intensity Scale on 7 occasions. Although there were no collapse losses reported, the structural integrity of at least one multi-million dollar government facility was affected.

The size of an earthquake can be expressed by the local strength of shaking. Ratings of earthquake effects are based on the following relatively subjective scale of descriptions:

### Modified Mercalli Intensity Scale

- I. People do not feel any Earth movement.
- II. A few people might notice movement if they are at rest and/or on the upper floors of tall buildings.
- III. Many people indoors feel movement. Hanging objects swing back and forth. People outdoors might not realize that an earthquake is occurring.
- IV. Most people indoors feel movement. Hanging objects swing. Dishes, windows, and doors rattle. The earthquake feels like a heavy truck hitting the walls. A few people outdoors may feel movement. Parked cars rock.
- V. Almost everyone feels movement. Sleeping people are awakened. Doors swing open or close. Dishes are broken. Pictures on the wall move. Small objects move or are turned over. Trees might shake. Liquids might spill out of open containers.
- VI. Everyone feels movement. People have trouble walking. Objects fall from shelves. Pictures fall off walls. Furniture moves. Plaster in walls might crack. Trees and bushes shake. Damage is slight in poorly built buildings. No structural damage.
- VII. People have difficulty standing. Drivers feel their cars shaking. Some furniture breaks. Loose bricks fall from buildings. Damage is slight to moderate in well-built buildings; considerable in poorly built buildings.
- VIII. Drivers have trouble steering. Houses that are not bolted down might shift on their foundations. Tall structures such as towers and chimneys might twist and fall. Well-built buildings suffer slight damage. Poorly built structures suffer severe damage. Tree branches break. Hillsides might crack if the ground is wet. Water levels in wells might change.
- IX. Well-built buildings suffer considerable damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The



- ground cracks. Reservoirs suffer serious damage.
- X. Most buildings and their foundations are destroyed. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, lakes. The ground cracks in large areas. Railroad tracks are bent slightly.
  - XI. Most buildings collapse. Some bridges are destroyed. Large cracks appear in the ground. Underground pipelines are destroyed. Railroad tracks are badly bent.
  - XII. Almost everything is destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move.

As you can see from the list above, rating the Intensity of an earthquake's effects does not require any instrumental measurements.

#### PREVIOUS OCCURRENCES

There were 105 events that occurred, 7 of which were felt within the Cherokee Nation TJSA. Some buildings with hazardous materials required evacuation and the structural integrity of at least one critical facility was affected.

#### PROBABILITY OF FUTURE OCCURRENCES

Although an earthquake can happen anywhere within the Cherokee Nation TJSA, the probability of a future event is low. According to NCDC earthquake related tremors have been felt at least 7 times within our TJSA.

#### SUMMARY:

#### OVERALL VULNERABILITY

Cherokee Nation structures were not built to comply with earthquake-resistant building codes. A large-magnitude earthquake near one of the towns or cities could cause structural failure, financial losses and possibly loss of life.

The building codes used to construct commercial structures and residential housing do not include any earthquake resistant codes. Due to the low level threat of this event, these codes are not yet enacted in this part of the country. Of special concern are the design and construction of the Tribe's critical facilities such as hospitals, clinics, casinos, tribal facilities, oil and gas pipelines, communication facilities/towers, electrical lines/plants, water supply and sewage treatment facilities.

#### IMPACT

The impact of an earthquake event within the Cherokee Nation TJSA depends on

the extent of the event. During earthquake events, buildings collapse leaving people without shelter, roads become impassable, pipelines break releasing oils and gasses, bridges fail impeding traffic, etc. Affected tribal businesses and citizens could have loss of income and structure failures.

## **EXTREME TEMPERATURES (HOT/COLD)**

### **DESCRIPTION**

An extreme temperature condition is defined as a situation wherein the citizens and property of the Cherokee Nation TJSA are threatened by the effects of an extreme temperature condition resulting from:

Extreme Heat = 10 degrees above average temperature combined with high humidity + consecutive days in a row

Extreme Cold = 10 degrees below average temperature + consecutive days in a row or record setting temperature several degrees below zero for just one day

Extreme temperatures are calculated based on temperature, humidity and wind.

### **LOCATION**

The entire Cherokee Nation TJSA experiences extreme temperatures. There are communities, critical facilities, clinics, government offices, businesses, elderly/disabled housing sites and early childhood centers located throughout the Cherokee Nation TJSA.

### **EXTENT**

The annual average temperature in the Cherokee Nation TJSA is 60 degrees. Record high temperatures of over 105 degrees have been recorded in all counties of the Cherokee Nation TJSA. Three counties in the northern portion of the TJSA have experienced record temperatures of -25 degrees. Extremely cold temperatures have caused major damages to Cherokee Nation buildings. Temperatures that cause adverse reaction to human, animals and mechanical devices can be defined as extreme.

### **PREVIOUS OCCURRENCES**

According to NCDC there were 103 reports of extreme temperature events within

the Cherokee Nation TJSA over the past 15 years. Extreme temperatures occur on a yearly basis in all areas of the Cherokee Nation TJSA. There have been 76 reported deaths in the last 10 years. Cherokee Nation's critical facilities and other buildings have been damaged when pipes burst due to cold temperatures. A sprinkler system pipe froze and burst, flooding the Youth Shelter in District 1, and the Wilma P. Mankiller Health Clinic in District 2, both causing thousands of dollars worth of damages to buildings and their contents.

#### **PROBABILITY OF FUTURE OCCURRENCES**

The Cherokee Nation TJSA has a high probability of future extreme weather events. The Cherokee Nation has tribal land, facilities, government offices, critical infrastructure and citizens in all counties listed with statistical data.

#### **SUMMARY:**

##### **OVERALL VULNERABILITY**

Cherokee Nation has businesses, property and citizens that can be adversely affected by extreme weather. The cost of heating or cooling building during times of extreme temperature can be costly to businesses and tribal citizens. These times can also overwork the heating and cooling systems thereby costing the Tribe expensive repairs to HVAC units.

Tribal citizens are venerable to extreme temperatures. Providing protection and treatment to citizens with extreme exposure can be costly. The Tribe provides air conditioners, fans, wood for wood burning stoves and various heating equipment to affected low income citizens. The hospitals, clinics and ambulance services can be overloaded with victims of extreme temperatures.

##### **IMPACT**

Extreme temperatures can have a serious economic impact on any community within the Cherokee Nation TJSA. In times of extreme heat the increased demand for water and electricity may result in shortages of resources. Freezing cold weather can cause pipes to burst in tribal buildings and residential housing resulting in thousands of dollars worth of damage.

## FLOODING/FLASH FLOODS

### DESCRIPTION

A flood is described as a general and temporary condition of partial or complete inundation of normally dry land area from an overflow of inland or tidal waters, or unusual and rapid accumulation or runoff of surface waters from any source, or mudflow, or collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels. Floods often happen when bodies of water overflow or tides rise due to heavy rainfall or thawing snow. You don't have to live near water to be at risk for flooding. A flash flood, which can strike anywhere without warning, occurs when a large volume of rain falls within a short time. The Flood Zones Classification table is located in Appendix B, Table 2.

### LOCATION

Cherokee Nation has many areas that are susceptible to flooding. Flooding occurs in low lying areas adjacent to the Illinois River, Lake Hudson, Arkansas River, North Canadian River, Deep Fork River, Verdigris River, Arkansas Navigational System, Baron Fork Creek, Pole Cat Creek, etc. Future mapping projects will create a more accurate hazard analysis because tribal lands do not coincide with current flood insurance rate maps.

All counties within the Cherokee Nation TJSA experience flooding. Flooding occurs along the rural hilly roads, making them impassable for residents and emergency vehicles. During times of heavy rain many towns and cities are very susceptible to street and intersection flooding. There are also creeks within city limits that overflow their banks causing residents to be evacuated.

### EXTENT

There are varying extents for flooding due to the Cherokee Nation TJSA ranging from 2 hours of constant rainfall to accumulations of 5 or more inches in low lying areas. These events can be considered severe.

There are three major types of floods experienced by the Cherokee Nation:

**Flash flood-** (the fastest moving type of flood) happens when heavy rain collects in a stream or gully, turning the normally calm area into an instant rushing current. Flash floods in Arroyos- an arroyo is a water-carved gully or a normally dry creek found in arid or desert regions. Storms that appear in these areas produce the rain water that cuts into the dry, dusty soil creating a small, fast-moving river. Flash flooding in an arroyo can occur in less than a minute, with enough power to wash away sections of pavement.

**River flood-** flooding along rivers is a natural event. Some floods occur seasonally when winter snows melt and combine with spring rains. Water fills river basins too quickly, and the river will overflow its banks. Often the land around a river will be covered by water for miles around.

**Urban flood-** as undeveloped land is paved for parking lots; it loses its ability to absorb rainfall. Rain water cannot be absorbed into the ground and becomes runoff, filling parking lots, making roads into rivers, and flooding basements and businesses.

These types of flood are typically used if the ground is not already saturated.

### PREVIOUS OCCURRENCES

According to the NCDRC there were 670 reports of flooding /flash flood events within the Cherokee Nation TJSA over the past 15 years. A flood could happen at any time within the Cherokee Nation TJSA. Also, power outages related to floods may disrupt water treatment and supply plants thereby increasing the risk of water-borne diseases, but may also affect proper functioning of health facilities.

The Cherokee Nation TJSA has many flood occurrences in its history. The Town Branch Creek in Tahlequah and Lake Hudson at Salina and Locust Grove have experienced flooding which caused evacuation of citizens living in low lying areas.

In the last five years, one severe flood resulted in an oil leak from a major oil refinery. This severely damaged and condemned tribal housing and citizen homes causing relocation of several families.

### PROBABILITY OF FUTURE OCCURRENCES

The Cherokee Nation TJSA has experienced an average of 7.24 flood events per year. The Cherokee Nation TJSA has a 100% probability of future flooding. The Cherokee Nation has tribal land, citizens, businesses, and structures in all counties listed with statistical data so the probability is high for flooding.

### SUMMARY:

#### OVERALL VULNERABILITY

The Cherokee Nation has buildings and property in low lying areas and flood inundation zones throughout the TJSA. Tribal casinos, clinics, head starts and government buildings are vulnerable to flooding. Tribal citizens require assistance due to repetitive flooding of their homes.

#### IMPACT

Critical facilities such as warehouses designated to receive and distribute Strategic

National Stockpile medicine, governmental facilities, clinics, enterprises and emergency services can be impacted by flood waters that make roads impassable, thereby causing delayed or no services to citizens or communities. Flood waters can also enter buildings causing extensive damage to equipment and the building.

The economic impact to Tribal citizens is devastating due to costly repairs and cleanup of repetitive flooding this is further compounded due to the lack of homeowner's flood insurance. Health issues become a factor due to the growth of mold and loss of finances impacted by the cost of flooding.

## **SEVERE STORMS (HAIL, LIGHTNING, HIGH WIND)**

### **DESCRIPTION**

Hail is a form of precipitation which consists of balls or irregular lumps of ice (hailstones), 5mm-50mm in diameter on average, with much larger hailstones from severe thunderstorms. Hail is always produced by cumulonimbus (thunderclouds), and is composed of transparent ice or alternating layers of transparent and translucent ice at least 1mm thick. Small hailstones are less than 5m in diameter. Unlike ice pellets, they are layered and can be irregular and clumped together.

Hailstones, while most commonly only a few millimeters in diameter, can sometimes grow to 15 centimeters and weigh more than half a kilogram (1.1 pounds). Pea or golf ball sized hailstones are common in severe storms affecting the Cherokee Nation TJSA.

Lightning is generated by the buildup of charged ions in a thundercloud. When that buildup interacts with the best conducting object or surface on the ground, the result is a discharge of a lightning bolt. Thunder is the sound of the shock wave produced by the rapid heating and cooling of the air near the lightning bolt. The air in the channel of a lightning strike reaches temperatures higher than 50,000 degrees Fahrenheit.

Wind is the rough horizontal movement of air caused by uneven heating of the Earth's surface. It occurs at all scales, from local breezes generated by heating of land surfaces and lasting tens of minutes to global winds resulting from solar heating of the Earth. The two major influences on the atmospheric circulation are the differential heating between the equator and the poles, and the rotation of the planet.

While high winds are commonly associated with severe thunderstorms, hurricanes, or tornados, they may also occur as a result of differences in air pressure, such as when a cold front passes across the area. These high winds do not have to accompany a storm to be dangerous. High winds, whether accompanied by a storm or not, can cause death, injury, and crop or property damages.

## LOCATION

Severe storms can occur anywhere within the Cherokee Nation TJSA. When these events occur, they can cause serious damage to buildings, automobiles and most commonly, farmers' crops.

Cherokee Nation Property and Receiving Warehouse was struck by lightning which melted an entire industrial sized electric panel. This resulted in inoperability for three days and required total replacement of the unit.

## EXTENT

Severe storms cause thousands of dollars in damages and lost revenue throughout the Cherokee Nation TJSA. Electrical fires, electricity loss, equipment damage and loss of life are a few of the main hazards associated with lightning strikes. Hail and high wind can damage roofs and awnings to any critical facility or building within the TJSA.

The intensity of a hailstorm is measured using the NOAA/TORRO Hailstorm Intensity Scale and wind intensity is measured using the Beauford Scale.

NOAA/TORRO Hailstorm Intensity Scale can be found in Appendix B, Table 3 and the Beauford Scale can be found in Appendix B, Table 4.

## PREVIOUS OCCURRENCES

According to NCDC there were 6,111 reports of Severe Storms – Hail/Lightning/High Wind events within the Cherokee Nation TJSA over the past 15 years. Five fatalities and nine injuries have been recorded in the TJSA over the past 15 years and are considered catastrophic events. A business that must shut down because of electrical loss, any lightning strike; hail over .80 inches and wind higher than 47 mph is considered a major event.

Cherokee Nation Property and Receiving Warehouse was struck by lightning which melted and entire industrial sized electric panel. This resulted in inoperability for three days and required total replacement. Straight line winds have damaged crops and residential roofing.

## **PROBABILITY OF FUTURE OCCURRENCES**

The Cherokee Nation TJSA has tribal land, citizens, and critical infrastructure within all counties listed with statistical data. Damage to tribal vehicles, government fleet vehicles, buildings, HVAC units and roofs has been documented through Cherokee Nation Risk Management.

According to the NCDC there were 3,223 hail events and 2,833 reports of high wind events within the Cherokee Nation TJSA over the past 15 years. All areas within the Cherokee Nation TJSA have been affected by power outages, buildings damaged and trees blown down. The Cherokee Nation has critical facilities, tribal buildings and tribal land in all counties within the TJSA.

Cherokee Nation owns a sanitation landfill which sustained considerable repetitive damage to the electronic weigh scale each time it was struck by lightning. Several Cherokee Nation departments have experienced lightning damage and destruction of electronic equipment such as computers, servers and radio base stations. Five fatalities and nine injuries have been recorded within the Cherokee Nation TJSA.

The Cherokee Nation TJSA is located in the middle area of the Great Plains which is most frequently affected by thunderstorms. The probability of future events is high.

## **SUMMARY:**

### **OVERALL VULNERABILITY**

The largest vulnerability is the potential for loss of human life. Anyone outdoors during a thunderstorm is exposed and at risk of injury from lightning.

Technology is very vulnerable to lightning strikes. Critical facilities, businesses and sub-offices are located throughout the TJSA. These buildings are dependent on computer networks for daily operations and some for temperature control.

Cherokee Nation Property and Receiving Warehouse were struck by lightning which melted and entire industrial sized electric panel. This resulted in inoperability for three days and required total replacement. Cherokee Nation vehicles have sustained windshield and body damages due to hail storms. High wind has also caused damage to tribal vehicles by flying debris and Head Start storage buildings were blown over, scattering and destroying contents. Doors, roofs, and shutters on tribal buildings, tribal housing, and residential homes have been repaired or replaced due to damage caused by high winds.



Cherokee Nation's disaster program provides limited home repair for roofs, well houses and windows of Tribal Citizens' homes damaged by severe storms.

## **IMPACT**

Lightning strikes to electronic and computer equipment within the Cherokee Nation TJSA can cause damage and shut down businesses and other critical facilities, such as health clinics and administrative buildings; it also affects emergency operations such as law enforcement and ambulance.

Tribal buildings and vehicles damage by hail and wind storms have caused expensive repairs and temporary loss of use. Additional funds could be required for repairs to busted windshields, body damage, roof shingles and repairs to Tribal Citizens' homes.

## **TORNADO**

### **DESCRIPTION**

A tornado is a rapidly rotating vortex or funnel of air extending to the ground from a cumulonimbus cloud. When the lower tip of a vortex touches earth, the tornado becomes a force of destruction. The path width of a tornado is generally less than a half-mile, but the path length can vary from a few hundred yards to dozens of miles. A tornado moves at speeds from 30 to 125 mph, but can generate winds exceeding 300 mph.

### **LOCATION**

The Cherokee Nation TJSA has structures that would make a critical impact on our communities in the path of a tornado. These structures include our Indian hospitals and Indian clinics. Most of our citizens rely on these for their medical, dental, optometry and pharmaceutical needs and if these entities are disrupted an individual could reach a life threatening situation if they are unable to receive attention in a timely manner. Another effect of a tornado would be damage to the businesses, hospitality and tourism centers that are located throughout the TJSA. These casinos are a major source of income for the Cherokee Nation. With these structures being so widespread the entire Cherokee Nation TJSA is vulnerable to tornado.

### **EXTENT**

A tornado can happen anywhere within the Cherokee Nation planning and can

devastate and destroy whole communities.

The Enhanced Fujita Scale, or EF Scale, is the scale for rating the strength of tornados in the United States estimated via the damage they cause. Implemented in place of the Fujita scale, it was used starting February 1, 2007. The scale has the same basic design as the original Fujita scale, six categories from zero to five representing increasing degrees of damage. It was revised to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. The new scale takes into account how most structures are designed, and is thought to be a much more accurate representation of the surface wind speeds in the most violent tornados. The Cherokee Nation TJSA can experience all categories of the scale.

The Fujita Scale is shown in Appendix B, Table 4.

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale (Appendix B, Table 5), which replaces it. None of the tornados recorded on or before January 31, 2007 will be re-categorized. Therefore maintaining the Fujita scale will be necessary when referring to previous events.

#### PREVIOUS OCCURRENCES

According to the NCDC there were 490 reports of tornado events within the Cherokee Nation TJSA over the past 15 years. Cherokee Nation has tribal land, facilities, critical facilities, and businesses in all counties listed with statistical data.

In the past 5 years, Cherokee Nation has experienced 31 tornados which reported 379 injuries and 21 deaths. All tornados can be devastating, such as the two recent events that recorded the most injuries within the TJSA. In March of 2006, a tornado destroyed and damaged homes and businesses located in Delaware County. There were 12 injuries reported with this event. The May 2008 tornado hit Pitcher, OK within the TJSA and injured a reported 150 people with 7 deaths attributed to this event. The amount of property damage was in the millions.

#### PROBABILITY OF FUTURE OCCURRENCES

Cherokee Nation TJSA is located in northeastern Oklahoma which is the most tornado-prone area of the United States. Each year Oklahoma has more tornado events per square mile than any other state. Cherokee Nation TJSA has a high probability of experiencing multiple tornado events every year.

## **SUMMARY:**

### **OVERALL VULNERABILITY**

Cherokee Nation TJSA has tribal housing, critical facilities, clinics, governmental offices, citizens, agricultural resources, and businesses that are vulnerable to a tornado event.

### **IMPACT**

A tornado event can have a serious economic impact and potential for loss of life for any community within the Cherokee Nation TJSA. Businesses and enterprises that are damaged or destroyed can cause a reduction of income which is used to maintain facilities and provide services to tribal members. Damage to any of the Tribe's facilities can cause a disruption of services and jobs for Tribal citizens plus the cost of repairs or replacement of damaged structures.

## **WILD FIRES**

### **DESCRIPTION**

A wildfire is known as an uncontrolled fire often occurring in wild land areas, but which can also consume houses or agricultural resources. Weather conditions can directly contribute to the occurrence of wildfires such as through lightning strikes, or indirectly such as by an extended dry spell or drought that contributes to the availability of fuel.

### **LOCATION**

Tribal hospitality, tourism and gaming facilities, clinics, critical facilities, businesses, head start, tribal housing and sub-offices located in rural areas are susceptible to a wildfire event. The Cherokee Nation has tribal land in all counties listed with statistical data and can experience all ranges of the Keetch-Byram Drought Index.

### **EXTENT**

Wildfire is a serious and growing hazard over much of the Cherokee Nation, posing a great threat to life and property, particularly when it moves from forest or rangeland into developed areas. Wildfires can happen anywhere within the Cherokee Nation TJSA. The Cherokee Nation is concerned with both wild land urban interface areas as well as rural areas. The Cherokee Nation TJSA has critical facilities within both areas of concern. Future mapping project will create a more accurate hazard analysis.

The Keetch-Byram Drought Index (KBDI) is basically a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. This system was originally developed for the southeastern United States and is based primarily on recent rainfall patterns. It is also one of the only drought index systems specifically developed to equate the effects of drought with potential fire activities.

The result of this system is a drought index number ranging from 0 to 800 that accurately describes the amount of moisture that is missing. A rating of zero defines the point where there is no moisture deficiency and 800 is the maximum drought possible.

These numbers correlate with potential fire behavior as follows:

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

The Cherokee Nation can experience the entire Keetch-Byram Scale during any time of the year depending on rainfall. Any acreage burned during a wildfire event would be considered a severe event.

#### PREVIOUS OCCURRENCES

According to the NCDC, over the past 15 years, there were 32 reports of wildfire events within the Cherokee Nation TJSA. During this time, 6 deaths and 66 injuries were also reported within the Cherokee Nation TJSA. Wildfire has destroyed homes, buildings, farm lands and forests causing \$10,590,000 in damages over the past 20 years.

## **PROBABILITY OF FUTURE OCCURRENCES**

The Cherokee Nation TJSA experiences unfavorable conditions on a yearly basis, making the probability of a wildfire event high.

## **SUMMARY:**

### **OVERALL VULNERABILITY**

Cherokee Nation has hundreds of thousands of acres of land throughout the TJSA. In addition to critical facilities, businesses, gaming, clinics and tribal housing, the lands are used for grazing, crops, forestry, hay fields and tourism. All areas within the TJSA are vulnerable to wildfire.

### **IMPACT**

The impact of a wildfire could have serious economical effect to the Cherokee Nation and its tribal members. Cherokee Nation is located in the area known as Green Country. Tribal businesses and tribal members depend on the tourist visits to the many area lakes, rivers and streams. Loss of income and loss of land use could take years for recovery.

## **WINTER STORMS (SNOW/ICE)**

### **DESCRIPTION**

A winter storm can range from moderate snow over a few hours to blizzard conditions with high winds, freezing rain or sleet, heavy snowfall with blinding wind-driven snow and extremely cold temperatures that lasts several days. A winter storm is one that drops 4 or more inches of snow during a 12-hour period, or 6 or more inches during a 24-hour span. An ice storm occurs when damaging accumulations of ice form from falling rain that freezes on impact. Significant ice storms are those with ice accumulations of ¼ inch or greater. A winter storm can range from a moderate snow fall over a few hours to blizzard conditions with possibly blinding, wind-driven snow lasting several days. Many winter depressions give rise to exceptionally heavy rain and widespread flooding. Conditions worsen if the precipitation falls in the form of snow, because it occupies seven to ten times more space than the same quantity of rain. The aftermath of a winter storm can impact a community or region for weeks, and even months.

### **LOCATION**

A winter storm can happen and pose a threat anywhere within the Cherokee Nation TJSA. The Cherokee Nation TJSA consists of large rural areas with many tribal

members living miles from the nearest town. Any tribal clinic, hospital, critical facility, business and citizens located throughout the TJSA can be affected by the effects of a winter storm.

## EXTENT

Cherokee Nation government and business are affected by snow when accumulation is over 6 inches. Maintenance and ground crews begin clearing roads, sidewalks and parking lots for the safety of citizens and employees. Significant accumulations of ice pull down trees and utility lines resulting in loss of power, communications and emergency access. Roadways and sidewalks become slick and become dangerous with .10 inch of ice. All winter storms make driving and walking extremely hazardous. The aftermath of a winter storm can impact a community or region for days, weeks, and even months. Storm effects such as extreme cold, flooding, and snow accumulation can cause hazardous conditions and hidden problems for people in the affected area. People can become stranded on the road or trapped at home, without utilities or a means to get heat, food, and water. Residents, travelers and livestock may become isolated or stranded without adequate food, and water. Winter storms are considered deceptive killers as they can indirectly cause transportation accidents, injury, and death resulting from exhaustion/overexertion, hypothermia, frostbite, and asphyxiation. House fires occur more frequently in the winter due to lack of proper safety precautions.

The Sperry-Piltz Ice Accumulation Index shown in Appendix B, Table 6.

## PREVIOUS OCCURRENCES

According to the NCDC there were 381 reports of winter events within the Cherokee Nation TJSA over the past 15 years. Previous ice storms caused residents to be trapped in their home without food, water, electricity and medications.

Cherokee Nation TJSA had four declared disasters resulting from winter storms within the past three years. These storms downed power lines and left large portions of the TJSA without electricity for several days and for weeks in some areas. Many rural water systems and water treatment plants were inoperative due to the power outages. Debris made roads impassable impeding emergency services.

## PROBABILITY OF FUTURE OCCURRENCES

The Cherokee Nation TJSA experiences winter weather several times a year. The Cherokee Nation has tribal land, facilities, and citizens in all counties listed with statistical data so the probability is high for winter weather.

## **SUMMARY:**

### **OVERALL VULNERABILITY**

Cherokee Nation TJSA has critical facilities, health clinics, hospitals, governmental offices, hospitality and gaming centers, and businesses that are vulnerable to a winter weather event. Tribal communities which are also located throughout the whole TJSA are vulnerable to winter weather events. Roadways could be blocked with downed trees and power lines, thereby trapping elderly and handicapped in their homes without food, heat, medication, or a means to get dialysis or medical treatment.

Cherokee Nation governmental offices, clinics and a high income generating business were shut down due to no electricity caused by winter weather. Tribal insurance claims indicate roofs and awning were damaged by falling tree limbs, fencing was destroyed and loss of income was some of the effects of these events.

### **IMPACT**

The Cherokee Nation TJSA has businesses and enterprises that generate income for Cherokee Nation programs and services. The economic impact from a casino shutting down for one hour due to an event is significant and can also cause a loss in program services to tribal citizens. Additionally, this size of loss can result in a decrease or elimination in sponsorship, donations, and community projects to non-tribal entities, schools and agencies.

### **Mitigation Strategy and Goals**

At the beginning of this process, Cherokee Nation Emergency Management (CNEM) met with the respective County Emergency Managers and requested a copy of each County's Hazard Mitigation Plan. We determined that only 2 of the 14 counties within our Cherokee Nation Tribal Jurisdictional Service Area (TJSA) actually had an approved hazard mitigation plans, thus only 2 of the counties were eligible for federal funding of mitigation projects. The information obtained from review of the current and expired county plans and/or conversations with respective officials for the area in which a plan was absent emphasized the importance of providing the tribe with a plan to reduce or eliminate loss of life and property damage from natural hazards.

This plan successfully identifies the natural hazards that exist within our

jurisdictional borders. Input was sought for tribal members as well as non-tribal members to identify the main concerns of the citizens residing within our jurisdictional boundaries. We have successfully provided actions based on risk assessment findings to mitigate the identified hazards' impact upon communities within our TJSA.

The most important roles that this plan has achieved, once adopted by resolution, are; becoming regulatory requirements in further planning efforts and contributing to the preservation of Cherokee cultural heritage by protecting tribal citizens, communities, and sacred culturally significant sites. The goal of this plan is to provide for the long-term protection of employees, tribal citizens, clients, the public, assets of our tribe, and to minimize injury, loss of life, and damage resulting from any type of natural hazard.

## **IDENTIFICATION AND ANALYSIS OF TRIBAL MITIGATION ACTIONS**

Several hazard mitigation actions were identified and analyzed that would benefit the Cherokee Nation Tribal Jurisdictional Service Area (TJSA). Input from Cherokee Nation's Hazard Mitigation Technical Advisory Planning Committee and community meetings with the tribal public and non-tribal public; as well as interaction with other tribal emergency managers and county emergency managers was integrated in this document. Final decision was based on social impact, technical feasibility, administrative capabilities, political, legal effects, economic, and environmental issues (S.T.A.P.L.E.E. Method).

Many Cherokee Nation tribal government departments and entities will work together to achieve these action items. Some departments will author and conduct while others will concentrate on distribution of information. Some of the programs included: Community Services, Natural Resources, Environmental Programs, Tribal Services, Human Services, Information Systems, Communications, Marshal Services, Attorney General, Risk Management, Emergency Medical Services, Environmental Health, Education Services, Cherokee Nation Entertainment (CNE), Cherokee First, et.al.

**Mitigation Action: INCREASE PUBLIC AWARENESS AND EDUCATION CAMPAIGNS**



**Identified Hazards:** Dam Failure, Drought, Earthquake, and Extreme Temperatures, Flooding/Flash Flooding, Hail/Lightning/High Winds, Tornadoes, Wildfire, and Winter Storms - Snow/Ice

**Action/Comments:** Create and implement public awareness campaigns for each hazard identified, methods for preventing damages resulting from hazardous conditions. Encourage tribal citizens to get involved in educating their community; establish trained community strike teams; create and distribute informative brochures/flyers, design and update web pages, develop and administer school training activities and functions; host and/or conduct workshops; assist community members in creating family disaster plans; create trainings and distribute emergency supply kits; develop partnerships with different types of media; i.e. newspaper, website, community, meetings, and radio to assist in spreading the message of how to mitigate hazards and the actions individuals and communities can take.

**Implementation Team:** Community Services, Natural Resources, Environmental Programs, Tribal Services, Human Services, Information Systems, Communications, Cherokee First, Emergency Management, CNE, Education Services

**Time Frame:** 12 months from funding date

**Administer:** Cherokee Nation Emergency Management

**Mitigation Action:** ADVANCE WARNING DEVICES

**Identified Hazards:** Dam Failure, Tornadoes, and Winter Storms - Snow/Ice

**Actions/Comments:** Obtain and install outdoor audible or visual warning devices throughout our TJSA. Provide advance notification to the occupants of critical facilities, permanent structures and outdoor events which are located within TJSA. Install weather observation cameras around critical facilities with monitors and viewing screens in EM office, Marshal Office, and community type Safe Rooms located at tribal facilities. This will allow observance of weather from safe shelter as well as provide shelter.

**Implementation Team:** Human Services, Tribal Services, GeoData, Community Services, Planning & Development, Tribal Facilities

**Time Frame:** 18 months from date of funding

**Administer:** Cherokee Nation Emergency Management

**Mitigation Action:** INDOOR WARNING DEVICES

**Identified Hazards:** Dam Failure, Extreme Temperature, Flooding/Flash Flooding, Tornadoes, Wildfire, and Winter Storms - Snow/Ice

**Actions/Comments:** Acquire NOAA radios with back-up batteries and receivers and place in all critical facilities, schools, and community buildings throughout

TJSA. Acquire and distribute NOAA radios in rural residential areas that do not have tornado sirens and/or other outdoor advance warning systems.

Implementation Team: Human Services, Tribal Services, Community Services, Tribal Facilities, GEO Data, Marshal Service

Time Frame: 12 months from date of funding

Administer: Cherokee Nation Emergency Management

Mitigation Action: BACK-UP DEVICE FOR ELECTRICAL EQUIPMENT AND/OR DATA

Identified Hazards: Dam Failure, Earthquake, and Extreme Temperature, Flooding/Flash Flooding, Hail/Lightning/High Winds, Tornadoes, Wildfire, and Winter Storms - Snow/Ice

Actions/Comments: Obtain and install back-up generators in all critical facilities for use during power outages caused by natural hazards. The generators would ensure the integrity of all critical tribal information i.e., tribal citizenship, medical records, natural resources, financial resources, business records; and ensure the continuation of critical functions and activities.

Implementation Team: Information Systems, CN Historical Society, Tribal Facilities, Health Facilities, CNE, GeoData

Time Frame: 24 months from date of funding

Administer: Cherokee Nation Emergency Management

Mitigation Action: DIGITAL MAPPING

Identified Hazards: Winter Storms - Snow/Ice Tornado, Flooding, Extreme Heat, Hail/Lightning/High Winds, Wildfire, Drought, Dam Failure, and Earthquake

Actions/Comments: Develop a tool or acquire software for digital mapping. Digitize current land maps; identify and generate flood maps.

Implementation Team: GeoData, Roads, Environmental Programs

Time Frame: 24 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: WINDOW FILMING

Identified Hazards: Winter Storms - Snow/Ice, Hail/Lightning/High Winds, Tornado, and Hail

Actions/Comments: Retrofit critical facilities by installing Window Safety Film on glass. The film not only improves the environmental quality of the rooms, but offers a shatter proof factor to the window. Strengthening windows/doors would reduce frequency of bodily injury due to flying glass and projectiles.

Implementation Team: Tribal Facilities, Planning & Development, Construction Management, Quality Assurance, Community Services

Time Frame: 12 months from funding date  
Administer: Cherokee Nation Emergency Management

Mitigation Action: TREE MANAGEMENT

Identified Hazards: Winter Storms - Snow/Ice, Hail/Lightning/High Winds High Winds, Wildfire, and Tornadoes

Actions/Comments: Work to develop and implement programs to trim trees from utility infrastructures, roadways, and property; reduce utility outages

Implementation Team: Natural Resources, Grounds Maintenance, Construction Management, Community Services

Time Frame: 36 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: MONITORING SYSTEM/DATA BASE/MAPS

Identified Hazards: Winter Storms - Snow/Ice, Extreme Temperatures, Flooding/Flash Flooding, Tornado, and Wildfire

Actions/Comments: Monitor elderly, chronically ill and special needs of the tribal population for life safety issues regarding approaching hazards.

Implementation Team: Information Systems, Human Services, Health Services, Comprehensive Care, Home Health, PACE, GeoData

Time Frame: 6-12 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: INDIVIDUAL STORM SHELTERS

Identified Hazards: Tornado and Hail/Lightning/High Winds

Actions/Comments: Administer reimbursement program for individual storm shelters within nine Cherokee Nation Districts; identify special needs populations. Educate the citizens on the use and location of the shelters to help reduce the loss of life during severe weather. Provide GPS coordinates to local law enforcement officials.

Implementation Team: Quality Assurance, Marshal Service, Risk Management, Community Services, GeoData, Communications, Cultural Resources, Planning & Development

Time Frame: 18 months from date of funding

Administer: Cherokee Nation Emergency Management

Mitigation Action: COMMUNITY STORM SHELTERS

Identified Hazards: Tornado

Actions/Comments: Install storm shelters on tribal housing additions, critical facilities, and educational institutes; educate the potential occupants on the use and

location of the shelters to help reduce the loss of life during severe weather.  
Provide GPS coordinates to local law enforcement officials.

Implementation Team: Quality Assurance, Marshal Service, Risk Management, Community Services, GeoData, Communications, Cultural Resources, Planning & Development

Time Frame: 36 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: HURRICANE CLIPS

Identified Hazards: Tornado, Hail/Lightning/High Winds

Actions/Comments: Author Tribal Resolution requiring installation of hurricane clips on new construction. Add addendum to Capital Improvement Plan to require hurricane strapping/clips for all new constructions; retrofit existing structure with hurricane clips to decrease severity of property loss, and potential for bodily injury. Install clips.

Implementation Team: Justice, Attorney General's office, Management Resources, Facilities Management, Construction Services, Community Services, Risk Management, Planning & Development

Time Frame: 36 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: SEISMIC RETROFITTING

Identified Hazards: Tornado, Earthquake, and Hail/Lightning/High Winds

Actions/Comments: Hardening existing critical facilities by replacing existing exterior single and double doors with metal doors with 5/16ths security glass laminate made to withstand hurricane type winds. Retrofitting structures to strengthen resistance to damage and install more secure frames by adding additional points of contact with reinforced hardware and panic locks will add reinforcement for hazard prone areas. Bring all critical facilities buildings up to International Builder's Code/International Residential Code. Replace any damaged roofs with natural resistant materials and build new construction using natural resistant construction techniques will reduce loss of life and property

Implementation Team: Quality Assurance, Tribal Facilities, Community Services, Housing Services, Planning and Development

Time Frame: Undetermined

Administer: Cherokee Nation Emergency Management

Mitigation Action: FLOOD REDUCTION OF WATERWAYS, CREEKS AND STREAMS

Identified Hazard(s): Flooding

Actions/Comments: Implementation of a major clean up of area creeks, streams and waterways. Implementation of a digital mapping project. Subsequent long-term monitoring of all waterways to ensure that problematic build up of debris and brush does not reoccur.

Implementation Team: Natural Resources, Environmental Programs, Quality Assurance, GeoData, Career Services

Time Frame: Undetermined

Administer: Cherokee Nation Emergency Management

Mitigation Action: PROPERTY ACQUISITION

Identified Hazard(s): Flooding, Flash Flooding

Actions/Comments: TJSAs have experienced flooding incidents in which homes were flooded more than once in five years. The TJSAs currently has homes and tribal housing subject to repetitive loss flooding incidents, most of which have been severe. Develop and implement a “buy out” ordinance for the areas that have been affected by flooding disasters.

Implementation Team: Justice, Attorney General, Environmental, GeoData, Risk Management, Realty, Emergency Management, Community Services, Communications, Marshal Service, Planning & Development

Time Frame: Undetermined

Administer: Cherokee Nation Emergency Management

Mitigation Action: ELEVATE/RELOCATE

Identified Hazard(s): Flooding and Flash Flooding

Actions/Comments: Assist tribal citizens with elevating existing home structures that are in risk of receiving damage or being destroyed from a flooding event or complete removal from flood zone area. Cost of elevation may outweigh expected losses to the home. Elevated structures can be more vulnerable to earthquakes unless additional bracing is used.

Implementation Team: Housing Rehab, Community Services, Communications, Realty, Justice, GeoData, Environmental Programs, Quality Assurance, Risk Management, Housing Services

Time Frame: 36 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: DRAINAGE CONDUITS

Identified Hazard(s): Flooding and Flash Flooding

Actions/Comments: Identify and upgrade the size of culverts in tribal communities to prevent repetitive flooding during and following heavy rain; may involve

installing or re-routing capacity of a storm drainage system that may involve detention and retention ponds, drainage easements, creeks or streams.

Implement: Community Services, Roads, Housing, GeoData, Quality Assurance

Time Frame: 18 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: WATER GAUGES

Identified Hazards: Flooding, Dam Failure, and Drought

Actions/Comments: Initiate a program to observe the water gauges in local streams and lakes. Develop a system for monitoring stream gauges and compiling data and reporting back changes to service area which could provide relevant information during severe weather events.

Implementation Team: Environmental Programs, GeoData, Natural Resources

Time Frame: 12 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: PROVIDE COOLING/WARMING STATIONS

Identified Hazards: Extreme Temperatures and Winter Storms-Snow/Ice

Actions/Comments: Installation of public misting systems outdoors, outdoor water fountains in public gathering areas and air conditioned/heated rooms indoors will protect tribal citizens from the dangers associated with extreme temperature events.

Implementation Team: Planning & Development, Construction, Grounds Maintenance, Quality Assurance, Environmental Health, Human Services

Time Frame: 18 months from funding

Administer: Cherokee Nation Emergency Management

Mitigation Action: INSTALLATION OF DRY HYDRANTS IN FIRE PRONE AREAS

Identified Hazards: Droughts and Wildfires

Actions/Comments: Install in fire prone areas throughout TJSA.

Implementation Team: Natural Resources, Community Services, Environmental Programs, Quality Assurance

Time Frame: Undetermined

Administer: Cherokee Nation Emergency Management

Mitigation Action: WATER RESERVOIRS

Identified Hazards: Drought

Actions/Comments: Build reservoirs in the TJSA to contain rain and run-off water for agriculture use with cattle, other farm animals and irrigation needs. Develop a "Wetland Oasis" area for tribal citizens to use for recreational/fitness purposes

such as a walking/running track, picnic area, fishing dock, etc.; as well as maintain a water supply and serve as a wildlife refuge.

Implementation Team: Environmental Programs, Community Services, GeoData, Natural Resources, Construction Management

Time Frame: 24 months from funding

Administer: Cherokee Nation Emergency Management

Mitigation Action: XERISCAPE

Identified Hazards: Drought

Actions/Comments: Establish, and monitor Xeriscape projects within tribal communities. Educate tribal citizens on Xeriscape, vegetation which requires less hydration than normal vegetation.

Implementation Team: Community Services, GeoData, Grounds Maintenance, Natural Resources, Communications

Time Frame: 30 months from funding

Administer: Cherokee Nation Emergency Management

Mitigation Action: RIPARIAN ZONE REESTABLISHMENT

Identified Hazards: Drought and Flooding

Actions/Comments: Establish a program of planting vegetation along the creeks and river beds affected by riparian zoning.

Implementation Team: Natural Resources, Community Services, Environmental Programs, GeoData, Environmental Programs

Time Frame: 12 months from funding date

Administer: Cherokee Nation Emergency Management

Mitigation Actions: FIRE BREAKS

Identified Hazards: Wildfires

Actions/Comments: Install fire breaks to impede the progress of wildfires around critical facilities

Implementation Team: Natural Resources, Tribal Facilities and Grounds Maintenance, Construction, Quality Assurance

Time Frame: 24 months after funding date

Administer: Cherokee Nation Emergency Management

Mitigation Action: SUPPRESSION / LIGHTNING RODS

Identified Hazard(s): Hail/Lightning/High Winds

Actions/Comments: Provide, THORGuard, lightning prediction and warning systems throughout the TJSA. Install lightning rods on critical facilities.

Implement: Housing Rehab, Construction, Community Services, Quality Assurance, Tribal Facilities

Time Frame: 12 months from funding date

Administer: Cherokee Nation Emergency Management

## **TRIBAL CAPABILITIES**

Once our Hazard Mitigation Plan is approved and adopted, the tribe will apply for State and Federal Hazard Mitigation Project Grant funds. This includes but is not limited to: FEMA, Homeland Security, Flood Mitigation Assistance, Department of Justice, USDA, Department of Agriculture, EPA, BIA, DOT, PDM and Community Development Block Grants. Pre-disaster and post-disaster funding discussions have been held with our Community Services Group to ensure the availability of funds to meet the in-kind match requirement for federally funded mitigation projects such as: Building or retro-fitting an existing areas for community tornado shelters. The volunteer labor of community members would also be documented and counted towards the 25% in-kind match.

The Cherokee Nation does not at this time have a budget to fund Hazard Mitigation projects. However internal resources may be utilized to develop legislative acts, building codes, etc. The Nation has a strong ability to document in-kind match for grants requiring said match. In-kind can be in the form of key personnel, donated training room space, donated conference room space, computer equipment, vehicles, donated goods and services from tribal enterprises, etc.

The Tribe does not have legislation prohibiting building in flood prone areas; however; our internal administrative process prohibits said development. Also, tribal citizens are required to have flood insurance to be eligible for tribal housing/housing rehabilitation services.

In addition, it is the practice for our Marshal Service and CHRs to conduct wellness checks on the elderly and homebound to ensure their needs are met pre- and post disaster. CN also has trained incident management team members as well as professional level staff such as carpenters to surgeons; we have in excess of 800 vehicles in our fleet which 40 passenger buses to water trucks; we also have heavy equipment and skilled operators located throughout our TJSA.

The CNEM department is the designated office for preparedness, response, recovery and mitigation functions for the tribe. Additionally, CNEM is responsible



for grant applications, administrating and financial reporting thereof. We train personnel, citizens and local government officials and coordinate activities which complement our disaster management capabilities.

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

The HMGP was created in 1988 by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended. This program is activated during Presidential Disaster Declarations to assist in identifying mitigation projects, and funding these projects on a 75% Federal / 25% non-Federal cost share basis. **Note:** Grantee, the 25% cost share is absorbed by the applicant/Sub-grantee, 12.5% applicant share and 12.5% state or sub-applicant share.

Possible projects include: updating plans, implementing the measures identified in all-hazard mitigation plans, developing tribal legislation, or adopting ordinances.

### **Pre-Disaster Mitigation (PDM) Program**

FEMA has long been promoting disaster resistant construction and retrofit of facilities that are vulnerable to hazards in order to reduce potential damages due to a hazard event. The goal is to reduce loss of life, human suffering, economic disruption, and disaster costs to the Federal taxpayer. This has been, and continues to be, accomplished through a variety of programs and grant funds.

### **Flood Mitigation Assistance (FMA) program**

The Flood Mitigation Assistance program is a State or Tribal administered cost-share program through which States or Tribes can receive grants for flood mitigation planning; flood mitigation projects; and FMA technical assistance. It is a Federal grant program, similar to the Hazard Mitigation Grant Program; however, FMA provides assistance to States and Tribes for flood mitigation planning and activities to fund cost-effective measures that reduce or eliminate the long-term risk of damage to buildings, manufactured home, and other NFIP-insurable structures, and it is not disaster dependent.

## **PLAN MAINTENANCE PROCESS**

Cherokee Nation Hazard Mitigation Plan (HMP) is required to be updated, submitted to FEMA for approval and adopted by Cherokee Nation Tribal Council within a five-year cycle. Responsibility for plan maintenance and coordinating the implementation of mitigation measures is the responsibility of the Cherokee Nation Emergency Management (CNEM) office. CNEM will be responsible for annual

progress reports to CNEM Policy Committee and for the five-year plan update to be submitted to FEMA for approval and adoption by Cherokee Nation Tribal Council.

CNEM will monitor the HMP and report quarterly to the Cherokee Nation Emergency Management Team. The CNEM Team will recommend ways to increase participation and coordination with tribal departments, tribal citizens and other jurisdictions and agencies.

Annual reviews conducted by the CNEM Team will identify progress made on the implementation of mitigations measures and projects. Annual reviews will also assess the impacts of disasters in the Cherokee Nation TJSA to determine whether the HMP should be revised based on the new information. Implementation problems (technical, political, legal and financial) will be identified and recommendations will be made. Project evaluations will occur at appropriate project specific intervals or when the HMP is updated. The annual review shall occur during the third quarter of the tribal fiscal year and an annual progress report made to CNEM Policy Committee within 30 days of the close of the tribe's fiscal year.

The process of updating the HMP will include a review of the hazard assessments, vulnerability assessments, potential losses, tribal capability, funding sources and potential new mitigation measures by the CNEM Team. The progress and effectiveness of mitigations actions will be examined and revised if necessary. The updated HMP process will begin the beginning of the fourth year and will be submitted to FEMA for re-approval within six months of the plan expiration date before being sent to Cherokee Nation Tribal Council for adoption.

## **MONITORING PROJECT IMPLEMENTATION**

Cherokee Nation Emergency Management will monitor progress on the implementation of mitigations actions and report to the CNEM Team during monthly team meetings.

All short-term mitigations actions will be monitored by CNEM on an ongoing basis until implementation is complete. Active long-term mitigation actions will be monitored on an ongoing basis or at least annually as needed. Long-term actions planned for the future will be reviewed annually by the CNEM Team during the third quarter of the tribal fiscal year.

A Project Officer or Specialist will be assigned to monitor each action throughout its life cycle. The assigned Project Officer will be responsible for grant program reporting (if required by funding agency), identifying accomplishments, problems, budget status and other activities affecting the project. Agency-specific final grant closeout documents will also be prepared by the assigned Project Officer at the conclusion of the performance period and submitted to the funding agency accordingly. Records will be maintained for three years after final closeout.

The system for reviewing and evaluating progress on achieving goals and implementing activities and projects in the mitigation strategy will be based on a checklist of all objectives, actions and progress of the mitigations action. This checklist will be developed by the CNEM Team and reviewed annually by CNEM Policy Committee. Modification to a project will be made as deemed necessary.

## **PLAN INTEGRATION**

The adoption of the Hazard Mitigation Plan will enable formal integration with the Capital Improvement Plan (CIP), the Integrated Resources Management Plan (IRMP) and others like the Land Consolidation Plan. The CN Hazard Mitigation Plan (CNHMP) is in keeping with our Declaration of Designed Purpose and compliments Cherokee Nation's vision and mission. The CNHMP will directly enhance one of our tribe's desired outcomes regarding community. The Nation has made a commitment to focus programs toward helping communities help themselves and helping communities work together. The CNHMP will be a valuable planning tool to this end.

To date, there have been few opportunities to integrate FEMA's mitigation programs and initiatives. Members of CNEM have attended various trainings and lectures on hazard mitigation at the Emergency Management Institution and at various conferences. The information obtained from these conferences/lectures was brought back to the Nation and integrated into respective programs by policy and procedural updates. In the future, CNEM will integrate information into other ongoing planning efforts on an annual basis as recognized by the department head. CNEM was awarded a Hazard Mitigation Planning Grant. CN has received reimbursement under the Public Assistance program. We have attended regional and national conferences for Hazard Mitigation and Public Assistance. Cherokee Nation Emergency Management is part of the Management Resources Group, as is the Office of Planning & Development. The Management Resources Group will

be tasked future planning efforts and with continuing to integrate mitigation programs and activities throughout all the Cherokee Nation.

### **Existing Plans / Programs**

There are various tribal entities, departments and other organizational programs which are discussed in the Tribal Hazard Mitigation Plan, and which coordinate or interact with the Hazard Mitigation Plan. Below is a list of the current Tribal Plans:

1. Cherokee Nation Emergency Operations Plan (EOP)
2. Capital Improvement Plan
3. CN Integrated Resources Management Plan
4. Forest Management Plan
5. Tribal Pandemic Flu Plan
6. Tribal Influenza Plan

With each plan listed above the HMP will be incorporated by the following process:

- Committee chairperson will contact each plan representative regarding potential strategies for implementation
- Plan representative will review potential strategies for incorporation into their document as approved by their respective planning committee during their update process
- As the strategies are revised the committee chairperson will continue to update planning representatives

### **Other programs are:**

#### **Federal Emergency Management Agency (FEMA)**

The Federal Emergency Management Agency (FEMA) was established by Congress in 1979 to consolidate the emergency planning and response functions of several Federal agencies under one director. The FEMA mission is: "Reduce the loss of life and property and protect our institution from all hazards by leading and supporting the Nation in a comprehensive, risk-based emergency management program of mitigation, preparedness, response and recovery."

Cherokee Nation mirrors parts or all of FEMA's mission and will participate in various programs such as: PDM, FMA, and SRL.

### **Continued Public Involvement**

During annual update and five year update we will continue to invite the public to participate by means of flyers, email, tribal newspaper, and tribal radio show.

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G.W.Y.O. DBP  
CHEROKEE NATION™



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# **Cherokee Nation Hazard Mitigation Plan**

## **Appendices**

# Appendix A, Article 1 - Resolution Authorizing the Submission of a Natural Hazard Mitigation Planning Grant Application

Committee: Resources  
Date: 10-02-08 Committee Date: 10-13-08

Author: Tamara Copeland  
Sponsor: Councilors Curtis Snell and Cara Cowan Watts

RESOLUTION NO. 90-08

## COUNCIL OF THE CHEROKEE NATION

### A RESOLUTION AUTHORIZING THE SUBMISSION OF A NATURAL HAZARD MITIGATION PLANNING GRANT APPLICATION

WHEREAS, the Cherokee Nation since time immemorial has exercised the sovereign rights of self-government in behalf of the Cherokee people;

WHEREAS, the Cherokee Nation is a federally recognized Indian Nation with a historic and continual government to government relationship with the United States of America;

WHEREAS, Cherokee Nation Emergency Management will apply to the Federal Emergency Management Agency (FEMA) through Oklahoma Department of Emergency Management for a Natural Hazard Mitigation Planning Grant in the amount of \$247,020.00;

WHEREAS, Cherokee Nation Emergency Management will work with communities to develop a Natural Hazards Mitigation Plan upon receipt of said grant funds;

WHEREAS, if funded, the Cherokee Nation Emergency Management will receive \$185,265.00 from Federal Emergency Management Agency through Oklahoma Department of Emergency Management with a local in-kind match of \$61,755 to develop the Natural Hazards Mitigation Plan.


BE IT RESOLVED BY THE CHEROKEE NATION, that the Council hereby authorizes the submission of a grant application to the United States Federal Emergency Management Agency (FEMA) through the Oklahoma Department of Emergency Management for a Natural Hazard Mitigation Planning Grant, and that the Principal Chief, or his designee, shall be authorized to conduct negotiations and execute all official documents in this regard.

#### CERTIFICATION

The foregoing resolution was adopted by the Council of the Cherokee Nation at a duly called meeting on the 10<sup>th</sup> day of November, 2008, having 17 members present, constituting a quorum, by the vote of 17 yea; 0 nay; 0 abstaining.

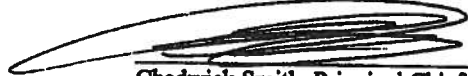
  
Meredith A. Frailey, Speaker  
Council of the Cherokee Nation

ATTEST:

  
Don Garvin, Secretary  
Council of the Cherokee Nation




Approved and signed by the Principal Chief this 14th day of November, 2008.



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Chadwick Smith, Principal Chief  
Cherokee Nation

**ATTEST:**



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Melanie Knight, Secretary of State  
Cherokee Nation

## **Appendix A, Article 2 – Legislative Submittal Process**

The legislative submittal process, the following steps should be taken when submitting proposed legislative acts or resolutions:

1. Prepare your proposed legislative package and ensure it is **complete** and in the proper legislative format, pursuant to CNCA Title 25 § 21 and § 27 (an act or resolution attached).
2. Fill out the Administrative Clearance/Routing form, obtain the proper signatures (up to Group Leader), and attach to your legislative package.
3. If Strategic Budget Committee (SBC) approval is required, attach a copy of the signed, approved grant clearance form to your legislative package.
4. If the source of match needs to be identified, please obtain the Controller's approval/signature on the Administrative Clearance/Routing form.
5. Contact a Councilmember(s) to sponsor your resolution or legislative act – Council will not accept legislation without a council sponsor. Sponsor has usually been the Chair of the anticipated committee your resolution or act will be assigned to.
6. Submit to Government Resources an original hard copy of your completed legislative package (unstapled) and an electronic copy of the resolution or act (by e-mail preferably).

Upon completion of these steps, Government Resources will date/stamp your legislative package, review the completed package, and submit for the Principal Chief's approval. Upon the Chief's approval, Government Resources will then submit to the Tribal Council for assignment to the appropriate committee.

The legislative forms and routing process memo are posted on the intraserver for your convenience. However, you may contact Lita Maupin at ext. 5309 or [lmaupin@cherokee.org](mailto:lmaupin@cherokee.org) should you have any questions or require further information.

**Appendix A, Article 3 – Resolution Adopting the Cherokee Nation Hazard Mitigation Plan**

**Cherokee Nation Hazard Mitigation Survey**

County \_\_\_\_\_

Date \_\_\_\_\_

City / Town / Community \_\_\_\_\_

**The Cherokee Nation is in the process of preparing a Natural Hazard Mitigation Plan. This survey is intended to gain an understanding of the public’s awareness and concern of hazards that could impact the communities within the Cherokee Nation Jurisdictional Service Area.**

**For each of the following hazards, please check the corresponding box indicating your level of concern for that hazard and it affecting your community.**

<b>Hazards</b>	<b>Not Concerned</b>	<b>Somewhat Concerned</b>	<b>Concerned</b>	<b>Very Concerned</b>
Dam Failure				
Drought				
Earthquakes				
Expansive Soil				
Extreme Heat				
Floods				
Wildfire				
Hailstorm				
High Winds				
Lightning				
Winter Storms				
Tornado				
Other _____				
_____				

**If you have any comments, suggestions or additional concerns, please note them in the space provided below and continue on back if needed.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Appendix B, Article 2 Community Meeting Sign in Sheet

Cherokee Nation Emergency Management  
 Hazard Mitigation Community Meeting

Location: Clowets Creek County: Delaware District: \_\_\_\_\_

Date: 10/28/08 Start Time: 6:30 End Time: \_\_\_\_\_

Name	Community
Ronald Blake	Colcord
Regina Curtis	None
Kasny Harritt	Grone
Marie Foreman	
Juanita Bark	Comm. Services
Bud Foreman	Colcord
Lini Howell	Colcord
Marin Jones	Fehlgrueh

**Cherokee Nation Emergency Management  
 Hazard Mitigation Community Meeting**

Location Clouds Creek County Delaware District \_\_\_\_\_

Date 10/28/8 Start Time 6:30 End Time \_\_\_\_\_

Name	Community
Cherlye Foreman	Clouds Creek
Curtis SNELL	Weslett, OK. or Bull Harbor.
Jack Farmer	Tollagood, OK
John Hembree	Westhill
Karen Cummings	Clouds Creek

Cherokee Nation Emergency Management

Hazard Mitigation Community Meeting

Location Clarks Creek Church

County Wagoner

District \_\_\_\_\_

Date 1/28/08

Start Time 6:30

End Time \_\_\_\_\_

Name	Community
Janis Colston	Colcord
Levi Colston	Colcord
Regina Cankiller	Colcord
Opal Farnum	Colcord
Shirley Jenkins	Leland Grove
Richard D. Davis	Jay
Dancy Solbie	Jay
Rumney Straley	Leland Grove
Janeta Coker	Colcord

Cherokee Nation Emergency Management  
 Hazard Mitigation Community Meeting

Location: Clouds Creek Church Delaware  
 County: \_\_\_\_\_ District: \_\_\_\_\_

Date: 10/28/08

Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Name	Community
JENORA Sixkiller-King	New Green (4miles north of Little Hauses)
Don King	New Green " "
Abeline Buzzard	Jay
Sharon Buzzard	Jay
Celene Starlin	Clouds Creek
Cynthia Buzzard	Cucha
Sharon Janes	Colcord
Yula Hornon	Jay
Billy Janes	Colcord



**Cherokee Nation Emergency Management  
Hazard Mitigation Community Meeting**

Location Clouds Creek

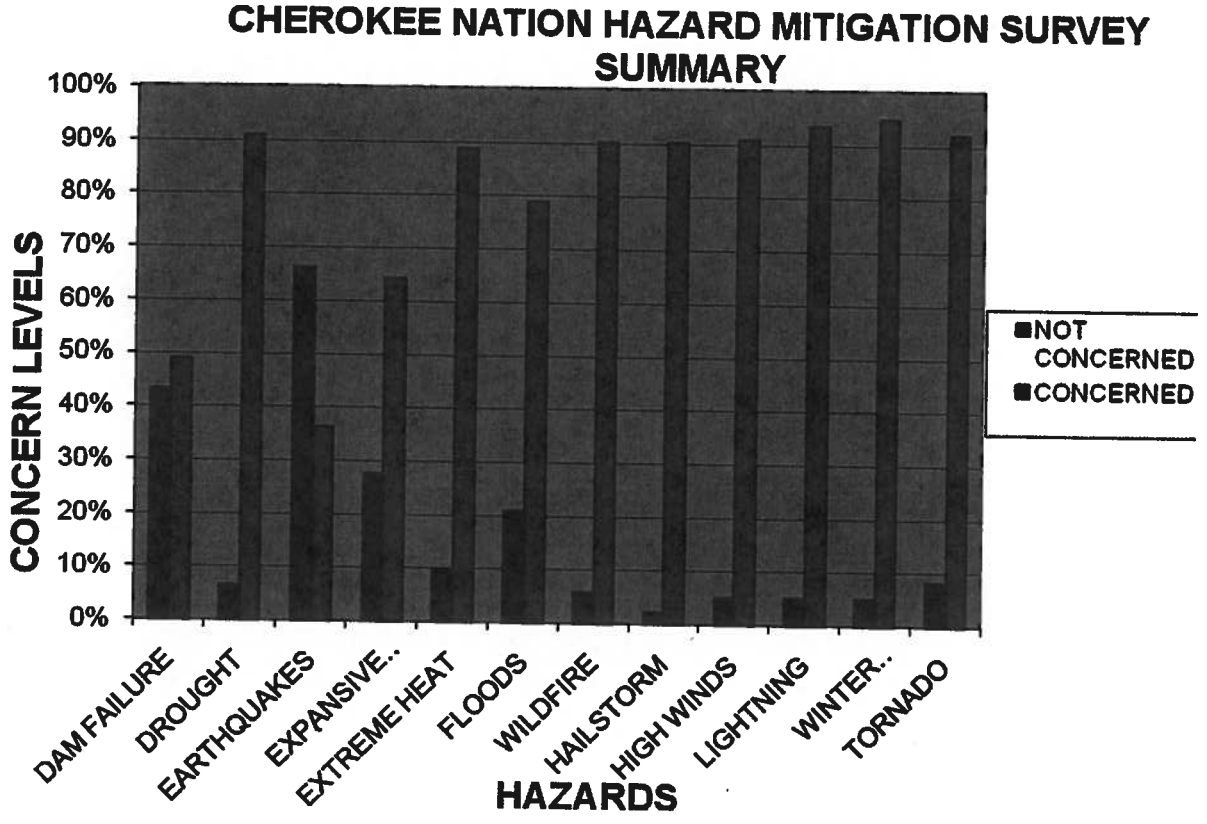
District Wefanua

Date 10/28/08

Start Time 6:30

End Time \_\_\_\_\_

Name	Community
Susan Roberts	Colcord
Janet Backwater	Colcord
Kevin Backwater	Colcord
Haley Buzard	Eucha
Warren Summers	CNHHS-Outreach
Shawna Foreman	Colcord
Delbert Foreman	Colcord
Abbie Foreman	Jay
Mary Creekipler	Colcord



Appendix B, Article 4 COTTA/Healthy Nation Conference Agenda



**3<sup>rd</sup> Annual COTTA/Healthy Nation  
Building Healthy Communities Conference  
Doubletree Hotel at Warren Place – Tulsa, Oklahoma  
July 22-24, 2010**

## **CONFERENCE AGENDA**

### **THURSDAY – JULY 22, 2010**

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<b>Conference Registration Opens</b>		<b>7:30 AM – 4:30 PM</b>
<b>Exhibits Open</b>		<b>8:00 AM – 4:30 PM</b>
<b>Continental Breakfast</b>		<b>7:30 AM – 9:00 AM</b>
<b>Opening/Plenary Session</b>	<b>Ballroom</b>	<b>9:00 AM – 9:45 AM</b>
	Lisa Pivec, Director of Community Health Promotion Rick Gassaway, COTTA Program Manager	
<b>Breakout Sessions:</b>		<b>10:00 AM – 10:50 AM</b>
Oklahoma Fit Kids Coalition – Ameyka Pittman		Salon A
COTTA-Healthy Nation-Behavioral Health Panel		Salon B
Oklahoma Center for Non-profits		Tulsa Learning Theater
Sarkey's Foundation – Diane Hartley		Parkview East
<b>Breakout Sessions:</b>		<b>11:00 AM – 11:45 AM</b>
Oklahoma Fit Kids Coalition – Ameyka Pittman		Salon A
Food Share America		Salon B
Oklahoma Center for Non-profits		Tulsa Learning Theater
Sarkey's Foundation – Diane Hartley		Parkview East
<b>Luncheon</b>	<b>Ballroom</b>	<b>12:00 PM – 1:30 PM</b>
	<b>Networking/Exhibits</b>	
	<b>Featuring: The Hazard Mitigation Plan</b>	
	<b>By Cherokee Nation Emergency Management</b>	

**Breakout Sessions:**  
 Disaster Response  
 Community/Schools Creating School Wellness Policies – Lezlie Jones  
 Healthy Community Design - Mark Fenton  
 Sustainable Green Country-Buy Fresh Buy Local

**1:45 PM – 2:35 PM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**  
 Indian Tribal Government Affairs  
 Community/Schools Creating School Wellness Policies – Lezlie Jones  
 Healthy Community Design - Mark Fenton  
 Sustainable Green Country-Buy Fresh Buy Local

**2:45 PM – 3:35 PM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Hotel Room Check-In**

**3:35 PM – 5:50 PM**

**Walk About with Mark Fenton**

Mark will lead a walking tour pointing out ways communities can identify factors that increase or decrease physical activity. Everything from the presence of sidewalks and bike paths to the types of crosswalks to the appearance of surrounding buildings can determine whether people chose to be physically active in their communities.

**4:30 PM – 5:30 PM**

**DINNER BUFFET**

**Ballroom**

**6:00 PM – 8:00 PM**

## **FRIDAY, JULY 23, 2010**

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**Conference Registration Opens**

**7:30 AM – 4:30 PM**

**Exhibits Open**

**8:00 AM – 4:30 PM**

**Continental Breakfast**

**7:30 AM – 8:45 AM**

**Breakout Sessions:**

Indian Tribal Government Affairs  
 Healthy Eating Active Living-A plan for Cherokee Communities - Mark Fenton  
 Oklahoma Center for Non-profits  
 Sarkey's Foundation

**9:00 AM – 9:50 AM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**

Indian Tribal Government Affairs  
 Community Gardens – Julie Kimble  
 Cherokee Native Art & Plant Society  
 Sustainable Green Country-Buy Fresh Buy Local

**10:00 AM – 10:50 AM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**

Community-SWAT 101 – D'Elbie Walker  
 Brian Jackson  
 Cherokee Byway – Donna Tinnin  
 Sustainable Green Country-Buy Fresh Buy Local

**11:00 AM – 11:45 AM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Luncheon**

**Ballroom**

**Keynote Speaker: Mark Fenton**

**12:00 PM– 1:30 PM**

**Breakout Sessions:**  
 Digital Storytelling  
 Healthy Eating Active Living-A plan for Cherokee Communities - Mark Fenton  
 CX-Tobacco Free Community Parks  
 Disaster Response

**1:45 PM – 2:35 PM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**  
 Digital Storytelling  
 Todd Enlow-Leadership  
 CX-Tobacco Free Community Parks  
 Cherokee Byway – Donna Tinnin

**2:45 PM – 3:35 PM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**  
 Community-SWAT 101 – D’Elbie Walker  
 Healthy Eating Active Living-A plan for Cherokee Communities - Mark Fenton  
 Food Share America  
 COTTA/Healthy Nation/Behavioral Health Panel

**3:45 PM – 4:35 PM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Conference Banquet and Awards Presentation**      **Ballroom**      **6:00 PM – 8:00 PM**

## **SATURDAY, JULY 24, 2010**

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**Conference Registration Opens**      **7:30 AM – 12:00 PM**

**Exhibits Open**      **8:00 AM – 12:00 PM**

**Continental Breakfast**      **7:30 AM – 8:30 AM**

**Breakout Sessions:**  
 Indian Tribal Government Affairs  
 Disaster Response  
 Todd Enlow-Leadership  
 COTTA/Healthy Nation/Behavioral Health Panel

**9:00 AM – 9:50 AM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**  
 Digital Storytelling  
 Cherokee Byways – Donna Tinnin  
 Community SWAT-101 – D’Elbie Walker  
 Community Gardens

**10:00 AM – 10:50 AM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**Breakout Sessions:**  
 Digital Storytelling  
 Cherokee Native Art & Plant Society  
 Food Share America  
 Community Gardens

**11:00 AM – 11:45 AM**  
 Salon A  
 Salon B  
 Tulsa Learning Theater  
 Parkview East

**LUNCH**      **Ballroom**      **12:00 PM – 1:30 PM**

**Safe Travels!**

Appendix B, Article 5 Hazard Mitigation Projects Survey

The following survey was used to gather data at the CHEROKEE NATION HEALTH FAIR/July 30, 2010

DATE: 07/30/2010 Your Community \_\_\_\_\_

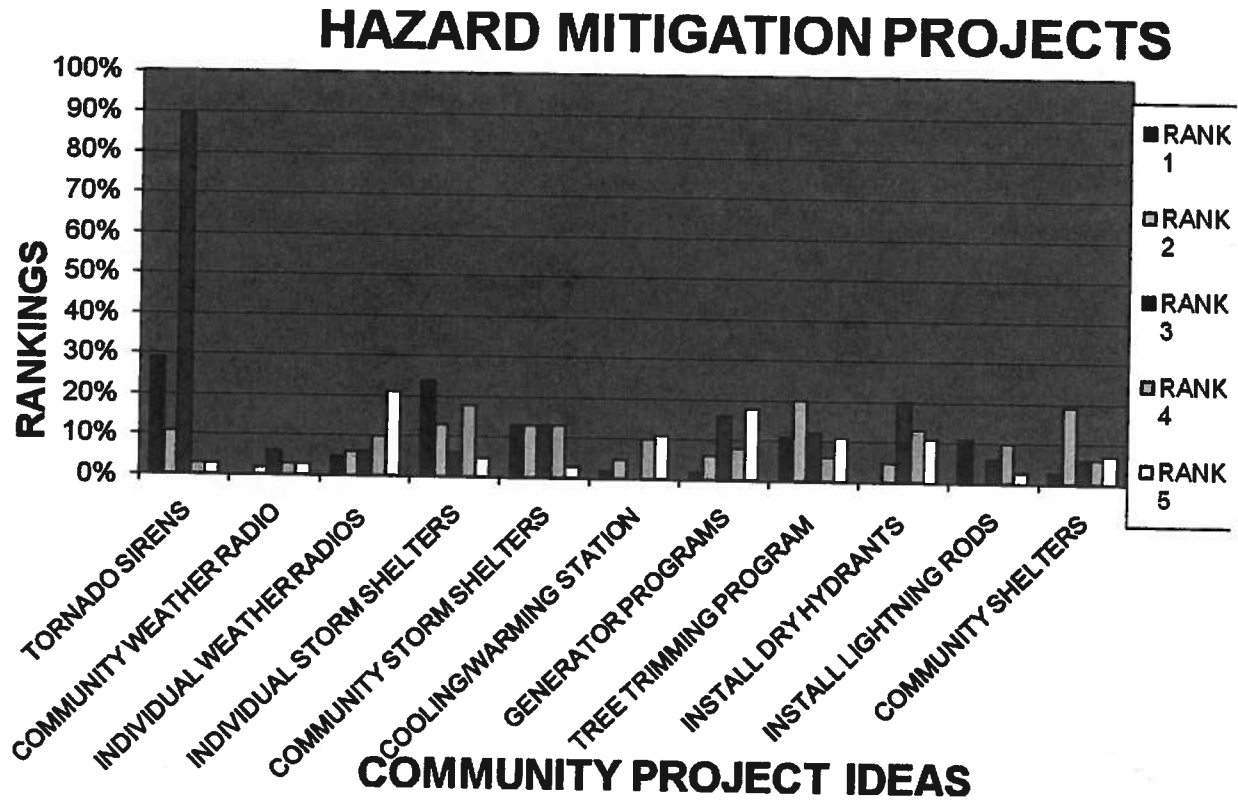
County in which you live: \_\_\_\_\_

**PLEASE PICK THE TOP 5 HAZARD MITIGATION PROJECTS YOU THINK ARE NEEDED WHERE YOU LIVE.**

Please rank 1 – 5 with #1 being the item you think is needed most in your area:

- \_\_\_\_\_ Tornado Siren
- \_\_\_\_\_ NOAA Weather Radio for public buildings
- \_\_\_\_\_ NOAA Weather Radio for individual homes
- \_\_\_\_\_ Individual Storm Shelter
- \_\_\_\_\_ Community Storm Shelters
- \_\_\_\_\_ Establish cooling/warming station in community
- \_\_\_\_\_ Generator for community building/warming station
- \_\_\_\_\_ Tree trimming program to keep tree limbs out of utility lines
- \_\_\_\_\_ Install dry hydrants in fire prone areas
- \_\_\_\_\_ Install lightning rods
- \_\_\_\_\_ Establish a shelter in your community

Appendix B, Article 6 Hazard Mitigation Projects Survey Results



Appendix B, Article 7 County Emergency Managers/Community Meeting

5.99 buffet



Community Meeting with County EM's

Hazard Mitigation Information Sign-in  
 Tuesday, November 3, 2009 @ 10:00 am  
 West Siltosam Springs CN Casino



Please Print

NAME	County or Jurisdiction	EMAIL	Cell Phone
1 Tamara Copeland	Cherokee Nation	tamara-copeland@cherokee.org	918-822-2764
2 Jimmy Moore	City of Muskogee	jmoore@muskogeeonline.org	918-684-6295
3 Jeff Smith	Muskogee County	JSMITH@READYMUSKOGEE.COM	918-1082-2551
4 Chris Keathley	Seminole Co	Chris.K@rossel.net	918-774-4632
5 MIKE McCool	TULSA/TULCO.	mmccool@cityoftulsa.org	918-5730-2084
6 Robert Rizzo	Del Co / Law	delawerem@phs.com	918-253-8085
7 Steve & Linda	DEM	Steve_palladin@rem.org	405-590-0109
8 CRAIG A DUNN	Tahlequah Cherokee Co	ead@cityoftahlequah.co	931-1903
9 Cindy Witherspoon	Tulsa & Rogers (?)	cindy.witherspoon@openm.com	918-384-7666
10 Dwayne Fain	Cherokee Nation	dfain@cherokee.org	918-822-2783
11 M. O. Bluejacket	Craig Co.	cceem@junct.com	918-244-1452
12 Delbert Bowles	City of Vinita	fredhief@compfunts.com	918-944-0524
13 Susan Kerner	CNEM	john.kerner@cherokee.org	918-316-7417
14 William Priddy	CNEM	william.pridy@cherokee.org	918-772-4138
15			



Appendix B, Table 1 – Palmer Classification Scale

Palmer Classifications	
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

Appendix B, Table 2 – Flood Zones Classification

Flood Zones Classification	
Zone A	The 100-year or Base Floodplain. There are six types of A zones:
	A The base floodplain mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30 These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format).
	AE The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
	AO The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH Shallow flooding base floodplain. BFE's are provided.
	A99 Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
AR The base floodplain that results from the de-certification 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	
Zone V and VE	V The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods. B zones are also used to designate base floodplains or 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.
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.
Zone D	Area of undetermined but possible flood hazards.
Source: Understanding Your Risks, identifying hazards and estimating losses, FEMA 386-2	






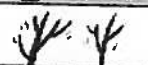







Appendix B, Table 3 – NOAA/TORRO Hailstorm Intensity Scale

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

Appendix B, Table 4 – Beaufort Scale

## Beaufort Scale

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

Appendix B, Table 5 - Fujita Scale

## Fujita Scale

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

Appendix B, Table 6 - Enhanced Fujita Scale

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

## Appendix B, Table 7 - Sperry-Piltz Ice Accumulation Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Revised September, 2009

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

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

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