Fannin County Texas

Multi-Jurisdictional Hazard Mitigation Plan

TCOG

Prepared by the Texoma Council of Governments
2015

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Executive Summary

Floods, tornadoes, winter storms, drought, and other hazardous events are a part of our world and their natural occurrence is inevitable and cannot be controlled. It is when these natural events intersect the man-made environment that disasters occur. Natural hazards cannot be prevented but actions can be taken to reduce their impact upon the human environment so that a disaster is less likely to result or may have less of an impact on the community. Hazard mitigation involves recognizing and adapting to natural forces, and is defined by the Federal Emergency Management Agency (FEMA) as "any sustained action taken to reduce long-term risk to human life and property from natural hazards". The primary goal of this plan is to mitigate or break the cycle of damage and reconstruction that can occur when a community is subjected to repeated natural hazards.

The Disaster Mitigation Act of 2000 (DMA 2000) amended the Stafford Act to emphasize the importance of mitigation planning before disasters occur. This planning is documented in a Hazard Mitigation Plan. Hazard Mitigation Plans express the proposed mitigation actions and document the risk to and capabilities of a community or communities. While jurisdictions are not required by FEMA to participate and adopt a mitigation plan, DMA 2000 requires all jurisdictions that wish to be eligible to receive FEMA mitigation grants to participate and adopt a plan, and to update the plan every five years. Fannin County's first hazard mitigation plan was approved by FEMA in 2009, and this 2014 update provides the first five-year update.

This plan update is a Multi-Jurisdictional Hazard Mitigation Plan focused on Fannin County, Texas, ten incorporated jurisdictions within the county including the cities and towns of Bailey, Bonham, Dodd City, Ector, Honey Grove, Ladonia, Leonard, Ravenna, Savoy, Trenton, and Windom, 8 school districts including: Dodd City ISD, Ector ISD, Fannindel ISD, Leonard ISD, Sam Rayburn ISD, Savoy ISD, and Trenton ISD, and the unincorporated areas. The Fannin County Multi-Jurisdictional Hazard Mitigation Plan will be referred to throughout the document as the "Mitigation Plan" or "Plan".

The Fannin County Mitigation Plan is a cooperative effort between Fannin County, incorporated and unincorporated jurisdictions, educational entities, citizens of Fannin County and the Texoma Council of Governments (TCOG). The plan will discuss the planning process, provide background information, benefits of mitigation planning, a hazard and risk assessment, describe mitigation strategies and their implementation, accomplishments since the 2009 plan, and plan maintenance procedures.

CHAPTER ONE - INTRODUCTION

1.1 Plan Purpose

Hazard mitigation planning is a long-term, on-going process. The primary purpose of this plan is to ensure that the residents, visitors, and businesses in Fannin County, Texas are safe and secure from natural and human-caused hazards by reducing the risk and vulnerability before disasters happen, through federal, state, and local community communication, public education, research, and data analysis. This plan is intended to serve as a guide in coordinating and implementing hazard mitigation policies, programs, and projects. The following objectives will be addressed in the plan:

- What hazards could occur?
- Frequency of occurrence?
- Hazard impact on community and severity of impact?
- Vulnerability to each hazard?
- Hazards with greatest risks?
- Prioritized mitigation actions?

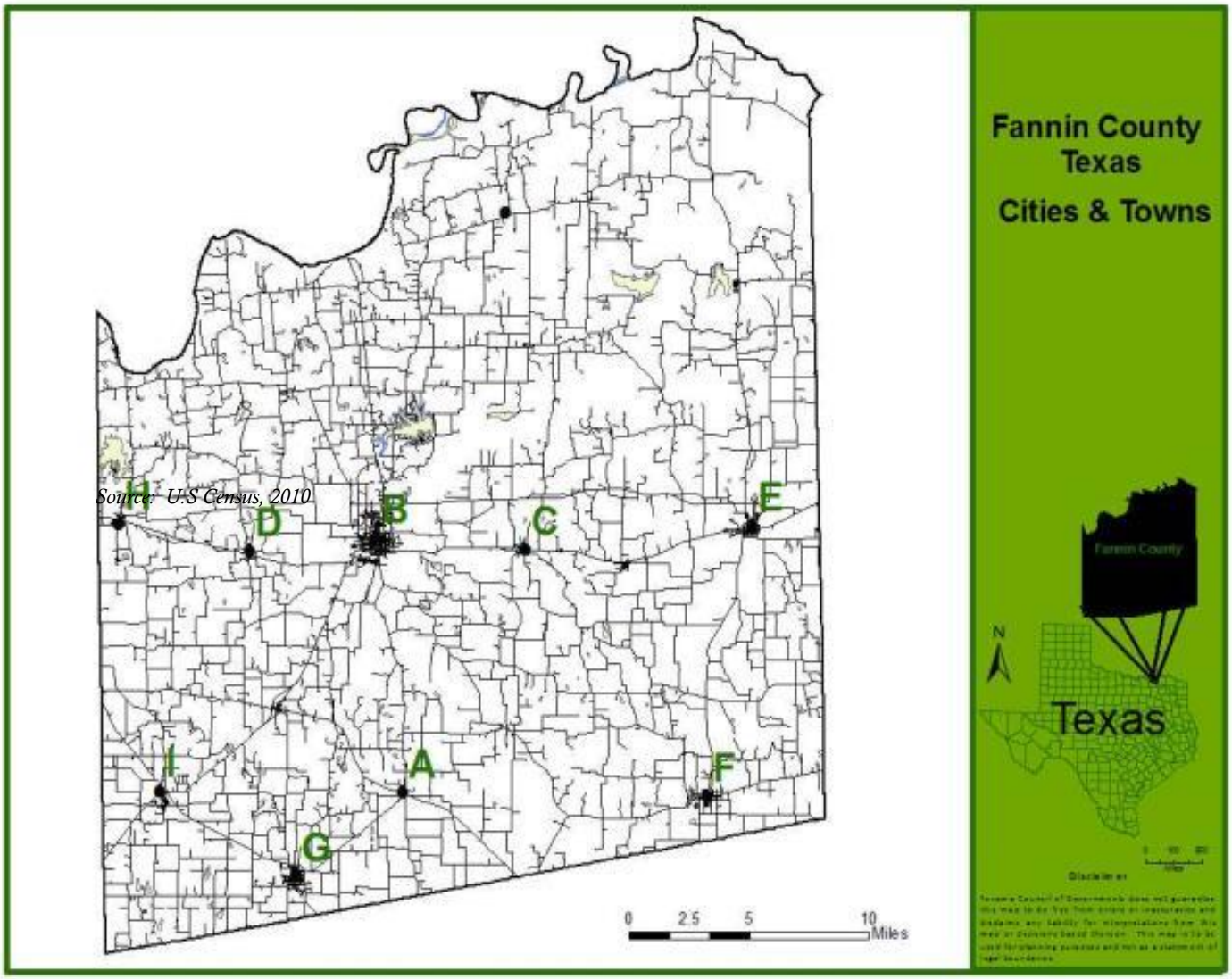
Hazard Mitigation is any sustained action taken to reduce or eliminate the long term risk and effects that can result from specific hazards.

Federal Emergency Management Agency (FEMA) defines a **Hazard Mitigation Plan** as the documentation of a state or local government evaluation of natural hazards and the strategies to mitigate such hazards.

1.2 Community Profile

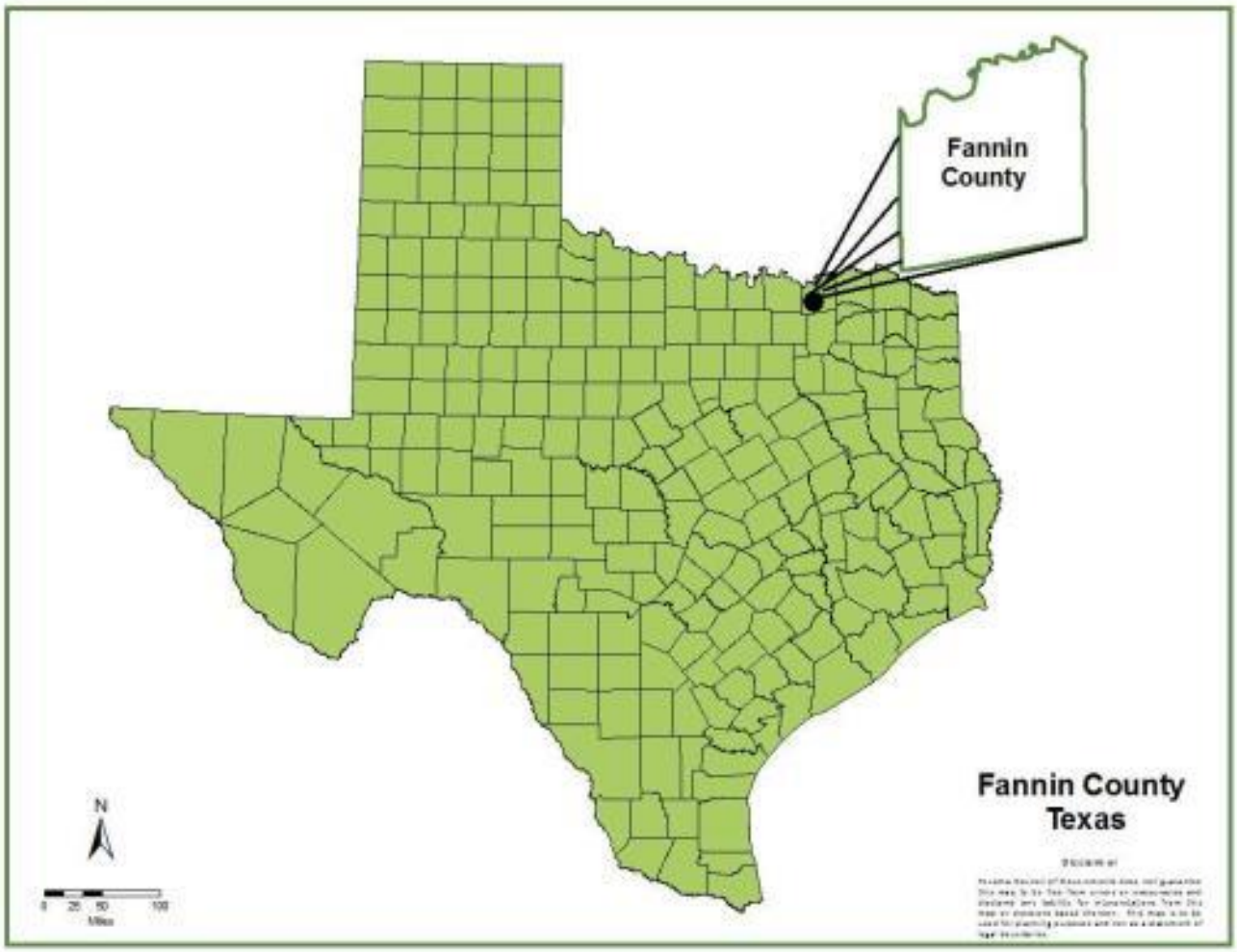
Fannin County is located in north Texas near the Texas-Oklahoma border. The county lies to the south of the Red River and was once a part of the original Red River County. The Red River County was broken into 14 counties in December of 1837. The county is linked by U.S. Highway 82 to Grayson County to the west and Lamar County to the east. The location of Fannin County in relation to the Dallas Fort Worth Metropolis provides for future exponential population growth.

Figure 1.2a: Map of Fannin County Jurisdictions and Communities



Map Location	Entity	Population (2010 census)
A	Bailey	289
B	Bonham	10,127
C	Dodd City	369
D	Ector	695
E	Honey Grove	1668
F	Ladonia	612
G	Leonard	1990
H	Ravenna	209
I	Savoy	831
J	Trenton	635
K	Windom	199

Figure 1.2b: Map of Fannin County, Texas



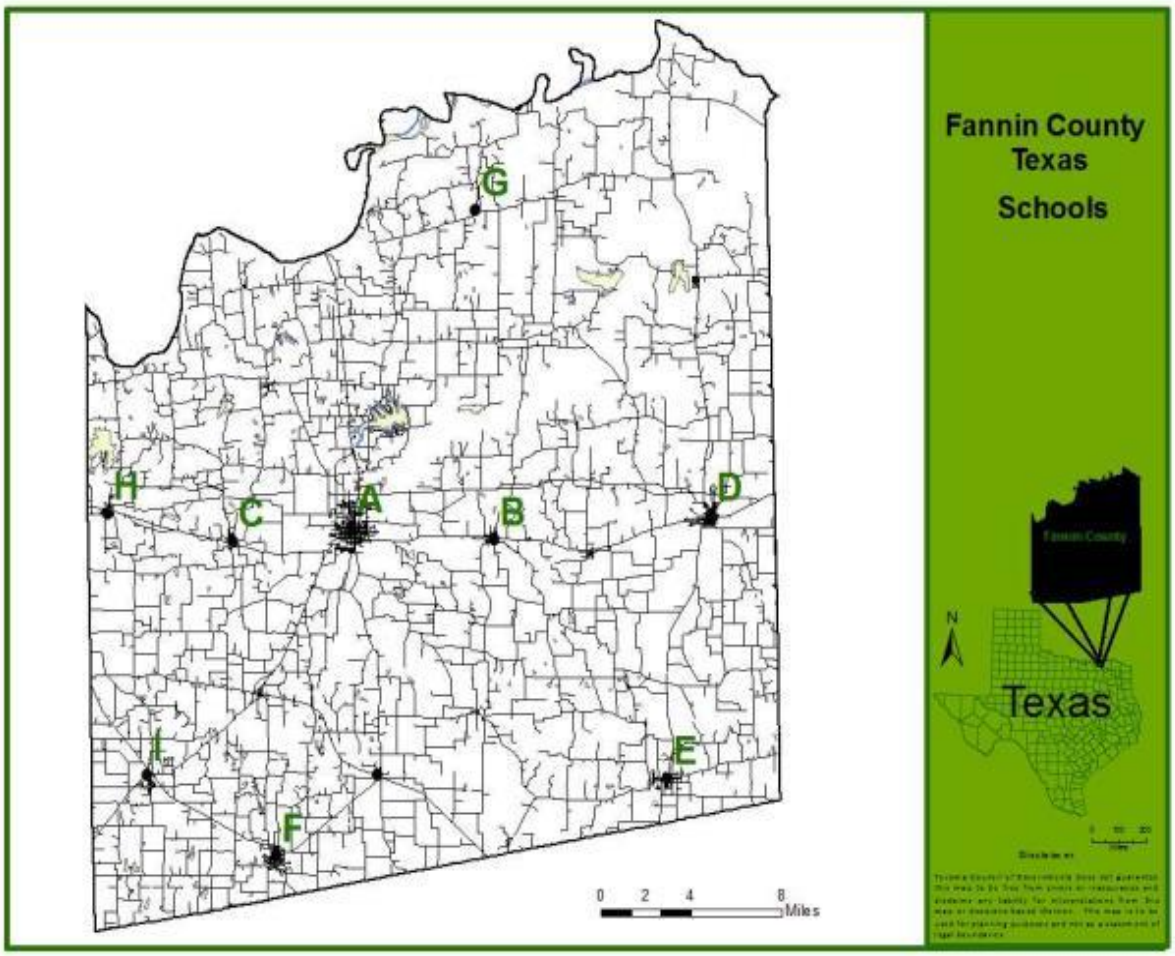
The county seat of Fannin County is Bonham. The county covers nearly 900 square miles, of which 891 square miles are land and 8 square miles are water. According to the 2007-2011 American Community Survey (07-11 ACS) there are 33,915 residents in Fannin County. The median household income is $44,136 with the per capita income at $20,153. Three highly vulnerable population groups were identified that would be more susceptible to hazards events than the general population. Those groups are:

- Elderly, persons 65 years of age or older, make up nearly 17% of the population (07-11 ACS).
- Low-income, persons whose income is below the poverty level, make up over 15% of the population (07-11 ACS).
- The disabled, incapacitated either by physical or mental injury, make up 20% of the population (Census, 2000).

1.3 Independent School Districts (ISDs)

School safety is a human concern, one that every school and community must take seriously and strive continually to achieve. It is also a legal concern; schools can be held liable if they do not make good-faith efforts to provide a safe and secure school environment. Fannin County ISDs realize the importance of hazard mitigation planning and were included in this plan as independent jurisdictions.

Figure 1.3: Map of ISDs



Map Location	ISD	Student Population	Teacher Population
A	Bonham ISD	1,955	158
B	Dodd City ISD	318	29
C	Ector ISD	251	24
D	Honey Grove ISD	612	60
E	Fannindel	196	19
F	Leonard	896	66
G	Sam Rayburn	444	38
H	Savoy	302	28
I	Trenton	574	48

Source: www.school-district.findthebest.com

1.4 Plan Background

Every year Mother Nature produces obstacles that challenge agriculture production in Fannin County as well as the entire State of Texas. Because agriculture relies on the weather, climate, and water availability, it is easily impacted by natural events such as floods, windstorms, and hailstorms. These events can cause contamination of water, loss of crops & livestock, and destruction of agricultural infrastructure.

Fannin County has a strong agricultural history. Although the number of actual farms decreased from over 7,000 in 1900 to only 1,500 in 1987, the county economy is still highly agricultural. This dependency on agriculture makes is very susceptible to natural disasters.

Presidential Declaration - a post-disaster status that puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses, and public entities. If declared, funding comes from the President's Disaster Relief Fund and disaster aid programs of other participating federal agencies.

Table 1.4: Presidential Disaster and Emergency Declarations from 1966-2008 for Fannin County.

Declaration #	County	Date	Disaster Description	Constant 2008 $*
218	Fannin	5/12/1966	Severe Storms and Floods	2,851,108
320	Fannin	1/27/1972	Heavy Rains and Floods	890,373
828	Fannin	5/19/1989	Severe Storms and Tornado	54,462,633
863	Fannin	5/2/1990	Severe Storms and Tornado	39,395,745
1239	Fannin	8/26/1998	Tropical Storm	38,153,774
1356	Fannin	1/8/2001	Severe Ice Storm	63,697,376
1624	Fannin	1/11/2006	Severe Wildfire Threat	47,672,918
1709	Fannin	6/29/2007	Severe Storms and Tornado	125,950,966
3284	Fannin	3/14/2008	Emergency Wildfire Declaration	15,095,739

Source: www.peripresdecusa.org
**Costs shown are statewide totals for the incident and are adjusted to 2008 dollars.*

1.5 Plan Adoption

According to FEMA's publication "Getting Started: Building Support for Mitigation Planning (FEMA386-1)" adoption of the plan solidifies the local governments' commitment to implement the plan and keep it alive with updates. Using this as a basis when the plan was completed it was submitted to the State Hazard Mitigation Officer and then to FEMA for final approval. During the State of Texas and FEMA approval the plan was available for public review at the Fannin County Office of Emergency Management (OEM) and the Texoma Council of Government's (TCOG) website. After State of Texas and FEMA approval each participating jurisdiction will adopt the plan and a copy of the resolution will be inserted in Appendix E: MOUs & Resolutions.

The Disaster Mitigation Act 2000 (DMA 2000) requires states, tribal governments, planning districts, and local jurisdictions to develop, and maintain a mitigation plan as a condition of receiving pre-disaster and post-disaster assistance.

1.6 Organizational Structure

Texoma Council of Governments (TCOG) is an organization comprised of city and county governments, colleges, service organizations, school districts, chambers of commerce, etc., with the goal to build strength through regional cooperation. It is through this regional cooperation that TCOG can serve its members by working to continually improve the economic, social, educational, and safety aspects of life for citizens of Fannin, Grayson, and Cooke Counties.

The Texoma Council of Governments (TCOG) is a partnership of governments and public representatives which will continually improve the economic, social and educational opportunities for the citizens of Fannin, Grayson and Fannin Counties by developing resources and developing quality programs and services.

TCOG served as the lead agency for the development of the plan and used the Direct Representation Model as guide in the planning process. TCOG's two emergency planners facilitated the plan development to ensure the plan met the requirements of DMA 2000. As the coordinator, TCOG had many responsibilities including administration, content organization, and text development. The following is a brief summary of TCOG's responsibilities:

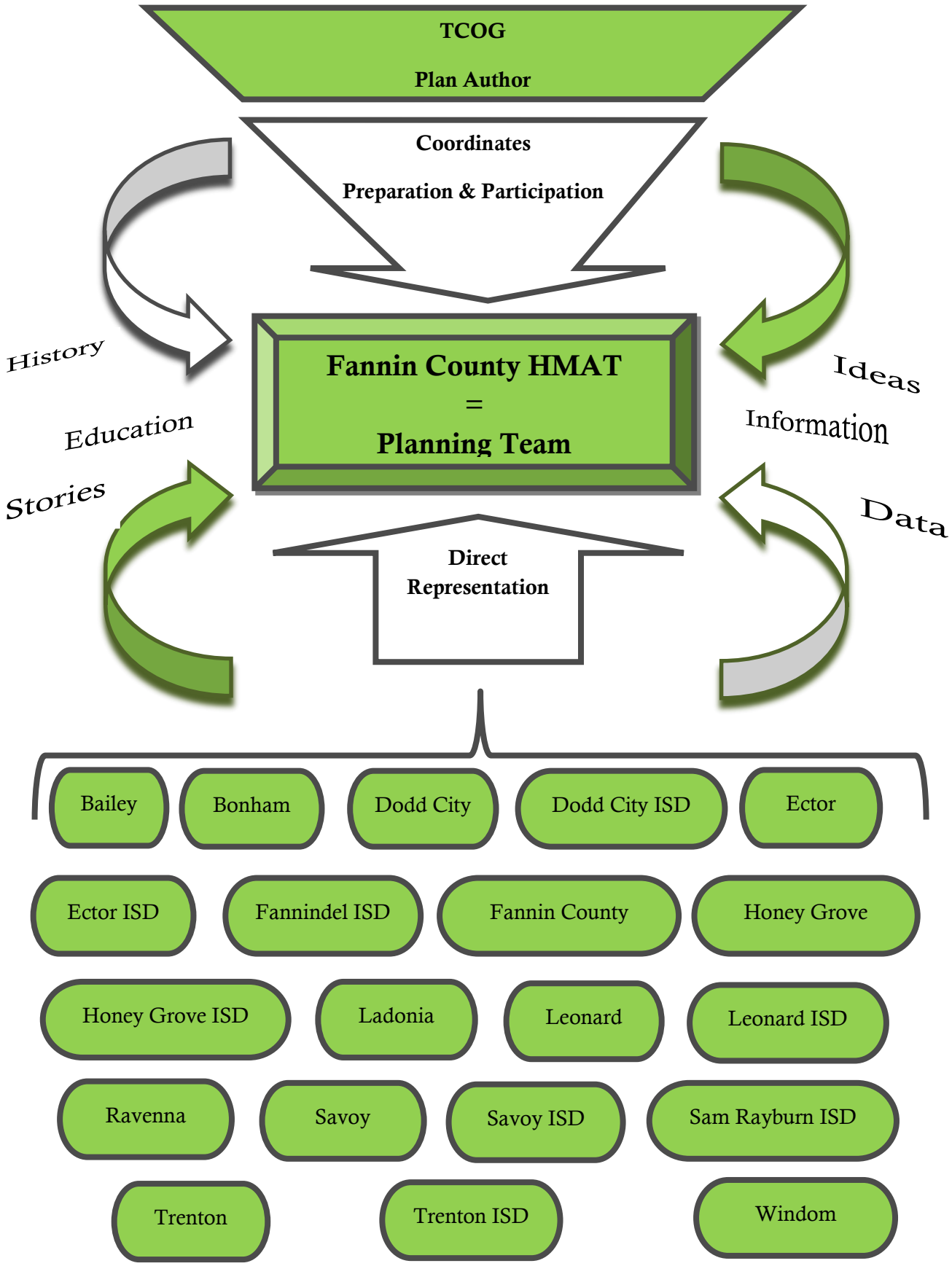
Fannin County Hazard Mitigation Planning Team (HMPT) is a team consisting of local interested individuals from the county, cities and unincorporated areas. They meet regularly with the mission to help establish a mitigation plan and to incorporate mitigation activities to prevent or reduce damage from both natural and man-made hazards.

- Assign a lead planning staff member to provide technical assistance and necessary data to the Fannin County Hazard Mitigation Planning Team (HMPT).
- Schedule, coordinate and facilitate community meetings with the assistance of the planning team.
- Provide any necessary materials, handouts, etc., necessary for public planning meetings.
- Work with the planning team to collect and analyze data and develop goals and implementation strategies.
- Prepare, based on community input and team direction, the first draft of the plan and provide technical writing assistance for review, editing and formatting.
- Coordinate with stakeholders within the schools, cities and unincorporated areas of Fannin County during plan development.
- Submit the final plan to the State of Texas and provide follow up technical assistance to the Fannin County Community Mitigation Planning Team to cure any noted deficiencies subsequent to the review of the plan by the State of Texas.
- Upon approval by the State of Texas and submission to FEMA, provide follow up technical assistance to the Fannin County Community Mitigation Planning Team to cure any noted deficiencies subsequent to the review of the plan by FEMA.
- Work with the Fannin County (OEM) to facilitate adoption coordination of all City and Town Councils, School Boards, and the Commissioners Court. Followed by submission of adoption documentation to the State of
- Submit final adoption documentation and approval signatures for all participating jurisdictions, to the State and FEMA and ensure plan is noted as complete and approved by both agencies.

A Multi-Jurisdictional Hazard Mitigation Planning Team (HMPT) was formed consisting of representatives appointed by local jurisdictions to work together with TCOG in the plan development. The team's primary duties were:

- Ensure that the Fannin County HMPT includes representatives from the neighborhood stakeholders groups, including all residents, neighborhood associations, community groups, property owners, institutions, businesses, schools, etc. Each participating jurisdiction must provide at least one representative to the county team and provide active support, input and attendance at program meetings.
- Attend regular meetings of the planning team.
- Assist TCOG staff with identifying hazards and estimating potential losses from future hazard events. Assist TCOG in developing and prioritizing mitigation actions to address the identified risks.
- Identify the community resources available to support the planning effort.
- Assist with recruiting participants for planning meetings, including the development of a community-wide mailing list and distribution of meeting announcements.
- Gain the support of neighborhood stakeholders for the recommendations resulting from the planning process.
- Submit the proposed plan to all city/county departments for review and comment and work with TCOG to incorporate the resulting comments into the proposed plan.
- After adoption, publicize the plan to neighborhood interests and ensure new community members are aware of the plan and its contents.
- Subsequent to State of Texas and FEMA approval of the plan, assume responsibility for bringing the plan to life by ensuring it remains relevant by monitoring progress, through regular maintenance and implementation projects.

Chart 1.6: Organizational Model



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Fannin County is Updating Hazard Mitigation Plan

Posted: Jan 07, 2014 8:46 PM CST

By Cathy Evans, Reporter / Meteorologist - bio | email

BONHAM -- Fannin county is updating their hazard mitigation plan.

A public meeting was held at the Darrell Hall Education Center in Bonham inviting school districts, city managers, and other members of the public to come and give their opinion on how to best prepare for an emergency, such as a tornado or an ice storm.

"We do a systematic threat assessment of any of the hazards that we might face here in Fannin county. Once you've done then we look at what we can do to mitigate that those hazards is there anything we could do. You can't stop a tornado but could we install a safe room or storm shelters," says Fannin county, Emergency Manager Darrell Brewer.

Texoma Headlines

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CHAPTER TWO – THE PLANNING PROCESS

2.1 Benefits of Mitigation Planning

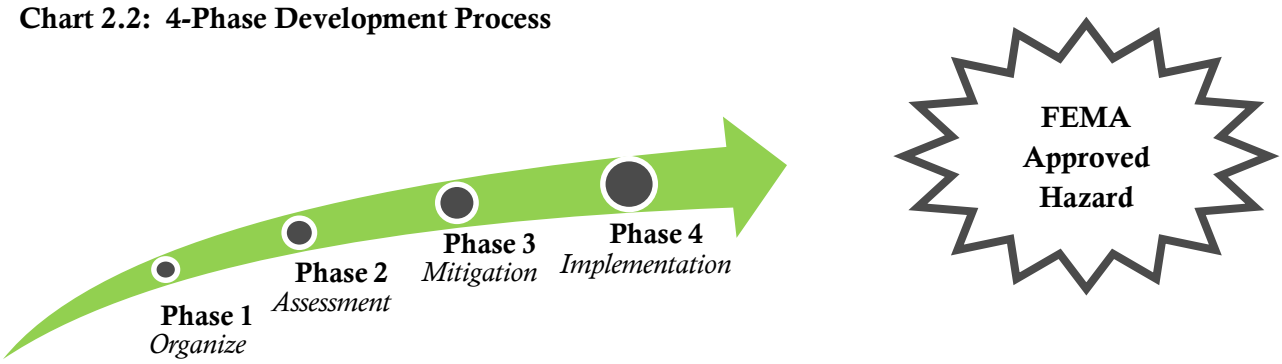
Hazard mitigation plans such as this one help communities reduce their risk from hazards by identifying weaknesses and developing strategies to alleviate (if not eliminate) the effects of the hazard. The benefits of this process are numerous and are supported by reports and case studies. Benefits include but are not limited to:

- Saves lives, property, and money.
- Speeds recovery following disasters.
- Reduces future vulnerability through wise development and reconstruction.
- Qualifies the receipt for mitigation funding.
- Demonstrates a firm commitment to improving community health and safety.

2.2 The Multi-Jurisdictional Hazard Mitigation Planning Process

Fannin County OEM applied for and received a Hazard Mitigation Planning Grant in response to DR-1999 and DR-4020 in summer of 2012. Fannin County solicited bids and chose to partner with TCOG, who had authored the previous plan. Together TCOG and Fannin County utilized a four phase plan development process.

Chart 2.2: 4-Phase Development Process



PHASE 1 - Organize Resources:

Effective planning efforts result in practical and useful plans, but written plans are only one element in the process. The planning process is as important as the plan itself. A successful planning process organizes resources by encouraging cooperation and bringing together a cross-section of government agencies, local entities, concerned citizens and other stakeholders to reach a consensus on achieving a desired outcome or resolving a community issue. Applying a community wide approach and including multiple aspects adds validity to the plan. Those involved gain a better understanding of the problem and how solutions and actions were devised. The result is a common set of community values and widespread support for directing financial, technical, and human resources to an agreed upon action.

RISK is the potential loss associated with a hazard, defined in terms of

Hazard Assessment Surveys were distributed through media, print, websites, emails, and through hard copies located at city halls and public establishments. A copy of the survey and results are located in appendix D

- A comprehensive county approach was taken in developing the plan. An open public involvement process was established for the public, neighboring communities, regional agencies, businesses, academia, water/wastewater districts, etc. to provide opportunities for everyone to become involved in the planning process and to make their views known. This was done by having public meetings in multiple locations to provide easier accessibility. The meetings were advertised with notices in public places and by media press releases.
- To ensure the understanding of the roles and responsibilities of the jurisdictions and Memorandum of Understanding (MOU) was created and signed by each respective jurisdiction. This MOU is an inter-local agreement outlining the respective roles and responsibilities in the planning process.
- Each jurisdiction was asked to appoint at least one representative to a county wide HMPT. This team was also open to members of incorporated jurisdictions or to citizens at large.
- A series of workshops was conducted to educate on the purpose, procedures, and general information regarding the Hazard Mitigation Planning Process. These workshops were also used to gather hazard information, develop mitigation strategies, and edit the plan during the writing process.
- The review and incorporation of appropriate existing plans, studies, reports, technical information, and other research was included into the plan during its drafting process.
- Support and information was obtained from other government programs and agencies such as the National Flood Insurance Program (NFIP), Natural Resources Conservation Service (NRCS), US Geological Survey (USGS), etc.
- Regular meetings were held to keep both the general public and team members informed of the progress, answer any questions, and notified of any changes to FEMA's guidelines for the creation of the plan.

Coordination with other agencies is vital in the development of a valuable plan. A list of utilized resources is located in Appendix C.

PHASE 2 – Risk and Vulnerability Assessment:

The plan must be reactive to hazards that the community faces. It is not sufficient to just identify the hazards. The potential consequences of these hazards must be assessed. This phase included identifying and profiling all hazards, assessing vulnerability and risk. An in-depth research into the history of Fannin County to document past disasters was required. Since many of these disasters occurred before the age of the internet local libraries were utilized as were life experiences from local residents.

Hazard Assessment Surveys were developed and used to document public concerns. These surveys were available in hard copy at numerous public places such as city halls and libraries and a more detailed version was posted on TCOG's website. All aspects of the local media were utilized to notify the public of how to

obtain access to these forms and the importance of having a large response. These surveys collected the following data:

- Which natural hazards are most likely to occur?
- How concerned are you about each natural hazard and its effect on the community?
- Have you been impacted by a natural hazard recently? If so which ones?
- How prepared are you and how could you be better prepared?

A general assessment included using local residents, historical data, the previous mitigation plan, Texas State Mitigation Plan, Local or Regional Reports, Strategic Plans, Flood Studies, and other data were used to establish the following:

- The type, location and extent of all hazards that can affect the jurisdiction, both historically and in the future.
- Past occurrences of hazard events in or near the community and the severity, duration, and the resulting influences on the area.
- Description of the jurisdictions vulnerability to those hazards including types and numbers of existing and future buildings, infrastructure and critical facilities in identified hazard areas.
- Probability or likelihood of hazard occurrence.
- Estimate potential dollar losses of those structures considered vulnerable.
- General description of land uses and development trends for future land use decisions.

The development of a Multi-Jurisdictional Hazard Mitigation Plan involved the use of many types of information: historical data on previous disasters, information on critical infrastructures, zoning and flood plains maps, records, charts, etc., from many sources. This data was assembled and stored in Geographic Information System (GIS) format. With the use of GIS technology and ESRI's ArcView program collected data can be stored, managed, and projected spatially. This data can then be easily shared and updated as needed. Copies of this data were distributed to several entities for safe keeping and for use in future planning projects.

The best available data was used to develop a base map of areas affected by multiple natural hazards. In conjunction with mapping, a comprehensive inventory or Geodatabase was created. This database consists of critical information such as (but not limited to): critical facilities, infrastructures, evacuation routes, and high risk hazard areas. Based on this and previous hazard information, an overview of each community's risks to specific hazards was developed. Maps were created from this data and were used for depicting location of structures; land use, population, etc. and are incorporated throughout the plan and in Appendix B.

Geographic Information Systems capture, store, analyze, and manages location linked data.

Geodatabase or Spatial Database is database designed to store, query, and manage spatial data.

*For more information on GIS and Geodatabases visit www.esri.com.

The copies of the GIS data gathered from external sources and any data collected in the field will be stored at the Fannin County Office of Emergency Management (OEM). This data will be available for the local jurisdictions for use in other planning projects as needed.

PHASE 3 – Evaluate Previous Mitigation Plan and Develop Additional Mitigation Strategies:
Phase 3 will be the evaluation and review of the mitigation strategies identified in the previous plan. The strategies that were implemented will be documented, those that weren't will be reexamined and possibly updated, and new strategies will be developed. Fannin County, Texas intends to reduce losses from the hazards identified in the Risk Assessment and will set goals and objectives to guide the selection of mitigation activities to reduce potential losses. The Mitigation Strategy section of the plan will include:

- A description of mitigation goals and objectives meant to reduce long-term vulnerabilities. These objectives were identified by the HMPT using hazard profiles, survey assessments, etc.
- A comprehensive analysis of previous Mitigation Plan mitigation strategies.
- Mitigation Plan progress, projects, and success since 2009 plan.
- Identification and analysis of a range of additional mitigation actions and projects.
- Action Plan describing how the mitigation actions and projects were prioritized, and how they plan to be implemented and administered.

PHASE 4 – Adoption, Implementation and Maintenance:
During develop and after completion of the draft plan it was distributed to the planning team and jurisdictions for comments. After the final draft was reviewed by interested parties it was submitted to the State of Texas Governor's Division of Emergency Management for their review. Once accepted, it was forwarded to the FEMA Region VI for final review and approval. After State and FEMA approval, the plan was returned to the Fannin County for jurisdictional, school district, and county adoption and implementation. Copies of the Adoption Resolutions are included in Appendix F. During the State of Texas and FEMA review the plan was available for public review and comment at the Fannin County OEM and on TCOG's website. By posting the plan on the web both residents of Fannin County and neighboring communities and entities have an opportunity to review and provide feedback.

Mitigation plans need to be a living document and to ensure this the plan must be monitored, evaluated, and updated on a five-year or less cycle. This includes incorporating the mitigation plan into county and local comprehensive or capital improvement plans as they are developed. This section describes the system that Fannin County and the participating jurisdictions have established to monitor the plan, provides a description of how, when, and by whom the HMPT process and mitigation actions will be evaluated, presents the criteria used to evaluate the plan, and explains how the plan will be maintained and updated.

Table 2.2: Hazard Mitigation Schedule

	2012	2013						2014						2015
	March-Dec	Jan/Feb	March/April	May/June	July/Aug	Sept/Oct	Nov/Dec	Jan/Feb	March/April	May/June	July/Aug	Sept/Oct	Nov/Dec	March-June
Application & Grant Award	X	X												
RFQ's/ Bids Contracts			X	X	X	X								
MOU's						X	X	X						
Hazard Identification							X	X	X	X				
Vulnerability Assessment									X	X				
Mitigation Measures									X	X	X			X
Implementation Strategies										X	X			
Public/Planning Team Meeting	X	X	X			X	X	X	X	X	X	X		X
Draft Plan											X	X		X
Submit to State											X	X		X
State & FEMA Approval														X
Adoption by Jurisdictions														X

2.3 Previous Mitigation Plan

The current Fannin County Multi-Jurisdictional Hazard Mitigation Plan was approved by FEMA in 2009, and this 2014 Plan update provides the first five-year update. The current plan was used as a template and as the foundation for the update.

Plan Updates: according to 44 CFR – A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to be eligible for mitigation project grant funding.

2.4 Goals of the Mitigation Planning Process

Through the planning process, Fannin County and the nineteen jurisdictions and schools within plan to achieve the following goals:

Goal 1: Protect the life, health and safety of Fannin County residents and minimize potential impacts of existing and future development from natural and human-caused hazards.

Goal 2: Facilitate a sustainable economy by protecting agriculture, businesses, infrastructure and other economic activities from natural and human-caused hazards.

Goal 3: Support the goals and objectives established in the State Hazard Mitigation Plan.

2.5 Hazard Mitigation Planning Team

The Fannin County Multi-Jurisdictional Hazard Mitigation Planning Team (HMPT) was formed to provide guidance during the preparation of this plan. Team members, along with their affiliation, are listed in Table 2.5. This team was comprised of private citizens and others from various local organizations, as well as representatives from Fannin County, jurisdictions, schools, businesses, and emergency response personnel. Representation was solicited upon recommendations from the Fannin County Commissioners, jurisdictions and school districts; however, no one wishing to participate was excluded from doing so. The meetings were open to the public and everyone was encouraged to bring other interested citizens. At the first meeting, attendees identified and discussed natural hazards most likely to impact the county, the planning process, and set goals for the plan. Additional smaller meeting were held later in the process to receive more localized information.

Table 2.5: Hazard Mitigation Planning Team Members and Information Sources

Jurisdiction	Name	Expertise
Bailey VFD	Kenny Burks	Fire Chief
Bonham PD	Tim La Vergne	City EMC
Bonham PD	Carl Graves	City EMC
City of Bailey	Kenneth Burks	Mayor pro tem
City of Bonham	Bill Shipp	City Manager
City of Bonham	David Trout	Citizen
City of Bonham	Roy Floyd	Mayor
City of Dodd City	Jackie Lackey	Mayor
City of Dodd City	Dillon Weeks	City Council
City of Dodd City	Jackie Lackey	Mayor
City of Ector	Mary Dean Norris	Mayor
City of Ector	Brett Stone	Mayor
City of Ector	Linda Bohn	City Council
City of Honey Grove	Jaci Garner	City Administrator
City of Honey Grove	Joey Rickman	Public Works Director
City of Honey Grove	Harold Roberts	Mayor
City of Ladonia	Isacc Scoggins	City Council
City of Ladonia	Jan Cooper	Mayor
City of Leonard	Glen Murphy	Public Works Director
City of Leonard	Willie Johnson	Mayor
City of Leonard	Alicia Booher	City Manager
City of Leonard	Butch Henderson	City Manager
City of Savoy	Steve Perkins	Mayor
City of Savoy	Denise Pugh	Mayor
City of Savoy	Missy Rickman	City Clerk
City of Trenton	Rodney Alexander	Mayor
City of Trenton	Robert Robinson	Police Chief
City of Trenton	Jamie Davis	City Clerk
Dodd City ISD	Craig Reed	Superintendent
Dodd City ISD	Jimmy Herpeche	School Board
Ector ISD	Gary Bohannon	Superintendent
Ector ISD	Edwina Lane	School Board
Fannin County	Darrell Brewer	EMC

Jurisdiction	Name	Expertise
Fannin County	Jerry Magnus	Commissioner
Fannin County	David Whitlock	Commissioner
Fannin County	Stan Barker	Commissioner
Fannin County	Randy McBroom	Citizen
Fannin County	Creta L Carter	County Judge
Fannindel ISD	Robert Milton	Principal
Fannindel ISD	RL Milton	Superintendent
Honey Grove ISD	Todd Morrison	Superintendent
Honey Grove ISD	Kyle Hutchings	Principal
Honey Grove VFD	Joey Rickman	Assistant Chief
Leonard ISD	Larry La Fevers	Superintendent
Leonard ISD	Brad Maxwell	Principal
Leonard ISD	Brad Connelly	Principal
Leonard PD	B Gomez	Interim Police Chief
Sam Rayburn ISD	Jeff Irvin	Superintendent
Sam Rayburn ISD	Wendy Keeton	Principal
Sam Rayburn ISD	Jim Shaw	Principal
Savoy ISD	Brian Neal	Superintendent
TCOG	CJ Durbin-Higgins	Public Safety Manager
TCOG	Randy McBroom	Director
TCOG	Stephanie Davidson	Public Safety Planner
Town of Ravenna	Joe Passanisi	Commissioner
Town of Ravenna	Claude Lewis	Mayor
Town of Windom	Donnie Cobb	Mayor
Town of Windom	Louise Knight	City Council
Trenton ISD	Jerry Don Cook	Superintendent

"Plans are nothing; planning is everything." – Dwight D. Eisenhower

2.6 Public Involvement in the Planning Process

Citizens were encouraged to attend the planning meetings. Meeting notices were posted per the county's public meeting policies. Emails, letters, phone calls, and the media were used to notify individuals, businesses, non-profit groups, and other public agencies that wished to be involved. Many of these entities were unable to attend all meeting but many made information contributions.

Hazard Mitigation was an agenda item in many county commissioners' court, city council and school board meetings. These meetings were publicly held in accordance with the open meeting act. Agendas were properly posted, and minutes taken in accordance with the law. Often after these public meetings an informal question and answering session occurred with concerned citizens who had been present.

A "round table" proved to be the most effective format for generating public and team input on the project and stimulate "out of the box" problem solving. Due to the fluid nature of the planning process over the planning period, participants were encouraged to make notations on maps as discussion occurred and use other free-flowing processes for documentation of the meeting topics. Discussion included: past occurrences, personal experiences, economic impacts, currently susceptible areas, future development, future economic impacts, and future hazard occurrence predictions.

Public input was obtained from visits to local business and attractions. Visits were made to the Chamber of Commerce, Parks, Libraries, Schools and other places where the general public could be questioned. Valuable input was gathered by talking to lifelong residents who were more than eager to share their stories on the history of Fannin County. All interested parties were encouraged to share their experiences, suggestions, and concerns for future mitigation activities.

Table 2.6: Participation Matrix

Activity	Date	Bailey*	Bonham	Bonham ISD	Dodd City	Dodd City ISD	Ector	Ector ISD	Fannindel ISD	Fannin County	Honey Grove	Honey Grove	Ladonia	Leonard	Leonard ISD	Ravenna*	Savoy	Savoy ISD	Trenton	Trenton ISD	Windom
Application	3/5/12									X											
Letters of Support	2009-2012	X	X		X		X			X	X		X	X		X	X		X		X
School Superintendent Meeting	10/2013			X		X		X	X			X			X			X		X	
Memos of Understandings	10/2013-1/2014	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Survey Distribution	11/2013-5/2014		X							X	X						X				
Planning Team Meetings	1/2014 - 7/2014		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hazard Identification	11/2013 - 5/2014	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vulnerability Assessment	3/2014 - 5/2014	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mitigation Measures	4/2014-4/2015	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Implementation Strategies	5/2014-7/2014	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Draft Review	7/2014	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Public Reviews**	8/2014-6/2015	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
State & FEMA Approval	?																				
Local Adoption	?																				

** Due to the small size of some jurisdiction they were represented by the Fannin County EMC in some activities.*
***The plan was available at the Fannin County OEM & TCOG for public review while pending State and FEMA approval*

2.7 Community Capability Assessment

The planning team conducted a capability assessment that identified capabilities, authorities, policies, and other resources available to reduce hazard vulnerability. These capabilities were divide into four categories and listed in Table 2.7. Local capabilities are very limited due to the size, geographic location, and below average local economy. The planning team along with the Fannin County jurisdictions will continue to strive to implement the maximum amount possible with their limited resources. This will be done primarily with low to no-cost public education measures.

Per Capita Income: Fannin County ranks 228 out of 254 counties on per capita income. – Bureau of Economic Analysis, U.S Department of Commerce, 2012

Planning and Regulatory – Existing plans, policies, ordinances, laws, etc. that decrease local vulnerability to natural hazards.

Administrative and Technical– Staff, skills, and tools that can be used for mitigation planning or to implement identified mitigation measures.

Financial – Local operating budget and capital improvement funding that may be utilized to fund mitigation projects.

Education and Outreach – Programs or methods in place that could be utilized for mitigation information dispersal.

Table 2.7: Capability Assessment

	Capability or Resource	Function	Mitigation Applications	Jurisdictions and/or Entities
Planning & Regulatory	Capital Improvement Plans/Strategic Plans	▪Short-range plans that identifies capital project and equipment purchases	▪ When updating plan give prioritization to projects that mitigate multiple hazards ▪ Ensure that capital improvements are consistent with mitigation goals and objectives	Bonham
	Flood Insurance Studies (FIS) & Food Insurance Rate Maps (FIRM)	▪Identifies areas where communities must regulate development, where flood insurance is required, and determines flood insurance rates	▪ Gathering of local flood data that can be incorporated into the FIS & FIRM updates will provide a more accurate document and allow for safer land use	Bailey, Bonham, Dodd City, Ector, Fannin County, Honey Grove, Ladonia, Leonard, Savoy, Trenton, & Windom
	Emergency Operation Plans (EOP) & Continuity of Operations Plans (COOP)	▪Describes what local entities will do when conducting emergency operations and how to sustain operations in an emergency event	▪ Incorporate the mitigation plan's identified hazards into the EOP and COOP plans to ensure that all hazards are supported by the EOP and Coop Plans ▪ When the county EMC updates the basic plan and the annexes incorporate mitigation in all documents not just Annex P: Mitigation	Bailey, Bonham, Dodd City, Dodd City ISD, Ector, Ector ISD, Fannin County, Honey Grove, Honey Grove ISD, Ladonia, Leonard, Leonard ISD, Sam Rayburn ISD, Savoy, Savoy ISD, Trenton, Trenton ISD, & Windom
	Comprehensive Land Use Plans	▪Promotes efficient land use of patterns that are sensitive to environmental and social concerns	▪ When plan is updated incorporate hazard mitigation measures through conservation, drainage management and flood control	Bonham
	Zoning & Building Ordinances	▪Regulates size and type of structures and land use.	▪ Improve zoning standards to address mitigation issues such as restricting building in high hazard areas and setting design stands for new construction to result in increased hazard resistance	Bonham, Fannin County, Honey Grove, Ladonia, Savoy, & Trenton
	District Improvement Plans	▪Annually revised plan that serves to guide district and campus staff in obtaining the districts goals through a continuous cycle of improvement	▪ Set a goal to strive to ensure a safe and orderly environment by utilizing mitigation measures such as construction a school safe room or incorporating water conservation into curriculum	Dodd City ISD, Ector ISD, Honey Grove ISD, Leonard ISD, Sam Rayburn ISD, Savoy ISD, & Trenton ISD

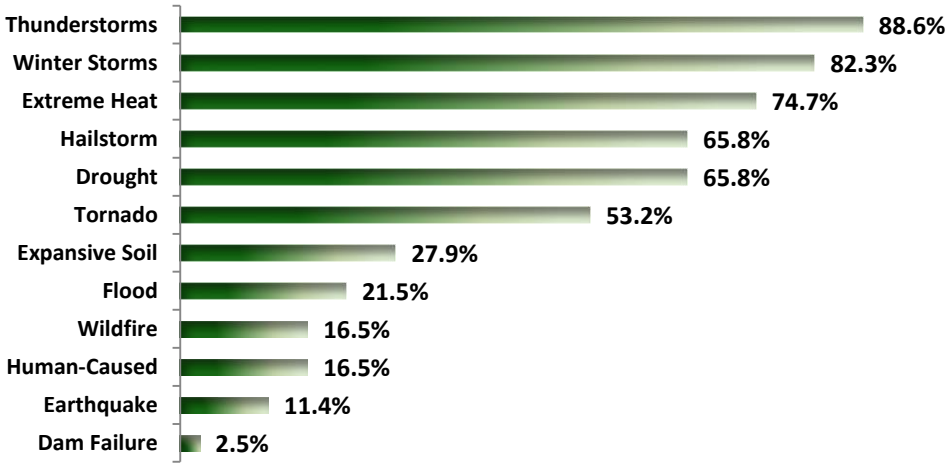
	Capability or Resource	Function	Mitigation Applications	Jurisdictions and/or Entities
Administrative & Technical	Fire Departments	▪Provides community with fire suppression and emergency services	▪ Provide fire safety training programs such as Fire Wise, evacuation plan development, fire safety house, etc.	Bailey, Bonham, Dodd City, Ector, Honey Grove, Ladonia, Leonard, Savoy, & Windom Trenton
	Police Departments	▪Enforces local, county, and state laws and ensuring safety of residents	▪ Conduct adolescent safety programs and 911 education programs. Enforce local codes and ordinances	Bonham, Ector, Fannin County, Honey Grove, Ladonia, Leonard, Savoy, & Trenton
	City Clerks	▪Custodian of records and data	▪ Record event data for incorporation into plans and regulations	Bailey, Bonham, Dodd City, Ector, Honey Grove, Ladonia, Leonard, Savoy, Trenton, & Windom
	Emergency Management Coordinator	▪Coordinates emergency management services to include both natural and man-made events	▪ Provide trainings, CERT recruitments, outreach activities that mitigate hazards	Bonham & Fannin County
	County Commissioners, Superintendents, Administrators and Elected Officials	▪Elected or appointed officials charged with administering local governments and education establishments	▪ Adopt and implement mitigation plan ▪ Establish and update building codes, zoning regulations, and ordinances that would mitigate hazards	Bailey, Bonham, Dodd City, Dodd City ISD, Ector, Ector ISD, Fannin County, Honey Grove, Honey Grove ISD, Ladonia, Leonard, Leonard ISD, Sam Rayburn ISD, Savoy, Savoy ISD, Trenton, Trenton ISD, & Windom
	Warning Systems (Code Red & Sirens)	▪Warn residents of approaching hazard and to take preparedness measures	▪ Give early notice so that mitigation can take place	Countywide
	Public Works	▪Responsible for maintaining public utilities	▪ Reduce erosion, soil expansion, and flooding by ensuring roadways and waterways are clear and needed upgrades are noted to officials	Bailey, Bonham, Dodd City, Ector, Honey Grove, Ladonia, Leonard, Savoy, Trenton, & Windom
Financial	Local Budgets	▪Local operating budget and capital improvement funds	▪ When setting local budgets fund mitigation projects	Bailey, Bonham, Dodd City, Ector, Fannin County, Honey Grove, Ladonia, Leonard, Savoy, Trenton, & Windom
	Taxation	▪Financial charge or levy imposed that allows government entities to carry out necessary functions	▪ Provide public with information about has cost-benefit mitigation can save future tax dollars	Countywide
	Grants	▪Non-repayable funds that requires a proposal or application	▪ Apply for and utilized grant funds such as for mitigation projects	All jurisdictions and entities
Education & Outreach	Service Organizations (CERT)	▪Volunteer groups that work to strengthen communities and serve the public	▪ Can provide education programs and localized response assistance	Countywide
	Public Utilities, Municipal Utility Districts (MUDs), & Special Utility Districts(SUDs)	▪Provide utilities services such as power, gas, water, phone, etc. to the residents of Fannin County. These entities have disaster response plans and in a disaster ensure that their services are restored as quickly as possible	▪ Education information can be provided on their web sites about storm preparedness and prevention tips that can mitigate utility damages	Countywide
	Schools	▪Provide education for over 5,000 students countywide from Pre-K to 12th grade	▪ Incorporate Hazard Mitigation Measures in school activities and in classroom education	Dodd City ISD, Ector ISD, Honey Grove ISD, Leonard ISD, Sam Rayburn ISD, Savoy ISD, & Trenton ISD
	Media (all forms)	▪Publications, digital articles, voice, and television outlets provide daily	▪ Distribute information on preparedness methods and approaching hazards	Countywide

CHAPTER THREE – HAZARD IDENTIFICATION AND ASSESSMENT

3.1 Identifying Hazards

The first step in planning is to identify and describe all the natural hazards capable of occurring within the County and the vulnerabilities to each one. Each community in the county is unique in location, topography, location of critical facilities, commercial and residential development, etc. Some municipalities are more susceptible to certain hazards because of these and other unique circumstances. It is important to identify these hazards so that appropriate action can be taken to mitigate the impact, minimize loss and recover as quickly as possible. It is recognized that all the demands of a disaster situation cannot be anticipated. By being aware of the areas, major facilities and persons that may be vulnerable to each type of hazard preventive measures can be planned.

Chart 3.1: Natural Hazards Experienced in Fannin County *



** This is based on the results of the Hazard Assessment Survey not past historic events.*

The National Climatic Data Center (NCDC) maintains records regarding weather events since 1950. This database along with information obtained from mitigation meetings was used to prepare profiles which assess each of the natural hazards capable of occurring within the County. Twelve hazards were identified by the HMPT and addressed in this plan. The hazards are in order of occurrence according to the Mitigation Survey.

Table 3.1 lists these natural hazards and explains how and why each was identified as a hazard to the County and jurisdictions.

Table 3.1 Summary of Hazards

Hazard	Type of Disaster	How Identified	Why Identified
Thunderstorms (Including Wind & Lightning) (Section 1)	Natural	• Review past disaster declarations • Wind Storm databases • Review NCDC database • Public Input • Local Media	• Flat terrain allows high velocity winds to occur • Damages to public and private sector • Economic dependence upon agriculture • Define "Wind" vs. "Tornado" in public mind
Winter Storms (Section 2)	Natural	• Review past disasters • Review NCDC database • Public Input • Farm Service Agency • NOAA • National Weather Center	• Occur rarely – which has left the area with little equipment • Damages to public and private sector caused by heavy snows, etc. • Humans and property are not prepared for extended periods of cold in this area
Extreme Heat Events (Section 3)	Natural	• Review past disaster declarations • Heat databases • Review NCDC database • Input from County	• Prolonged temperatures over 100 degrees Fahrenheit are common in summer months • Heat affects people, animals and crops
Hailstorm (Section 4)	Natural	• Review past disaster declarations • Wind Storm databases • Review NCDC database • Public Input • Local Media	• Hail is a major economic hazard to this agricultural area • Hail events occur every year
Droughts (Section 5)	Natural	• Review past disasters • Drought databases • Review NCDC database • Public Input • Farm Service Agency	• Drought is common in County • Drought in common in State • Drought was one of the most costly past disasters • Economic dependence upon agriculture
Tornado (Section 6)	Natural	• Review past disaster declaration • Tornado databases • National Weather Service • Review NCDC database • Public Input • Local Media	• Common to State • Public Concern • Past damages • Damages to public and private sector
Expansive Soils (Section 7)	Natural	• Review past disaster declarations • Soil databases • Public Input • Natural Resource Conservation Service (NRCS) • Local Media	• Common to area • Affect utilities by breaking underground lines • Cause foundation damage • Cause road/street upheavals
Floods (Section 8)	Natural	• Review of FIRMS • Risk Assessments • Public Input • Review of past disasters • NFIP repetitive loss properties	• The County contains many rivers and streams • Experienced frequent flooding in past • Most common disaster for this area • Construction of two large reservoirs • Increased development in drainage basin

Hazard	Type of Disaster	How Identified	Why Identified
Wildfire (Section 9)	Natural	• Review past events • Review NCDC database • Public Input • Texas Forestry • Local Media • Public Input	• Common to area • Can occur in conjunction with drought and/or lightning • Damages to public and private sector • Recent disaster declarations
Human-Caused (Terrorism/ Hazardous Materials) (Section 10)	Human-Caused	• Homeland Security • Public Input • Media • EPA • Past events	• Increasing likelihood • Potential for mass casualties • All-hazard approach • Increasing amount of hazardous materials being transported through County
Earthquake (Section 11)	Natural	• USGS Database • Earthquake databases • Review NCDC database • Public Input • Local Media	• Although Earthquakes with epicenters within this region are rare and small there is seismic activity • According to USGS several earthquakes with a magnitude of 3 to 4.5 will probably occur each century
Dam Failure (Section 12)	Technological	• Public Input • Risk Assessment • Texas Commission on Environmental Quality (TCEQ) • National Inventory of Dams (NID) • Fannin County Dam Study	• Population and buildings below dam are very vulnerable in event of release or dam failure

3.2 Hazard Assessments

The Hazard Profiles, found in following sections, were prepared for each identified natural hazard and assess the hazard per the following eight categories.

1. **Description**: Identification and description of hazards likely to affect the multi-jurisdictional area along with the sources used to identify these hazards.

2. **Location:** The location or geographic area affected by each natural hazard along with a map of the areas affected.

3. **Impact/Extent:** The impact/extent is the magnitude of the damages or consequences that the hazard is capable of inflicting upon the jurisdictions. Classification methods such as the Fujita scale and Richter scale are used to illustrate extent. Due to the limited amount of county and city-specific documented data, the analysis for determining potential severity was limited to obtaining opinion and information furnished by local residents, emergency responders, and the county and city Emergency Management Coordinators.

Table 3.2a: Impact/Extent of Hazards

Potential Severity of Impact: (30% of Priority Risk Index)

Substantial Index Value = 4	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major Index Value = 3	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor Index Value = 2	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited Index Value = 1	• Injuries and/or illnesses are treatable with first aid. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

Warning Time: (15% of Priority Risk Index)		**Duration:** (10% of Priority Risk Index)	
Index Value = 4	• Less than 6 hours	Index Value = 4	• More than a week
Index Value = 3	• 6 to 12 hours	Index Value = 3	• Less than a week
Index Value = 2	• 12 to 24 hours	Index Value = 2	• Less than 24 hours
Index Value = 1	• More than 24 hours	Index Value = 1	• Less than 6 hours

4. <u>Previous Occurrences:</u> Previous Occurrences describes the hazard in terms of what, when, and where past events have occurred and the extent of damages. Maps are used to identify affected areas and illustrate the severity of damages.

Table 3.2b: Previous Occurrences

Hazard	Previous Occurrences	Probability of Future Events	Probable Location
Thunderstorms	160 events between 1982-2012	Highly Likely	Random throughout county
Winter Storms	18 events between 1994-2011	Highly Likely	Random throughout county
Extreme Heat	7 events between 1998-2011	Highly Likely	Regional
Hailstorm	72 events between 1981-2013 (1.5 "+)	Highly Likely	Random throughout county
Drought	10 severe events between 1924-2011	Highly Likely	Regional
Tornado	47 events between 1955-2012	Highly Likely	Random throughout county
Expansive Soil	Limited Data	Unlikely*	Random throughout county
Flood	40 events between 1996-2012	Highly Likely	Floodplains Areas, City of Bonham, and Lake Bonham
Wildfire	Wildfires are numerous each year	Highly Likely	Random throughout county
Human-Caused	Limited Data	Likely	Critical Facilities, VA Hospital, & Correctional Facilities and Hwy 82, 121, 56, & 78
Earthquake	No record of previous occurrence	Unlikely	Regional
Dam Failure	No record of previous occurrence	Unlikely	Lake Bonham Dam, Coffee Mill Dam, & Coffee Mill Dam

**What is considered Expansive Soil in Fannin County is often referred to as normal settling of the soil. Even the most severe damages would not result in a threat to health or life.*

5. <u>Probability of Future Events:</u> Probability of Future Events describes the probability that the hazard will occur within the County and six jurisdictions. Each hazard is assigned a Probability of Future Events rating based on the criteria and methods described below:

Table 3.2c: Probability of Hazards

Probability of Future Events: (45% of Priority Risk Index)	
Highly Likely Index Value = 4	• Event probable in the next year. • 1/1 = 1.00 (Greater than .33)
Likely Index Value = 3	• Event probable in next 3 years. • 1/3 = .33 (Greater than 0.20, but less than or equal to 0.33)
Occasional Index Value = 2	• Event probable in next 5 years. • 1/5 = 0.20 (Greater than 0.10, but less than or equal to 0.20)
Unlikely Index Value = 1	• Event probable in next 10 years. • 1/10 = 0.10 (0.10 or less)

** Example: If Fannin County has had 10 tornado years recorded in the last 100 years 10 / 100 = 0.10 average per year, which would make tornadoes "Unlikely" to occur within the County.*

6. Vulnerability: Vulnerability describes how exposed or susceptible to damage the county is in terms of why and where the hazard can occur within the county and/or the eleven jurisdictions. The vulnerability is the risk of future occurrences. HAZUS, THMP, and other local data were used to establish a base map and conduct risk assessments.

7. Secondary Hazards: Lists other hazards often triggered by the identified natural hazard event. Some natural disasters set off other types of catastrophes in a cascade of effects that lead to a highly complex situation. Secondary hazards can be events such as transportation and communications disruptions, fire, hazardous materials dispersion, power outages, and other utilities disruptions. These secondary events are identified along with the associated primary hazard due to how they can dictate the amount of impact a natural hazard event can have on the county and/or the eleven jurisdictions.

8. Overall Summary of Vulnerability and Impacts: This section summarizes the vulnerability of the entire county and the possible impacts of the natural disaster. The following table represents the priority risk index of hazards facing Fannin County and its jurisdictions.

Table 3.2d: Priority Risk Index (PRI)*

High Risk	PRI score 3.0 or greater	Medium Risk	PRI score 2.0 to 3.0	Low Risk	PRI score 2.0 to 3.0

Hazard*	Probability (45%)	Impact/Extent (30%)	Warning Time (10%)	Duration (10%)	PRI Score
Thunderstorms	4	3	4	2	3.3
Winter Storm	4	3	1	3	3.1
Extreme Heat	4	3	1	4	3.2
Hailstorm	4	2	4	1	2.9
Drought	4	3	1	4	3.2
Tornado	4	4	4	1	3.5
Expansive Soil	1	1	1	4	1.25
Flood	4	3	3	4	3.4
Wildfire	4	3	4	4	3.5
Human-Caused **	3	3	4	1	2.75
Earthquake	1	1	4	1	1.25
Dam Failure	1	3	4	2	1.95

**Priority Rating Index is based on severity, probability, & vulnerability*
***Human-Caused Probability is not based on previous occurrences but on general perceived terrorism threat.*

HAZARD PROFILE: Section One - Thunderstorms (Including Wind & Lightning)

1. Description

Thunderstorms disrupt more lives than any other form of weather. Produced by a cumulonimbus cloud, a thunderstorm is an atmospheric disturbance with lightning and thunder. 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 lightning bolt. Lightning is a major threat during a thunderstorm. Each year in the U.S. 75 to 100 people are hit and killed by lightning. A bolt of lightning can reach temperatures of over 50,000 degrees F.

Thunderstorm Facts

- No place is the U.S. is immune to thunderstorms.
- 2000 thunderstorms are in progress around the world at any given moment.
- Less than 1 % of all thunderstorms reach severe levels.

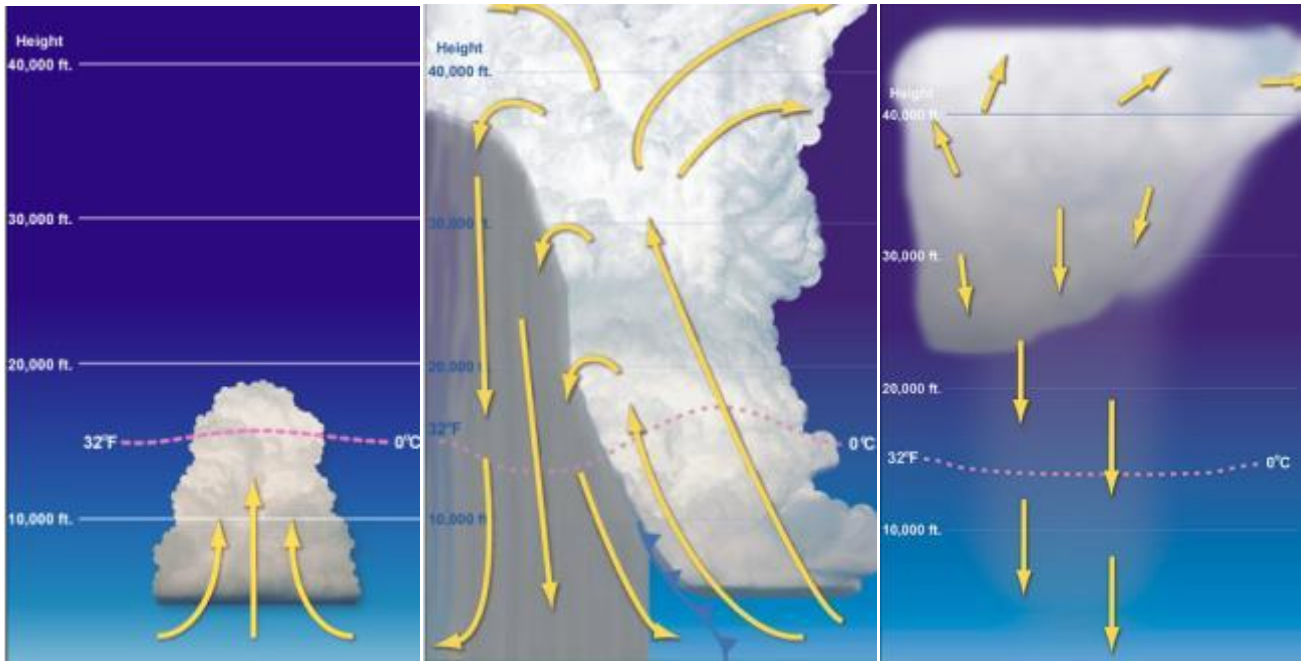
Thunder is the sound of the shock-wave produced by the rapid heating and cooling of the air near the lightning bolt. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes and may also be accompanied by high winds, rain, and hail. A thunderstorm is considered severe if it produces hail at least ¾ inch in diameter, or high damaging winds 58mph or greater. The high winds may be in the form of straight-line winds or a microburst. While thunderstorms are capable of producing tornadoes, hail, and floods, this Hazard Mitigation plan profiles these events as separate natural hazards.

Lightning Facts

- 100 lightning strikes happen worldwide every second.
- The average lightning flash could light a 100 watt bulb for 3 months.
- Can reach temperatures five times hotter than the sun.

The National Weather Service distinguishes between straight-line winds and tornadoes when surveying storm damages. Straight-line wind damage will push debris in the same direction the wind is blowing while a tornado will scatter the debris in a variety of different directions. The general public often believes a tornado has occurred when it is really straight-line winds. Straight-line winds can be as powerful as a tornado.

Figure 1: Life Cycle of a Thunderstorm



Cumulus Stage

The Cumulus Stage is the developing stage of the thunderstorm. At this stage the storm only consists of warm updrafts or upward moving air currents caused by convection. The updrafts can reach heights of around 20,000 feet and form Cumulus Clouds.

Mature Stage

The Mature Stage is the strongest and most dangerous stage of the storm. This stage has updrafts but also has cool downdrafts that contain precipitation. The clouds often have a considerable depth of 40,000 to 60,000 feet. Hail, damaging winds or tornadoes, and flooding may occur.

Dissipating Stage

The cool downdrafts and precipitation eventually weaken the storm. These downdrafts hit the ground spread out and stop the influx of warm air feeding the storm.

Source: The National Weather Service

Squall Lines – Storms organize into a linear structure. These storms can also produce hail and weak tornadoes.

Bow Echoes – Often embedded in a squall line can produce tornado-like damage, or occasionally produce a tornado.

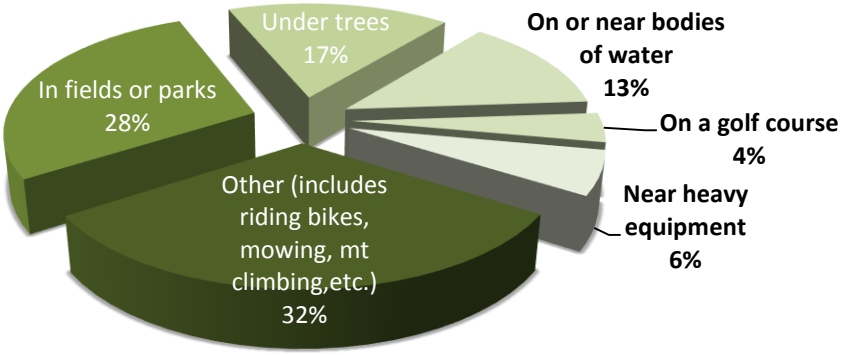
Micro Bursts – These storms produce downburst that can do tornado equivalent damages to homes, trees, and power lines with winds in excess of 100 mph.

Super Cells – These are the strongest and longest type of thunderstorms. These storms are capable of producing winds in excess of 80mph, strong tornadoes, and large hail.

2. Location

There is no place in the U.S immune from thunderstorms or lightning strikes and that is true for the entire Fannin County area which, according to the Oklahoma Climatological Survey, averages 30-50 thunderstorm days a year.

Chart 2: Location of Fatal Lightning Strikes



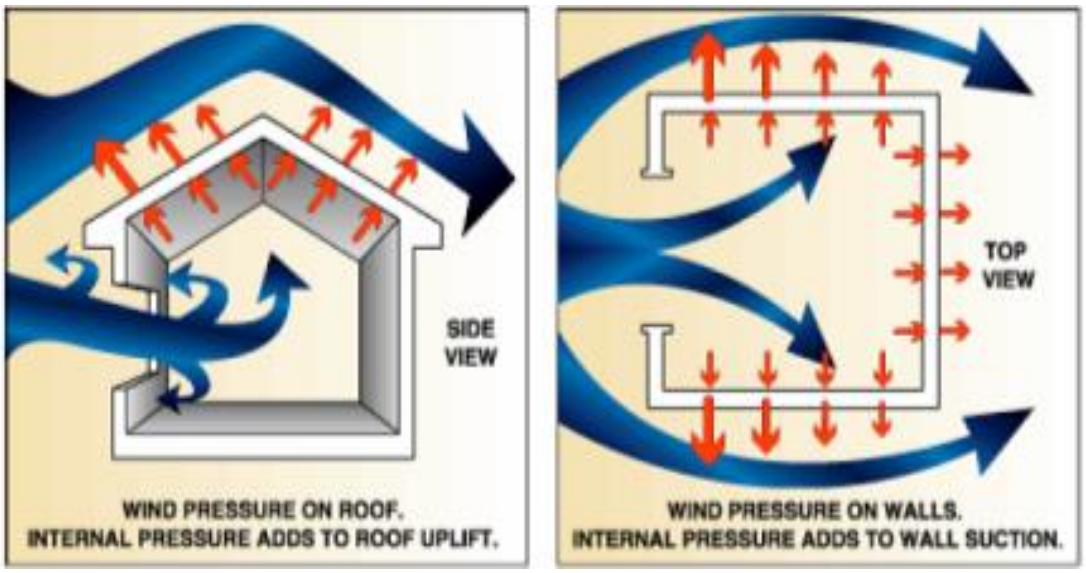
Source: National Weather Service

3. Impact/Extent

A worst case scenario involving thunderstorms would be a solid or redeveloping line of severe thunderstorms that moves through the entire county. These storms can result in heavy rains causing wide spread flooding and road closures. Large economic loss to agriculture and/or major damage to buildings and other property can result if such storms are accompanied by hail and high winds. High winds and lightning associated with such storms can also down trees and highline poles and result in power outages capable of affecting large areas of the county.

Extreme winds can cause several kinds of damage to a building. Figure 3 below shows how extreme winds affect a building and helps explain why these winds cause buildings to fail. Wind speeds, even in these extreme wind events, rapidly increase and decrease. An obstruction such as a house in the path of the wind causes the wind to change direction. This change in wind direction increases pressure on parts of the house. The combination of increased pressures and fluctuating wind speeds creates stress on the house that frequently causes connections between building components to fail.

Figure 3: Windstorm Effects on Structures



Buildings that fail under the effects of extreme winds often appear to have exploded, giving rise to the misconception that the damage is caused by unequal wind pressures inside and outside the building. This misconception has led to the myth that during an extreme wind event, the windows and doors in a building should be opened to equalize the pressure. In fact, opening a window or door allows wind to enter a building and increases the risk of building failure.

Damage can also be caused by flying debris (referred to as windborne missiles). If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, walls, or the roof. For example, an object such as a 2" x 4" wood stud weighing 15 pounds, when carried by a 250-mph wind, can have a horizontal speed of 100 mph and enough force to penetrate most common building materials used in houses today. Even a reinforced masonry wall will be penetrated unless it has been designed and constructed to resist debris impact during extreme winds. Because missiles can severely damage and even penetrate walls and roofs, they threaten not only buildings but the occupants as well.

With thunderstorms also comes lightning. Each second there are 50 to 100 cloud-to-ground lightning strikes across the U.S. These strikes can kill humans and animals, disrupt utilities, and start wildfires.

4. Previous Occurrences

Since 1982 the National Climatic Data Center (NCDC) recorded 154 thunderstorm and high wind events and 6 reported cases of lightning damage in Fannin County. Due to the rural nature of the County, most reports of thunderstorms and associated damage are from cities and towns. Losses from livestock deaths in rural areas of the county often go unreported.

Table 4a: Thunderstorms 1982-2012

Location	Date	Type	Wind Speeds	Property Damages
Fannin	5/31/1982	Thunderstorm Wind	52 knots	0
Fannin	6/15/1982	Thunderstorm Wind	0 knots	0
Fannin	6/28/1983	Thunderstorm Wind	61 knots	0
Fannin	6/28/1983	Thunderstorm Wind	61 knots	0
Fannin	6/28/1983	Thunderstorm Wind	70 knots	0
Fannin	7/1/1983	Thunderstorm Wind	56 knots	0
Fannin	4/20/1984	Thunderstorm Wind	0 knots	0
Fannin	7/12/1984	Thunderstorm Wind	0 knots	0
Fannin	10/31/1984	Thunderstorm Wind	0 knots	1 Injury
Fannin	10/31/1984	Thunderstorm Wind	0 knots	0
Fannin	10/31/1984	Thunderstorm Wind	0 knots	0
Fannin	5/13/1985	Thunderstorm Wind	52 knots	0
Fannin	3/11/1986	Thunderstorm Wind	0 knots	0
Fannin	4/19/1986	Thunderstorm Wind	0 knots	0
Fannin	6/23/1986	Thunderstorm Wind	0 knots	0
Fannin	7/2/1986	Thunderstorm Wind	57 knots	0
Fannin	5/19/1987	Thunderstorm Wind	0 knots	0
Fannin	5/28/1987	Thunderstorm Wind	0 knots	0
Fannin	9/18/1987	Thunderstorm Wind	0 knots	0
Fannin	3/24/1988	Thunderstorm Wind	0 knots	0
Fannin	6/4/1989	Thunderstorm Wind	0 knots	0
Fannin	6/4/1989	Thunderstorm Wind	0 knots	0
Fannin	7/2/1989	Thunderstorm Wind	52 knots	0
Fannin	9/9/1989	Thunderstorm Wind	61 knots	0

Location	Date	Type	Wind Speeds	Property Damages
Fannin	4/10/1990	Thunderstorm Wind	0 knots	0
Fannin	4/15/1990	Thunderstorm Wind	52 knots	0
Fannin	5/2/1990	Thunderstorm Wind	0 knots	0
Fannin	5/27/1990	Thunderstorm Wind	0 knots	0
Fannin	5/30/1990	Thunderstorm Wind	0 knots	0
Fannin	4/13/1991	Thunderstorm Wind	0 knots	0
Fannin	5/3/1991	Thunderstorm Wind	0 knots	0
Fannin	5/4/1991	Thunderstorm Wind	0 knots	0
Fannin	11/29/1991	Thunderstorm Wind	0 knots	0
Fannin	5/11/1992	Thunderstorm Wind	0 knots	0
Fannin	6/10/1992	Thunderstorm Wind	0 knots	0
Fannin	9/2/1992	Thunderstorm Wind	0 knots	0
Fannin	9/2/1992	Thunderstorm Wind	52 knots	0
Fannin	10/7/1992	Thunderstorm Wind	0 knots	0
Fannin	11/1/1992	Thunderstorm Wind	61 knots	0
Bonham	5/29/1994	Thunderstorm Wind	57 knots	50K
Mulberry	7/12/1994	Thunderstorm Wind	57 knots	50K
Mulberry	7/12/1994	Thunderstorm Wind	0 knots	50K
Bonham	7/13/1994	Thunderstorm Wind	57 knots	1K
Bonham	7/14/1994	Thunderstorm Wind	55 knots	0
Savoy	8/7/1994	Thunderstorm Wind	0 knots	5K
Ladonia	11/4/1994	Thunderstorm Wind	52 knots	0
Bailey	3/25/1995	Thunderstorm Wind	52 knots	2K
Bonham	4/17/1995	Thunderstorm Wind	61 knots	0
Bonham	4/19/1995	Thunderstorm Wind	56 knots	0
Bonham	5/1/1995	Thunderstorm Wind	52 knots	0
Leonard	5/1/1995	Thunderstorm Wind	52 knots	0
Trenton	7/4/1995	Thunderstorm Wind	0 knots	0
Bailey	7/4/1995	Thunderstorm Wind	0 knots	0
Bonham	7/5/1995	Thunderstorm Wind	0 knots	25K
Honey Grove	4/28/1996	Thunderstorm Wind	61 knots	0
Bonham	6/12/1996	Thunderstorm Wind	52 knots	0
Bonham	6/12/1996	Thunderstorm Wind	52 knots	0
Honey Grove	6/12/1996	Thunderstorm Wind	71 knots	10K
Bonham	6/17/1996	Thunderstorm Wind	0 knots	15K
Honey Grove	6/17/1996	Thunderstorm Wind	52 knots	0
Leonard	8/11/1996	Thunderstorm Wind	0 knots	15K
Monkstown	9/20/1996	Thunderstorm Wind	0 knots	10K
Telephone	9/20/1996	Thunderstorm Wind	0 knots	5K
Trenton	4/22/1997	Thunderstorm Wind	0 knots	0
Leonard	4/22/1997	Thunderstorm Wind	0 knots	0
Fannin	6/9/1997	Thunderstorm Wind	0 knots	15K
Leonard	6/9/1997	Thunderstorm Wind	0 knots	0
Trenton	6/22/1997	Thunderstorm Wind	0 knots	0
Bonham	6/22/1997	Thunderstorm Wind	0 knots	0
Bonham	6/23/1997	Thunderstorm Wind	50 knots	0
Trenton	7/15/1997	Thunderstorm Wind	0 knots	0
Windom	8/20/1997	Thunderstorm Wind	87 knots	1.1M
Leonard	8/20/1997	Thunderstorm Wind	0 knots	75K

Location	Date	Type	Wind Speeds	Property Damages
Leonard	6/4/1998	Thunderstorm Wind	0 knots	2K
Trenton	6/4/1998	Thunderstorm Wind	0 knots	1K
Bonham	6/4/1998	Thunderstorm Wind	65 knots	2K
Bailey	8/30/1998	Thunderstorm Wind	52 knots	2K
Savoy	11/9/1998	Thunderstorm Wind	50 knots	0
Bonham	11/9/1998	Thunderstorm Wind	50 knots	0
Bonham	4/3/1999	Thunderstorm Wind	61 knots	0
Leonard	4/26/1999	Thunderstorm Wind	0 knots	1K
Bonham	4/26/1999	Thunderstorm Wind	52 knots	0
Trenton	4/26/1999	Thunderstorm Wind	0 knots	20K
Honey Grove	4/26/1999	Thunderstorm Wind	0 knots	2K
Leonard	5/11/1999	Thunderstorm Wind	0 knots	1K
Bonham	8/13/1999	Thunderstorm Wind	0 knots	1K
Bonham	8/13/1999	Thunderstorm Wind	0 knots	1K
Ladonia	5/12/2000	Thunderstorm Wind	0 knots	5K
Trenton	5/27/2000	Thunderstorm Wind	52 knots	0
Leonard	5/27/2000	Thunderstorm Wind	60 knots	15K
Ladonia	5/27/2000	Thunderstorm Wind	52 knots	2K
Fannin	2/9/2001	Thunderstorm Wind	52 knots	0
Telephone	2/9/2001	Thunderstorm Wind	52 knots	2 Injuries & 10K
Fannin	2/9/2001	Thunderstorm Wind	52 knots	5K
Honey Grove	2/9/2001	Thunderstorm Wind	52 knots	5K
Ladonia	2/9/2001	Thunderstorm Wind	52 knots	10K
Bonham	2/24/2001	Thunderstorm Wind	52 knots	0
Monkstown	5/6/2001	Thunderstorm Wind	52 knots	0
Honey Grove	5/27/2001	Thunderstorm Wind	52 knots	5K
Leonard	5/27/2001	Thunderstorm Wind	52 knots	0
Ladonia	5/28/2001	Thunderstorm Wind	0 knots	15K
Bonham	5/31/2001	Thunderstorm Wind	52 knots	0
Ivanhoe	6/14/2001	Thunderstorm Wind	52 knots	0
Trenton	9/8/2001	Thunderstorm Wind	61 knots	50K
Trenton	9/9/2001	Thunderstorm Wind	52 knots	20K
Bonham	11/23/2001	Thunderstorm Wind	0 knots	5K
Honey Grove	7/24/2002	Thunderstorm Wind	0 knots	5K
Fannin	7/24/2002	Thunderstorm Wind	0 knots	5K
Windom	8/14/2002	Thunderstorm Wind	0 knots	3K
Fannin	8/14/2002	Thunderstorm Wind	0 knots	3K
Bailey	8/25/2002	Thunderstorm Wind	57 knots	3K
Bonham	8/25/2002	Thunderstorm Wind	57 knots	0
Bonham	8/27/2002	Thunderstorm Wind	52 knots	5K
Trenton	9/8/2002	Thunderstorm Wind	61 knots	50K
Windom	9/23/2002	Thunderstorm Wind	52 knots	6K
Bonham	6/11/2003	Thunderstorm Wind	52 knots	0
Trenton	7/22/2003	Thunderstorm Wind	52 knots	0
Honey Grove	8/21/2003	Thunderstorm Wind	52 knots	5K
Trenton	3/4/2004	Thunderstorm Wind	61 knots	0
Bonham	6/2/2004	Thunderstorm Wind	52 knots	1K
Bonham	6/7/2004	Thunderstorm Wind	52 knots	0
Bailey	4/25/2005	Thunderstorm Wind	70 knots	10K

Location	Date	Type	Wind Speeds	Property Damages
Bonham	6/17/2005	Thunderstorm Wind	50 knots	3K
Bonham	6/17/2005	Thunderstorm Wind	50 knots	0
Bonham	6/17/2005	Thunderstorm Wind	50 knots	30K
Bonham	7/1/2005	Thunderstorm Wind	50 knots	5K
Bonham	9/28/2005	Thunderstorm Wind	56 knots	10K
Fannin	11/27/2005	High Wind	50 knots	3K
Dodd City	5/9/2006	Thunderstorm Wind	52 knots	40K
Bonham	7/17/2006	Thunderstorm Wind	65 knots	30K
Bonham	8/11/2006	Thunderstorm Wind	50 knots	0
Fannin	2/24/2007	High Wind	50 knots	2 Injuries & 225K
Telephone	5/30/2007	Thunderstorm Wind	50 knots	5K
Bonham	5/30/2007	Thunderstorm Wind	50 knots	0
Bailey	5/30/2007	Thunderstorm Wind	50 knots	1K
Ivanhoe	9/25/2007	Thunderstorm Wind	50 knots	50K
Bonham	4/3/2008	Thunderstorm Wind	52 knots	10K
Leonard	4/10/2008	Thunderstorm Wind	70 knots	250K
Fannin	4/10/2008	Thunderstorm Wind	65 knots	40K
Honey Grove	4/17/2008	Thunderstorm Wind	50 knots	10K
Fannin	4/17/2009	Strong Wind	39 knots	3K
Telephone	5/6/2009	Thunderstorm Winds	52 knots	2K
Trenton	5/8/2009	Thunderstorm Wind	52 knots	4K
Trenton	6/10/2009	Thunderstorm Wind	56 knots	6K
Bonham	6/10/2009	Thunderstorm Wind	56 knots	5K
Trenton	10/25/2009	Thunderstorm Wind	50 knots	
Leonard	7/18/2010	Thunderstorm Wind	50 knots	25K
Bonham	5/22/2011	Thunderstorm Wind	52 knots	15K
Bonham	6/20/2011	Thunderstorm Wind	45 knots	
Honey Grove	7/02/2011	Thunderstorm Wind	56 knots	12K
Bonham	10/22/2011	Thunderstorm Wind	52 knots	5K
Ravenna	6/11/2012	Thunderstorm Wind	52 knots	15K
Randolph	6/13/2012	Thunderstorm Wind	83 knots	600K

Source: www.ncdc.noaa.gov

February 10, 2013 – Honey Grove, Texas

Main Street Presbyterian Church in Honey Grove burned to the ground after being struck by lightning.

Source: Hone Grove Main Street Presbyterian Church

Table 4b: Lightning 2005-2013

Location	Date	Type	Damages
Bailey	7/1/2005	Lightning	Power substation knocked out & 5K
Bonham	9/25/2007	Lightning	Power outages near Lake Bonham & 10K
Bonham	5/6/2009	Lightning	Lightning struck the communications tower on the top of the Fannin County Sheriff's Office destroying the radio consoles and disabling computer systems
Trenton	6/10/2009	Lightning	Private residences struck destroying electric appliances
Trenton	5/9/2010	Lightning	Lightning struck steeple of church causing a debris field
Honey Grove	2/10/2013	Lightning	Lightning struck a historic church built in 1902 causing it to burn to the ground 100K+

Source: www.ncdc.noaa.gov

5. Probability of Future Events

There is an average of at least 5 documented significant losses from strong thunderstorms, high wind events, and/or lightning events in the county each year. Based upon past occurrences the probability of future severe thunderstorm events within the county is highly likely.

6. Vulnerability

Vulnerability is difficult to evaluate since thunderstorms can occur at different strength levels, in random locations and can create relatively narrow paths of destruction. Due to the randomness of this event, the entire population of the County remains vulnerable to possible injury and/or property loss from lightning and strong winds associated with thunderstorms.

Fannin County's susceptibility to wind disaster is compounded by the fact that there are over 2331 manufactured homes in the county, according to the Texas Department of Housing and Community Affairs this is an increase of over 100 from 4 years ago.

Although manufactured homes are more vulnerable to strong wind than other structures, all structures are vulnerable to lightning. Lightning can strike ten miles out from the rain column, enabling injurious lightning strikes. These strikes can occur under a clear sky ahead of the storm.

7. Secondary Hazards

Secondary hazards can include power failures, transportation accidents and wildfires. Thunderstorms in the summer often produce numerous lightning strikes with little precipitation setting the stage for a wildfire scenario. Hail, flooding, and tornadoes, although associated with thunderstorms, are profiled as separate events with their own secondary hazards.

8. Overall Summary of Vulnerability and Impacts

Statewide Texas has a significant exposure to thunderstorms. In addition to high damaging winds and lightning, thunderstorms are capable of producing tornadoes, hail, and rain causing floods. This plan profiles high winds and lightning with thunderstorms. Damage similar to that caused by tornadoes can result from high winds such as straight-line and microburst winds associated with thunderstorms. Within the County, inferior construction, mobile homes and crop land are most vulnerable to high winds. Overall, lightning is the most constant and widespread threat to people and property during the thunderstorm season.

Table 8: Summary

Jurisdiction	Potential Severity of Impact	Probability of Future Events	Risk
Bailey	Major	Highly Likely	High
Bonham	Major	Highly Likely	High
Dodd City	Major	Highly Likely	High
Dodd City ISD	Major	Highly Likely	High
Ector	Major	Highly Likely	High
Ector ISD	Major	Highly Likely	High
Fannindel ISD	Major	Highly Likely	High
Honey Grove	Major	Highly Likely	High
Honey Grove ISD	Major	Highly Likely	High
Ladonia	Major	Highly Likely	High
Leonard	Major	Highly Likely	High
Leonard ISD	Major	Highly Likely	High
Ravenna	Major	Highly Likely	High
Sam Rayburn ISD	Major	Highly Likely	High
Savoy	Major	Highly Likely	High
Savoy ISD	Major	Highly Likely	High
Trenton	Major	Highly Likely	High
Trenton ISD	Major	Highly Likely	High
Windom	Major	Highly Likely	High
Rural Areas	Major	Highly Likely	High

HAZARD PROFILE WORKSHEET

HAZARD: Thunderstorms (Including Wind & Lightning)

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major X	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Thunderstorms occur year-round

SOURCE DOCUMENTS:

NOAA, NWS, Local Media, Texas Hazard Mitigation Plan, and local news media

DATA LIMITATIONS:

Limitations in quantifying long term economic losses.
Damage to rural areas often goes unreported

PROBABLE DURATION & WARNING TIME

Cold fronts can stall causing severe weather to threaten the area for several days.

CASCADING POTENTIAL:

Heavy downpours of rain from extended duration may cause flash flooding
Lightning can cause wildfires
Can produce downbursts, large hail and violent tornadoes

EXISTING WARNING SYSTEMS:

Local weather forecasts broadcasted via the media, social media, internet weather sites, weather radios, reverse 911 and storm warning sirens

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Emergency phone alerting is available for entire county on landline and mobile phones
100+ residential storm shelters have been installed
Additional storm warning sirens and upgrades to some of the existing sirens
Increased use of social media for all types of hazard information
Increase number of CERT volunteers trained and ready for emergency response

HAZARD PROFILE: Section Two – Winter Storms

1. Description

Winter storms happen in Fannin County when precipitation occurs while the temperature is near or below freezing. This plan defines a winter storm as a single event or combination of the following winter weather types occurring over a wide area of the county:

Ice storm – Ice storms are described by the National Weather Service (NWS) as an occasion when damaging accumulations of ice are expected during freezing rain situations. Significant ice accumulations are usually accumulations of 0.25 inches or greater. These ice accumulations make walking and driving extremely dangerous, and can create extreme hazards to motorists.

Heavy snow - Defined as either a snowfall accumulation of four inches or more in depth within 12 hours, or snowfall accumulation of at least six inches in depth within 24 hours.

Freezing rain or freezing drizzle - An occasion when rain or drizzle freezes on surfaces such as trees, power lines, highways, etc.

Sleet – Raindrops that freeze into ice pellets before reaching the ground. These pellets usually bounce after hitting surfaces.

Extreme Cold – When temperatures drop well below normal for the area it is considered to be Extreme Cold. Exposure to extreme cold temperatures can lead to serious or life-threatening health issues such as hypothermia and frostbite.

Winter Storm Watch – Significant winter weather is expected.

Winter Storm Warning – Significant winter storm or hazardous winter weather is occurring.

Winter Weather Advisory – When significant winter storms and/or hazardous winter weather is occurring.

Snow Flurries – Light snow falling for short durations. A light dusting may occur but no accumulations.

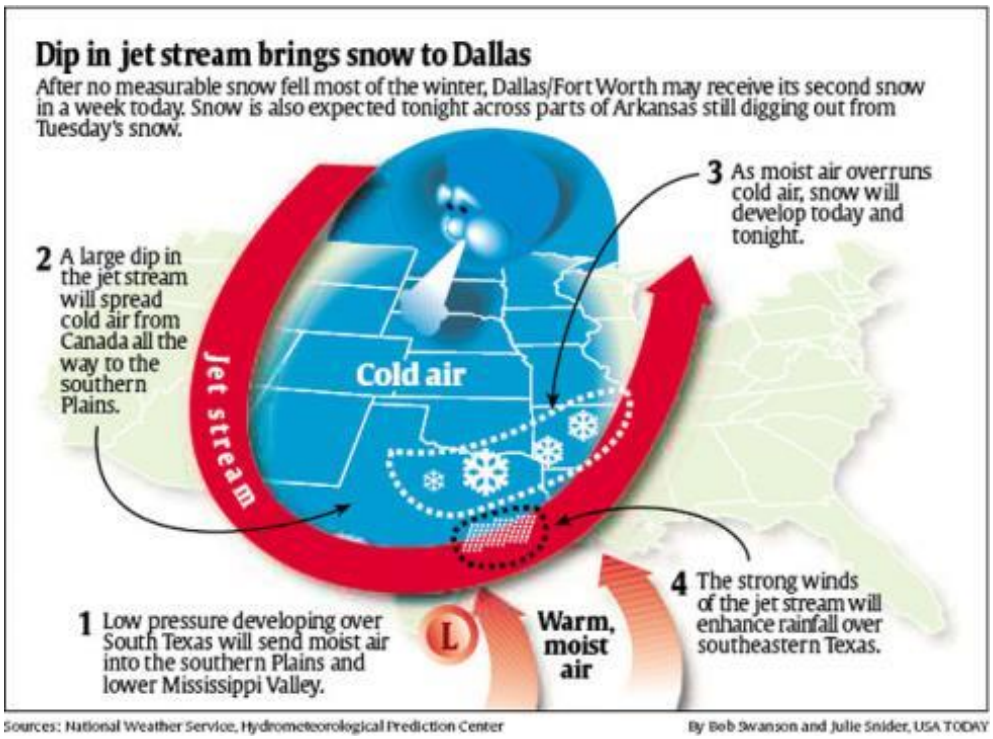
Snow Showers – Snow falling at varying intensities for brief periods of time. Accumulations may occur.

Blizzard – Winds over 35 mph with blowing snow reducing visibility to or near zero.

2. Location

Winter Storms have no distinct geographic boundary. They can occur in every area of the county including the north Texas region. Figure 2 illustrates the weather set up that brings winter weather to Fannin County.

Figure 2: North Texas Winter Storm Setup March 2008.



USA TODAY weather focus: **"Dip in jet stream brings snow to Dallas"**

Rain is expected to change over to snow along and north of I-20 in North Texas this afternoon. The National Weather Service is forecasting 1 to 2 inches of snow for the Dallas-Fort Worth metro area, with roads becoming slick for the evening and Friday morning commutes. If the forecast verifies, it would push the snowfall total this year close to the annual average of 2.5 inches at DFW. (Reprinted from USA TODAY Newspaper)

3. Impact/Extent

Winter storms such as blizzards can strike unexpectedly and can create hazardous travel conditions and utility outages. Winter weather, every year, indirectly kills hundreds of people in the U.S, primarily from automobile accidents but from overexertion and hypothermia as well.

Heavy accumulations of ice can bring down trees and power lines, disabling electric power and communications for days. Heavy snow or ice can immobilize communities by shutting down transportation into, out of, and within the county. In rural areas and smaller communities, homes and farms may be isolated for days. Livestock and other animals can die from exposure. When the event happens in the early spring, crops such as fruit can be destroyed. Fortunately, Fannin County is not affected by Winter Storms as often as other parts of the state. Damages usually occur in loss of water due to frozen water lines, loss in agricultural revenue due to loss of livestock, loss of power from down power lines and the structure loss of collapsed outbuildings.

4. Previous Occurrences

Between 1994 and 2011 the National Climatic Data Center (NCDC) recorded 28 18 significant winter storm events in Fannin County. Some examples of past winter storm events in Fannin County include the following:

Table 4: Winter Storms 1994-2011*

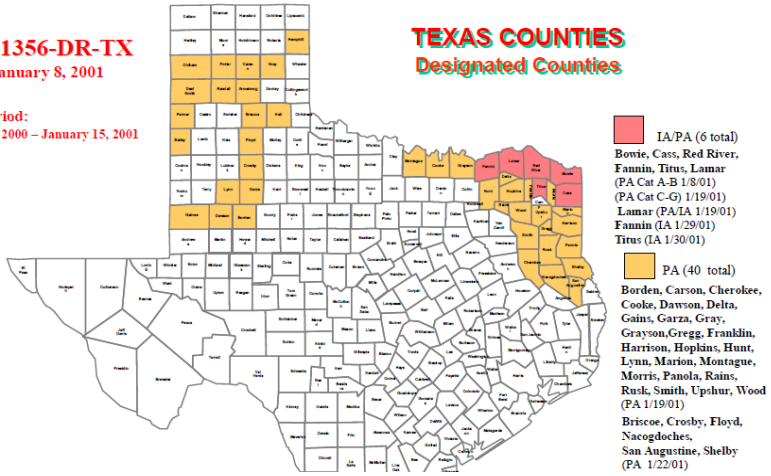
Location	Date	Type	Damages
Fannin & 76 other counties	2/9/1994	Ice Storm	• $50M in damages • Temperature drop of 60º in 48 hours • Up to 4 inches of ice and sleet • Over 30,000 power outages
Fannin & 47 other counties	11/24/1996	Winter Storm	• Icing of roads resulting in mass traffic accidents
Fannin &	4/12/1997	Cold/Wind Chill	• Unusually Strong Artic Cold Front • 2 days of extreme cold with below freezing temps and heavy frost • 75%-90% loss of fruit and vegetable crops
Fannin & 47 other counties	12/22/1998	Ice Storm	• Ice event, at least 2,000 traffic accidents • 6 deaths • Highways closed due to ice & accidents
Fannin & 47 other counties	1/25/2000	Winter Storm	• 2 to 5 inches of sleet and snow • At least 4 deaths • Hundreds of traffic accidents *& over 400 flight canceled
Fannin & 47 other counties	12/12/2000	Winter Storm	• Up to 1 inch of ice • Over 110,000 people without power • Major highways closed due to ice & numerous accidents
Fannin & 47 other counties	12/25/2000	Winter Storm	• Up to 4 inches of ice • Thousands without power
Fannin & 47 other counties	12/31/2000	Winter Storm	• Up to 3 inches of snow • Melted snow froze into sheets of ice on roadways
Fannin & 47 other counties	1/1/2001	Heavy Snow	• Continuation of Dec 31st event
Fannin & 40 other counties	11/27/2001	Ice Storm	• Up to 5 inches of snow • Hundreds of traffic accidents
Fannin & 19 other counties	2/5/2002	Winter Storm	• Up to 6 inches of snow
Fannin & 22 other counties	3/2/2002	Winter Storm	• Fannin county received less than 0.25 inches of snow
Fannin & 46 other counties	2/24/2003	Winter Storm	• $15M in damages • Hundreds of traffic accidents • Up to 3 inches of sleet and ice
Fannin & 11 other counties	2/14/2004	Heavy Snow	• Up to 5.5 inches of snow
Fannin & 45 other counties	12/22/2004	Winter Weather/mix	• Up to 3 inches of snow • Over 500 traffic accidents
Fannin & 30 other counties	12/7/2005	Winter Storm	• Up to a quarter inch of ice • Up to 3 inches of snow • Hundreds of traffic accidents
Fannin & 10 other counties	1/17/2007	Ice Storm & Winter Weather	• $10K in damages • Up to 1 inch of ice on roads

Location	Date	Type	Damages
Fannin County	3/3/2008	Winter Weather	• Up to 5 inches of snow
Fannin & 2 other counties	12/15/2008	Winter Weather	• $750K in damages • Numerous injuries & several fatalities
Fannin & 7 other counties	12/23/2008	Winter Weather	• $150K in damages • Numerous wrecks
Fannin & 26 other counties	1/27/2009	Ice Storm	• 1 death & $1 M in damages • Thousands of traffic accidents • Up to ½ inch of ice • Over $1M in injuries • Hwy 69 between Trenton & Whitewright was iced
Fannin & 14 other counties	12/24/2009	Winter Weather	• $2M in damages • Up to 1 inch of snow created icy roads throughout county for Christmas morning travel
Fannin & 31 other counties	2/11/2010	Heavy Snow	• Record snow fall of up to 14.4 inches • Over 500,000 power outages for up to 4 days • Collapsed roofs and buildings • Road damage from weight of snow • 1 death & $48M in damages • Local reports of 8 inches of snow
Fannin & 6 other counties	3/20/10	Heavy Snow	• Average of 4 inches but up to 8 inches • 2 deaths & $210K in damages
Fannin & 8 other counties	1/9/2011	Heavy Snow	• Up to 5 inches • 1 death & $970K in damages
Fannin & 20 other counties	2/1/2011	Ice Storm	• Two extreme winter weather events within a week • Thunder sleet • Up to 8 inches of snow, ¾ in of ice, and 2 inches of sleet • Rolling blackouts due to electricity demand • 1 death • $4.4 million in damages
Fannin County	2/4/2011	Heavy Snow	• Continuation of February 1st event • Rolling blackouts due to electricity demand • Schools and business closed for over a week
Fannin County**	12/4/2013	Ice Storm & Winter Weather	• Multiple deaths • Damages to schools • Power Outages • Transportation routes closed & Flights canceled • Over $28.5 M in damages

** Events after 2/11not documented in NOAA database, information in based on locally collected data and application for disaster declaration*
Source: www.ncdc.noaa.gov

Based on past occurrence, Fannin County winter storms have not been shown to have significant impact on agricultural and loss of life, but there has been property and economic damage. The entire population of the County has been affected, with thousands without power for days and some were without power for weeks. Loss of power also can disable rural and municipal water districts for days, leaving rural and town residents without running water.

Figure 4: DR 1356



Source: Texas State Mitigation Plan

5. Probability of Future Events

Based on Previous Occurrences, 27 winter weather events have occurred in the 17 years between 1994 and 2011. This would indicate that the probability of a winter storm occurring within the County is highly likely with an average of 1.6 events a year.

6. Vulnerability

Cold waves pose a variety of threats to individuals and communities. These threats are sometimes compounded by accumulations of ice or snow. The delivery of public services and maintenance of infrastructure are often disrupted by cold waves. Frozen and burst water lines are a common problem. Increased consumption of heating fuel and electricity can lead to energy shortages, rolling blackouts and higher prices. People and animals are subject to health risks from extended exposure to cold air.

All populations, buildings, critical facilities, and infrastructure in Fannin County are vulnerable to severe winter events. The elderly in Fannin County, however, are at greater risk of death from hypothermia during these events. According to the U.S. Center for Disease Control, every year hypothermia kills about 600 Americans, half of whom are 65 years of age or older. Hypothermia occurs when a person's normal body temperature drops from 98.6 degrees to 95 degrees.

7. Secondary Hazards

The National Weather Service refers to winter storms as "Deceptive Killers" because most deaths are the result of the secondary hazards. Secondary hazards can include traffic accidents due to snow and ice covered roads, and death from hypothermia due to prolonged exposure to cold. Wind-driven snow can result in "whiteout" conditions which can also make driving extremely dangerous. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during winter storms also present a greater danger because water supplies may freeze and impede firefighting efforts.

Chart 3: Wind Chill Index

Wind (mph)	Temperature (°F)																	
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Source: NOAA

Carbon Monoxide Poisoning can be a secondary hazard with any cold weather event. With power outages there is a need for alternative sources of heat such as generators, wood fires, gas cook stoves, grills, lanterns, etc., but unfortunately these energy sources emit carbon monoxide which can build to lethal levels in confined areas. More than 400 people die each year from this odorless gas.

Wind Chill Index – The calculation of temperature that takes into consideration the effects of wind and temperature on the human body. This is not the actual air temperature but the temperature the air feels like to the body.

Table 7: Carbon Monoxide Levels

Concentration (parts per million)	Source	Concentration	Health Issues
0.1 ppm	Natural atmosphere level		
0.5 to 5 ppm	Average level in homes		
5 to 15 ppm	Levels near properly adjusted gas		
		35 ppm	Headache and dizziness within 6-8 hours of constant exposure.
100 to 200 ppm	Mexico City central area from automobiles	100 ppm	Slight headache in two to three hours
		200 ppm	Slight headache within two to three hours.
		400 ppm	Frontal headache within one to two hours.
		1,600 ppm	Dizziness, nausea, and convulsions within 45 minutes. Insensible within two hours.
		3,200 ppm	Headache, dizziness and nausea in five to ten minutes. Death within 30 minutes.
5,000 ppm	Chimney of a wood fire place	6,400 ppm	Headache and dizziness in one to two minutes. Death in less than 20 minutes.
7,000 ppm	Undiluted warm car exhaust		
30,000 ppm	Undiluted cigarette smoke	12,800 ppm	Unconsciousness after 2-3 breaths. Death in less than three minutes.

8. Overall Summary of Vulnerability and Impacts

A winter storm can range from accumulating snow and/or ice over a few hours to blizzard conditions with blinding, wind-driven snow lasting several days. In latitudes like Texas' where moist Gulf air collides with arctic temperatures from the Canadian Shield, winter storms - particularly ice storms - have the potential to cause significant property damage, transportation problems, and utility service failure over large areas of the State. The aftermath of a winter storm can continue to impact a region for weeks, and even months.

Table 8: Summary

Jurisdiction	Potential Severity of Impact	Probability of Future Events	Risk
Bailey	Major	Highly Likely	High
Bonham	Major	Highly Likely	High
Dodd City	Major	Highly Likely	High
Dodd City ISD	Major	Highly Likely	High
Ector	Major	Highly Likely	High
Ector ISD	Major	Highly Likely	High
Fannindel ISD	Major	Highly Likely	High
Honey Grove	Major	Highly Likely	High
Honey Grove ISD	Major	Highly Likely	High
Ladonia	Major	Highly Likely	High
Leonard	Major	Highly Likely	High
Leonard ISD	Major	Highly Likely	High
Ravenna	Major	Highly Likely	High
Sam Rayburn ISD	Major	Highly Likely	High
Savoy	Major	Highly Likely	High
Savoy ISD	Major	Highly Likely	High
Trenton	Major	Highly Likely	High
Trenton ISD	Major	Highly Likely	High
Windom	Major	Highly Likely	High
Rural Areas	Major	Highly Likely	High

HAZARD PROFILE WORKSHEET

HAZARD: Winter Storms

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major X	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Late Fall, Winter, and Early Spring

SOURCE DOCUMENTS:

NOAA, NWS, Local News Media, Oklahoma Climatological Survey

DATA LIMITATIONS:

Limitations in quantifying long term economic losses for local business and agriculture

PROBABLE DURATION & WARNING TIME

Cold fronts can stall causing severe weather to threaten the area several days

CASCADING POTENTIAL:

If the winter storm follows a very wet spell then the melted runoff can cause flooding
Winter weather increases the number of transportation accidents and increases potential for HAZMAT incident
Power outages from down power lines and rolling blackouts from extreme power use

EXISTING WARNING SYSTEMS:

Local weather forecasts broadcasted via the media, social media, internet weather sites, and storm warning sirens

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Emergency phone alerting is available for entire county on landline and mobile phones
Increased use of social media for all types of hazard information
Increase number of CERT volunteers trained and ready for emergency response
Fannin County Government COOP plan developed and exercised
Fannin County Courthouse has installed a backup generator

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

Category	Heat Index	Possible heat disorders for people in high risk groups
Extreme Danger	130°F or higher (54°C or higher)	Heat stroke or sunstroke likely.
Danger	105 - 129°F (41 - 54°C)	Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.
Extreme Caution	90 - 105°F (32 - 41°C)	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Caution	80 - 90°F (27 - 32°C)	Fatigue possible with prolonged exposure and/or physical activity.

Source: NOAA

HAZARD PROFILE: Section Three - Extreme Heat

Extreme Heat- Extended periods of excessive hot weather with a serious impact on human and/or animal populations particularly the elderly or those with respiratory ailments.

1. Description

Temperatures that extend 10°F or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperature, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

2. Location

Extreme Heat events are regional in nature. The entire county is equally affected by extreme heat.

3. Impact/ Extent

The severity of the extreme heat is dependent on a combination of temperature and humidity. When combined with high humidity, high temperatures can put an area in the "Extreme Danger" category on the National Weather Service Heat Index scale. When extreme heat is combined with drought, results can include, not only excessively dry hot conditions that contribute to a high risk of life-threatening heat related illnesses, but can also provoke dust storms with low visibility.

Heat is one of the leading weather-related killers in the US. Heat kills by pushing the human body beyond its limits. Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.

Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Other conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality.

A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock.

Heat Wave – A prolonged period of excessive heat most often combined with high humidity.

Heat Index – Humidity and temperature is used to determine the felt air temperature

Heat Stroke – A life threatening condition where the victim's body can not sufficiently cool itself can result in brain damage and death.

Heat Exhaustion – A form of mild shock where blood flow is sent to skin and away from the vital organs. It is the result of strenuous activity in the heat where the body has lost fluids by sweating.

Hyperthermia – Severe heat exposure occurs when the body temperature rises to 106ºF

All of the jurisdictions in Fannin County would feel the effects of an Extreme Heat event. Bonham could see a greater effect from an Extreme Heat event in comparison to other jurisdictions. This is due to larger population of residents over the age of 65 located in the northeast corner of the city and due to the fact that the elderly are more susceptible to heat induced illnesses.

4. Previous Occurrences

In a normal year, approximately 175 Americans die from extreme heat. Between 1936 and 1975, nearly 20,000 people succumbed to the effects of heat and solar radiation. From 1979-1999, excessive heat exposure caused 8,015 deaths in the United States. On average approximately 400 people die each year from exposure to heat.

Fannin County and Texas are no strangers to hot temperatures and what may seem like a heat wave in the northeastern United States is just an average summer for Fannin County. The 2006 North American Heat Wave affected Fannin County but not as drastically as it did other parts of the county. During this event there were reports from Dallas of rupture water lines and buckled roads.

North Texas has an average of 16 days a year of >100ºF days but in 1980 it saw 69 of those days. In June of 1980 a high pressure ridge built over the central and southern parts of the US leaving the areas dry and hot. There were 42 consecutive days of >100ºF and records were broken. In Wichita Falls an all-time high temperature of 117ºF was recorded. The heat was blamed for over 1,700 deaths and reports suggest the heat was the cause for up to 10,000 deaths and an estimated 20 billion dollars in damages.

Extreme Heat Facts

- People from communities with average household incomes of $36,999 or less were hospitalized more than twice as often for heat related issues as people who came from wealthier areas where average household incomes topped $61,000.
- The rate of hyperthermia hospital admissions for uninsured patients was significantly higher (17 percent) than hospital admissions for uninsured patients as a whole (5 percent).
- The hospitalization rate for people over 65 with hyperthermia was 15 times greater than for people age 17 and younger.

Table 4: Excessive Heat Events (1998-2011)

Location	Date	Type	Deaths*	Description
Fannin and 45 other counties	7/1/1998	Excessive Heat	32	28 days at or over 100 degrees
Fannin and 50 other counties	8/1/1999	Excessive Heat	3	26 days at or over 100 degrees
Fannin and 47 other counties	7/1/2000	Excessive Heat	8	Highs over 100 from 12th through the 21st
Fannin and 47 other counties	8/1/2000	Excessive Heat	5	27days at or over 100 degrees
Fannin and 47 other counties	9/1/2000	Excessive Heat	5	High temperatures of 108 to 111 degrees
Fannin and 33 other counties	8/1/2011	Excessive Heat	27	High temperatures of 105-111 degrees
Fannin and 7 other counties	8/6/2011	Excessive Heat	11	Triple digit temperatures nearly every day in Aug 2011

**Deaths numbers were for entire affected area.*
Source: www.ncdc.noaa.gov

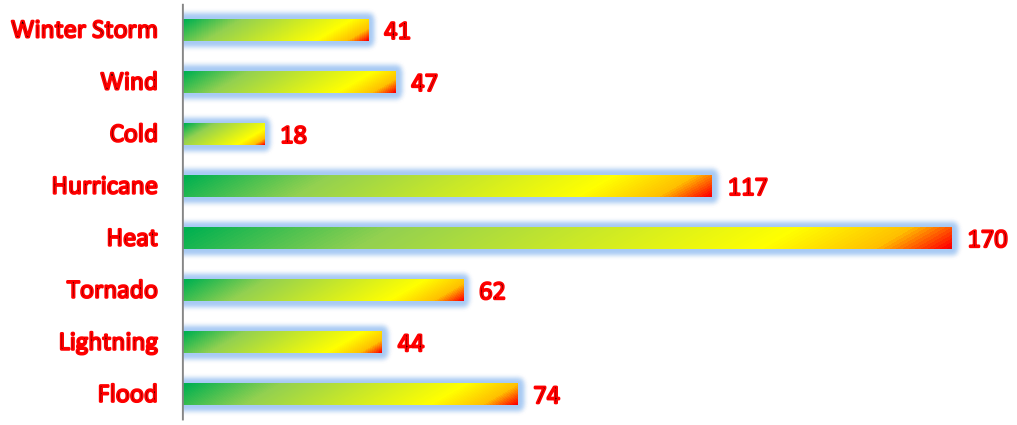
5. Probability of Future Events

Fannin County has experienced 7 extreme heat events in the past 13 years and averages 15 to 20 days per year of daytime high temperatures greater than 100° F. Therefore extreme temperatures are highly likely to occur anywhere within the County.

6. Vulnerability

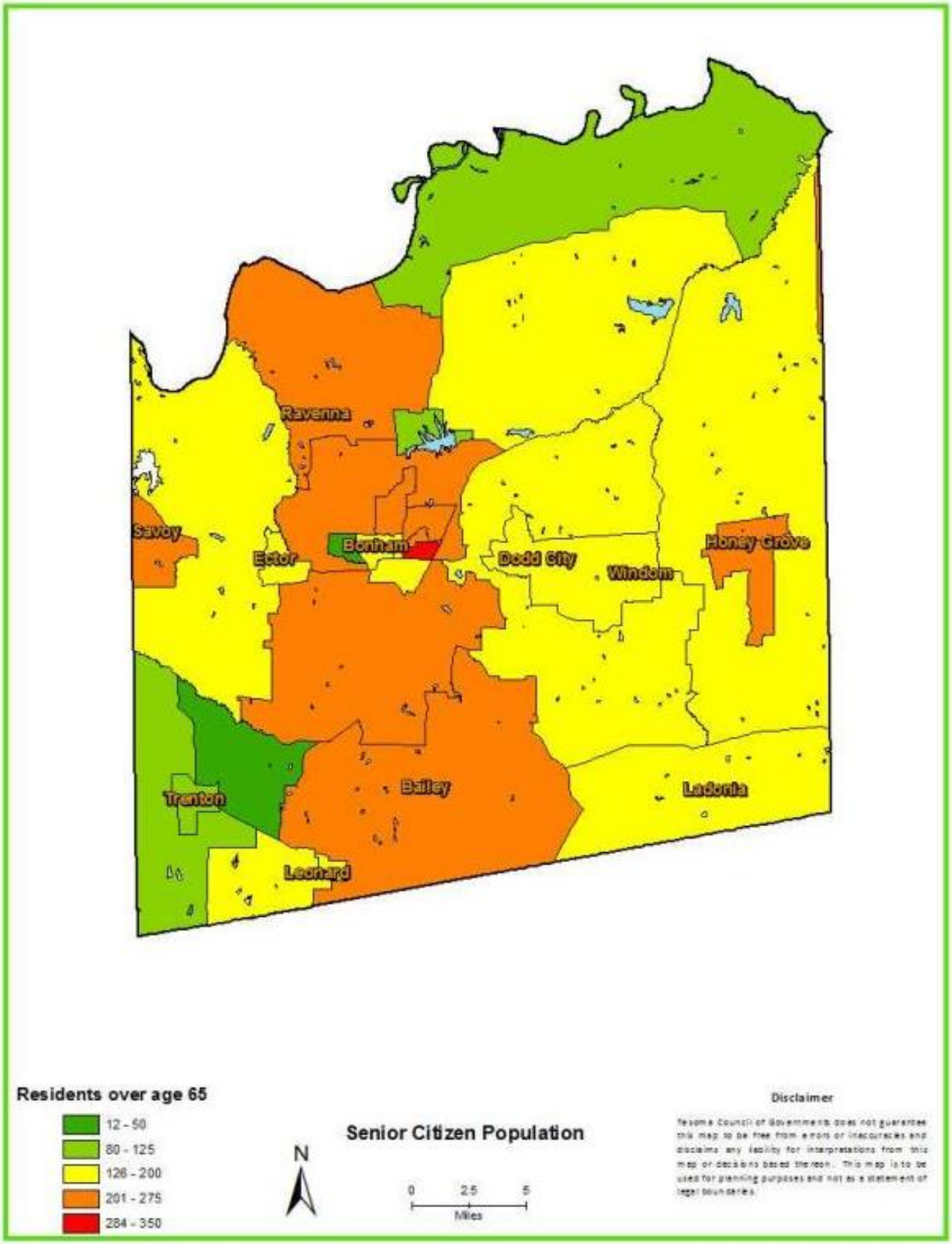
Heat waves are the most lethal weather phenomenon. During an average year heat-related deaths outnumber the deaths from all other weather events. Young children, elderly people, and those who are sick or overweight are more likely to become victims to extreme heat. Other conditions that can limit the ability to regulate temperature include fever, dehydration, heart disease, mental illness, poor circulation, sunburn, prescription drug use, and alcohol use. Another segment of the population at risk is those whose jobs consist of strenuous labor outside. Livestock and crops can also become stressed, decreasing in quality or in production, during times of extreme heat. Since the most vulnerable population groups are scattered throughout the county the entire county is equally vulnerable.

Chart 6: Average Deaths per Year



Source: NOAA

Figure 6: Most Vulnerable Areas – High Senior Citizen Population

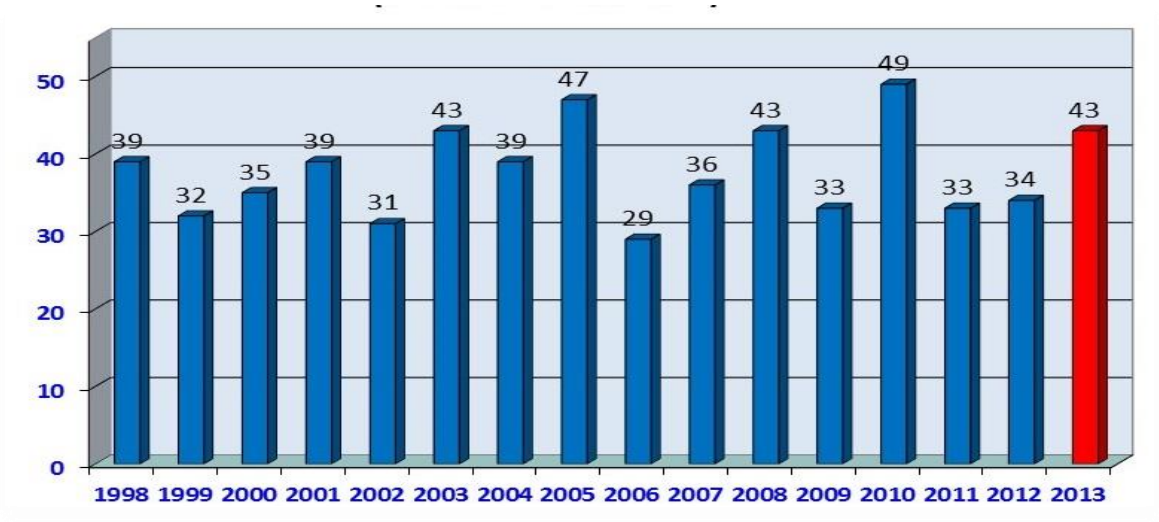


7. Secondary Hazards

Secondary Hazards resulting from extreme heat are many but one of the most preventable is heatstroke death of children and pets left in a parked vehicle. Children, disable adults, and pets should never be left in a parked vehicle, even if the window is cracked.

Because men sweat more than women, men are more susceptible to heat illness since they dehydrate quicker. – www.srh.noaa.gov

Chart 7: US Children Heatstroke Deaths in Vehicles



Source: NOAA

Extreme high temperatures can cause droughts, water shortages, increase fire danger, and prompt excessive demands for energy. The possibility of rolling blackouts is increased with unseasonably high temperatures in what is a normally mild month with low power demands. This was the case for the Dallas area in April 2006. Damage to property during extreme heat can be related to expanding and contracting soil (see section, "Expansive Soils"). Another secondary hazard is air pollution in summer months resulting from consistent high temperatures and stagnant airflows. There are several impacts on transportation documented in case studies. Aircraft lose lift at high temperatures. Phoenix airport has been closed due to periods of extreme heat that made aircraft operations unsafe. Highways and roads are damaged by excessive heat. Asphalt roads soften. Concrete roads have been known to "explode" lifting three foot wide pieces of concrete. During the 1980 heat wave hundreds of miles of highways buckled (NOAA, 1980). Stress is placed on automobile cooling systems, diesel trucks and railroad locomotives. This leads to an increase in mechanical failures. Train rails develop sun kinks and distort. Refrigerated goods experience a significant greater rate of spoilage due to extreme heat.

8. Overall Summary of Vulnerability and Impacts

The term Heat Wave evokes thoughts of southern climates with the aridity of Phoenix or the subtropical humidity of New Orleans. Yet, extreme heat is a hazard that can affect all of us in any part of the country. Fannin County in the last 13 years there have been 7 documented extreme heat events with a total of 91 deaths resulting. These extreme heat events occurred in July and August. The severity of the extreme heat is dependent on temperature and humidity. High temperatures and high humidity can result in dangerous conditions that expose people to an increased risk of heat stroke and other heat related illnesses. The most vulnerable populations are the elderly, young children, and those who are sick, overweight, or who work outside. Extreme heat can also cause stress on livestock and other agricultural productions.

Table 8: Summary

Jurisdiction	Potential Severity of Impact	Probability of Future Events	Risk	Justification for Differences
Bailey	Major	Highly Likely	High	
Bonham	Major	Highly Likely	High	Bonham could see a greater impact due to a higher elderly population.
Dodd City	Major	Highly Likely	High	
Dodd City	Major	Highly Likely	High	
Ector	Major	Highly Likely	High	
Ector ISD	Major	Highly Likely	High	
Fannindel ISD	Major	Highly Likely	High	
Honey Grove	Major	Highly Likely	High	
Honey Grove	Major	Highly Likely	High	
Ladonia	Major	Highly Likely	High	
Leonard	Major	Highly Likely	High	
Leonard ISD	Major	Highly Likely	High	
Ravenna	Major	Highly Likely	High	
Sam Rayburn	Major	Highly Likely	High	
Savoy	Major	Highly Likely	High	
Savoy ISD	Major	Highly Likely	High	
Trenton	Major	Highly Likely	High	
Trenton ISD	Major	Highly Likely	High	
Windom	Major	Highly Likely	High	
Rural Areas	Major	Highly Likely	High	

HAZARD PROFILE WORKSHEET

HAZARD: Extreme Heat

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major X	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Extreme Heat events most often occur in July, August and Early September

SOURCE DOCUMENTS:

NOAA, Local Media, AHRQ, Texas Hazard Mitigation Plan, LA Office of Emergency Preparedness, and local newspaper articles

DATA LIMITATIONS:

Limitations in quantifying long term economic losses

PROBABLE DURATION & WARNING TIME

Duration is from a few days to several weeks

CASCADING POTENTIAL:

Extreme temperatures can cause droughts, water shortages, increase fire danger, and prompt excessive demands for energy

Transportation can be affected by sun kinks in railways and buckled highways

EXISTING WARNING SYSTEMS:

Local weather forecasts, NOAA Weather Alerts, Social Media, Emergency phone alerting, internet weather sites, and word of mouth

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Emergency phone alerting is available for entire county on landline and mobile phones
Increased use of social media for all types of hazard information
Increase number of CERT volunteers trained and ready for emergency response
Increase in cooperative agreements between public and private agencies for operation of cooling centers

HAZARD PROFILE: Section Four - Hailstorm

Hail – a form of precipitation which consists of balls or irregular lumps of ice. – The Glossary of Meteorology

Hailstone – is an individual unit of hail.

1. Description

Due to Texas' rapidly changing climate, large scale hailstorms are especially prevalent. Hail is formed by actions of wind and rain at freezing temperatures which cause water particles to become frozen and condense into particles ranging from very small to grapefruit size. Hailstones may be spherical, conical or irregular in shape. The size and shape of hailstones is determined by the strength of wind within the storm cell. Each lifting, falling, recoating cycle produces a larger hailstone until finally the weight of the stone causes it to fall to earth.

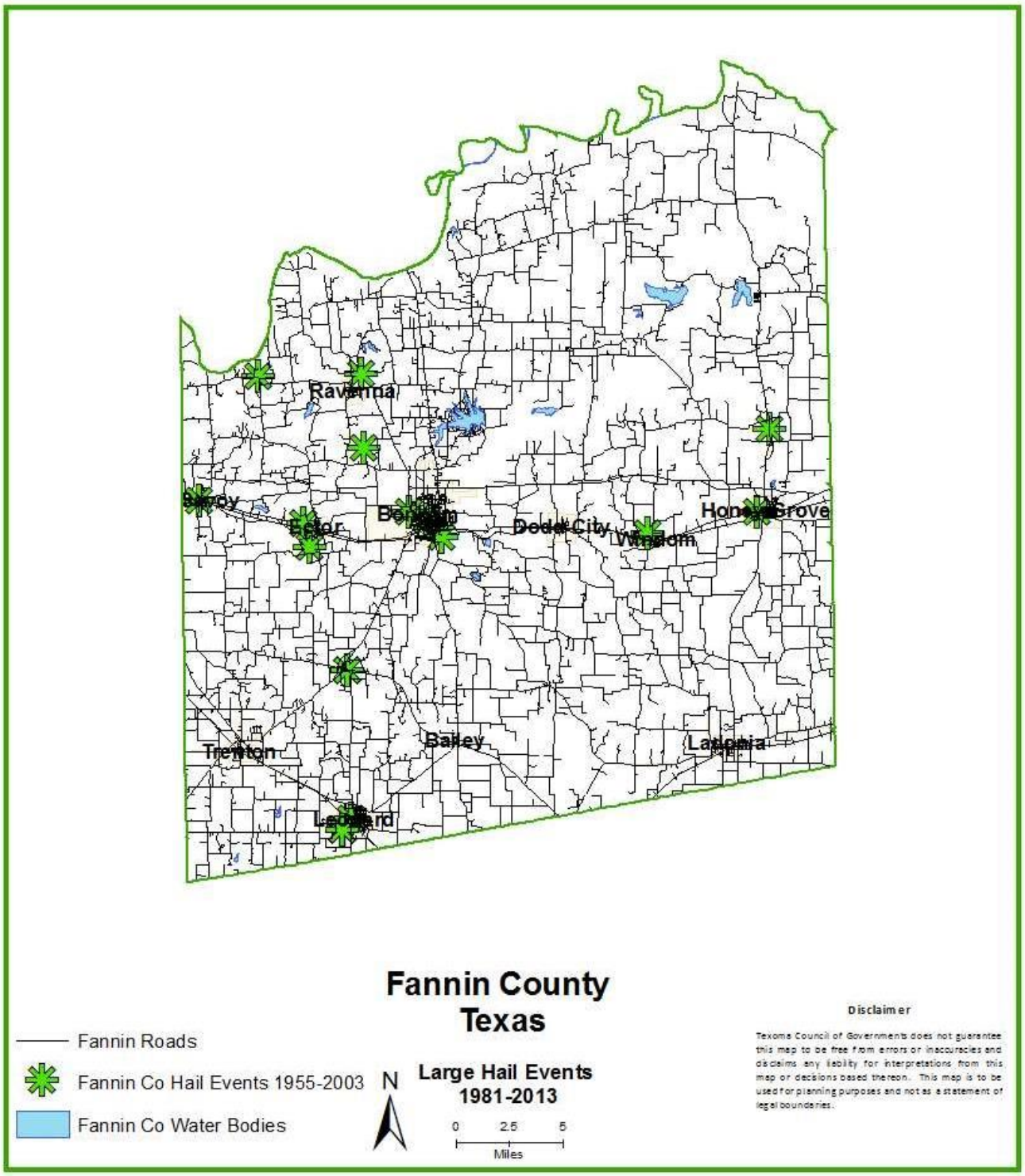
Hail is associated with severe thunderstorms. Powerful updrafts produce cumulonimbus clouds that tower tens of thousands of feet above the ground. Air temperature in the upper levels of these clouds may be -50°F or below. Hailstones grow as ice pellets, are lifted by updrafts, and collect super-cooled water droplets. As they grow, hailstones become heavier and begin to fall. Sometimes, they are caught by successively stronger updrafts and are circulated through the cloud again and again; growing larger each time the cycle is repeated. Eventually, the updrafts can no longer support the weight of the hailstones. As hailstones fall to the ground they produce a hail streak that may be more than a mile wide and a few miles long. A single thunderstorm can produce several hail streaks.

Note that although hail is associated with thunderstorms, this plan profiles hail equal to or larger than 1.5" inches in diameter as a separate natural hazard event. Based on previous occurrences, when hail gets this large it can be damaging to cars, roofs, windows, and even people.

2. Location

There has been over 18 documented reports of hail 2.5 inches in diameter or larger since 1981. Locations of these "*Tennis Ball*" sized hailstone events are show in Figure 2. These incidents were reported throughout the county therefore establishing that all parts of Fannin County are equally vulnerable to hailstorms.

Figure 2: Hail Events 2.5 Inches or Larger (1981-2013



3. Impact/Extent

The severity of damage caused by hailstorms depends on the hailstone sizes (average and maximum), number of hailstones per unit area, and associated winds. Storms that produce high winds in addition to hail are most damaging and can result in numerous broken windows and damaged siding.

Hailstorms can cause extensive property damage affecting both urban and rural landscapes. Fortunately, most hailstorms produce marble-size or smaller hailstones. These can cause damage to crops, but they normally do not damage buildings or automobiles. Larger hailstones can destroy crops, livestock, and wildlife and can cause extensive damage to buildings, including roofs, windows, and outside walls. Vehicles can be total losses. When hail breaks windows, water damage from accompanying rains can also be significant. A major hailstorm can easily cause damage running into the millions of dollars. Nationwide hail is responsible for over $1 billion in property and crop damages per year.

The Hailstorm Intensity Scale is representative of the damage from hail storms this community has experienced in the past and will likely experience in the future. This scale allows planners to gauge past damage and mitigate for future expected damage.

All of Fannin County has the potential of being affected by a hailstorm. Hailstorms can cause thousands of dollars of crop and roof damages within minutes. A square mile hailstorm could do roof damages in the millions. Because of the high structural density the City of Bonham would be most affected by a hailstorm. Farming areas of the county to the north near the Red River and to the east near Honey Grove would be affected greatly by a major hailstorm.

Table 1: Hailstorm Intensity Scale

Size Code	Intensity Category	Size (diameter inches)	Descriptive Term	Typical Damage
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33 - 0.60	Marble	Slight damage to plants and crops
H2	Potentially Damaging	0.60 - 0.80	Dime	Significant damage to plants and crops
H3	Severe	0.80 – 1.20	Nickel	Severe damage to plants and crops
H4	Severe	1.2 – 1.6	Quarter	Widespread glass and auto damage
H5	Destructive	1.6 – 2.0	Half Dollar	Widespread destruction of glass, roofs, and risk of injuries
H6	Destructive	2.0 – 2.4	Ping	Aircraft bodywork dented and brick walls pitted
H7	Very Destructive	2.4 – 3.0	Golf Ball	Severe roof damage and risk of serious injuries
H8	Very Destructive	3.0 – 3.5	Hen Egg	Severe damage to all structures
H9	Super Hailstorms	3.5 – 4.0	Tennis Ball	Extensive structural damage could cause fatal injuries
H10	Super Hailstorms	4.0 +	Baseball	Extensive structural damage could cause fatal injuries

Source: www.ncdc.noaa.gov

4. Previous Occurrences

Between 1981 and 2013 National Climatic Data Center documented a total of 72 large hail events that produce stones 1.5 inches or larger in diameter in Fannin County. The most damaging hail event recorded in the county was on June 13, 2013. The small City of Leonard experienced over $1 Million in damages from 4.25 inch in diameter.

Hail Facts

- The largest hailstone on record weighed in at over 1.6 lbs.
- Large hailstones can fall at speeds of over 100 mph.
- Hail causes nearly $1 billion in damage to property and crops every year.
- Hail can contain foreign matter such as nuts, twigs, insects, etc.

Table 4: Fannin County Hail Events 1.5 Inches or Larger (1981-2013)

Location	Date	Size
Fannin	5/13/1981	1.75 in.
Fannin	4/2/1982	3.00 in.
Fannin	4/2/1982	2.50 in.
Fannin	5/31/1982	1.75 in.
Fannin	12/23/1982	1.75 in.
Fannin	6/3/1983	1.75 in.
Fannin	6/3/1983	2.00 in.
Fannin	6/28/1983	2.75 in.
Fannin	6/28/1983	2.75 in.
Fannin	6/28/1983	1.75 in.
Fannin	6/28/1983	2.75 in.
Fannin	6/28/1983	2.75 in.
Fannin	7/1/1983	1.75 in.
Fannin	4/20/1984	2.75 in.
Fannin	4/20/1984	2.00 in.
Fannin	4/20/1984	2.00 in.
Fannin	5/20/1985	1.75 in.
Fannin	4/4/1986	1.75 in.
Fannin	4/19/1986	1.75 in.
Fannin	3/24/1988	1.75 in.
Fannin	10/27/1988	1.75 in.
Fannin	5/16/1989	4.50 in.
Fannin	9/9/1989	1.75 in.
Fannin	4/15/1990	2.50 in.
Fannin	4/26/1991	1.75 in.
Fannin	5/11/1992	2.75 in.
Fannin	5/11/1992	1.75 in.
Fannin	5/11/1992	1.75 in.
Fannin	5/11/1992	2.00 in.
Fannin	5/11/1992	1.75 in.
Fannin	9/2/1992	1.75 in.
Fannin	9/2/1992	1.50 in.
Ravenna	4/26/1994	1.75 in.
Bonham	4/29/1994	2.75 in.
Ector	4/29/1994	2.75 in.
Ector	4/29/1994	1.75 in.
Leonard	4/30/1995	2.75 in.

Location	Date	Size
Trenton	4/30/1995	1.75 in.
Honey Grove	4/30/1995	2.75 in.
Bonham	5/3/1995	2.75 in.
Honey Grove	5/3/1995	1.75 in.
Fannin	5/3/1995	1.75 in.
Trenton	7/4/1995	1.75 in.
Monkstown	9/20/1996	2.75 in.
Honey Grove	9/20/1996	1.75 in.
Trenton	5/2/1998	1.75 in.
Bonham	5/27/2000	1.75 in.
Bonham	5/27/2000	1.75 in.
Ector	4/6/2003	1.75 in.
Savoy	4/6/2003	1.75 in.
Bonham	4/6/2003	1.75 in.
Ector	4/6/2003	1.75 in.
Savoy	4/6/2003	1.75 in.
Bonham	4/6/2003	1.75 in.
Honey Grove	5/30/2004	1.75 in.
Trenton	4/25/2005	1.75 in.
Bonham	4/25/2005	1.50 in.
Randolph	4/25/2005	1.75 in.
Bailey	4/25/2005	1.75 in.
Bailey	4/25/2005	2.00 in.
Trenton	5/9/2006	1.75 in.
Telephone	5/10/2006	1.75 in.
Honey Grove	5/13/2006	1.75 in.
Fannin	5/10/2008	1.75 in.
Bonham	3/8/2011	1.75 in.
Windom	3/8/2011	2.75 in.
Leonard	4/14/2011	1.75 in.
Mulberry	4/19/2011	2.00 in.
Sash	4/19/2011	1.75 in.
Leonard	6/3/2012	4.25 in.
Honey Grove	3/31/2013	1.75 in.

Source: www.ncdc.noaa.gov

5. Probability of Future Events

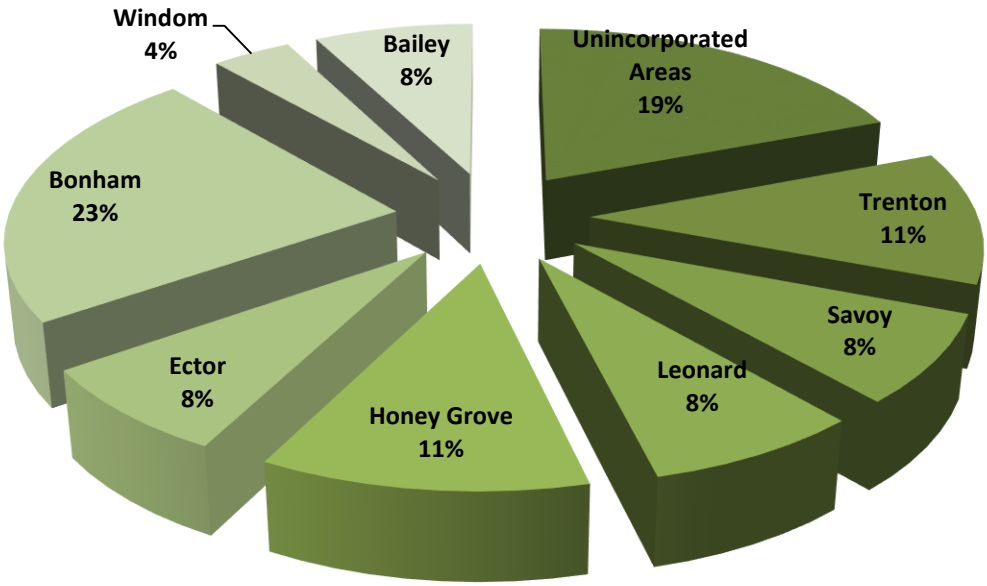
Based on the previous occurrences of 72 large-hail events recorded in the last 32 years, an average of 2 events occur per year; therefore, the probability of large hail (equal to or greater than 1.5 inches in diameter) occurring within the county each year is highly likely.

6. Vulnerability

Although hailstorms can occur in almost every state, they are most common in the plains. Vulnerability is difficult to evaluate since hail events has no geographic boundaries. Chart 6 illustrates that within the last 15 years local jurisdictions were comparable in the number of hail events.

Hail is capable of causing considerable damage to crops, buildings, and vehicles, and occasionally death to farm animals. The most vulnerable area to hail would be the entire county due to the highly agriculture areas outside of the higher population density area of the City of Bonham.

Chart 6: Hail Events in Fannin County 1998-2013 by Jurisdiction



Source: www.ncdc.noaa.gov

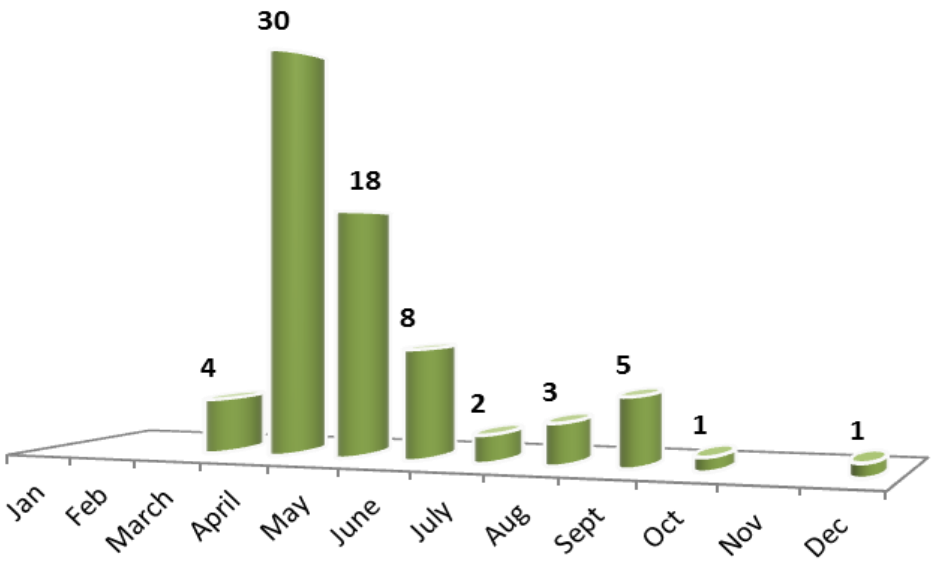
7. Secondary Hazards

Deep hail can easily worsen a flash flood situation by clogging drainage paths, culverts and grates. Hail is capable of breaking glass and allowing interior flooding in buildings.

8. Overall Summary of Vulnerability and Impacts

Hail can occur in any strong thunderstorm any time of year. However, the size of the hailstones is a direct function of the severity and size of the storm. Hail larger than 1.5 inches can cause serious damage to cars, roofs, walls, windows, and inflict serious bodily injury as well. All of Texas has a significant threat of hailstorms, and virtually all buildings and automobiles are at risk. Crops are also at risk since the peak periods for hailstorms occur during early April and May, which coincide with critical agricultural seasons.

Chart 8a: Fannin County Monthly Hail Activity (1955-2008)



Source: *www.ncdc.noaa.gov*

Chart 8b: Summary

Community	Potential Severity of Impact	Probability of Future Events	Risk	Justification for Differences
Bailey	Minor	Highly Likely	Medium	
Bonham	Major	Highly Likely	Medium	Due to the structural density the hailstorm damages would be greater than for other jurisdictions Bonham.
Dodd City	Minor	Highly Likely	Medium	
Dodd City ISD	Minor	Highly Likely	Medium	
Ector	Minor	Highly Likely	Medium	
Ector ISD	Minor	Highly Likely	Medium	
Fannindel ISD	Minor	Highly Likely	Medium	
Honey Grove	Minor	Highly Likely	Medium	
Honey Grove ISD	Minor	Highly Likely	Medium	
Ladonia	Minor	Highly Likely	Medium	
Leonard	Minor	Highly Likely	Medium	
Leonard ISD	Minor	Highly Likely	Medium	
Ravenna	Minor	Highly Likely	Medium	
Sam Rayburn	Minor	Highly Likely	Medium	
Savoy	Minor	Highly Likely	Medium	
Savoy ISD	Minor	Highly Likely	Medium	
Trenton	Minor	Highly Likely	Medium	
Trenton ISD	Minor	Highly Likely	Medium	
Windom	Minor	Highly Likely	Medium	
Rural Areas	Substantial	Highly Likely	High	Wheat & corn crops are extremely vulnerable to hail of any size.

HAZARD PROFILE WORKSHEET

HAZARD: Hailstorm

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor **X**	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Most common in Spring but can occur at any time

SOURCE DOCUMENTS:

NOAA, Local Media, Texas Hazard Mitigation Plan, Fannin County Farm Service Agency, and local newspaper articles

DATA LIMITATIONS:

Limitations in quantifying long term economic losses and damages in rural areas

PROBABLE DURATION & WARNING TIME

Duration and warning time are both less than 6 hours

CASCADING POTENTIAL:

Power failures and damage to structures and equipment
Higher food prices from crop damages

EXISTING WARNING SYSTEMS:

Local weather forecasts, NOAA Weather Alerts, Social Media, Emergency phone alerting, internet weather sites, and word of mouth

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Emergency phone alerting is available for entire county on landline and mobile phones
Increased use of social media for all types of hazard information
Increase in structures built with hail resistant roofing

A small town in Texas suffered from a severe drought that lasted for almost thirty years.

When it finally did rain, it was just a brief shower. One of the town's residents was outside and when the rain fell on him it was such a shock that he fainted…

They had to throw two buckets of dust in his face to bring him to.

HAZARD PROFILE: Section Five -Drought

1. Description

The lack of or shortage in amount of rainfall for an extended period of time is crippling not just to farmers but to the general public. Drought is caused by a deficiency of precipitation over a prolonged period of time. This deficiency results in water shortages and climatic factors such a high temperatures, strong winds, and low relative humidity can augment the severity of the drought.

Drought – "a period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affect area" – Glossary of Meteorology (1959).

True drought is defined as less the 75% of the average yearly rainfall between 1931 and 1960. According to the publication *Rangeland Risk Management for Texas,* produced by Agricultural Communications, The Texas A & M University System, in Texas this level of drought occurs from 16% to 45% of the time. These percentages increase when moving from East to Far West Texas.

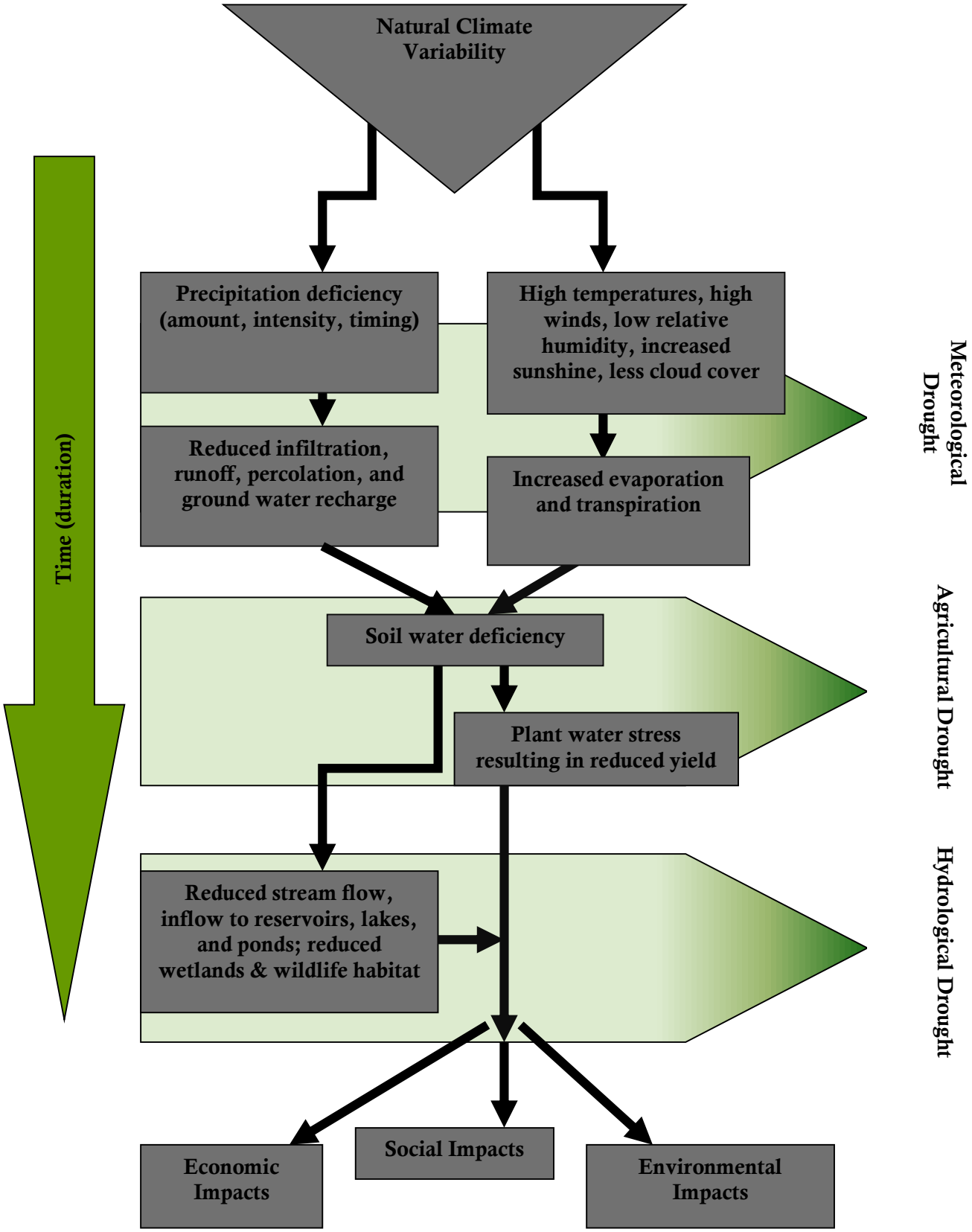
Droughts caused at least $1 billion in crop damage per year in the U.S. for nine of the 25 years between 1980 and 2005.

Droughts tend to be more severe in some areas than in others. Catastrophic droughts generally occur at latitudes of about 15°-20°, in areas bordering the permanently arid regions of the world. In North America, archaeological studies of Native Americans and statistics derived from long-term agricultural records show that six or seven centuries ago whole areas of the Southwest were abandoned by the indigenous agriculturists because of repeated droughts and were never reoccupied. The statistics indicate that roughly every 22 years—with a precision of three to four years—a major drought occurs in the United States, most seriously affecting the Prairie and mid-western states. A drought is a period of abnormally dry weather which persists long enough to produce a serious hydrologic imbalance. There are four ways that drought can be defined:

***** For the purpose of this plan drought is defined as when a calendar year with less than 75% of the 1931-1960 average yearly precipitation.

- Meteorological – a measure of departure of precipitation from normal.
- Agricultural – refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.
- Hydrological – occurs when surface and subsurface water are below normal.
- Socioeconomic – the situation that occurs when physical water shortage begins to affect people.

Chart 1: Diagram of a Drought



2. Location

Throughout history Texas has been prone to droughts. These droughts are caused by a combination of weather patterns and geographic location. All areas of the state and Fannin County are susceptible to drought. The rural areas of the county, that are highly agricultural are the most vulnerable to the drought and usually feel it first. Just an inch shortage of rainfall can cause crops to fail and the needed supplemental feeding of cattle. In Figure 2 a look at the Texas Drought Monitor shows that Fannin County was in a Moderate Drought on March 3, 2009 but according to the May 6, 2014 the most of the county was in an extreme drought

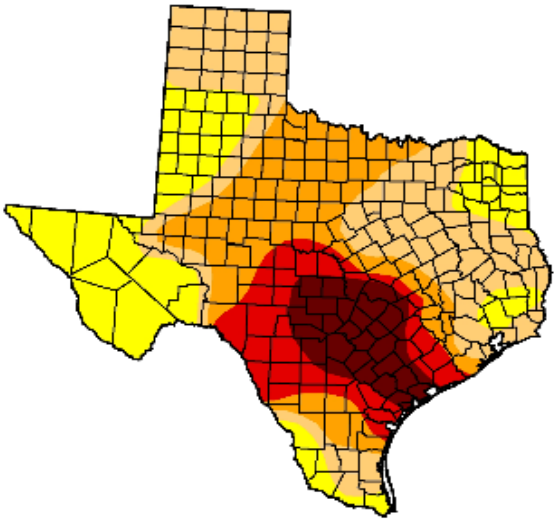
Figure 2: Texas Drought Monitor (March 3, 2009 top & May 6, 2014 bottom)

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.0	100.0	74.6	44.4	21.7	9.6
Last Week (02/24/2009 map)	3.2	96.8	65.5	43.1	19.9	8.6
3 Months Ago (12/09/2008 map)	52.9	47.1	24.6	15.0	8.1	3.2
Start of Calendar Year (01/06/2009 map)	41.7	58.3	24.5	15.0	9.1	4.2
Start of Water Year (10/07/2008 map)	67.2	32.8	20.5	11.0	3.6	0.0
One Year Ago (03/04/2008 map)	25.9	74.1	45.3	25.2	2.0	0.0

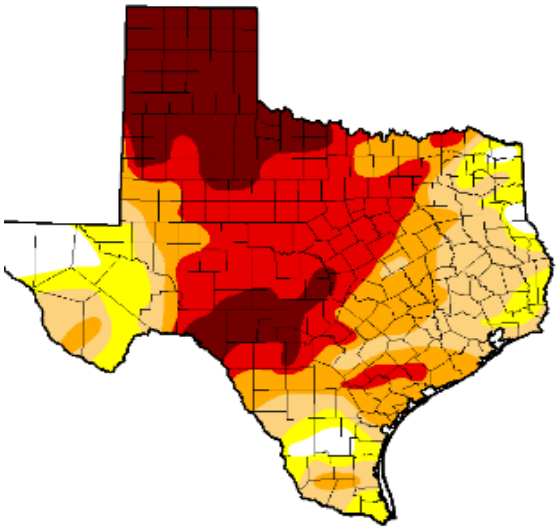
Intensity:

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



U.S. Drought Monitor

Texas



May 6, 2014

(Released Thursday May 8, 2014)

Valid 8 a.m. EDT

Statistics type: Traditional (D0-D4, D1-D4, etc.) Categorical (D0, D1, etc.)

Drought Condition (Percent Area):

Week	Date	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5/6/2014	5.11	94.89	83.35	65.13	46.17	21.28
Last Week	4/29/2014	9.88	90.12	74.47	52.91	37.86	17.75
3 Months Ago	2/4/2014	14.95	85.05	51.68	22.34	7.95	0.71
Start of Calendar Year	12/31/2013	28.48	71.52	43.84	21.15	5.82	0.79
Start of Water Year	10/1/2013	6.62	93.38	70.95	25.08	4.01	0.12
One Year Ago	5/7/2013	1.45	98.55	92.13	72.82	40.58	12.88

View More Statistics

Intensity:

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

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Source: www.drought.unl.edu

Category	Description	Possible Impacts	Palmer Drought Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water	-5.0 or less

3. Impact/Extent

Drought impacts in a number of ways, spanning all regions, and is capable of affecting the economy as well as the environment. Specific impacts can include reduced crops and rangeland, increased livestock and wildlife mortality, increased fire hazard, diminished water supplies for municipal/industrial, agricultural and power uses, damage to fish and wildlife habitat, reduced tourism and recreational activities, reduced tax revenues because of reduced expenditures, and foreclosures on bank loans to farmers and businesses.

The most direct impact of drought is economic rather than loss of life or immediate destruction of property. While drought impacts in Texas are numerous and often dependent upon the timing and length of individual drought episodes, the greatest impacts of drought are usually experienced in the agricultural community. In addition to the obvious direct losses of both crop and livestock production due to a lack of surface and subsurface water, drought is frequently associated with increases in insect infestations, plant disease, and wind erosion.

One of the most significant potential impacts of drought relates to public water supply. In metropolitan areas there may be a need to stop washing cars, cease watering lawns and take other water conservation steps. In smaller communities, reduced flow in rivers and streams can have a significant effect on the water amount allowed for municipal use. Hot weather during the summer increases demand as well as evaporation. In turn, increased water demand can stress many smaller and/or antiquated delivery and treatment facilities to the point of collapse. Prolonged drought has a greater impact on rural communities, which usually rely on relatively small watersheds and are especially vulnerable during such periods.

Water shortages can also affect firefighting capabilities in both urban and rural settings through reduced water flows and pressures. Most droughts dramatically increase the danger of fires on wild land. When wild lands are destroyed by fire, the resulting erosion can cause heavy silting of streams, rivers, and reservoirs. Serious damage to aquatic life, irrigation, and power production then occurs. Although drought can have serious impact during winter months, it is most often associated with extreme heat. Wildlife, pets, livestock, crops, and humans are vulnerable to the high heat that can accompany drought. When temperatures reach 90 degrees and above, people and animals are more likely to suffer sunstroke, heat cramps, and heat exhaustion.

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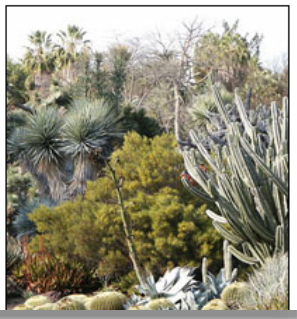
FRONT PAGE

Xeriscaping

By Shawn Brown, New Leaf Tree and Shrub Care
Aug 8, 2014



With ever-present drought and water restrictions here in Texas, it is little wonder why Xeriscaping is quickly growing in popularity. Xeriscape lawns and flowerbeds are more and more commonly dotting local neighborhoods as many people attempt to lower water consumption. Today, with about half of our total water supply going towards the maintenance of lawns and ornamental plants, low-water landscaping is becoming a necessity.

Xeriscaping, said simply, is landscaping with plants requiring little water. By using drought-tolerant native species, water consumption can be reduced by fifty to seventy five percent, conserving a great amount of water. And with many counties and cities currently going into severe water restrictions, low-water landscaping is gaining momentum.

4. Previous Occurrences

The state of Texas is divided into ten climatic divisions by the National Weather Service. Fannin County is one of the 44 counties that make up the North Central Texas Region. This region, according to the Texas Almanac 2014-15 Edition, has experienced severe 15 drought years between 1892 and 2012.

In 2011, Texas endured the worst single-year drought in its history and is still trying to recuperate. Most of Texas has seen a decade of high temperatures and little rain leaving Texas communities with water restrictions and fears of limited water availability. The current drought started in the fall of 2010 and continues throughout most of the state today. The recent state water plan stated that "Texas does not and will not have enough water".

This drought followed a severe drought in 2005-2006 that hit Texas agriculture harder than any previous event and made Texas more vulnerable to the current drought. The statewide drought losses from this event were estimated at $4.1 billion and $1.9 billion in North Texas alone.

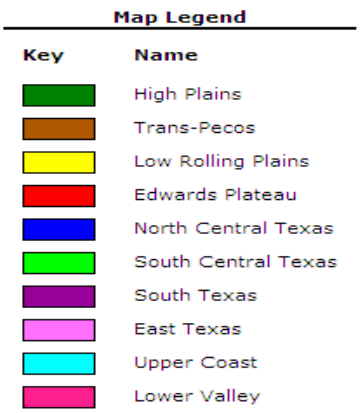
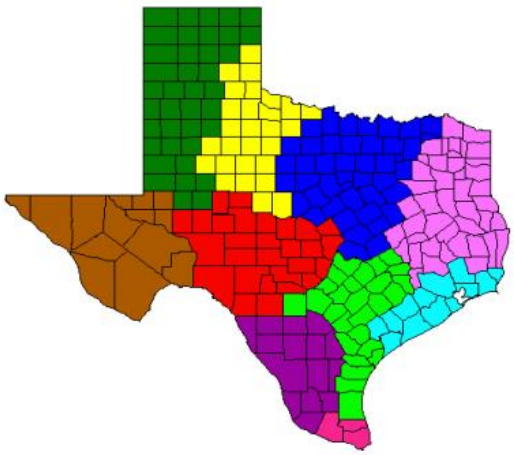
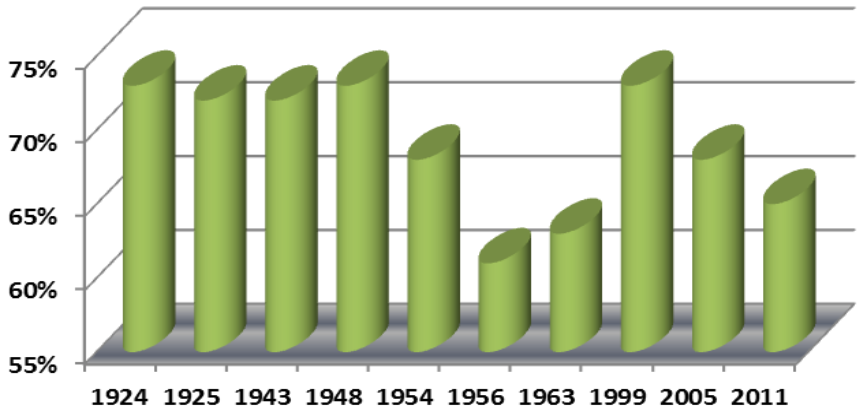


Figure 4: Texas Climatic Regions



Source: www.nass.usda.gov & The Texas Almanac, 2008-2009 Edition

Chart 4: North Central Texas Drought Years & Percentage of Normal Rainfall *



** Normal Rainfall amount are based on 1931-1960 average precipitation for the North Central Texas Region.*

5. Probability of Future Events

Given that 10 severe drought events have occurred in the North Central Texas Region over the past 100 years one may conclude that Texas can expect a severe drought every decade. However, long-term forecasts of droughts are difficult and inexact. The U.S. Corp of Engineers (USACE) is preparing the *National Drought Atlas* to provide information on the magnitude and frequency of minimum precipitation and stream flow for the contiguous United States and to assist in the prediction of future drought. NOAA states that at any given time 20% of the nation in a drought. For the purpose of this plan drought events are highly likely.

6. Vulnerability

The cause of all droughts is the shortage of rainfall. During a drought, the earth is so dry that even if a rainfall occurs it evaporates quickly. The cause for this hazard in the Fannin County area often is a high pressure system. A high pressure system brings warm sunny weather and serves as a moisture dam in the atmosphere. A high pressure system can weaken or even block a low pressure system, which is the needed rainfall. A drought is aggravated by the fact that as the ground gets drier there is less moisture for cloud development or rain and the high pressure system becomes stagnant, therefore a drought can elevate its own severity.

In 1970 Texas governor Preston Smith initiated a statewide cloud seeding program for a three month period. In July Texas suffered severe flooding and the seeding program was blamed. Although no facts ever support the claims the program was stigmatized and ended.

The primary air masses that bring moisture to the area originate in the Gulf of Mexico. Air masses that come into the state from the west are usually stripped of moisture by the Rocky Mountains. Fannin County's location makes the entire county vulnerable to drought because of its distance from the Gulf of Mexico. Tropical moisture rich air masses weaken as it goes further inland. Although the entire county is vulnerable to a drought the vulnerability is greater in rural and agricultural areas of the county.

7. Secondary Hazards

Drought is considered a secondary hazard brought about by extreme heat and low precipitation. Droughts can have high impact on agricultural businesses, hydro-electric power, recreation and tourism, and other water dependent industries. The drought impacts both direct and indirect have a domino effect and the results of Texas droughts are felt nationwide by reductions in recreation areas, reduced crops, high food prices, loss of wildlife habitat and endangered species, etc.

Table 7: Economic, Environmental, and Social Impacts of Drought

Economic	Environmental	Social
Agricultural losses	Damage to animal species	Health
Reduction in recreation	Hydrological effects	Amplified water conflicts
Agriculture reliant businesses may fail	Loss of wildlife due to reduced food and habitat	Anxiety or depression about economic losses caused by drought
Real estate values decrease	Increase in wildfires	Population movements
Increase energy consumption	Reduced soil quality	Increased poverty
Decline in food production	Diminished air quality	Reduced quality of life
Increased food prices	Reduction in vegetative cover	Jeopardized public safety

8. Overall Summary of Vulnerability and Impacts

Previous plans have had limited information about exact drought events. This is because of a lack of local data. The drought information is for a multi-county area therefore it is hard to pinpoint the exact locations of droughts. Heat induced thunderstorms can put repeatedly put down much-needed rain on one person's farm and leave the neighbor without a drop.

According to NOAA at any time at least on 20% of the U.S. is experiencing a moderate to severe drought. The major drought of the 20th century in terms of length and extent would be the 1930's Dust Bowl which lasted for up to seven years in some areas of Texas and the Great Plains. This drought, depicted in John Steinbeck's novel *The Grapes of Wrath*, was so severe that is caused a mass migration to the western U.S.

Droughts are still a common occurrence in Fannin County as well as the rest of the U.S. It is difficult to predict drought probabilities for the near future because of the nature and complexity of the hazard. Droughts evolve over time as certain conditions are met and can spread over a large geographical area. Drought severity depends on its duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. The impact of hazards such as Extreme Heat, Expansive Soils, and Wildfires can be intensified during times of drought. Otherwise, the most direct impact of drought is economic rather than loss of life or immediate destruction of property.

...Now the wind grew strong and hard,
it worked at the rain crust
in the corn fields.

Little by little the sky
was darkened by the mixing dust,
and the wind felt over the earth,
loosened the dust and carried it away.

...from The Grapes of Wrath,
written by John Steinbeck

Table 8: Summary

Community	Potential Severity of Impact	Probability of Future Events	Risk	Justification for Differences
Bailey	Major	Highly Likely	High	
Bonham	Major	Highly Likely	High	
Dodd City	Major	Highly Likely	High	
Dodd City ISD	Major	Highly Likely	High	
Ector	Major	Highly Likely	High	
Ector ISD	Major	Highly Likely	High	
Fannindel ISD	Major	Highly Likely	High	
Honey Grove	Major	Highly Likely	High	
Honey Grove ISD	Major	Highly Likely	High	
Ladonia	Major	Highly Likely	High	
Leonard	Major	Highly Likely	High	
Leonard ISD	Major	Highly Likely	High	
Ravenna	Major	Highly Likely	High	
Sam Rayburn	Major	Highly Likely	High	
Savoy	Major	Highly Likely	High	
Savoy ISD	Major	Highly Likely	High	
Trenton	Major	Highly Likely	High	
Trenton ISD	Major	Highly Likely	High	
Windom	Major	Highly Likely	High	
Rural Areas	Major	Highly Likely	High	Drought can be devastating to the agricultural economy.

HAZARD PROFILE WORKSHEET

HAZARD: Drought

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major **X**	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Most likely in Summer or Winter but can occur at any time

SOURCE DOCUMENTS:

NOAA, Texas Hazard Mitigation Plan, Texas Drought Monitor, The Texas Almanac, The National Drought Atlas, www.thmp.info, and local newspaper articles

DATA LIMITATIONS:

Limitations in quantifying long term economic losses

PROBABLE DURATION & WARNING TIME

Duration is from a few weeks to several months

CASCADING POTENTIAL:

Droughts can cause water shortages, increased fire risk, and excessive demands on energy

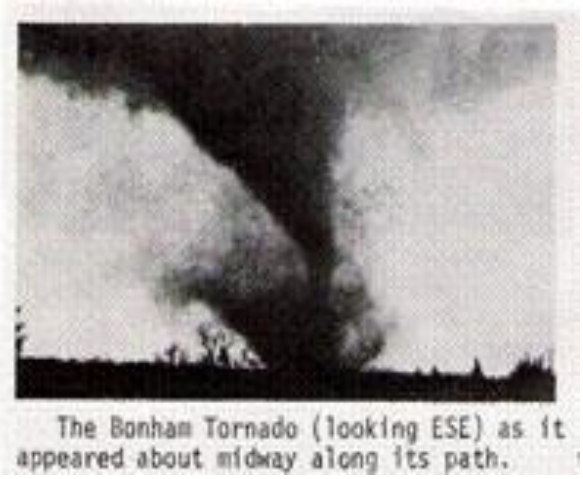
EXISTING WARNING SYSTEMS:

Local weather forecasts broadcasted via the media and internet weather sites

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Increased use of social media for all types of hazard information
Increase number of CERT volunteers trained and ready for emergency response
Jurisdictions have drought contingency plans and back-up water supplies
Increased utilization of Xeriscaping and rainwater harvesting throughout the county

April 2, 1982 Tornado Outbreak



Source: www.ncdc.noaa.gov

HAZARD PROFILE: Section Six - Tornado

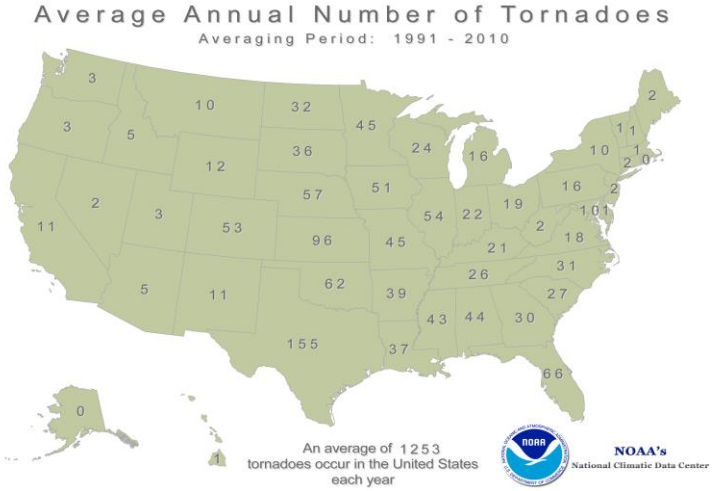
1. Description

Tornadoes are earth's most violent storms. With an average of 155 (1991-2010) tornadoes touching down each year, Texas ranks first in tornado occurrences. A tornado is a brutal windstorm characterized by a twisting, funnel-shaped cloud. Tornadoes occur in association with strong thunderstorms and commonly are accompanied by lightening, heavy, rain, and/or hail. Note that although tornadoes are associated with thunderstorms, tornadoes are profiled in this plan as a separate event.

Tornado – is a violent rotating column of air. - www.wikipedia.org

Data on tornado events was gathered from various sources including the Hazard Mitigation Planning Team, local emergency officials, NOAA, and the Hazard Assessment Survey.

Figure 1: Average Number of Tornadoes per Year (1991-2010)



Source: www.ncdc.noaa.gov

2. Location

"Tornado Alley" is the term used to describe the region of the U.S. where the strongest tornadoes occur most frequent. "Tornado Alley" does not have an officially defined area but includes eastern SD & CO, NE, KS, OK, and north Texas. This area has a reported concentration of five or more tornadoes per 10,000 square miles due to the geography. "Tornado Alley is the result of the cool dry downdraft of air from the Rocky Mountains and that merges with warm moist air from the Gulf of Mexico. Although tornados can form anywhere, this combination provides the perfect environment for large storms that produce high magnitude Tornados that are wide and leave long paths of destruction. Fannin County is located in this "Tornado Alley" and the entire county is equally susceptible to tornado damages. Due to the county wide probability of tornado every structure has equal probability to be struck by an EF0 tornado or higher.

Figure 2: "Tornado Alley" Resulting from Geographic Location

Source: Wikipedia

3. Impact/Extent

Tornadoes form when the right amount of shear is present in the atmosphere and causes the updraft and downdraft of a thunderstorm to rotate. This column of rotating air is referred to as a funnel cloud. The funnel cloud does not become tornado until it touches the ground. After contact with the ground is made a tornado has intense wind speed normally from 40 miles per hour to more than 300 miles per hour. Although a tornado is usually on the ground for a short time the damage that it can do is severe. Until February 2007 tornadoes were rated on the Fujita Scale (F-Scale). Using the wind speed and the type of damage they were giving a rating of F-0 to F-5.

The Enhance Fujita Scale was enacted in the U.S. on February 1, 2007. This new version of Dr. Ted Fujita's 1971 classification system accounts for different degrees of damage that occur to different types of structures. It is thought to provide a better estimate for winds speeds and sets no upper wind speed limit. Although the U.S. is officially using the new standard most of the world is still using the former Fujita Scale.

Table 3: Fujita Scale & Enhance Fujita Scale

Fujita Scale		Enhanced Fujita Scale		Potential Damage
Rating	Wind Speed	Rating	Wind Speed	
F0	40-72 mph	EF0	65-85 mph	**Light** Tree branches are broken and shallow-rooted trees are toppled.
F1	73-112 mph	EF1	86-110 mph	**Moderate** Roof surfaces are peeled off, windows are broken, some tree trunks are snapped, and unanchored mobile homes or outbuilding overturned.
F2	113-157 mph	EF2	111-135 mph	**Considerable** Roof structures are damaged, mobile homes are destroyed, debris becomes airborne (missiles are generated); large trees are snapped or uprooted.
F3	158-206 mph	EF3	136-165 mph	**Severe** Roofs and walls are torn from structures, some small buildings are destroyed, non-reinforced masonry buildings are destroyed, and trees are uprooted.
F4	207-260 mph	EF4	166-200 mph	**Devastating** Well-constructed houses are destroyed, some structures are lifted from foundations and blown some distance, cars are blown some distance, and large debris becomes airborne.
F5	261-318 mph	EF5	>200 mph	**Total Destruction** Strong frame houses are lifted from foundations, reinforced concrete structures are damaged, automobile-sized missiles become airborne, and trees are completely debarked.

Tornadoes that occur in areas of low development cause little to no damage; conversely, tornadoes which drop in heavily populated areas can cause extreme loss of property and loss of human life. Winds of such velocity can lift even the most solidly built structure. Mature trees can be uprooted and flung across fields or into homes or businesses. Cars and automobiles can be lifted and projected into other structures. Smaller projectiles made of glass shards, splintered lumber, or metal have been documented to pierce trees, homes, and other property. Death can result from any debris source at this speed. The most severe impact by a tornado would be the result of an EF4 or EF5 tornado moving through the county and hitting several communities.

4. Previous Occurrences

Fannin County has 47 documented tornado events recorded between the years 1955-2012. There have been 1 death, 10 injuries and over $6 million in damages reported during this time period.

Table 4: Fannin County Texas Reported Tornadoes 1955-2012

Location or County	Date	Time	Magnitude	Damage
Fannin	4/6/1955	3 AM	F3	$2.5M
Fannin	8/12/1958	5 PM	F1	$3K
Fannin	3/20/1959	12 PM	F2	$25K
Fannin	3/20/1959	12 PM	F2	$25K
Fannin	5/20/1960	5AM	F1	1 injury & $3K
Fannin	5/23/1966	4 PM	F0	
Fannin	5/23/1966	4 PM	F0	
Fannin	5/23/1966	4 PM	F1	
Fannin	5/23/1966	4 PM	F1	
Fannin	5/23/1966	4 PM	F1	
Fannin	5/23/1966	4 PM	F1	
Fannin	3/25/1967	11 PM	F2	
Fannin	4/25/1970	5 AM	F1	
Fannin	12/14/1971	10 PM	F1	$250K
Fannin	5/6/1973	7 PM	F2	$25K
Fannin	5/6/1973	11 PM	F2	3 injuries & $250K
Fannin	4/20/1976	1 AM	F1	
Fannin	5/30/1976	8 PM	F1	
Fannin	4/18/1977	5 PM	F0	
Fannin	4/18/1977	7 PM	F1	
Fannin	10/17/1980	5 AM	F1	$250K
Fannin	10/17/1980	5 AM	F1	$3K
Fannin	5/13/1981	6 AM	F2	$25K
Fannin	4/2/1982	3 PM	F3	1 death, 1 injury, & $2.5 M
Fannin	4/2/1982	3 PM	F2	
Fannin	4/25/1982	4 PM	F0	
Fannin	11/22/1982	6 PM	F1	$3K
Fannin	6/28/1983	7 PM	F0	$25K
Fannin	4/20/1984	6 PM	F0	
Fannin	4/4/1986	5 PM	F0	
Fannin	6/4/1986	7 PM	F0	
Fannin	6/4/1986	7 PM	F0	
Fannin	6/4/1986	7 PM	F0	
Fannin	6/23/1987	5 PM	F0	
Fannin	6/23/1987	5 PM	F0	
Fannin	6/23/1987	5 PM	F0	

Location or County	Date	Time	Magnitude	Damage
Fannin	4/5/1988	4 PM	F0	
Fannin	8/12/1988	12 PM	F1	
Fannin	10/7/1992	5 PM	F1	$3K
Lake Bonham	4/26/1994	6 PM	F0	
Bonham	4/26/1994	6 PM	F0	
Honey Grove	4/26/1994	6 PM	F0	$50K
Ivanhoe	1/17/1996	9 PM	F2	5 injuries & $150K
Trenton	4/26/1999	8 AM	F1	$40K
Leonard	5/27/2000	4 PM	F0	
Honey Grove	4/14/2011	9 PM	EFO	
Randolph	6/13/2012	6 PM	EFO	$50 K

Source: www.ncdc.noaa.gov

Fannin County has had some significant tornado events in the past. The most damaging one in the past 55 years was the April 2, 1982 tornado outbreak. The storm moved into Fannin County from the west where it had just produced golf-ball sized hail in Grayson County. The storm reportedly generated hailstones as large as six inches in diameter. A rotating cloud was then spotted over Ravenna before it touched down as an F2 three miles south-southeast of the community. This twister was briefly accompanied by another smaller tornado. The storm continued in an eastward track into Lamar County where it struck the county seat of Paris taking 10 lives. The storm left Fannin County with one fatality, six homes, two mobile homes, ten barns, and countless storage building and power lines destroyed.

Most tornado events in Fannin County have a magnitude of F0 to F1. These tornadoes are on the ground for a short time, less than 50 yards in width and damage is mostly confined to trees and power lines. These small tornadoes can do significant damage in a more vulnerable surrounding for example an F1 tornado on October 1980 caused over $150,000 in damages.

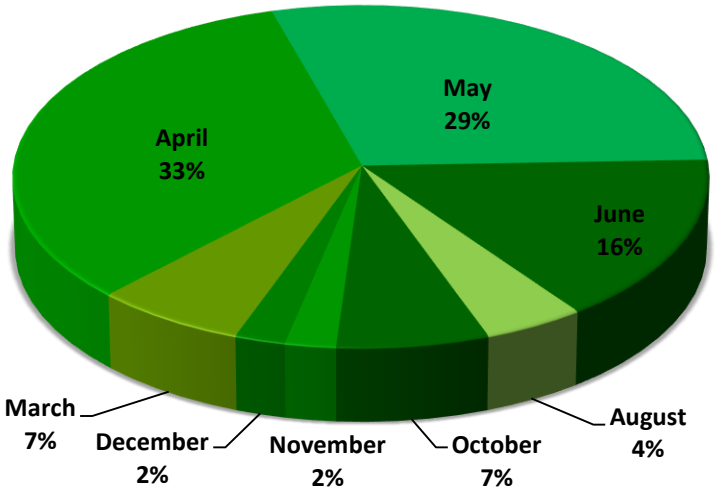
5. Probability of Future Events

In the last 53 years Fannin County had 47 tornadoes, resulting in an average of 0.89 reported tornadoes per year. Therefore the probability of a tornado occurring within the county each year is highly likely. April to June is the predominate tornado season, though again, they can occur any time of year. Over 75% of tornadoes occur between noon and midnight, and one third from 3:00 to 6:00 pm.

Tornado Facts:

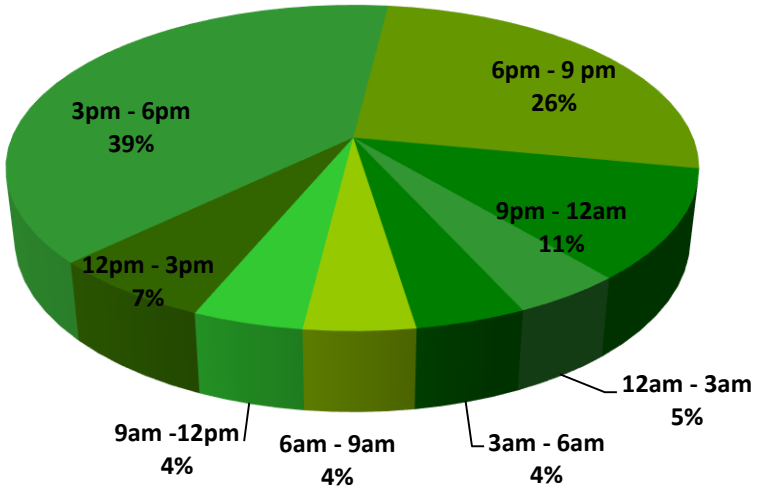
- May appear transparent until dust and debris are picked up
- Movement is generally Southwest to northwest
- Average speed of a tornado is 30 mph, but may vary from stationary to 70mph
- Tornados are most likely to occur between 3pm and 9pm
- Waterspouts are tornadoes that form over water

Chart 5a: Percentages of Tornado Occurrences by Month



Source: www.ncdc.noaa.gov

Chart 5b: Percentages of Tornado Occurrences by Time



Source: www.ncdc.noaa.gov

6. Vulnerability

Located in the central part of Texas, Fannin County is in an active part of tornado alley and has a designated wind speed rating of a Zone IV. Zone IV is associated with 250 mph wind speeds. Historically the average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Consequently, vulnerability of humans and property is difficult to evaluate since tornadoes form at different strengths, in random locations, and create relatively narrow paths of destruction. Although tornadoes strike at random, making all buildings vulnerable, four types of structures are more likely to suffer damage:

- Manufactured homes
- Homes on crawlspaces (more susceptible to lift)
- Buildings with large spans, such as shopping malls, gymnasiums and factories
- Small barns and outbuildings

Figure 6a: Wind speed rating Zones.

Source: www.fema.gov

Structures within the direct path of a tornado vortex are often reduced to rubble. However structures near the tornado's path are often severely damaged by high winds flowing into the tornado vortex, known as inflow winds. It is here, adjacent to the tornado's path where the building type and construction techniques are critical to the structure's survival.

Advances in meteorology and the use of Doppler radar allow efficient prediction of tornado formation before they occur. A network of storm watchers attempt to identify funnel clouds and report to various networks to alert the population. Even though these advances have significantly improved the available response time, tornadoes can still occur unexpectedly and without warning.

The use of better building techniques and the availability of affordable home storm shelters have helped to mitigate losses in Fannin County. The growing popularity of mobile/manufactured homes and structures without basements contraindicate any advances. The rapid urbanization of rural areas also intensifies the probability of being affected by a tornado.

Tornado Danger Signs:

- Sky becomes greenish black color
- Large Hail golf ball size or larger
- Low-lying dark clouds
- Loud roar like a freight train
- Rotation near cloud base

Figure 6b: Most Vulnerable Areas – Fannin County Manufactured Home Areas

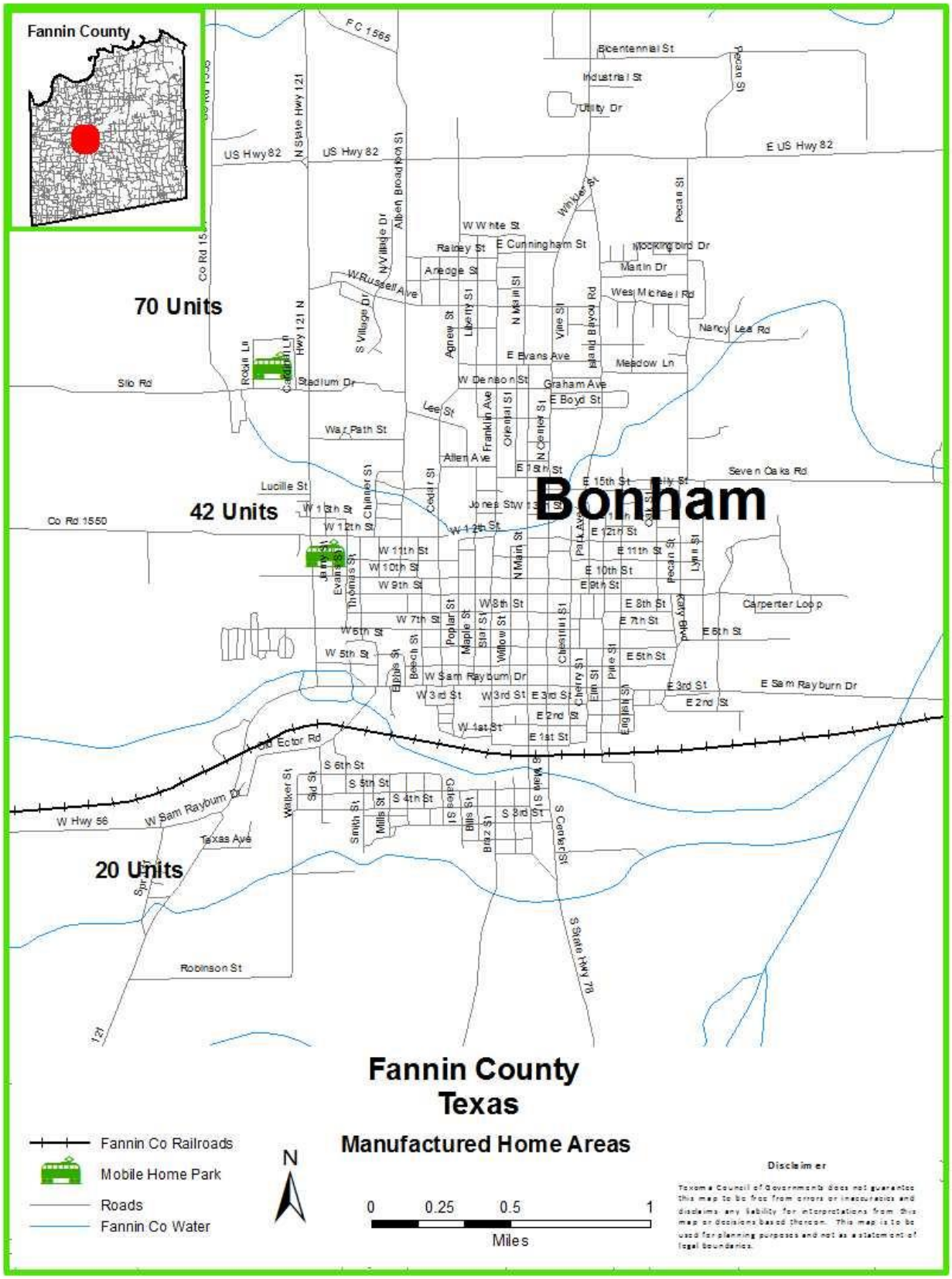


Figure 6c: Most Vulnerable Areas – Fannin County 65+ Population

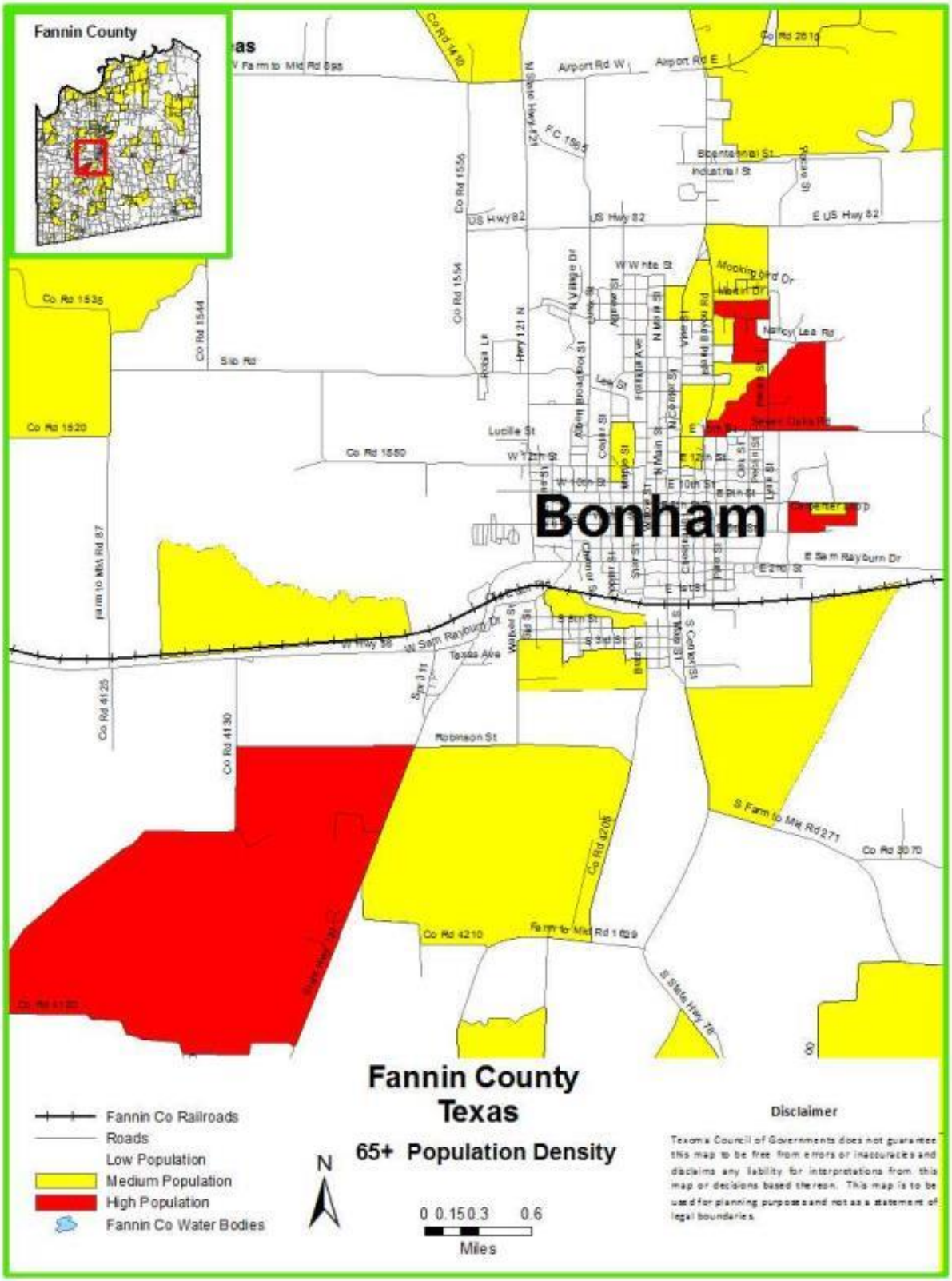
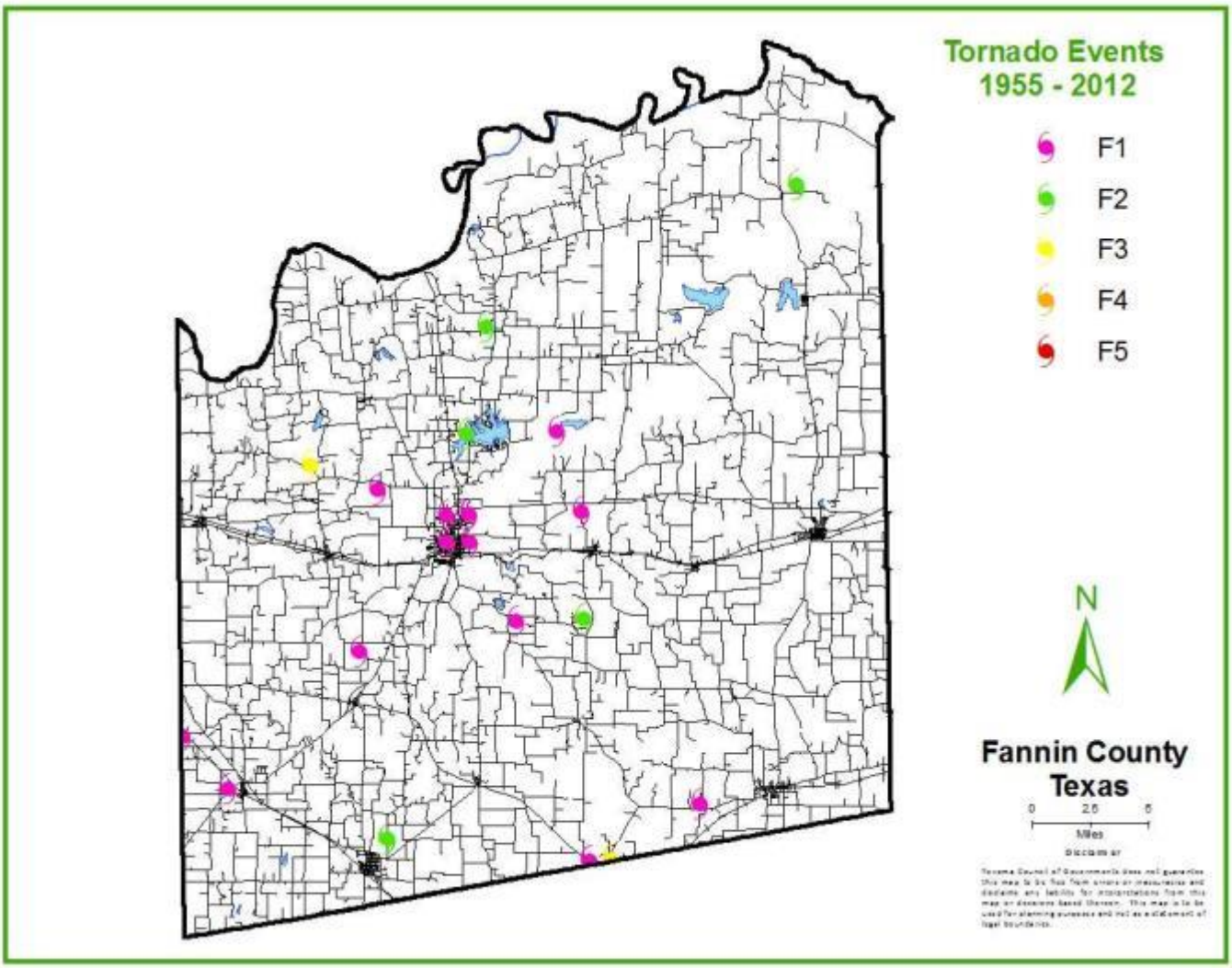


Figure 6c: Past Events (1955-2012)



7. Secondary Hazards

Secondary hazards can include fire, power outages, communications disruption, and failure of municipal services. Peripheral damages can occur caused by the accompanying thunder/rain storm activity. Lighting can cause fire. Rain can cause flooding. Tornadoes often affect areas not directly struck by the tornado event. Loss of power and telephone service due to downed lines within the system can lead to a wide range of problems. Debris can cause damage ranging from minor inconvenience to major transportation problems. The resulting "building rush" following a major event can lead to material shortages and price increases.

8. Overall Summary of Vulnerability and Impacts

Texas, located in "Tornado Alley", is hit by more tornadoes each year than any other state. Between the years 1991 to 2010 Texas averaged 156 tornadoes per year, the majority occurring between March and June in the afternoon hours. A tornado can generate winds exceeding 300 mph making all critical facilities and structures vulnerable. The path width of a tornado is generally less than a one half-mile, but path length can vary from a few hundred yards to dozens of miles. Therefore the impact of human life and property can be substantial. In the last 53 years Fannin County has experienced tornadoes of various intensities, with eight tornadoes rated as an F2 and two rated as F3 on the Fajita scale.

Statewide between 1950 and 1995 nearly $2 billion dollars in tornado damages, over 7,500 injuries, and 478 deaths were caused by tornados. This calculates out to about $4 per person per year in tornado damages, a risk of one in 66,712 of an injury, and one in 1,054,267 of sustaining a fatal injury from a tornado in any given year.

Table 8: Summary

Jurisdiction	Potential Severity of Impact	Probability of Future Events	Risk
Bailey	Substantial	Highly Likely	High
Bonham	Substantial	Highly Likely	High
Dodd City	Substantial	Highly Likely	High
Dodd City ISD	Substantial	Highly Likely	High
Ector	Substantial	Highly Likely	High
Ector ISD	Substantial	Highly Likely	High
Fannindel ISD	Substantial	Highly Likely	High
Honey Grove	Substantial	Highly Likely	High
Honey Grove ISD	Substantial	Highly Likely	High
Ladonia	Substantial	Highly Likely	High
Leonard	Substantial	Highly Likely	High
Leonard ISD	Substantial	Highly Likely	High
Ravenna	Substantial	Highly Likely	High
Sam Rayburn ISD	Substantial	Highly Likely	High
Savoy	Substantial	Highly Likely	High
Savoy ISD	Substantial	Highly Likely	High
Trenton	Substantial	Highly Likely	High
Trenton ISD	Substantial	Highly Likely	High
Windom	Substantial	Highly Likely	High
Rural Areas	Substantial	Highly Likely	High

HAZARD PROFILE WORKSHEET

HAZARD: Tornado

POTENTIAL SEVERITY OF IMPACT:

Substantial X	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Most common in Spring but can occur at any time

SOURCE DOCUMENTS:

NOAA, Local Media, Texas Hazard Mitigation Plan, and local newspaper articles

DATA LIMITATIONS:

Limitations in quantifying long term economic losses.

PROBABLE DURATION & WARNING TIME

Duration is less than 6 hours with a warning time of less than 6 hours.

CASCADING POTENTIAL:

Power and Communication failures, destroyed infrastructure, gas leaks from damaged lines, and displaced homeowners

EXISTING WARNING SYSTEMS:

Local weather forecasts broadcasted via the media, internet weather sites, and storm warning sirens

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

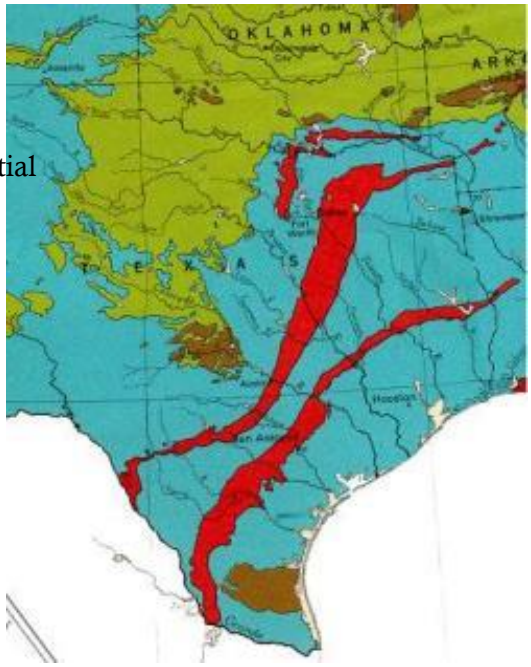
Emergency phone alerting is available for entire county on landline and mobile phones
100+ residential storm shelters have been installed
Additional storm warning sirens and upgrades to some of the existing sirens
Increased use of social media for all types of hazard information
Increase number of CERT volunteers trained and ready for emergency response

Abundance of clay in soils, extremely high swelling potential

Frequent clay in soils, high swelling potential

Some clay in soils, moderate swelling potential

Little to no clay in soils, little to no swelling potential



Source: www.geology.com

HAZARD PROFILE: Section Seven - Expansive Soils

Expansive Soils – Soils that tend to swell or shrink based on moisture.

1. Description

Expansive soils are soils with a relatively high percentage of clay minerals that are subject to changes in volume as they swell and shrink with changing moisture conditions. As the soils swell pressure is exerted on structures. When the soil dries out the soil shrinks and support for the structure can be displaced. These changes can impact the integrity of structures built on or within the surface of such soils.

2. Location

The entire county is susceptible to "high" to "extremely high" soil swelling. The map above shows the abundance of clay in the region and is based upon "*Swelling Clays Map of the Continuous United States"* by W. Olive, A. Chleborad, C. Frahme, J. Shlocker, R. Schneider and R. Schuster.

3. Impact/Extent

The most extensive damage from expansive soils can occur to bridges, highways and streets. Homes, buildings and other structures can have extensive damage resulting in sticking doors, uneven floors and cracks in the foundation, floors, walls, and ceilings. The greatest damage occurs when structures are constructed when clays are dry (such as during a drought) and then subsequent soaking rains swell the clay. Damage can become so severe that the cost of repair can exceed the value of the building.

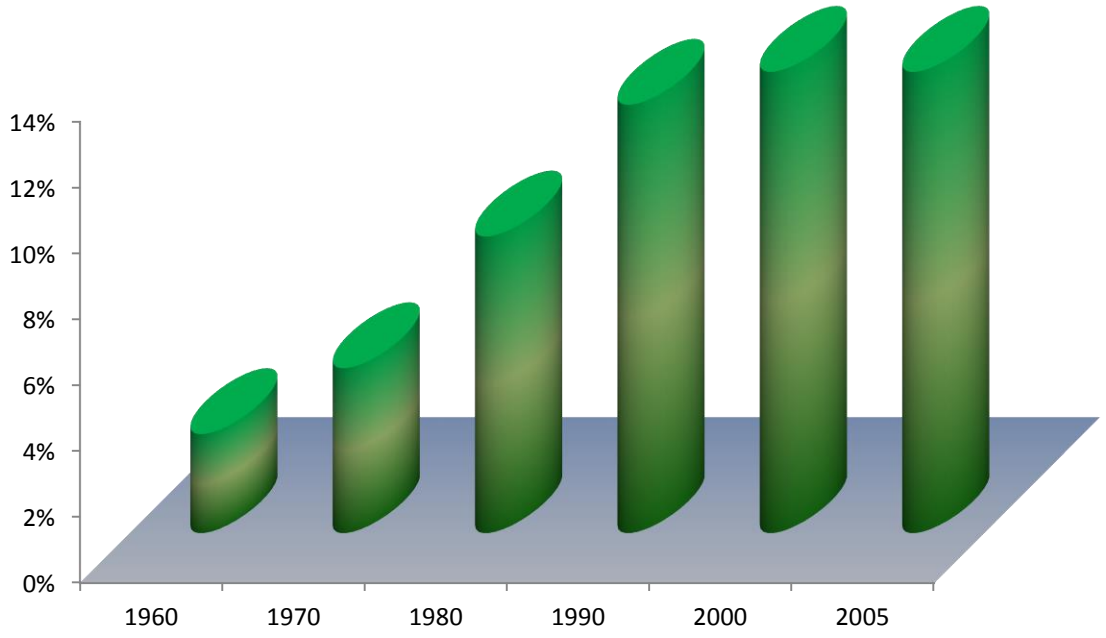
Both public and private structures can develop extreme foundation problems during times of shrink-swell events. The most common signs of damage are cracks in foundations, brick exteriors, drywall interiors, sidewalks and other concrete structures within the building.

Sewer and water lines are also affected by shrink swell soils. The action of the movement of the soils can snap water and sewer lines, producing a minimum of area discomfort, and a maximum of a serious health and welfare risk.

4. Previous Occurrences

Since this hazard develops gradually and seldom presents a threat to life, problems may not be recognized as being related to expansive soils or may be considered only nuisances and therefore never repaired or reported. No records of specific incidences of structure loss due to expansive soils in Fannin County were found.

Chart 4: Texas Insurance Claims Involving Foundations



Source: Texas Department of Insurance (TDI)

5. Probability of Future Events

Since no records of specific incidences of loss associated with expansive soils were found and no specific areas of expansive soils were identified within the county, Probability of Future Events cannot be determined at this time. However, according to public opinion, the probability of future events of loss due to expansive soils within the county is possible but unlikely.

6. Vulnerability

The effects of expansive soils are most prevalent when periods of moderate to high precipitation are followed by drought and then again by periods of rainfall. Other cases of damage result from increases in moisture volume from such sources as broken or leaking water and sewer lines. Dry clays are capable of absorbing water and will increase in volume in an amount proportional to the amount of water absorbed. Areas capable of these changes in soil volume present a hazard to buildings, slabs, concrete, asphalt and other structures built over them and to the pipelines buried in them. Houses and one-story commercial buildings are more apt to be damaged by the expansion of swelling clays than are multi-story buildings, which are usually heavy enough to counter swelling pressures. However, if constructed on wet clay, multi-story buildings may also be damaged by clay shrinkage when moisture levels are substantially reduced.

7. Secondary Hazards

Depending on the use of the pipeline, contamination of soils and groundwater could occur should buried pipelines become damaged by expansive soils.

8. Overall Summary of Vulnerability and Impacts

Changes in soil volume present a hazard primarily to structures built on top of expansive soils. Damages occur as clay moisture content expands or shrinks the soil volume causing different parts of the structure to move at different rates and distances. Houses and one-story commercial buildings are more apt to be damaged since they are usually not heavy enough to counter swelling pressures. However, multi-story buildings may be damaged by clay shrinkage when moisture levels are substantially reduced.

The local economy can feel the impacts if the expansive soils cause mass foundation issues within a community or jurisdictions. These issues can lower the values of homes which would reduce tax flow to the local governments and education systems. The issues could also discourage the settling of new residents and even businesses in the area.

There are no records of specific incidences of loss within the County due to expansive soils. For large areas of the U.S., little information is reported other than field observations of the physical characteristics of clay. As a result, fixed criteria for determining the swelling potential have not been devised.

Table 8: Summary*

Jurisdiction	Potential Severity of Impact	Probability of Future Events	Risk
Dodd City	Limited	Unlikely	Low
Dodd City ISD	Limited	Unlikely	Low
Ector	Limited	Unlikely	Low
Ector ISD	Limited	Unlikely	Low
Honey Grove ISD	Limited	Unlikely	Low
Ladonia	Limited	Unlikely	Low
Leonard	Limited	Unlikely	Low
Leonard ISD	Limited	Unlikely	Low
Ravenna	Limited	Unlikely	Low
Sam Rayburn ISD	Limited	Unlikely	Low
Trenton	Limited	Unlikely	Low
Windom	Limited	Unlikely	Low
Rural Areas	Limited	Unlikely	Low

**Only jurisdictions that identified Expansive Soils as a hazard are listed.*

HAZARD PROFILE WORKSHEET

HAZARD: Expansive Soils

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited X	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
❑ Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. X Unlikely: Event possible in next 10 years.	Most likely in Summer or Winter but can occur at any time

SOURCE DOCUMENTS:

www.geology.com, State mitigation plan, and the Texas Department of Insurance, Soil Survey of Fannin County

DATA LIMITATIONS:

Limitations in reported losses and in quantifying long term economic losses.

PROBABLE DURATION & WARNING TIME

Varies from a days to years dependent on weather.
Damage is often gradual and continual therefor warning time in constant and ongoing.

CASCADING POTENTIAL:

Could cause old pipes to suddenly bust

EXISTING WARNING SYSTEMS:

Structure and facility inspections can alert of possible problems

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Community Education on methods to damage to homes by expansive soils

HAZARD PROFILE: Section Eight - Flooding

1. Description

Flooding is the most prevalent and costly disaster in the United States. Floods have the ability to roll boulders the size of cars, uproot trees, and transport building. Floods occur any time and are typically the result of dam failures, rains, or melting snows exceeding the absorptive capacity of the soil and the flow capacity of rivers, streams or coastal areas. At the point the water concentration hyper extends the capacity of the flood way, the water enters the floodplain. Floods are most common in seasons of rain and thunderstorms. Floods can be associated with other natural phenomenon such as rainstorms, thunderstorms, hurricanes, earthquakes, tsunamis and rapidly melting snow.

Flooding – The accumulation of water within a water body and the overflow of excess water on adjacent floodplain lands.

Floodplain – the land adjoining the watercourse or water body that is susceptible to flooding.

Flash Flood Watch – Flash flooding is possible. Be prepared to move to higher ground.

Flood Warning – Flooding is occurring or will be occurring soon.

Flash Flood Warning – A flash flood is occurring seek higher ground.

Fannin County is prone to two types of floods:

- Riverine Flood – Occurs in the floodplain of a river or stream when the amount of water and the rate at which the moving increases. This type generally can be forecast in advance, and proper precautions taken to save lives.
- Flash Flood – A type of Riverine flood that occurs after a heavy storm, when the ground cannot absorb the high amount of precipitation. This can occur when heavy precipitation falls on already-saturated soils. Flash Floods occur rapidly with little warning.

2. Location

Flood hazard areas are determined using statistical analyses of records of river flow, previous occurrence information, topographic surveys, and hydrological analyses. FEMA's Flood Insurance Rate Maps (FIRMs) identify areas subject to flood hazard. These include Special Flood Hazard Areas, which is defined as the area that will be inundated by the flood event having a one percent chance of being equaled or exceeded in any given year. The one-percent-annual-chance flood is also referred to as the base flood or 100-year flood. Moderate flood hazard areas are also shown on the FIRM, and are the areas between the limits of the base flood and the two-percent-annual-chance (or 500-year) flood.

Fannin County's terrain consist of rolling prairie and is drained by the Red River on the north and Bois D'Arc Creek rising up in neighboring Grayson County near Whitewright and running northeast over 60 miles to its confluence with the Red River. The drainage for the southeastern corner of the county is provided by the North Sulphur River. Fannin County has limited flood issues due to the lack of development near the floodplain. There has only been three repetitive flood claims in the county and they were all within the city limits of Bonham. The main tributaries of the Bois D'Arc Creek are the Powder Creek and Pig Branch Creek flow run through the more established and older areas of Bonham. These waterways provide the main drainage vessel for runoff collection. When heavy rain events occur in Bonham and west of the city these hardly noticed creeks swell. When they overflow their banks they can disrupt transportation from the southwest of town on Sam Rayburn Drive and south of the downtown area on Hwy 78. With this type of rain events residential structures on the south side Pig Branch Creek experience some water encroachment. This is the area where two of the three repetitive flood claims exist.

Texas Flood Facts

- Central Texas has been identified as the most flash-flood prone area in the U.S. by the National Weather Service.
- Texas holds 6 of 12 world records for rainfall rates in 24 hours or less. – USGS
- Texas leads the nation in the most flood-related deaths.
- 20 million of Texas' 171 million acres are flood-prone (more than any other state). – Blue Ribbon Study
- Texas has approximately 8 million structures located in floodplains. 3 million of these have no flood insurance. – Blue Ribbon Study

The two creeks merge into the Bois D'Arc Creek on the east side of town and flow northeast to the Red River through primarily agricultural areas. Flooding can be a problem along the Bois D'Arc Creek for local farms but the proposed Lower Bois D'Arc Creek Reservoir could alleviate some of this damage.

The North Sulphur River provides drainage for the Ladonia area and is formed about a mile from the Gober residential area running east and southeast until flowing into neighboring Delta County. The current river went through a channelization and straightening to prevent flooding in the late 1920's the result is a channel top with of 16 to 30 feet and a depth of 9 to 12 feet. Due to the shale riverbed some areas have experience extreme eroding and incising with channel depths of 40 feet in some areas. These channels can contain flows in excess of the 100-year flood according to engineers.

Other flooding may also occur in the floodplains surrounding local lakes. Lake Bonham has one repetitive flood structure that has flooded twice in the past 30 years. The City of Bonham has ordinances and restrictions from building in the floodplain to prevent this type of incident in the future. Floods event has also been reported as a transportation problems with road closures required. FM 100, FM 1396, and FM 271 north of Honey Grove, Hwy 11 crossing the Bois' D Arc Creek west of Randolph, FM 2645 west of Ector, and Hwy 78 between Bonham and Bailey are transportation routes that in times of heavy rain may be closed due to high water. The maps provide in section 6 show previous flood locations in comparison to the floodplains.

Over 75% of declared federal disasters are related to floods. - USGS (2007)

3. Impact/Extent

The extent of floods in Fannin County is influenced by several factors including rainfall intensity, duration, and location of the rainfall. Heavy rains cause most of Fannin County's flood problems by causing small creeks and waterways to exceed their banks. Flash floods are the most dangerous since they can occur suddenly with little to no notice. A maximum flood threat could result if the soils were saturated and a wide heavy rain event occurred.

The City of Bonham is the most vulnerable to floods in comparison to the other local jurisdictions. Bonham's terrain is rather flat with two floodplain areas in the city limits. These areas are the Pig Branch and Powder Creek, which are tributaries of the Bois D'Arc Creek. Theses tributaries provide the backbone of the Bonham storm water drainage system but also serve as the source of flood waters in flash floods. Bonham also experiences more flooding events than other jurisdictions due to amount of paved areas in the city. These paved areas block water absorption and promote runoff. In times of heavy downpours the drainage system is inundated with too much water. The City of Bonham is working diligently to address current and future storm drainage issues.

The City of Leonard, Honey Grove, & Trenton are also affected by flood. Heavy rain events overwhelm the storm drainage system allowing for the overflow to turn streets into streams. The City of Leonard is currently working on a major drainage project with plans for others in the near future. Other jurisdictions experience the same type of flooding but due to the smaller population density, more open spaces, and less pavement the effects are usually limited.

4. Previous Occurrences

According to *"American Hazardscapes: The regionalization of Hazards & disaster published by the National Academy Press"*, Texas because of its size and location consistently outranks other states in deaths and damages from floods. Recent flooding occurred around Bois D'Arc Creek and its tributaries in October 1981, May 1989, and January 1998. The most significant flooding on record occurred in 1989 when flood rescue operations for a number of Bonham residents took place. The Bonham floodplain administrator indicated that at least 100 homes were flooded by the event. In addition, flooding from Bois D'Arc Creek damaged properties, agricultural crops and equipment throughout the county.

Repetitive Loss Property – is a property which has had two or more NFIP losses of at least 1K in a 10 year period.

Severe Repetitive Loss Property (SRL) – a property which has had at least four claims exceeding a cumulative total of 20K or had two separate claims that cumulatively exceed the market value of the structure. (Fannin County does not currently have any SRL properties.)

Table 4: Repetitive Flood Loss Properties

Structure	Date & Damage	Mitigation Cost	Mitigation Action
Residential near Lake Bonham	05/15/2005 - $7,046	$3,950.93	No information as to any action was found.
Commercial structure in south Bonham	10/19/1993 - $6,162	$1,965.92	The creek channel that caused the flooding was dredged and widened.
Residential structure in south Bonham	10/16/1981 - $1,270	$2,940.35	

Source: Texas State Mitigation Office

Table 4b: Past Flood Events 1996-2012

Location	Date	Type	Property Damage
Honey Grove	6/12/1996	Flash Flood	
Bonham	11/7/1996	Flash Flood	
Honey Grove	2/20/1997	Flash Flood	
Bonham	4/4/1997	Flash Flood	
Ivanhoe	12/20/1997	Flash Flood	
Bonham	12/20/1997	Flash Flood	$50K
Bonham	12/21/1997	Flash Flood	$25K
Bonham	1/4/1998	Flash Flood	
Bonham	1/4/1998	Flash Flood	
Bonham	6/8/1999	Flash Flood	
Fannin	5/27/2000	Flash Flood	
Honey Grove	12/26/2000	Flash Flood	
Countywide	2/27/2001	Flash Flood	
Bonham	2/28/2001	Flash Flood	
Fannin	3/19/2002	Flash Flood	
Dodd City	8/27/2002	Flash Flood	$5K
Bonham	1/2/2005	Flash Flood	$25K
Countywide	1/3/2005	Flash Flood	$100K
Leonard	4/5/2005	Flash Flood	$25K
Fannin	4/5/2005	Flood	
Trenton	3/19/2006	Flash Flood	
Leonard	8/27/2006	Flood	
Randolph	9/17/2006	Flood	
Bailey	4/24/2007	Flash Flood	
Bonham	5/30/2007	Flash Flood	
Bonham	6/20/2007	Flash Flood	
Fannin	6/28/2007	Flash Flood	$200K
Trenton	7/10/2007	Flash Flood	
Bonham	7/30/2007	Flash Flood	$40K
Bonham	7/31/2007	Flash Flood	
Trenton	3/18/2008	Flash Flood	$40K
Honey Grove	6/14/2008	Flash Flood	
Trenton	4/29/2009	Flash Flood	

Location	Date	Type	Property Damage
Trenton	10/6/2009	Flash Flood	$15K
Bonham	10/9/2009	Flood	
Honey Grove	10/25/2009	Flash Flood	
Bailey	5/14/2010	Flash Flood	
Bonham	5/14/2010	Flood	
Ladonia	5/14/2010	Flash flood	
Lamasco	4/25/2011	Flash Flood	
Bonham	5/20/2011	Flood	
Telephone	5/20/2011	Flash Flood	
Bonham	2/3/2012	Flash Flood	
Mulberry	3/19/2012	Flash Flood	

Source: www.ncdc.noaa.gov

5. Probability of Future Events

Fannin County receives abundant rainfall mainly in the spring and fall. Consequently, rivers and creeks overflow their banks during these seasons. NOAA has documented 40 notable flood events specifically for the Fannin County from 1996 to 2012. This gives an average of 2.2 large floods occurring in Fannin County each year. Many of these floods are of small consequence; however, the number of major floods in the last 100 years warrants a highly likely probability rating.

Halff Associates has updated the Fannin County Floodplain since the previous mitigation plan in 2009. Another update will be warranted as construction on the two planned lakes begins: Lower Bois D'Arc Lake and Lake Ralph Hall.

6. Vulnerability

Any structure or property that is located in a floodplain is vulnerable to flooding. A property's vulnerability to a flood depends on its location in the floodplain. The properties that lie along the banks of a waterway are the most vulnerable and are often repetitive loss structures. Fannin County has no repetitive loss structures but does have roads and bridges that are located in these flood areas. Honey Grove has one structure that has received floods on more than one occasion but the flooding did limited damage. This property is used as a rental property and is vacant often.

The property within the floodplain is broken into zones depending on its distance from the waterway. The 10-year flood zone is an area that has 10% chance of flood every year. Encompassing the 10-year flood zone and extending further out from the waterway is the 50-year floodplain. This area has a 2% chance of flooding each year. Encompassing both the 10-year and 50-year and extending further away is the 100-year flood zone. This area has a 1% chance of occurring in any given year. Many people fall victim in the 100-year flood zone because of the thought that it would only occur once every 100 years but in reality may happen more often.

Flooding vulnerability in Fannin County is primarily in the floodplain however; the City of Bonham has increase vulnerability in areas not located in the floodplain. This vulnerability is due to recent development. Development and growth of a city enhances the threat of flooding where drainage systems cannot cope with the increased storm runoff.

Fannin County does have a secondary risk from dams flooding. There are four dams in the county that have the potential to causes major flooding damages if they are breeched. The areas that are vulnerable to this type of flooding are identified in Section Twelve.

Table 6a: Structures Located in the Fannin County Floodplain*

Location	Description
Lake Bonham	Approximately 60 residential structures (2,000 sq. ft. Custom Homes HAZUS Replacement Cost of $108.5 per sq. ft. = $217K each) = $13M Approximately 3 businesses (2,500 sq. ft. HAZUS Recreation/Restaurant Replacement Cost of $162.8 per sq. ft. =$407K each) = $1.7M
City of Bonham	Approximately 40 residential structures (County average home value of $80K each) = $3.2M Approximately 3 businesses (15,000 sq. ft. HAZUS Warehouse Cost of $70.5 per sq. ft. =$1M each) = $3M
Other areas	Less than 50 residential structures (County average home value of $80K each) < $4M

** These are estimates based on available, HAZUS, THUMP, FIRMS, & Aerial Photography*

Table 6b: Flood Zone Designations

Zone	Description
A (High Risk)	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown.
AE, A1-A30 (High Risk)	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown at selected intervals.
AH (High Risk)	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals.
AO (High Risk)	River or stream flood hazard areas and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown.
AR (High Risk)	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system. Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99 (High Risk)	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown.
B, C, and X (Moderate to Low Risk)	Areas outside the 1% annual chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. Insurance purchase is not required in these zones.
D (Undetermined Risk)	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted.

Figure 6a: Fannin County Flood Zones- Countywide Flood Areas

The Bois D'Arc Creek throughout the county is known for its ability to disrupt transportation in heavy rain events. Heavy rain events can cause road and bridge washouts and the need for swift water rescues.

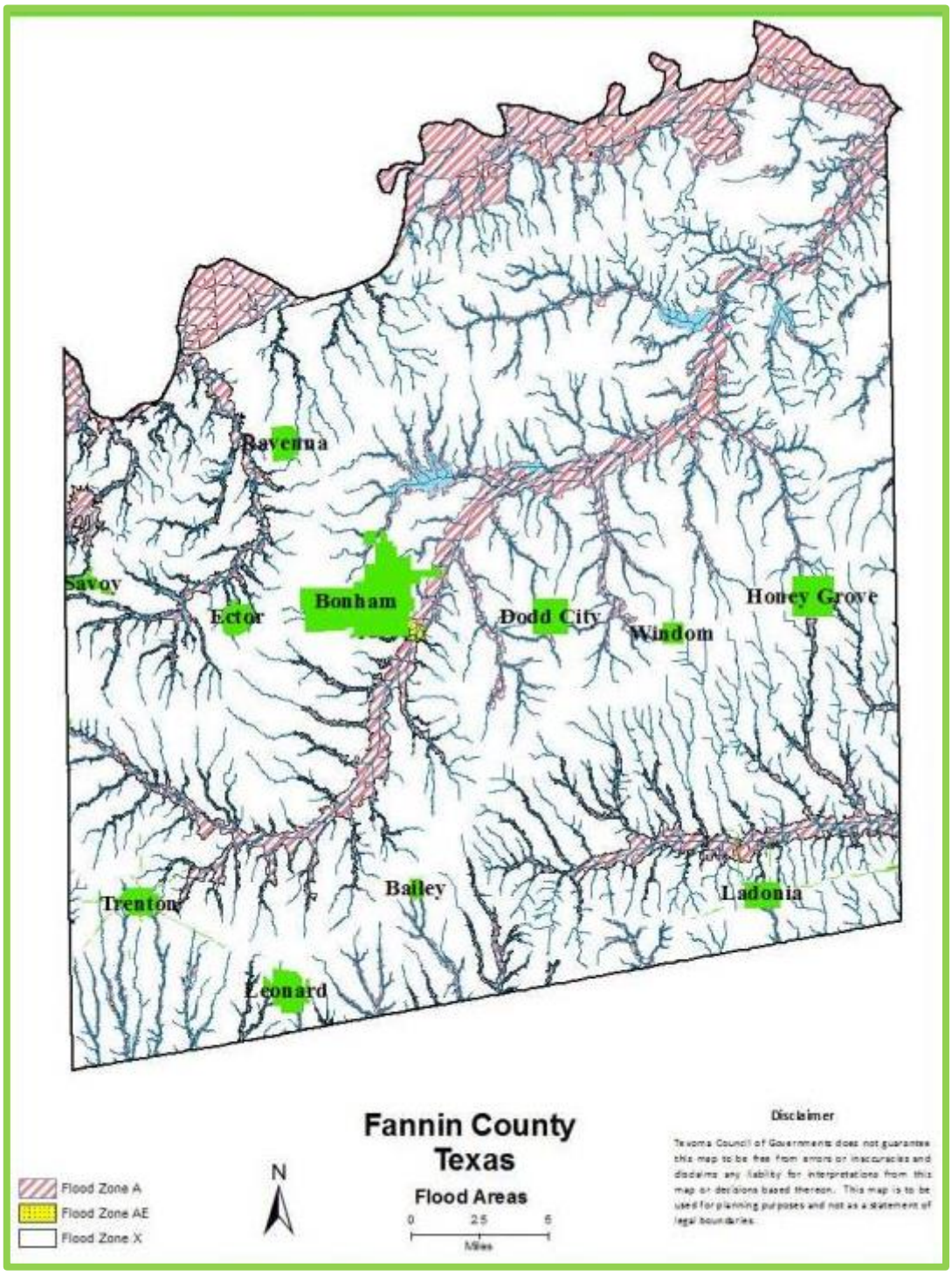


Figure 6b: Fannin County Flood Zones- Lake Bonham Area

Approximately 125 homes, 2 businesses, 2 Repetitive Flood Loss Properties and numerous boathouses occupy the floodplain area around Lake Bonham.

Figure 6c: Fannin County Flood Zones- City of Bonham

Approximately 35 homes, 5 businesses, and portions of two school campuses are located in the floodplain that is located within the Bonham City Limits. The businesses located in the flood area include 2 warehouses, an equipment rental business, an antique store, and part of an auto dealer lot.

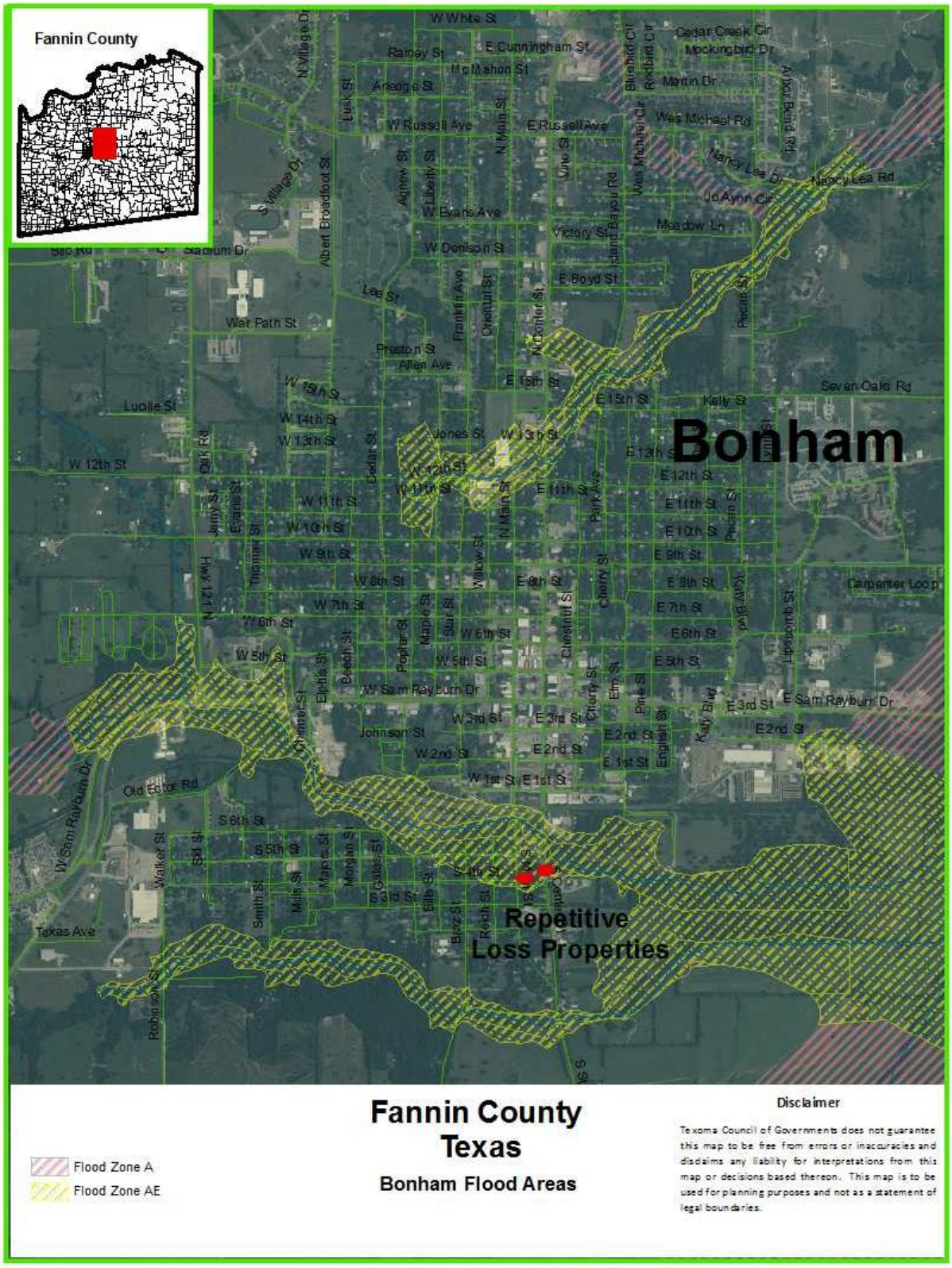


Figure 6d: Fannin County Flood Zones- Honey Grove Area

Transportation issues occur in the Honey Grove area on FM 271 north of town. This road experiences closures in heavy rain events. The Honey Grove School campus is within the city limits is not located near a high risk flood area.

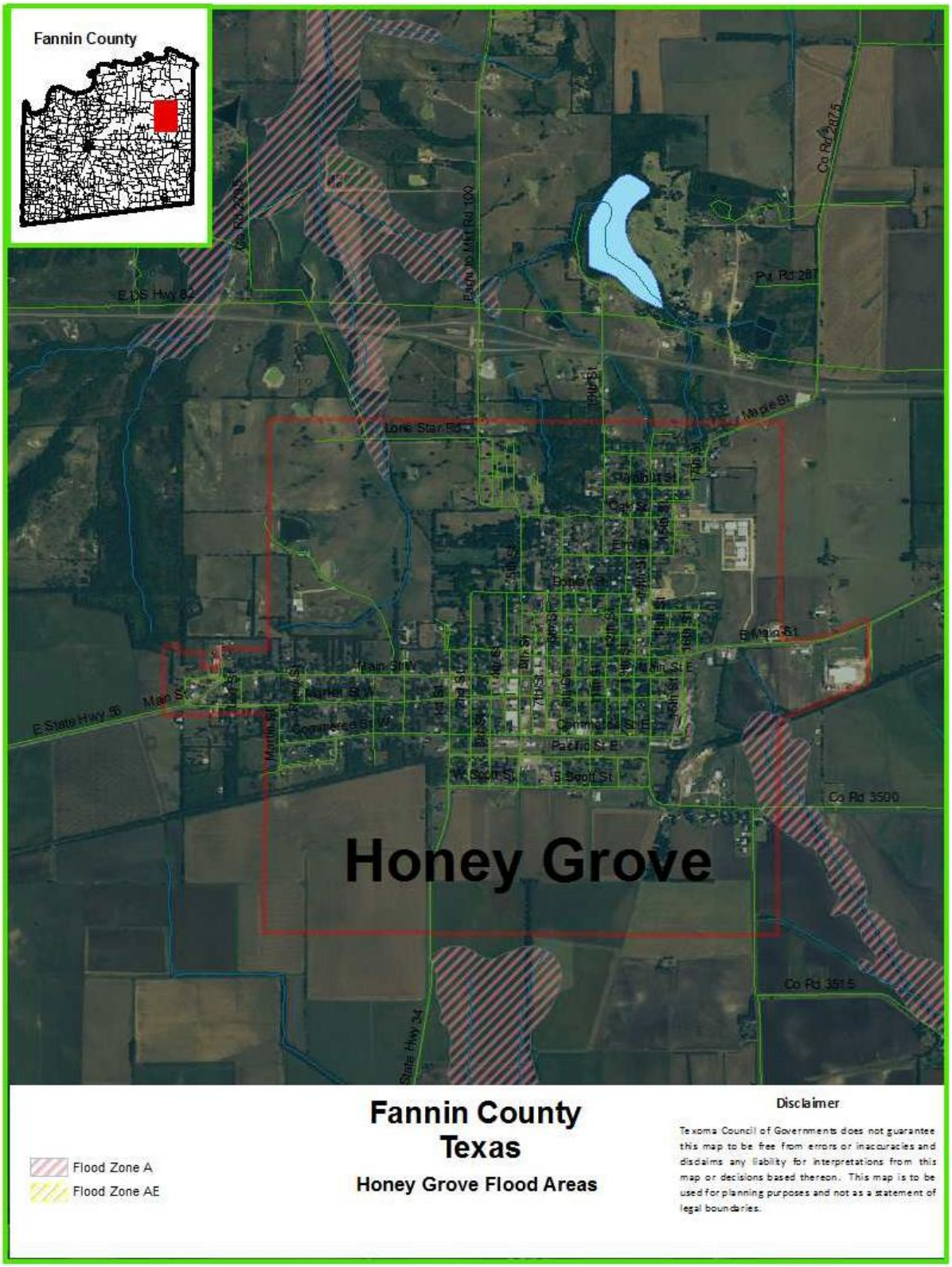


Figure 6e: Fannin County Flood Zones- Leonard Area

State Hwy 78 experiences some flooding issues with the low passage below the railroad overpass. The Leonard School campus is within the city limits is not located near a high risk flood area.

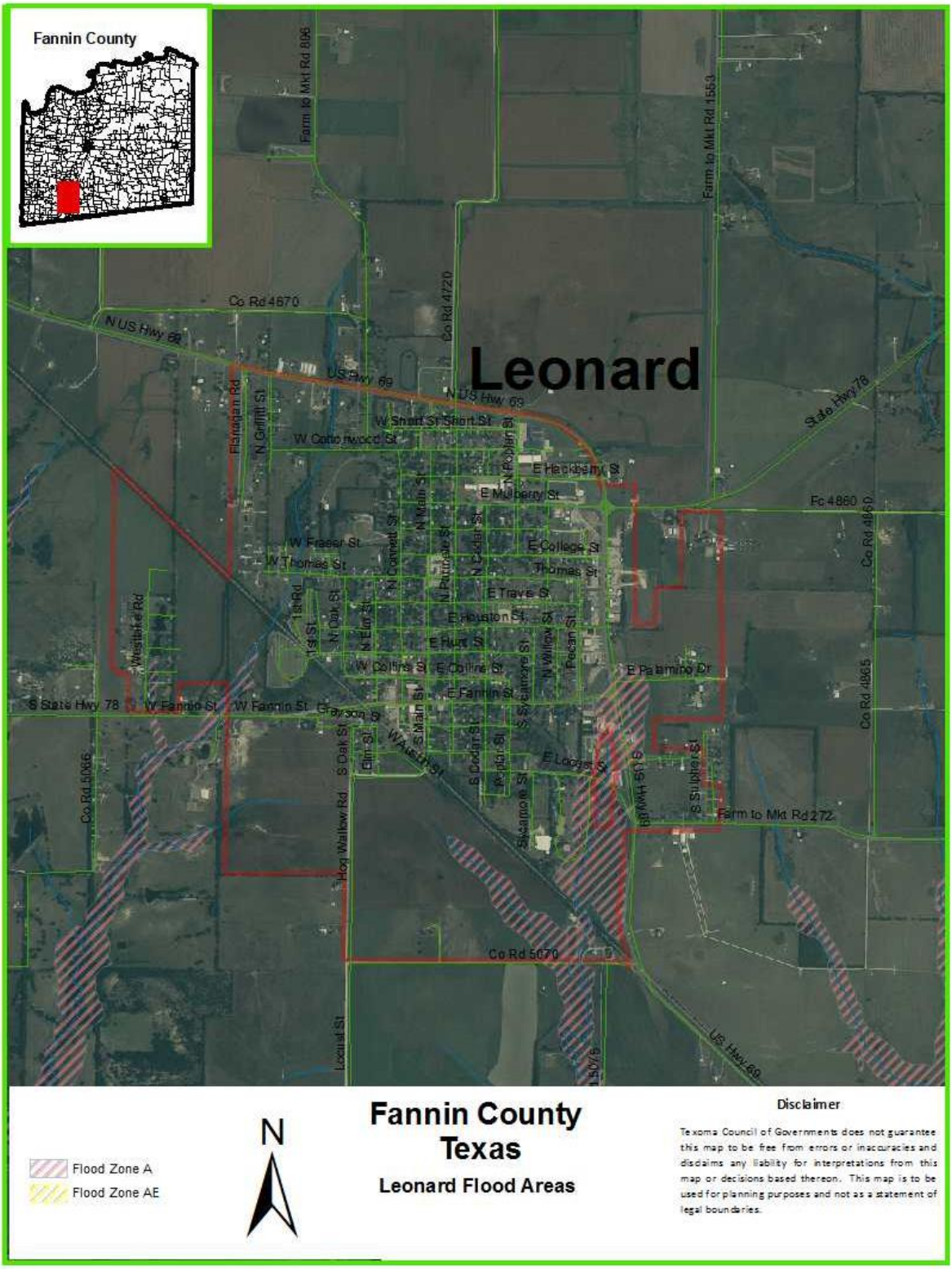
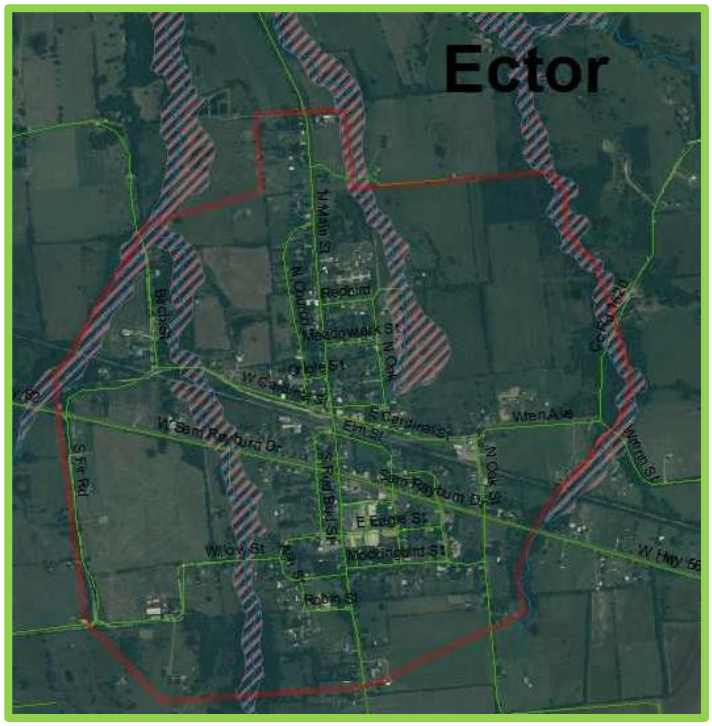


Figure 6f: Fannin County Flood Zones- Ravenna, Ector, and Ladonia Areas

Flooding in these areas is very limited. FM 2645 west of Ector has a history of occasional flooding. Fannindel ISD is located within the city limits of Ladonia and has facilities located near the flood zone. The school has had no past history of flooding and the campuses are at higher elevations then the nearby flood zone.



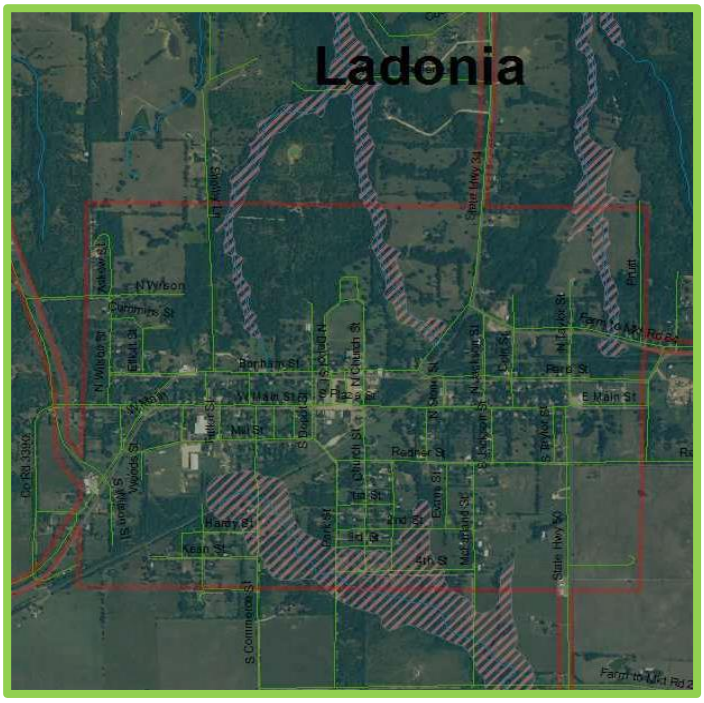


Figure 6g: Fannin County Flood Zones- Savoy and Trenton Areas

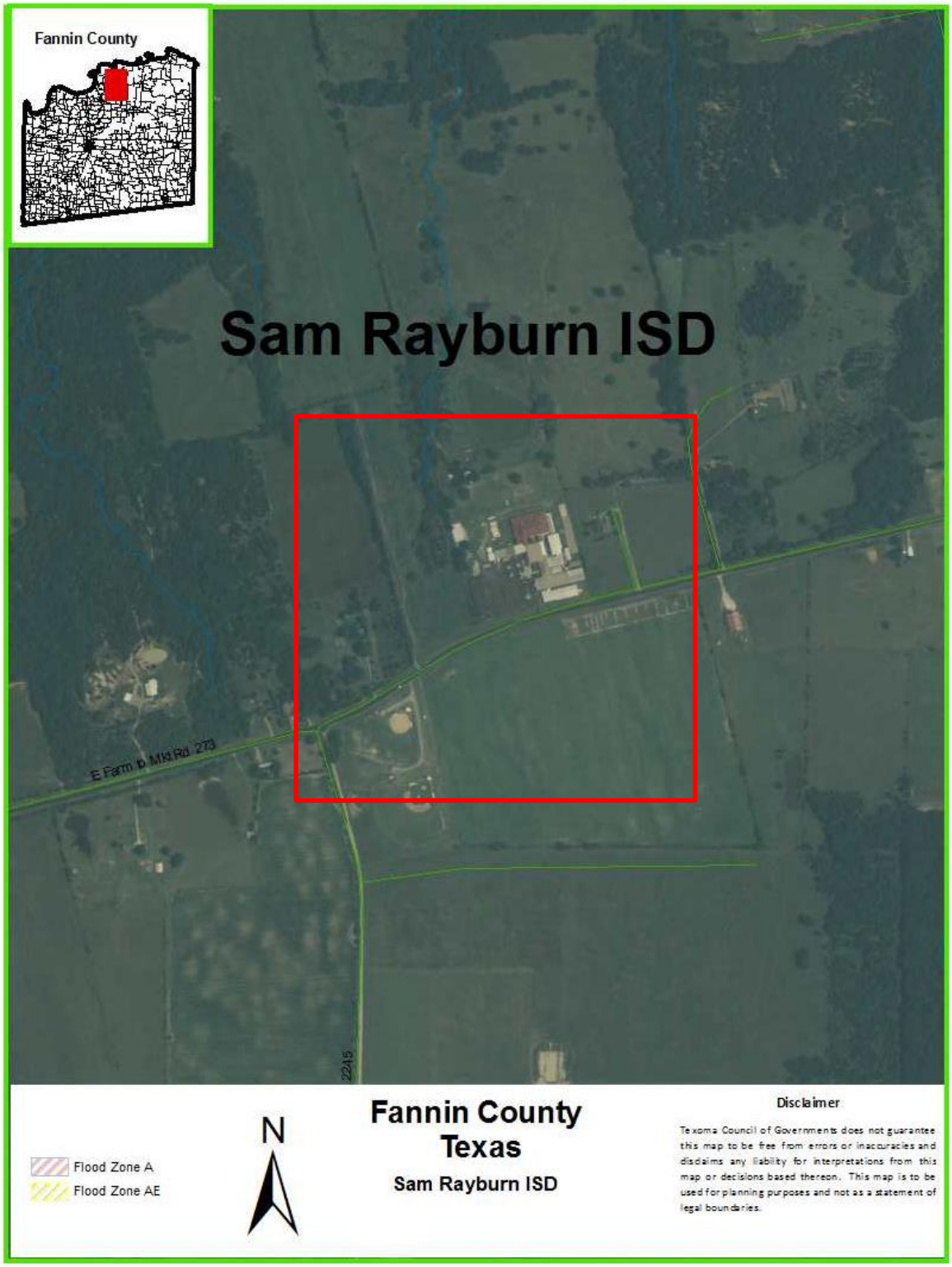
Trenton & Savoy have limited flood damage history. Flooding in these areas would be from flash floods that generated massive runoff quickly. The Savoy and Trenton School campuses are within the city limits are not located near high risk flood zones.

Figure 6h: Fannin County Flood Zones- Bailey, Dodd City, and Windom

Bailey experiences some disrupted transportation on Hwy 78 & Hwy 11 in heavy rain events. Dodd City & Windom are located at higher elevations than most of the communities in the county therefore limiting flooding.

Figure 6i: Fannin County Flood Zones- Sam Rayburn ISD

Sam Rayburn ISD is the only ISD that is not within a city limits but in a rural county areas. Sam Rayburn does not experience flooding issues and does not have any facilities located near a flood areas.



7. Secondary Hazards

Fannin County drains to the northeast into the Red River. Upstream flooding can have significant impact on the water quality, flood control, wildlife habitats, recreational opportunities, and other functions that are essential for maintaining the quality of life and economic prosperity through a large section of Texas. Secondary hazards include transportation disruptions, dam failure, and dispersion of contaminants and threatened water supplies not just to the immediate area but throughout the river basin that reaches to the Bay of Galveston. Hazardous materials and other possible sources of contaminants are not identified in the area, but may need to be addressed in updates to this plan as Fannin County becomes more populated.

The National Flood Insurance Program (NFIP) is a federal program that enables property owners to purchase flood insurance as protection against flood losses in exchange for state and community floodplain management regulation to reduce future flood damages.

Fannin County's floodplains and storm drainage areas have been modified over time by agricultural practices, mitigation projects, development, and erosion. The riparian corridor along waterways has been severely reduced and floodplain wetlands converted to farmland. The loss of stream bank vegetation has increases the county to a secondary hazard of erosion.

The fall of the local economy can be felt as a secondary hazard of floods. Local businesses often do not reopen after being destroyed by a flood. Residents whose homes were flooded may relocate to different communities to make a fresh start. The cost of the damages to property most affects the local economy. Most homeowner insurance policies do not cover floods; hence an additional flood policy is needed for coverage. Fannin County, Bailey, Bonham, Honey Grove, Ector, Ladonia, Leonard, Savoy, Trenton, and Windom are participants in the National Flood Insurance Plan Program (NFIP). Their participation in this program allows the residents the option to purchase a flood insurance policy.

Nine of the twelve jurisdictions in Fannin County participate in the NFIP. Those not participating in the NFIP are Dodd City, Ravenna, and Windom. These do not participate currently due to the current flood information not identifying them as a Special Flood Hazard Area (SFHA) and no available FIRMs for the area.

Table 7a: Why You Need Flood Insurance

Why You Need Flood Insurance	
Floods and flash floods can occur anytime, anywhere.	• Floods happen in all 50 states: on coasts, along rivers, in the desert, in communities of every size. • Roughly 30% of all flood insurance claims came from areas not considered high risk.
You can't rely on Federal Disaster Assistance alone.	• Many people don't qualify for grants, making the most common form of assistance a disaster home loan. • These loans must be repaid: principal plus interest.
You may be required to have Flood Insurance.	• Homes & buildings in high-risk flood areas with mortgages from federally regulated or insured lenders are required to have flood insurance. These areas have a 1% or greater chance of flooding in any given year, which is equivalent to a 26% chance of flooding during a 30-year mortgage. • When property owners receive federal financial assistance following a presidentially declared disaster, they may be required to purchase flood insurance coverage.

Table 7b: National Flood Insurance Program (NFIP) Communities in Fannin County

Entity	Current Map Date	Sanction Date	# of Current Policies	Current Insured Amount	# of Policies 5 years ago	Insured Amount 5 years ago
Fannin County	2/18/11	1/04/05	98	$13M+	31	$5.6M +
Bailey	2/18/11 (M)	7/01/92	0	0	1	$42K +
Bonham	2/18/11	2/01/88	49	$8M+	10	$970K +
Ector	2/18/11 (M)	10/1/2007	1	$179K+	0	0
Honey Grove	2/18/11 (M)	11/7/2007	0	0	0	0
Ladonia	2/18/11 (M)	2/11/09	0	0	0	0
Leonard	2/18/11 (M)	8/26/77	2	$208K+	0	0
Savoy	No Special Flood Hazard Zone	6/19/85	0	0	0	0
Trenton	2/18/11(M))	9/02/88	6	$1M+	9	$954K +
Windom	2/18/11(M))		0	0	0	0

(M) – No elevation determined, all zones A, C, & X
Source: NFIP (updated 3/31/2014)

8. Overall Summary of Vulnerability and Impacts

Spring and fall rains can result in a rise in the County's rivers and creeks resulting in floods that vary in intensity. Severity of flooding is determined by several factors including rainfall intensity, duration, and location. Flash floods are most likely to close roads and cause evacuations in Bonham, where rain can fall faster than the drainage system can handle.

With over 20 significant flood events in the past 10 years it is obvious that Fannin County is vulnerable to flooding events. Dollar amounts are often unavailable due to most flooding events occurring in rural agriculture areas and going unreported. These numbers are difficult to calculate due to the difficulty in placing a dollar amount on the agricultural loss such as failed or low-yield crops, erosion, and the leaching of the soil of valuable minerals and nutrients.

With the addition of two lakes in the county the vulnerability of flooding will change. Areas that were once considered high land may become susceptible to 10-year and 50-year floods. Fannin County DFIRMS were created in 2011 but most of these maps will be outdated within the next five due to the construction beginning on the lakes in the next year or two. Maps of the two planned lakes are located in Appendix B.

Table 8: Summary*

Community	Potential Severity of Impact	Probability of Future Events	Risk	Difference Justifications
Bailey	Limited	Highly Likely	Low	Mostly transportation issues.
Bonham	Major	Highly Likely	High	Large floodplain areas in city limits.
Dodd City	Major	Highly Likely	Medium	Flood area on bus routes.
Dodd City ISD	Minor	Likely	Medium	
Ector	Minor	Highly Likely	Medium	Floodplains in city.
Ector ISD	Limited	Unlikely	Low	
Fannindel ISD	Minor	Likely	Low	Floodplain area near school.
Honey Grove	Major	Likely	High	Floodplain area to the north of city.
Honey Grove	Limited	Unlikely	Low	
Ladonia	Limited	Likely	Low	Drainage waterway located in a deep channel.
Leonard	Major	Highly Likely	High	Low bridge areas that floods and southeast portion of town in floodplain.
Leonard ISD	Limited	Unlikely	Low	No floodplain near school.
Ravenna	Limited	Unlikely	Low	
Sam Rayburn	Limited	Unlikely	Low	Higher elevation.
Savoy	Limited	Unlikely	Low	
Savoy ISD	Limited	Unlikely	Low	
Trenton	Limited	Highly Likely	Low	Several low areas within the city.
Windom	Limited	Unlikely	Low	Higher elevation.
Rural Areas	Major	Highly Likely	High	

**Only jurisdictions that identified Flooding as a hazard are listed.*

NEWS 12 FOX foxtexoma.com

Woman rescued in high flood waters in Fannin Co.

By: KXII Staff Email
Updated: Thu 12:52 PM, Jan 26, 2012

FANNIN COUNTY, TX - Rising flood waters trapped a woman in her car in Fannin County Wednesday afternoon.

The Fannin County Sheriff's Office says she drove into what she thought was a few inches water on County Road 2630. They say her car stalled, and she couldn't get her doors open panicked and called 911. A Bonham Fire Department rescue team rescued her, but authorities say they had a tough time getting to her because of all the high water in the area.
Brad Hammit owns a ranch on 2630. He says that when it rains as much as it has been, road conditions in the area can get pretty treacherous.

"When it rains there's a lot of water that's carried through this county and down this creek bottom down to the Bois D'arc and all that," said Hammit, "so it's pretty treacherous sometimes. "

No one was hurt during the rescue.

HAZARD PROFILE WORKSHEET

HAZARD: Floods

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major X	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	Most likely in April to June but can occur at any time

SOURCE DOCUMENTS:

FIRMS, Texas Geographic Society Studies, www.thmp.info, NJDEP, USGS, NRCS, NOAA, The Blue Ribbon Study, CBO: Value of Properties in the NFIP, State of Texas Hazard Mitigation Plan

DATA LIMITATIONS:

Limitations in quantifying long term economic losses

PROBABLE DURATION & WARNING TIME

Flood can last from a few hours up to several months depending upon weather patterns
Warning time can vary from several days to a couple of hours

CASCADING POTENTIAL:

Runoff can contaminate water supplies throughout the drainage basin, standing water can cause illnesses, water damage to structures can cause mold, and increased need of shelters for those driven away from their homes

EXISTING WARNING SYSTEMS:

USGS monitors stream flows, NOAA weather alerts, and local media weather reports.

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Additional communities participating in NFIP program
No new construction in major flood areas
County has received zoning authority from state legislature around one of the planned lakes
Although floodplains have grown the number of residential structures in the City of Bonham located in the floodplain have decreased

HAZARD PROFILE: Section Nine - Wildfire

1. Description

The normal Texas climate is characterized by periods of above and below normal rainfall. The periods of plentiful rains allows for increased vegetation growth. While the periods of below normal rains allow this vegetation to dry and provide ample fuel for wildfires. This was the situation leading up to the series of destructive wildfires in 2011. Over 31,000 fires burned over 4 million acres, destroyed approximately 3,000 homes, caused 6 fatalities, and caused over $510 million in immediate damages. The agricultural loss to the Texas economy is expected to be in the billions.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the air for miles around. Wildfires pose a great threat to life and property, particular as they move from forest or rangeland into Wildland Urban Interface or Intermix areas. The Interface and Intermix are the areas where human development meets or intermingles with undeveloped wildland or vegetation. More and more residents want their home in a woodland setting, not realizing that they are putting themselves under a real threat of wildfire.

2. Location

Wild fires can occur throughout Texas and Fannin County due to the combination of dry burnable ground cover and lightning storms. There is a higher risk of fatalities in the Interface or Intermix areas as shown in Figure 2. Areas such as Bonham are not as threatened as are areas located in the northern parts of the county. The City of Ravenna and the area near the Bois D'Arc Creek are at greatest risk due to the vegetation content, population location, and the fact the community does not have a full time fire department to mitigate and protect these areas around the clock.

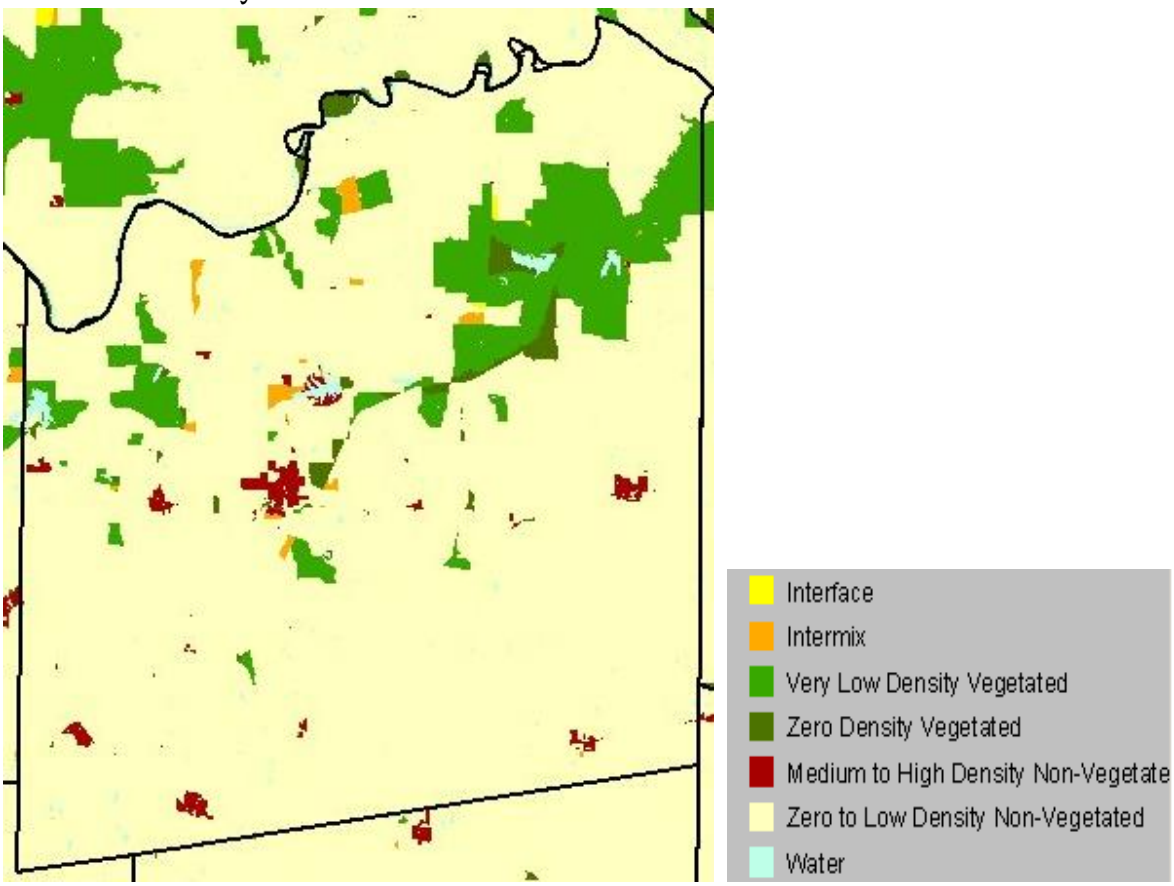
Wildfires can be classified as one of three key types:

Surface Fires – most common and slowly move along forest floor.

Ground Fires – usually result from lightning strikes and they burn on or below the ground.

Crown Fires – spread quickly from tree top to tree top by wind.

Figure 2a: Fannin County Interface and Intermix Areas



Source: www. silvis.forest.wisc.edu

3. Impact/Extent

The extent or intensity of a wildfire is dependent on three key elements:

Fuels – Lighter fuels such as grasses, leaves, and twigs burn rapidly, while heavier fuels such a large stumps, logs, and green branches take longer to ignite and burn.

Weather – Heat and drought ripen vegetation for wildfires. Warm temperatures, low humidity and high winds allow for the quick spreading of embers and can produce vigorous fire activity. Thunderstorms can actually encourage wildfire development by providing strong changing winds and fire starting lightning.

Topography – Fannin County has a gently rolling terrain that actually helps with fire suppression. Steep slopes can increase the spread of a wildfire. Canyons can funnel air and intensify the fire.

Dry conditions, high temperatures, low humidity, and high winds can increase the potential and severity of a wildfire. In such conditions wildfires can spread quickly, affecting large areas in a short amount of time. A worst case scenario would be multiple wildfires started simultaneously by lightning during dry thunderstorms that move across an area experiencing drought conditions. This type of fire could burn for days destroying structures and lives.

Rural areas in northeastern Fannin County experience the majority of wildfires. This is due to the large tracts of vast wildland in and near the Caddo National Grassland. These areas are not highly populated but are popular with hikers and campers. The communities of Windom and Dodd City have a slightly high risk of being affected by wildfire due to their location to the south of these wildland areas. An out of control wildfire fueled by a strong north wind could put these jurisdictions in danger.

WFAA.com
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Wildfires burning in three North Texas counties

WFAA

Posted on September 3, 2011 at 6:00 PM

Updated Saturday, Sep 3 at 11:03 PM

The threat of wildfires is extremely high this weekend. We've seen two new fires break out Saturday in Grayson and Fannin counties.

The fire in Fannin County has spread to about 50 acres along Highway 78 between Leonard and Bailey.

The Texas Forest Service has already done a water drop there, and some structures are threatened.

4. Previous Occurrences

A La Nina weather pattern that provided extremely dry weather and high winds fueled the 2011 the Texas wildfire event. The fire danger was enhanced by the continuing drought that had started the year before. Texas recorded 2011 as the worst one-year drought since 1895. By Labor Day 2011 Fannin County along with 250 of the 254 counties were under a burn ban. Fannin County experienced 102 outside fires during the 2011 fire season. A Disaster Resolution (DR) – 4029-TX was signed by the President making public assistance available to those directly affected.

According to the National Climatic Data Center (NCDC), no significant wildfires have been recorded in Fannin County. This does not mean that there were no wildfires. Wildfires that do not encounter a human population are difficult to calculate damages and often go unreported. Wildfire events documented by the NCDC are large fires involving several counties and burning thousands of acres.

Table 4: 2004-2012 Fannin County Fire Statistics

Fannin County	Total Fires	Structure Fires	Vehicle Fires	Outside Fires	Deaths	Injuries
2004	211	52	30	129	2	4
2005	222	44	18	160	1	2
2006	275	36	33	206	1	0
2007	169	44	28	97	2	1
2008	278	45	32	201	1	0
2009	204	37	19	148	4	0
2010	145	29	22	94	0	0
2011	145	28	15	102	0	1
2012	128	23	19	86	0	0

Source: Fires in Texas 2007 & NOAA

5. Probability of Future Events

Although the number of incidences indicate that wildfires are likely to occur, most wildfires in Fannin County are small in size and contained by local resources. Education about the Wildland Urban Interface and the dangers of building within seem to be helping. The probability of future major wildfire events like this is direct in relationship to future drought events in Fannin County. Major wildfires are usually secondary hazards of extreme heat and drought periods.

6. Vulnerability

Periods of drought, dry conditions, high temperatures, and low humidity set the stage for wildfires. Areas along railroads and rural homes in woodland settings have an increased risk of wildfire. The sparsely populated tall grassed rangelands are capable of experiencing large sweeping fires. Ironically, fire suppression is capable of creating larger fire hazards, because live and dead vegetation is allowed to accumulate in areas where fire has been excluded. In the incorporated areas the greatest vulnerability is unoccupied buildings and empty lots that have not maintained.

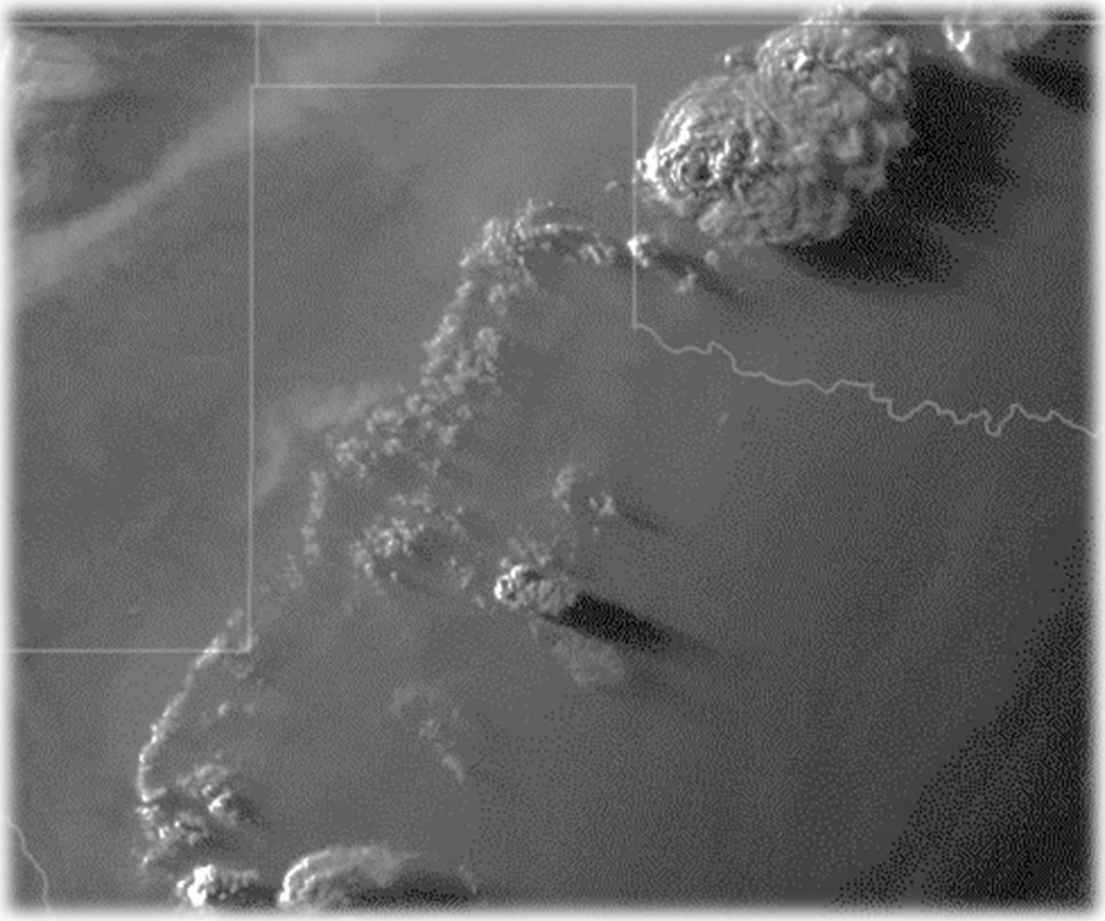
Fire vulnerability can be determined using the many methods including the Keetch-Byram Drought Index (KBDI). This is a drought index designed for fire potential assessment. The index is a continuous reference scale for estimating the dryness of the soil and duff layers. The index increases for each day without rain (the amount of increase depends on the daily high temperature) and decreases when it rains. The scale ranges from 0 (no moisture deficit) to 800. The range of the index is determined by assuming that there is 8 inches of moisture in a saturated soil that is readily available to the vegetation.

For different soil types, the depth of soil required to hold 8 inches of moisture varies (loam=30", clay=25" and sand=80"). A prolonged drought (high KBDI) influences fire intensity largely because more fuel is available for combustion (i.e. fuels have a lower moisture content). In addition, the drying of organic material in the soil can lead to increased difficulty in fire suppression. High values of the KBDI are an indication that conditions are favorable for the occurrence and spread of wildfires, but drought is not by itself a prerequisite for wildfires. Other weather factors, such as wind, temperature, relative humidity and atmospheric stability play a major role in determining the actual fire danger.

7. Secondary Hazards

Secondary hazards included increased insurance premiums, loss of recreation areas, soil erosion, economic stresses, and reductions in animal habitats and air pollution. This diminished air quality effects everyone but especially the elderly, young children, pregnant women, and those who have a pre-existing respiratory condition. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long term effects. The smoke plumes from wildfires fires can also contain potentially carcinogenic matter. Figure 7 shows how the plumes can impact neighboring areas.

Figure 7: Smoke Plumes from Wildfires



Source: NOAA

8. Overall Summary of Vulnerability and Impacts

People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are another leading cause of wildfires. Other sources of ignition include railroads, catalytic converters on automobiles, and spontaneous ignition of hay bales. The recent development and building in the urban interface areas has increased wildfires ability to overtake structures. Fannin County has limited growth in these rural areas therefore wildfires are not currently a major threat to homes. However, fire can increase erosion and result in a deterioration of soil and water quality. Fortunately most wildfires are small and quickly contained by the local fire departments within the County. Mitigation measures in the past consisted of education about being "*Fire Wise*". With the increasing population of the county more education will be needed.

Table 8: Summary*

Community	Potential Severity of Impact	Probability of Future Events	Risk	Justification for Differences
Bailey	Minor	Highly Likely	Medium	
Bonham	Minor	Occasional	Low	Higher population density than other areas. Low vegetation density. Small area of intermix on south side.
Dodd City	Minor	Highly Likely	Medium	
Dodd City ISD	Major	Occasional	Low	School adjacent to crop field with an increase in grass fire threat and impact from blowing smoke.
Ector	Minor	Highly Likely	Medium	
Ector ISD	Minor	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Fannindel ISD	Minor	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Honey Grove	Major	Occasional	Low	Highways surrounding the city serve as fire breaks. Row crops are grown on three sides of Honey Grove. These often plowed filed serve as fire breaks but threat of grass fires during growing season.
Honey Grove ISD	Limited	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Ladonia	Major	Highly Likely	Medium	Rough terrain with deep ravines & canyons can limit fire suppression activities.
Leonard	Major	Highly Likely	Medium	
Leonard ISD	Minor	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Ravenna	Minor	Highly Likely	Medium	
Sam Rayburn ISD	Minor	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Savoy	Minor	Highly Likely	Medium	
Savoy ISD	Minor	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Trenton	Minor	Highly Likely	Medium	
Trenton ISD	Minor	Occasional	Low	Schools are protected by large concrete parking areas and low vegetation play areas.
Windom	Major	Highly Likely	High	Greater threat for grass fires.
Rural Areas	Substantial	Highly Likely	High	Areas near Coffee Mill Lake and the Caddo National Grassland are high risk due to the increased vegetation. Limited Volunteer Fire Department resources increases damage potential in rural areas.

**Only jurisdictions that identified Wildfire as a hazard are listed.*

HAZARD PROFILE WORKSHEET

HAZARD: Wildfire

POTENTIAL SEVERITY OF IMPACT:

Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major X	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
X Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	During dry season or droughts Often thought to be a summer problem but often a bigger winter problem

SOURCE DOCUMENTS:

NOAA, Local Media, Texas Hazard Mitigation Plan, Texas Forestry, and local newspaper articles

DATA LIMITATIONS:

Limitations in quantifying long term economic losses

PROBABLE DURATION & WARNING TIME

Duration can be from a few hours to several days, depending on available fuels and winds
Warning time is very limited although red flag days are often predicted 24-72 hours prior

CASCADING POTENTIAL:

Public and private structures burned, roads closed, utilities disrupted, and lives lost
Ground cover destroyed increasing erosion of topsoil

EXISTING WARNING SYSTEMS:

County Fire Marshall, Advertised Burn Bans, local media weather reports and house to house evacuations

PROGRESS SINCE EXISTING PLAN DEVELOPMENT

Many communities have instigated community cleanups that include clearing of overgrown abandoned lots

HAZARD PROFILE: Section Tem – Human Caused (Anthropogenic)

1. Description

Human-caused or anthropogenic disasters can strike anywhere and at any time and can have substantial impacts such as: multiple deaths shut down of critical facilities and obliteration of properties. There are three primary types of human-caused hazards; accidental, criminal and terrorist. Accidental hazards are due to human-error or mechanical failure and are done with no intent to do harm. Criminal acts are intended to cause harm to either persons or property but unlike terrorist acts are not done to try to coerce, intimidate or strong-arm a government or a population. Terrorist events are the unlawful use of force and violence against persons or property to intimidate or coerce a government or the civilian population. Although Fannin County has no publicized large human-caused event, planning and mitigation can help reduce the risk of a future event. With the increasing number of both domestic and international terrorist events and the fact that a terrorist event could include or cause many other human caused hazards events, terrorism will be the focus of this hazard profile.

2. Location

The form and locations of many natural hazards are identifiable and, even in some cases, predictable. Human-caused events, however, cannot be forecast with any accuracy. There is, therefore, some potential for most, if not all, types of human-caused acts to occur anywhere and at any time in Fannin County. Critical facilities and infrastructure are at the greatest risk to an event and are located throughout the county. Figure 2a shows a generalized location of pipelines running through the county. Due to security concerns this information is not exact and should only be used to give the reader an idea of the dimension of the potential threat. Airports, roadways and other infrastructure as shown in Figures 2a, 2b and 2c could be probable terrorist targets due to the potential to impair the local population. Threat is also posed by the locations throughout the county of hazardous materials.

The Federal Bureau of Investigation (FBI) categorizes terrorism in the U.S. as:

Domestic Terrorism – terrorist activities that focus on facilities or populations without foreign direction

International Terrorism – terrorist activities that are foreign-based and/or are sponsored by organizations or groups outside the US.

Varying quantities of hazardous materials from industrial chemicals and toxic waste to household detergent and air fresheners, hazardous materials are part of our everyday lives. Hazardous material incidents can range from a chemical spill on a highway to contamination of groundwater by naturally occurring methane gas. Communities and residences located near industries or other property that use hazardous materials have a higher risk of a hazardous materials incident. However, many hazardous materials are transported regularly over our highways and by rail, and if released during transport these materials can spread quickly to any nearby community.

Figure 2a: Potential for Human Caused Event – Transportation Infrastructure: Airports and Railroads

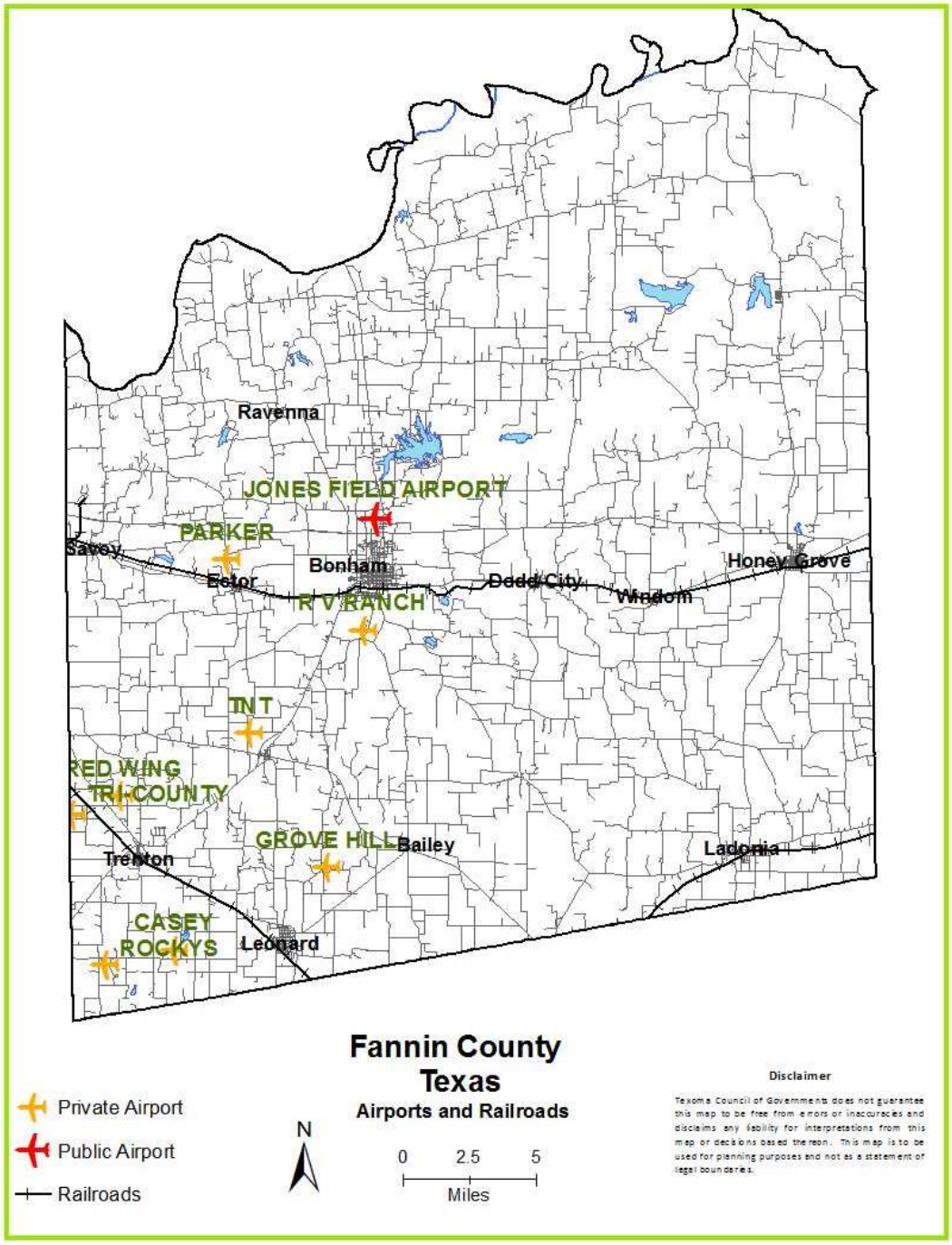


Figure 2b: Potential for Human Caused Event – Transportation Infrastructure: Major Roadways

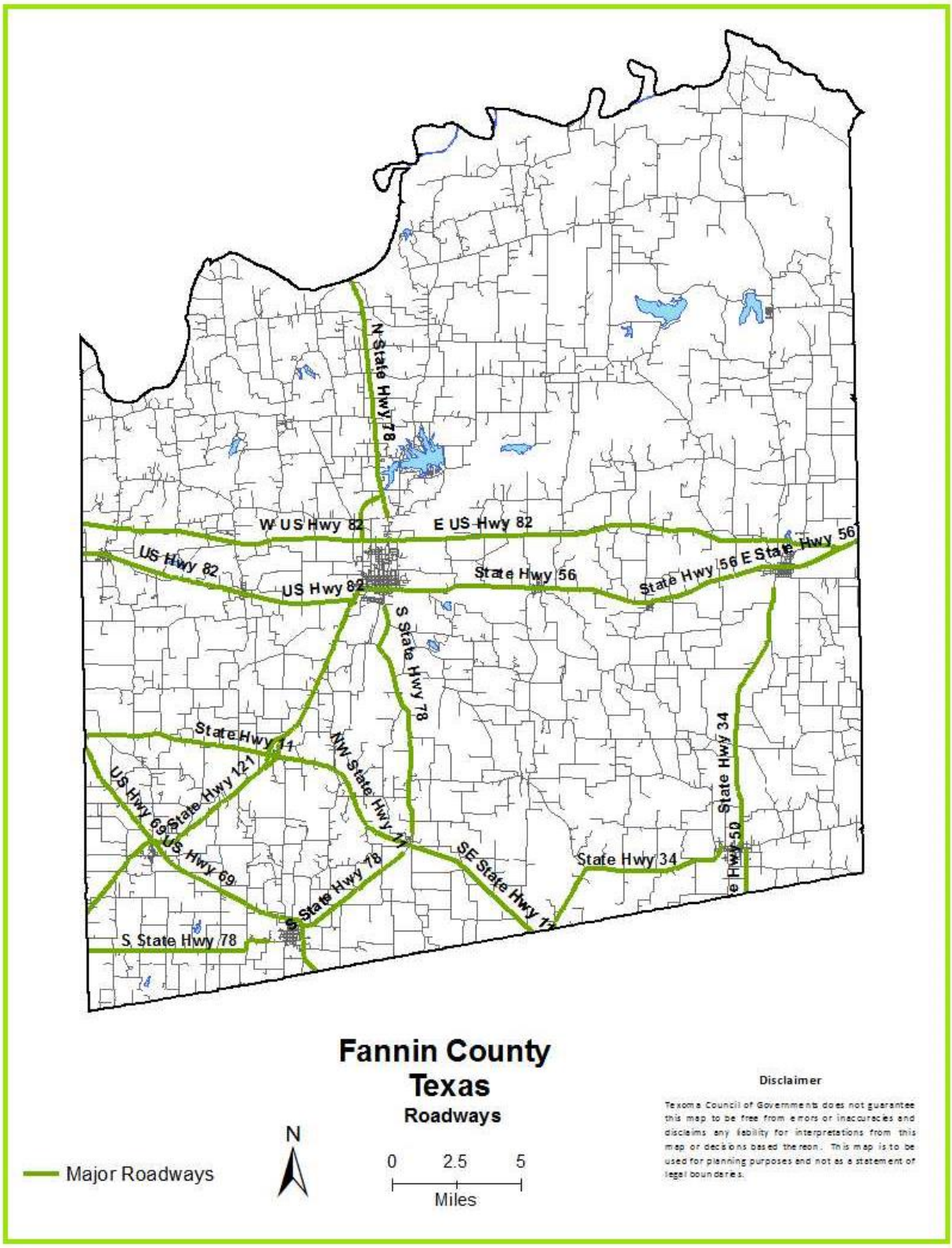
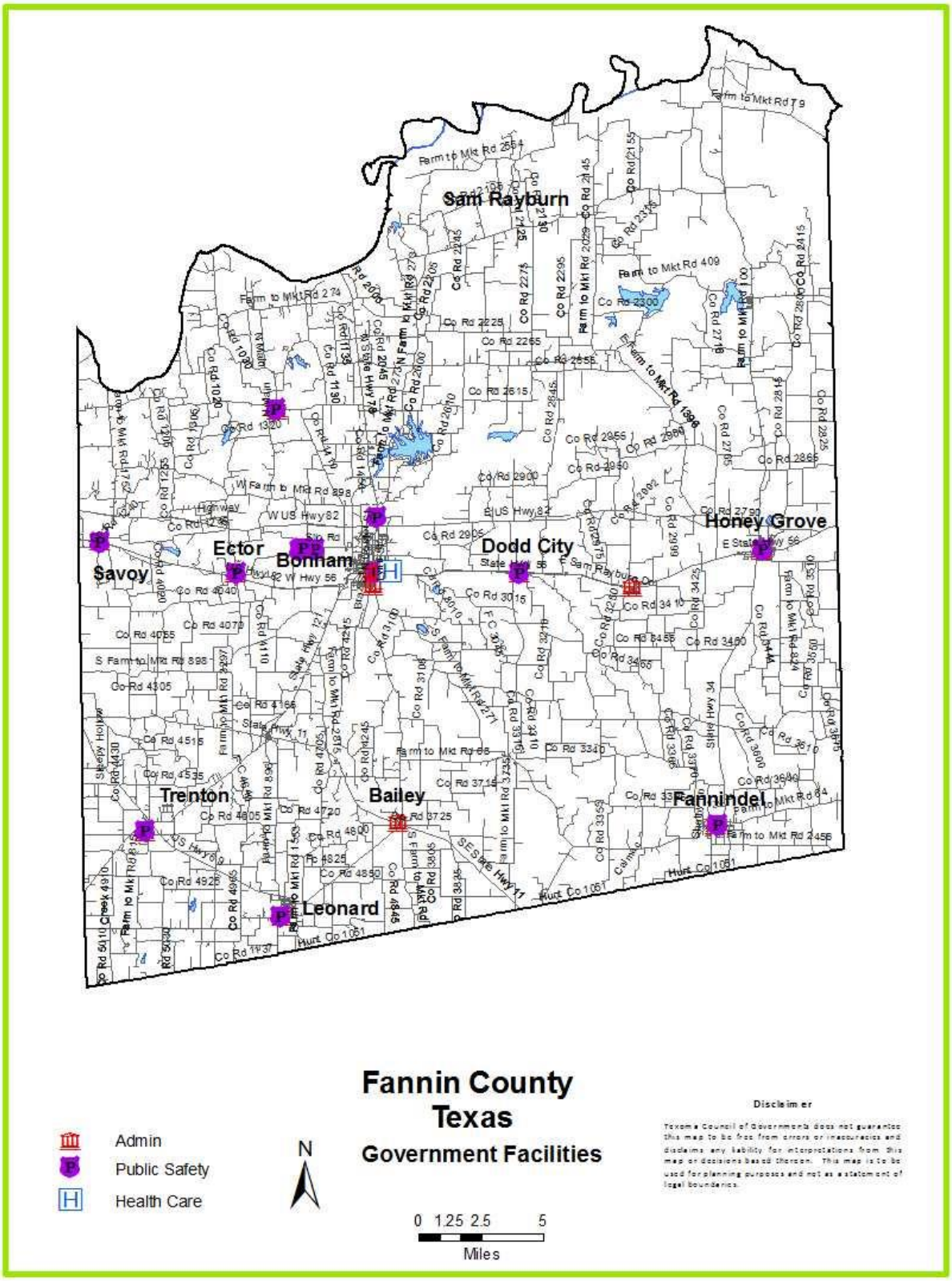


Figure 2c: Potential for Human Caused Event – Government Facilities



3. Impact/Extent

The extent of a human-caused event can vary from small to catastrophic. A large scale event may cause multiple deaths, completely shut down facilities for thirty days or more, and cause more than fifty percent of affected properties to be destroyed or suffer major damage. Even a small human-caused incident could have multiple impacts spreading throughout a community such as disruption of services, interruptions to business, banking, communications systems, and long term trauma to responders, witnesses, caregivers, and could devastate the county physically, economically, and psychologically for many years to come.

Table 3.1: Terrorist Attack Impacts/Extent

Terrorist Agent	Description
Bombs, Guns, Explosives, Fires	• "Traditional" weapons used by terrorists worldwide • Less technically and resource demanding to create
Biological Agent	• The release of infectious microbes or toxins to produce illness or death in people, animals, or plants • Can be dispersed as aerosols or airborne particles • Potential biological weapons include: anthrax, botulism, smallpox, water safety threats, and food safety threats.
Chemical Agent	• Can kill or incapacitate people, slay livestock, and destroy crops. • Some are odorless and tasteless making them even harder to detect • Vary in the effects on the body based on dose, exposure mechanism, and length of exposure, toxicity, origination, and form. • Examples of chemical agents, mustard agent and cyanide.
Radiological Agent	• Constructing a nuclear bomb would be relatively difficult and require special resources, training, and materials • The fallout could have secondary impacts greater than the original act
Cyber Terrorism	• Attacks computers and networks, and the information contained within them • Could potentially disrupt communications, banking systems, power systems, and emergency networks

4. Previous Occurrences

No community in Fannin County has experienced a terrorist act but they are occurring closer each year. The U.S., as shown in Table 4, has experienced numerous large terrorist events include two large one in Texas in the past 5 years.

Table 4: Recent National Terrorist Events

Date	Event	Terrorist	Type	Damage
4/19/1995	OKC Murrah Federal Building	Tim McVeigh & Terry Nichols	Domestic	168 deaths & over 800 injuries
9/11/2001	World Trade Center Attack	Al-Qaeda	International	Over 2,800 deaths & over 6,000 injuries
9/11/2001	Pentagon Attack/Plane Crash	Al-Qaeda	International	184 deaths/40 deaths
9/18/2001	Anthrax Attacks	Bruce Ivans	Domestic	5 deaths
11/5/2009	Fort Hood Shooting	Malik Hasan	Domestic	13 deaths
2/18/2010	Austin Suicide Attack	Andrew Joseph Stack III	Domestic	2 deaths
4/15/2013	Boston Marathon Bombing	Dzhokhar Tsarnsev & Tamerlan Tsamaaev	Domestic	3 deaths & over 180 injuries

Source: U.S. Department of Homeland Security

Although Fannin County has not experienced a terrorist act they have and will continue to experience other human-caused hazards. Emergency officials continually respond to small hazardous material incidents and constantly prepared for larger ones. In October 2004 a fire at a previous landfill tested the county preparedness. Piles containing wood, drums, tires, trash and other unknown industrial trash were on fire when emergency officials arrived. Approximately 12-14 residents were evacuated from their homes. TCEQ & EPA were called in due to the fear of exposure from contaminated air and the potential for water runoff to enter a nearby creek.

5. Probability of Future Events

The Department of Defense (DOD) estimates that as many as 26 nations may possess chemical agents and/or weapons and the Central Intelligence Agency (CIA) reports that at least ten countries are believed to possess or to be conducting research on biological agents for weapon use. As more countries possess and acquire these ability the probability of future events increases.

Fannin County's most probable human-caused threat is from hazardous material and explosives being transported to and through the county by vehicles using Hwy 82 and other main arteries. The risk of hazardous material spills accidental, criminal or terrorist related during transport exists and may increase with the continued industrial development in the City Bonham.

Table 5: The Homeland Security Advisory System

Color	Threat Level	Governmental actions to be taken
Green	Low	Requires "protective measures" such as regularly assessing facilities for weaknesses and finding ways to reduce them, and making sure State and local government employees are trained to handle terrorism situations.
Blue	Guarded	Requires government agencies to review and update emergency response procedures and communications systems, as well as provide the public with necessary information.
Yellow	Elevated	Includes increasing surveillance of critical locations, coordinating emergency plans with nearby jurisdictions and implementing contingency and emergency response plans.
Orange	High	Requires coordinating necessary security efforts with armed forces or law enforcement agencies, taking additional precautions at public events, preparing to work at an alternative site or with a dispersed workforce and restricting access to essential personnel.
Red	Severe	Includes assigning emergency response personnel and setting up specially trained teams; monitoring, redirecting, or constraining transportation systems; closing public and government facilities; and increasing or redirecting personnel to address emergency needs.

Source: U.S. Department of Homeland Security

6. Vulnerability

All persons and properties in Fannin County are vulnerable to human-caused events such as hazardous material discharge and acts of terrorism. The degree to which the population and properties are impacted depends on factors multiplied by various conditions including location and method. Fannin County transportation system doesn't require the transportation of hazardous material to avoid driving through the city. This means that potentially lethal, hazardous, and flammable materials pass within two hundred feet of critical infrastructure such as the Fannin County Courthouse.

7. Secondary Hazards

The resulting secondary effects from a human-caused incident are contingent on the type, location, and severity of the initial event. A nuclear detonation is potentially the most destructive of any attack. The amount of destruction would vary depending on the size of the weapon. The secondary effects or fallout would depend on other factors, such as wind speed and weather conditions.

The secondary effects of a hazardous material spill that was caused by human error could be devastating as well. A hazardous material accident can have secondary effects on the environment, local economy, and society. If the material spilled is flammable, both urban and rural fires can occur. The greatest secondary effect is associated with transportation accidents that occur on major transportation routes. These events can cause traffic accident and have the potential to expose a moving population to toxic chemicals without a way of monitoring any lasting effects. Fallout effects on the surrounding environment and population could be felt for many years and have greater secondary effect than the initial event.

8. Overall Summary of Vulnerability and Impacts

While we may not be able to prevent an attack, it is well within our ability to lessen the likelihood and/or the potential effects of an incident. Cities in the county should continue to improve their readiness to respond to human-caused incidents through participation in State and Federal programs that provide training and equipment for agencies that would respond to a local terrorist incident, and in exercises that help to improve agency coordination and test local response plans. Although the likelihood of such a major event in Fannin County is currently low there is a likelihood of more localized accidental human-caused event.

Table 8: Summary

Community	Potential Severity of Impact	Probability of Future Events	Risk	Justification for Differences
Bailey	Major	Likely	Medium	
Bonham	Major	Likely	Medium	Higher population density & critical infrastructure.
Dodd City	Major	Likely	Medium	
Dodd City ISD	Major	Likely	Medium	
Ector	Major	Likely	Medium	
Ector ISD	Major	Likely	Medium	
Fannindel ISD	Major	Likely	Medium	
Honey Grove	Major	Likely	Medium	
Honey Grove ISD	Major	Likely	Medium	
Ladonia	Major	Likely	Medium	
Leonard	Major	Likely	Medium	
Leonard ISD	Major	Likely	Medium	
Ravenna	Major	Likely	Medium	
Sam Rayburn	Major	Likely	Medium	
Savoy	Major	Likely	Medium	
Savoy ISD	Major	Likely	Medium	
Trenton	Major	Likely	Medium	
Trenton ISD	Major	Likely	Medium	
Windom	Major	Likely	Medium	
Rural Areas	Major	Likely	Medium	

HAZARD PROFILE WORKSHEET	
HAZARD: Human-Caused	
POTENTIAL SEVERITY OF IMPACT:	
Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major X	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
❑ Highly likely: Event probable in next year. X Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. ❑ Unlikely: Event possible in next 10 years.	No seasonal pattern

SOURCE DOCUMENTS:
CDI-Terrorism Project, Texas Homeland Security Strategic Plan, Texoma Regional Response Plan, Homeland, Texoma Threat and Hazard Identification and Risk Assessment, Emergency Response Review: Callahan Landfill Fire
DATA LIMITATIONS:
Limitations in quantifying long term economic losses
PROBABLE DURATION & WARNING TIME
Duration can vary from less than a day to years
CASCADING POTENTIAL:
Public and private structures destroyed, roads closed, utilities disrupted, and lives lost Ground cover destroyed increasing erosion of topsoil
EXISTING WARNING SYSTEMS:
Local and National news and social media
PROGRESS SINCE EXISTING PLAN DEVELOPMENT
Additional CERT members trained, public awareness programs such as neighborhood watch, tightened security near critical facilities, and County Government COOP plan developed and exercised

According to an Indian legend, a Caddo Indian Chief was warned by the "Great Spirit" to move his village from the low lands. The Chief overlooked the warning and one day while he and his men were out hunting the ground shook. When they returned, their village was gone beneath the water of the newly formed Caddo Lake. In 1811 New Madrid, Missouri had an earthquake that measured 8.9. This could have knocked down enough trees to form the great raft that dammed the Red River and formed Caddo Lake.

Source: http://ops.tamu.edu/x075bb/caddo/caddo.html

HAZARD PROFILE: Section Eleven - Earthquake

1. Description

Over 110 earthquakes with a magnitude between three and six on the Richter scale have been recorded in Texas' history. Although most of those epicenters were far from Fannin County some of them were felt by local residents. An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth surface. This sudden motion or trembling is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.

Earthquakes – The sudden, rapid shaking of the earth caused by shifting of the rock beneath the earth's surface. – www.wikipedia.org

Tectonic plates lie below the Earth's crust. These plates are all moving in different directions at different speeds. These plates sometimes crash together, pull apart, or even slide against each other. When this happens, it commonly results in an earthquake.

2. Location

All of Fannin County is equally susceptible to earthquakes. Earthquakes are not limited to certain areas of the county or certain communities. It is regional in nature, covering vast expanses of the country. An extremely devastating earthquake centered several states away could affect Fannin County. With this in mind, all buildings and structures are equally susceptible to earthquake and its destruction.

58% of Fannin County's households use some form of gas as a heating source so there would be many pipelines and storage facilities in Fannin County. This issue, combined with the fact that the majority of homes in the county are at least 30 years old and not up to earthquake codes, creates the possibility of a major catastrophe in the event of a major earthquake.

3. Impact/Extent

Earthquakes have a high potential for causing catastrophic casualties, property damage, and economic disruption. The extent of an earthquakes hazard depends greatly on the magnitude or size of the event. The magnitude is measured using the amplitude of ground motion as recorded on a seismograph. Figure 3 shows and compares the Richter or Local Magnitude Scale and the Modified Mercalli Intensity Scale. An earthquake will only have one Magnitude number based on the epicenter. The same quake will have numerous MMI numbers with the largest nearest to the epicenter and diminishing as the physical damages lessens.

The Richter Scale or more recently Local Magnitude (M_L) – assigns a single number to quantify the amount of energy released by an earthquake. – www.wikipedia.org

The Modified Mercalli Intensity Scale (MMI) – used to measure an earthquake by quantifying the effects of the physical damage. – www.wikipedia.org

Table 3: Richter – Mercalli Scale

Magnitudes	Description	Earthquake Effects	Frequency of Occurrence (Est.)	Mercalli Scale
< 2.0	Micro	Micro earthquakes, not felt.	8,000 per day	I. Instrumental
2.0-2.9	Minor	Generally not felt.	1,000 per day	II. Feeble
3.0-3.9	Min	Often felt, but rarely causes damage.	49,000 per year	III. Slight
4.0-4.9	Light	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 per year	IV. Moderate (4.0-4.3) V. Rather Strong (4.4-4.8)
5.0-5.9	Moderate	Felt by all. Many frightened. Damage to masonry mostly minor such as cracks and flaking. Can cause major damage to poorly constructed buildings over small regions.	800 per year	VI. Rather Strong (4.9-5.4) VII. Strong (5.5-6.1)
6.0-6.9	Strong	Damage to masonry greater such as falling chimneys and movement of foundations. Can be destructive in areas up to about 160 kilometers (100 mi) across in populated areas.	120 per year	VIII. Destructive (6.2-6.5) IX. Ruinous (6.6-6.9)
7.0-7.9	Major	Most masonry and frame structures destroyed with their foundations. Serious damage to dams and barriers. Underground pipes burst. Can cause serious damage over larger areas.	18 per year	X. Disastrous (7.0-7.3) XI. Very Disastrous (7.4-8.1)
8.0-8.9	Great	Can cause serious damage in areas several hundred miles across. Damage nearly total.	1 occurence per year	XII. Catastrophic (>8.1)
9.0-9.9	Great	Catastrophic. Devastating in areas several thousand miles across.	1 occurence per 20 years	XII. Catastrophic (>8.1)
10.0 ≥	Epic	Never recorded. Damage of epic preportions.	Extremely rare (Unknown)	XII. Catastrophic (>8.1)

4. Previous Occurrences

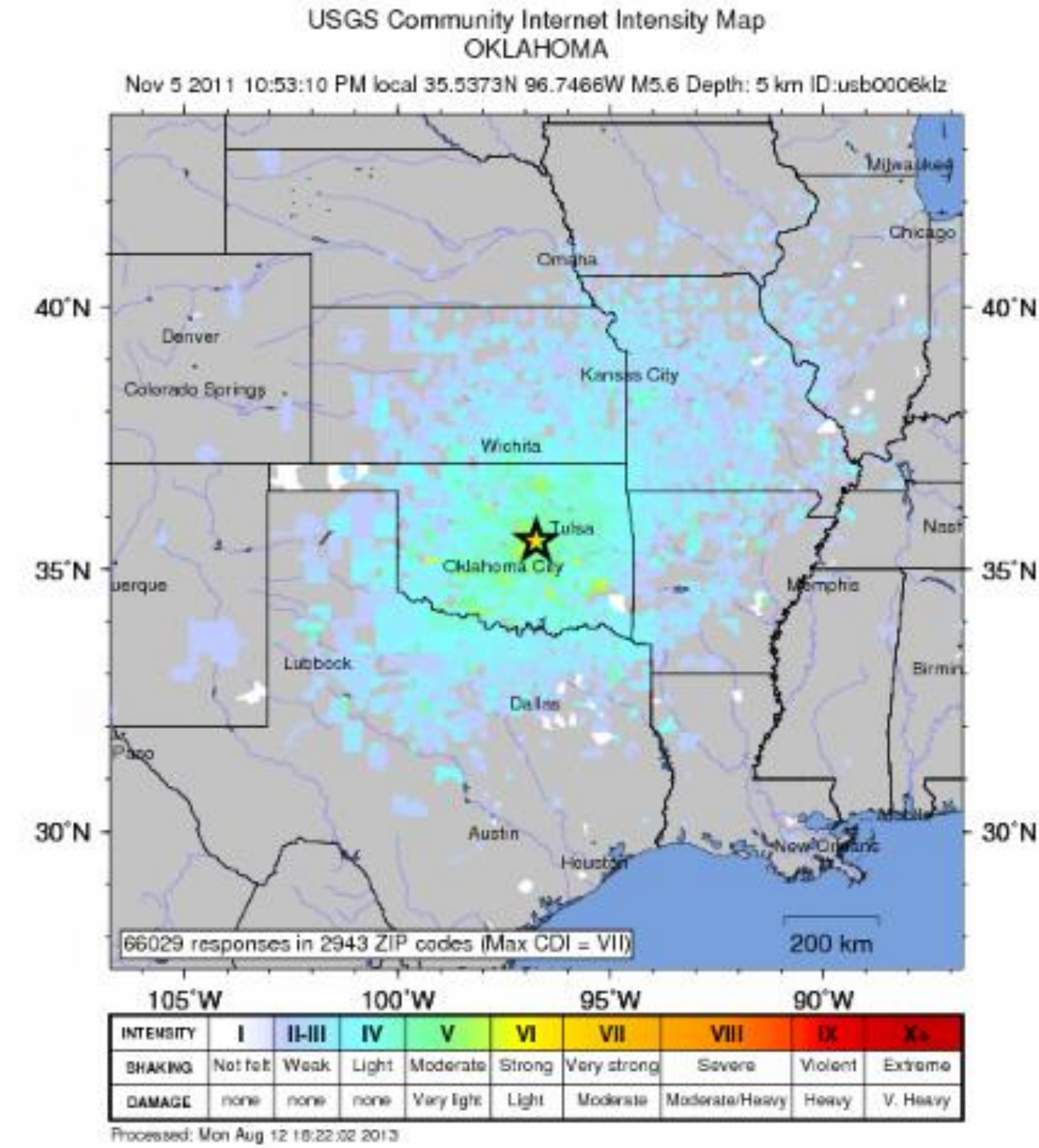
Earthquakes centered within Fannin County are rare but have occurred. The few events that have been recorded are largely unfelt and are seismically rated at or below a level 2. Occasionally earthquakes in this area are felt and documented. These quakes can be from natural origins but many times the tremor is caused from excavation and oil exploration. Some of these events include:

Table 4: Earthquakes Possibly Felt in Fannin County, Texas

Date	Magnitude	Cause	Epicenter	Damages
2/7/1812	8	Tectonic	New Madrid, MO	Speculation to the formation of Caddo Lake
10/22/1882	5.6	Tectonic	Ft Gibson, OK	Bricks chimneys in Bonham, TX were shaken loose
4/9/1932	4	Oil Exploration	Mexia, TX	Bricks chimneys near epicenter were shaken loose
4/12/1934	4.2	Tectonic	N of Paris, TX	One house needed re-leveling
4/9/1952	5.5	Tectonic	El Reno, OK	Felt as far south as Austin, TX
3/19/1957	3	Oil Exploration	Gladewater, TX	
5/31/1997	3.4	Tectonic	Commerce, TX	Slight damage reported
11/5/2011	5.6	Tectonic	Lincoln Co, OK	2 people injured & 14 homes destroyed

Source: Institute for Geophysics

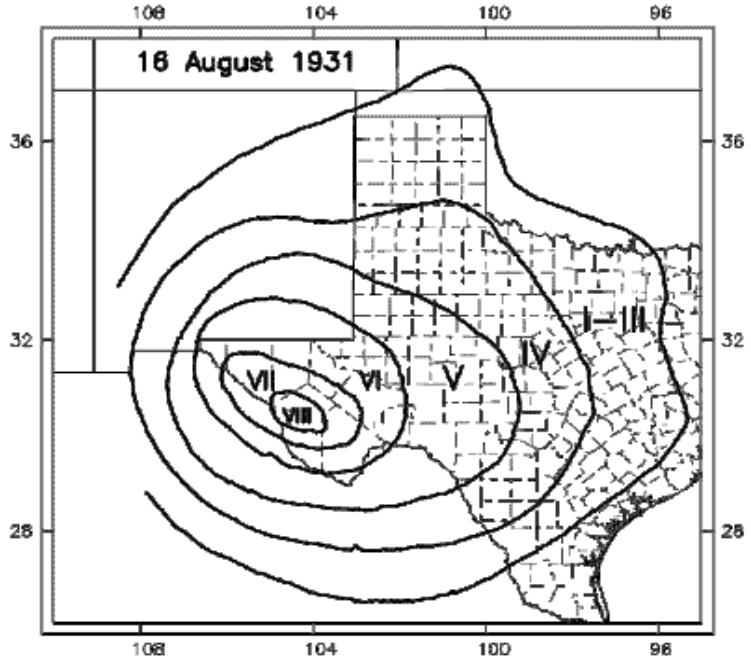
Figure 4a: Intensity Map for Oklahoma 5.6 Earthquake



Source: www.usgs.gov

The State of Texas has had one reported death and limited damage resulting from earthquakes. The highest magnitude quake was centered in Valentine, Texas on August 16, 1931. It registered 6.0 on the Richter scale. Masonry structures were damaged by the quake but there were no deaths. The one death came from a 4.7 magnitude quake near El Paso. A man lived about 10 miles from the epicenter in Mexico but died when his adobe house collapsed on him.

Figure 4b: 1931 Valentine Texas Earthquake's MMI Intensities

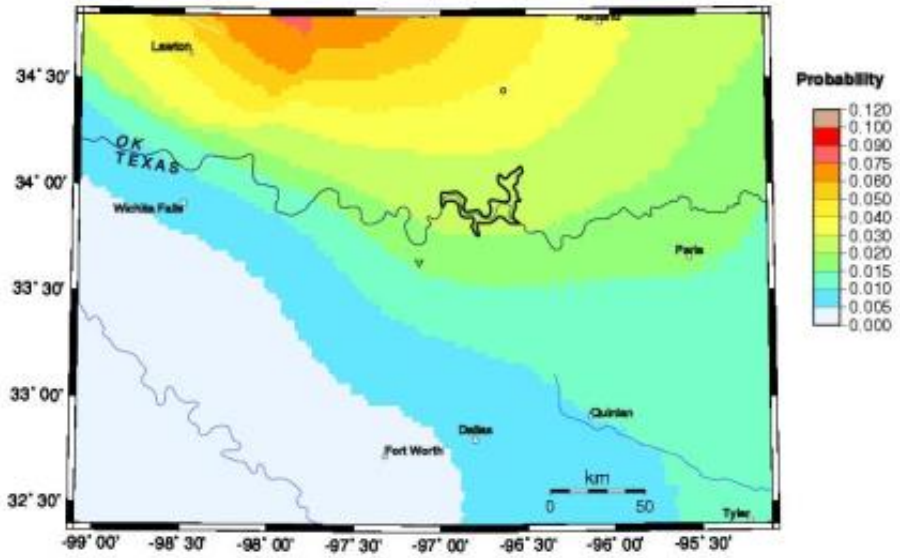


Source: www.ig.utexas.edu

5. Probability of Future Events

The United State Geological Survey's (USGS) PSHA Models shown in Figure 6.5 gives the probability of an earthquake with a magnitude equal to or greater than 4.75 occurring in the next 50 years to be between 10% and 20%. The probability increases to the north where more seismic activity has been recorded and projected. Earthquakes centered in Fannin County are very rare and are pose little hazard due to their low magnitude. However, this region is most at risk from a very large, distant earthquake that might occur in Oklahoma or the Missouri-Tennessee areas that would have an MMI in this area of VI or greater. This type of earthquake has a probability of occurring once per 500 years.

Figure 5a: Probability of an Earthquake with a Magnitude of ≥ 4.75 with 50 Years



Source: USGS PSHA Model

6. Vulnerability

A building's construction is a key factor in withstanding the forces produced by earthquakes. Unreinforced masonry buildings are most at risk in an earthquake because the walls are prone to collapse outward. Steel and wood buildings have more ability to absorb the energy from an earthquake. Wood buildings with proper foundation ties have rarely collapsed in earthquakes. The majority of homes in Fannin County are wooden structures but in the outskirts of Bonham there are many newer masonry constructed homes that are slab-on-grade structures. In downtown Bonham there are many multi-storied masonry building that are older and built to lower standards. These structures have the potential to collapse following an earthquake.

Most of Fannin County's seismic events are so small that they aren't felt, but these events could still be causing damage to the integrity of infrastructures. Because of the weak strength of existing earthquakes and the low probability of a significant event, information to quantify damage to infrastructure in the County has never been developed. It is this lack of planning that causes the county the most vulnerability.

Seismic risk uses the results of a seismic hazard analysis, and includes both consequence and probability. – www.wikipedia.org

7. Secondary Hazards

Secondary hazards can include fire, landslides, collapse or structural failure of bridges, dams, overpasses, roads, and disruption of economic activity across the region. Dispersion of contaminants from chemical spill and busted pipelines could also occur. Hazardous materials and other contaminants were not identified in the area, but will be addressed in updates of this plan.

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking.

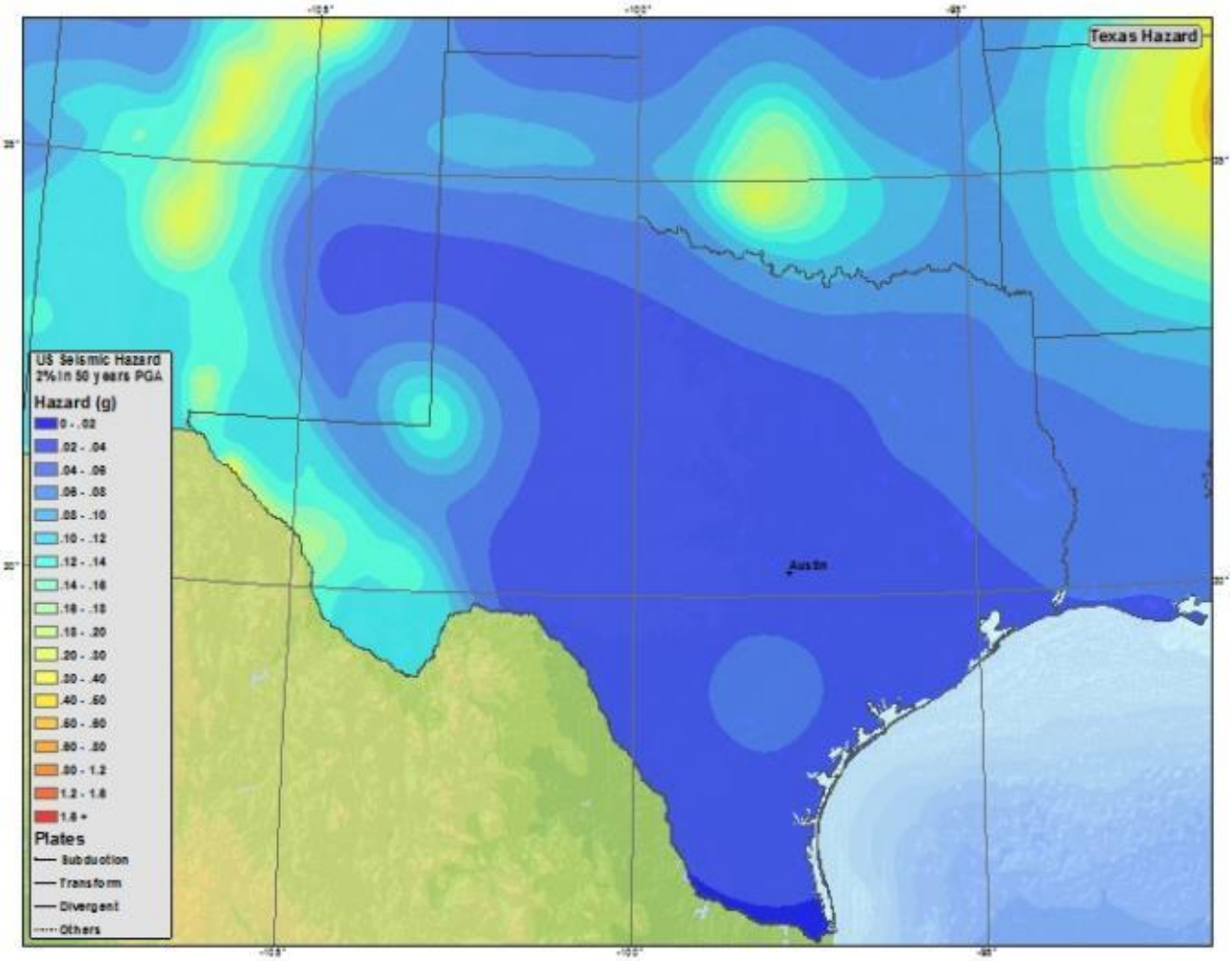
8. Overall Summary of Vulnerability and Impacts

Damage from an earthquake centered in Fannin County is "Unlikely" but there is a small risk from earthquakes that may occur outside of Texas. Earthquakes in Fannin County are rare and the few events that have occurred were largely unfelt. There is concern as to the long term effects of the unfelt earthquakes on the integrity of numerous pipelines associated with the oil, gas, water and wastewater systems located within the County. However, these concerns do not appear to present significant problems and no information was found that would document damages to these systems.

Earthquake Facts

- **Largest recorded earthquake in the United States** was a 9.2 that struck Prince William Sound, Alaska, March 28, 1964.
- **Moonquakes** ("earthquakes" on the moon) happen less frequently and have smaller magnitudes than earthquakes on the Earth.
- The **hypocenter** of an earthquake is the location beneath the earth's surface where the rupture of the fault begins.
- The **epicenter** of an earthquake is the location directly above the hypocenter on the surface of the earth.
- From 1975-1995 there were only four states that did not have any earthquakes reported. They were: Florida, Iowa, North Dakota, and Wisconsin.

Figure 8: Seismic Hazard Map



Source: USGS

Table 8: Summary *

Community*	Potential Severity of Impact	Probability of Future Events	Risk
Ector	Limited	Unlikely	Low
Ladonia	Limited	Unlikely	Low
Rural Areas	Limited	Unlikely	Low

**Only jurisdictions that identified Earthquakes as a hazard are listed.*

HAZARD PROFILE WORKSHEET	
HAZARD: Earthquake	
POTENTIAL SEVERITY OF IMPACT:	
Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited X	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
❑ Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. X Unlikely: Event possible in next 10 years.	

SOURCE DOCUMENTS:
Texas Hazard Mitigation Plan, www.thmp.info, USGS, and www.ig.utexas.edu
DATA LIMITATIONS:
Limitations in reported losses and in quantifying long term economic losses
PROBABLE DURATION & WARNING TIME
Duration can range from a few seconds to a couple of minutes
CASCADING POTENTIAL:
A large earthquake could have aftershocks near the same intensity as the earthquake, weekend dams, levee, and stream banks
EXISTING WARNING SYSTEMS:
USGS monitors seismic activity
PROGRESS SINCE EXISTING PLAN DEVELOPMENT
Additional CERT volunteers trained and ready to assist in response activities

HAZARD PROFILE: Section Twelve - Dam or Barrier Failures

1. Description

Dams are usually what is referred to when talking about floodgates, levees, dikes and other barrier methods used to control water flow. These barriers provide benefits such as reservoirs, hydroelectric power, recreation, and flood control. Dams are an important part of our public works infrastructure, and at the same time they pose a risk to public safety. Failure of a major dam is an unlikely event that occurs with little or no warning. If a major dam should fail, the impact could be substantial with loss of lives, loss of critical facilities, and affected properties would be severely damaged if not destroyed.

A dam or barrier failure is a collapse or breach in the structure characterized by the sudden, rapid, and uncontrolled release of impounded water. Dam failures most often occur from prolonged periods of rain and flooding in the drainage basin but they can result from any one or a combination of the following causes:

- Structural failure either in the design or material used
- Failure of other upstream barriers in same drainage basin
- Movement, erosion or settling of the support of the dam
- Inadequate maintenance and assessment of the dam
- Deliberate acts of sabotage

Texas Administrative Code Title30, Part 1, Chapter 299 defines dams as:

- Height great than or equal to 25 ft. and a max storage capacity greater than or equal to 15 acre-ft.;
- Height greater than 6ft. and maximum storage capacity greater than or equal to 50 acre-ft.;
- Are classified as high or significant-hazard dam, regardless of height or maximum storage capacity; or
- Are used as a pumped storage or terminal storage facility.

Once a dam is built the function of the engineer does not end. The engineers must monitor the dam for safety and ensure that routine maintenance is performed on the inside and outside of the dams. Dams or other barriers can safely operate for long periods of time if they are maintained on a regular basis.

2. Location

Over sixty dams in Fannin County made the National Inventory of Dams. The dams are scattered throughout the county with the larger more high-hazard ones be located in what was originally the more rural areas. The dams create a recreational environment that people want to build near. The building near dams is with the assumption that the dam will protect them which is not always the case. Dams can fail with little or no warning causing the loss of property and life.

Figure 2a: Davy Crockett Dam

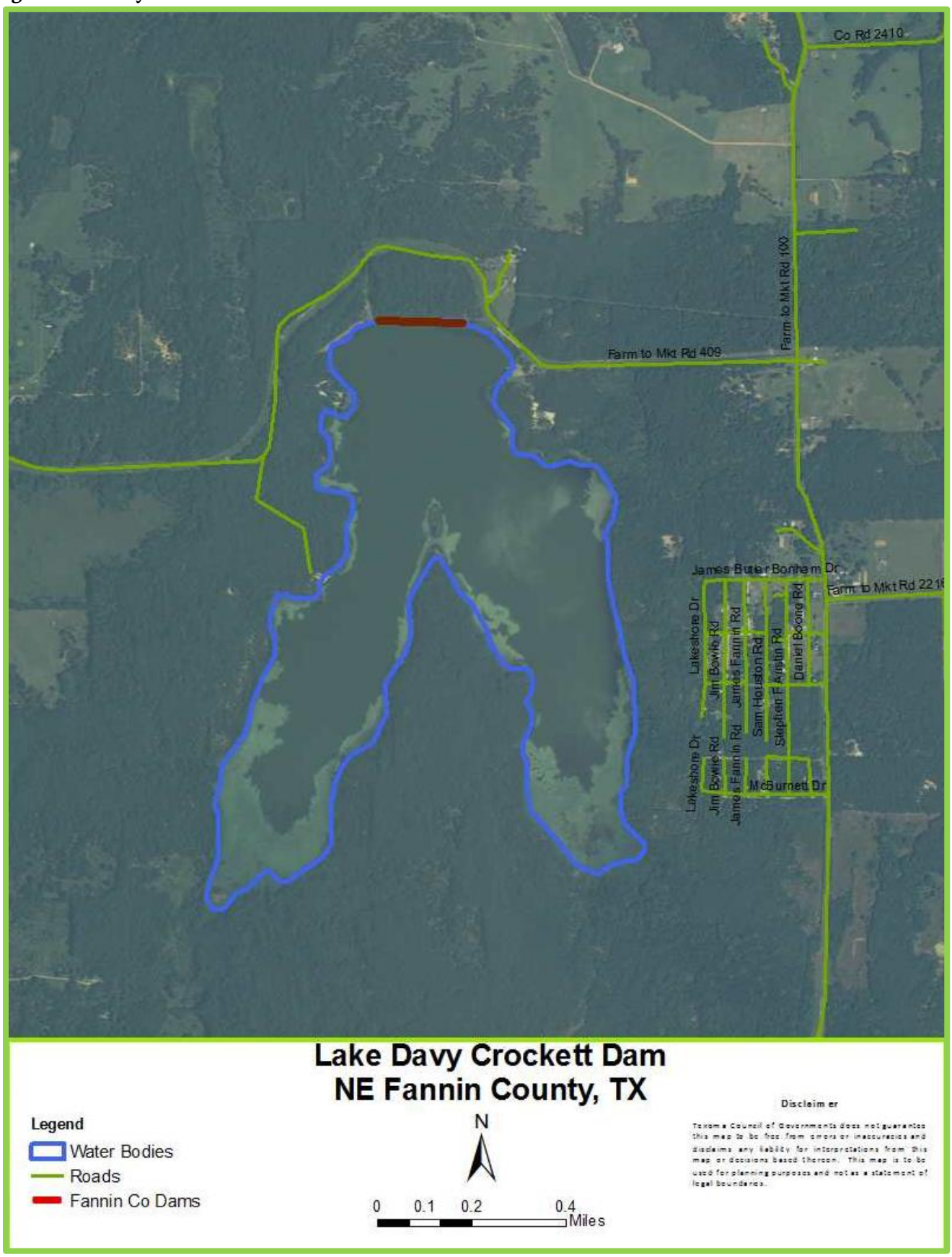
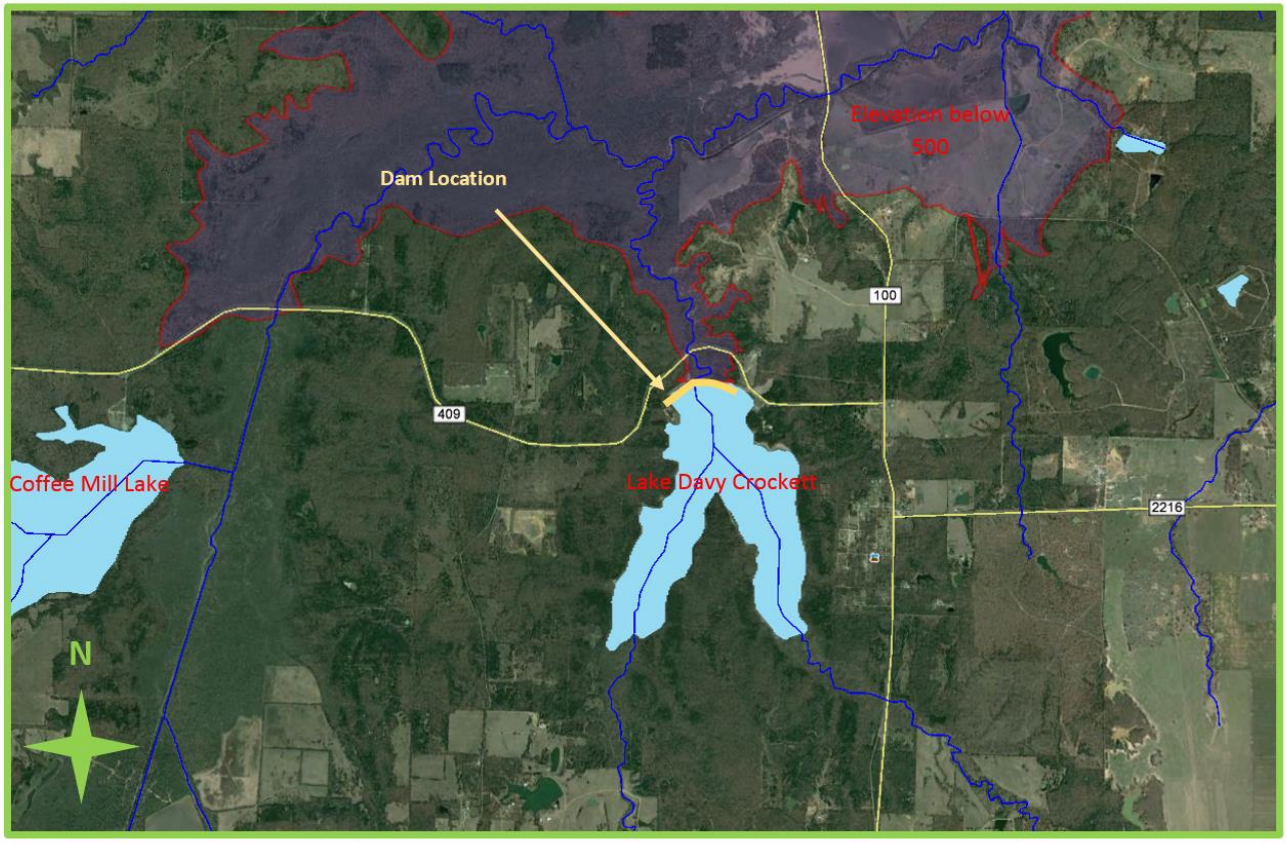
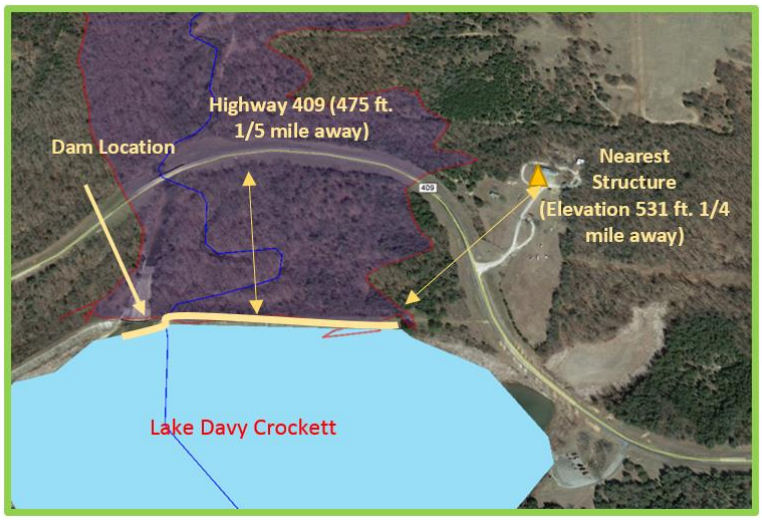


Figure 2b: Lake Davy Crockett Dam

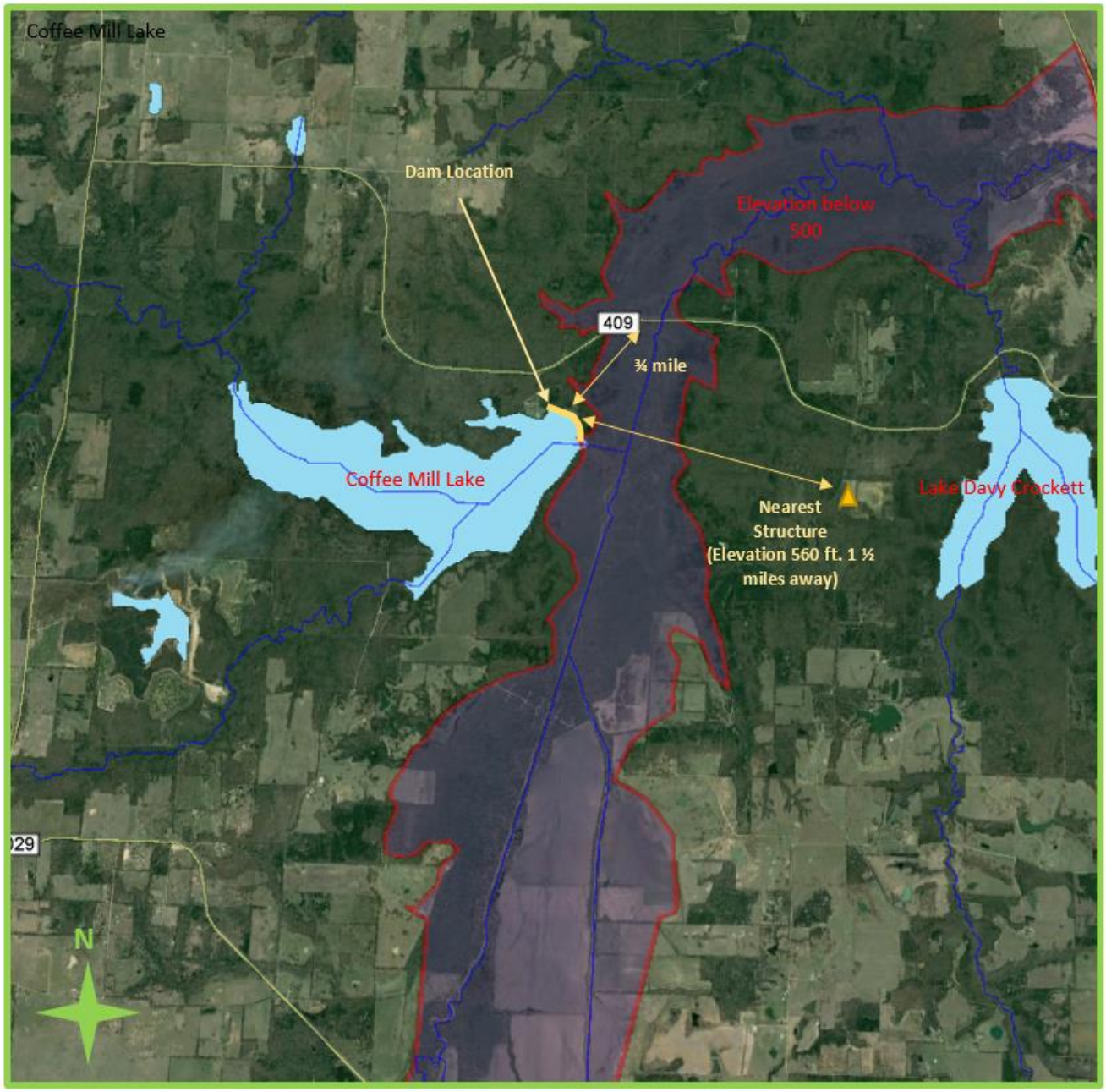




Lake Davy Crockett is a controlled level reservoir located in the Caddo National Grasslands. Normal conservation pool of the lake is 487 ft. but a water level drawn down has kept the reservoir 6.5 feet low since spring 2013. The spillway elevation is 503 ft. and the maximum depth of the lake is 20ft. During non-drought conditions the spillway is be used regularly to regulate water levels therefore ample area for overflow is available. Since no detail studies are available the map above shows approximately 4 miles around the dam and the areas with an elevation below 500 ft. The few structures located in the area are above the elevation of the dam including the nearest ¼ mile away at 531 ft. The greatest impact would be to Highway 409 that is only 1/5 mile away with an elevation of 475ft. Depending on the initial surge and the type of break this road could be damaged by the failure of the dam. The loss of use of Highway 409 would not alienate any homes in the area and other transportation routes are available for traffic rerouting.

Figure 2c: Coffee Mill Dam

Figure 2d: Coffee Mill Dam



Coffee Mill Lake is a controlled level reservoir located in the Caddo National Grasslands. This lake has a spillway elevation of 496 feet and the water level has remained at least three feet below the spillway since 2010, due to drought conditions. In non-drought conditions the spillway would be used regularly to regulate water levels therefore ample area for overflow is available. Since no detail studies are available the map above shows approximately 4 miles around the dam and the areas with an elevation below 500 feet. There are no houses or structures located in the area but Highway 409 does cross the area with its lowest elevation being 470 feet at a distance of ¾ mile from the dam site. The nearest structure is 1 1/2 miles away at an elevation of 560 feet.

Figure 2e: Lake Bonham Dam

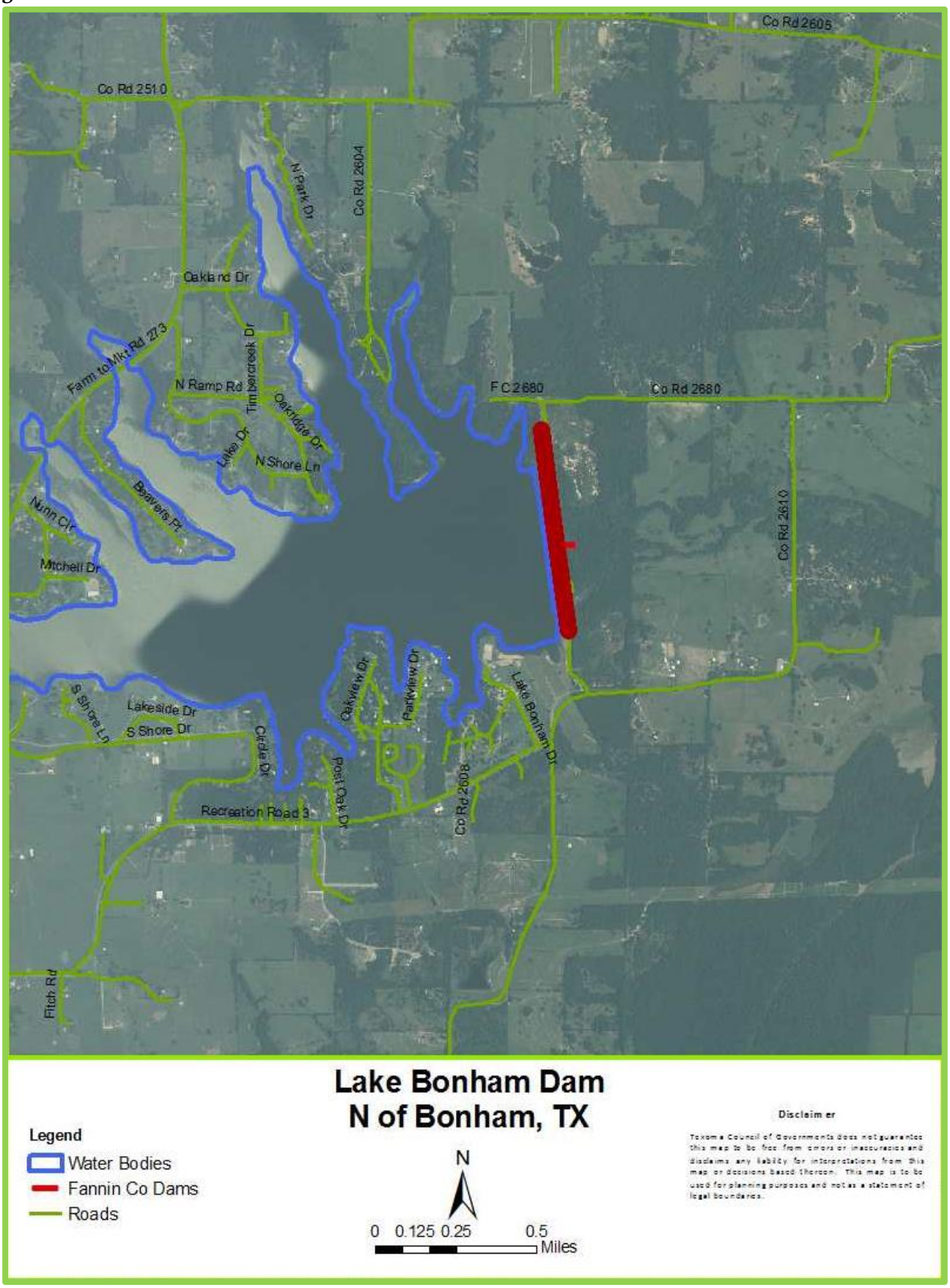
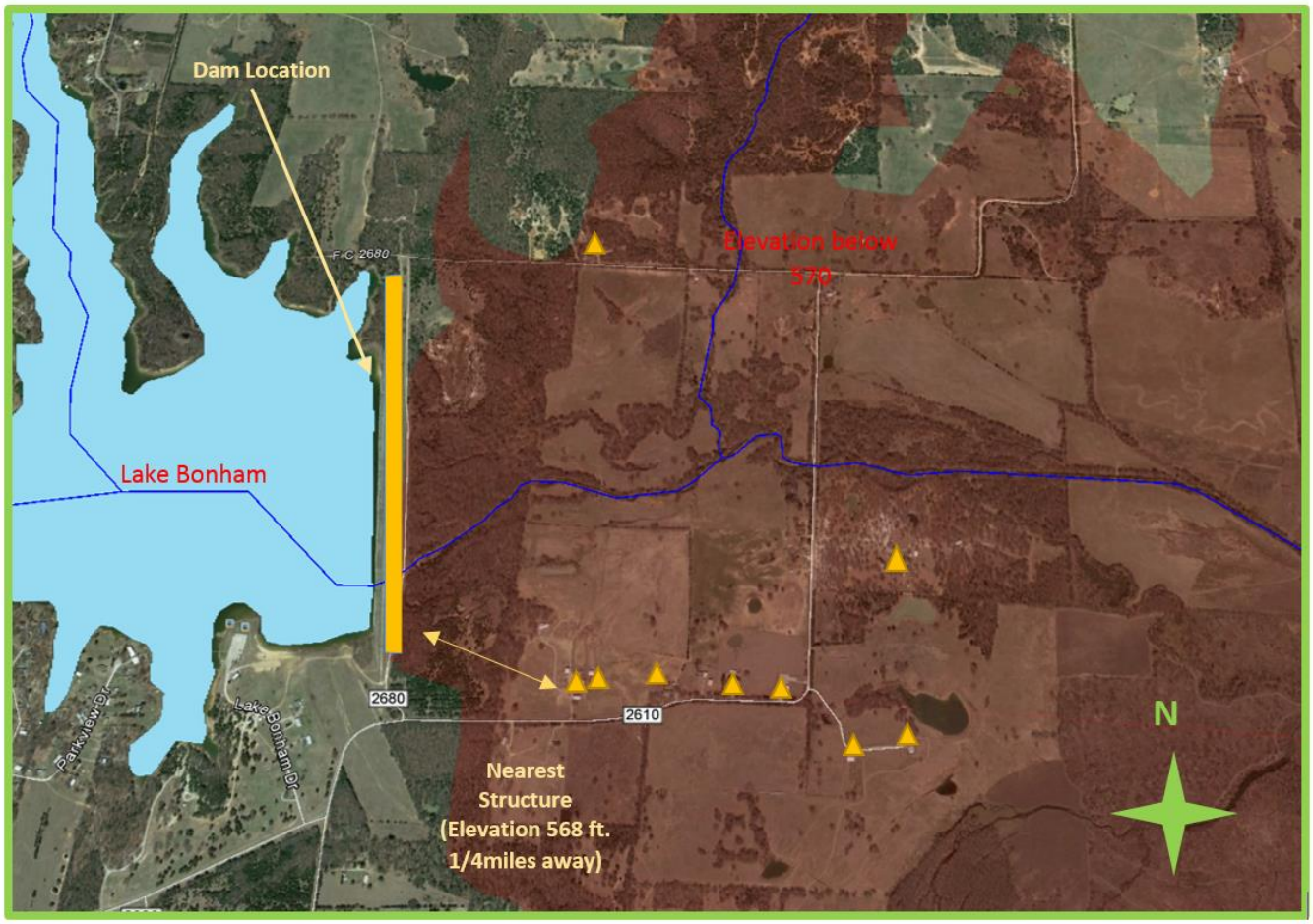


Figure 2f: Lake Bonham Dam



Bonham Lake is a 1020 acre man-made lake impounded in 1969. The lake conservation pool elevation is 565ft. with a maximum depth of 30 ft. The lake has a dam elevation of 570 ft. with an uncontrolled spillway. There are approximately 6 homes and about 15 barns that have elevations below 570 located behind the dam. These structures are at least ¼ mile away from the dam and all have an elevation about 560 ft.

There are currently no inundation studies or emergency plans for this dam. The future Lower Bois D'Arc Creek Reservoir will consume most of the land behind the dam when completed. The lake will incorporate over 16,500 acres and will have to capacity to handle any dam failure that Lake Bonham may have. Currently land is being acquired including any structures in the area. This lake is scheduled for construction in 2015 with a completion date of 2020 and will be included in future plan updates.

Figure 2g: Valley Lake Dam

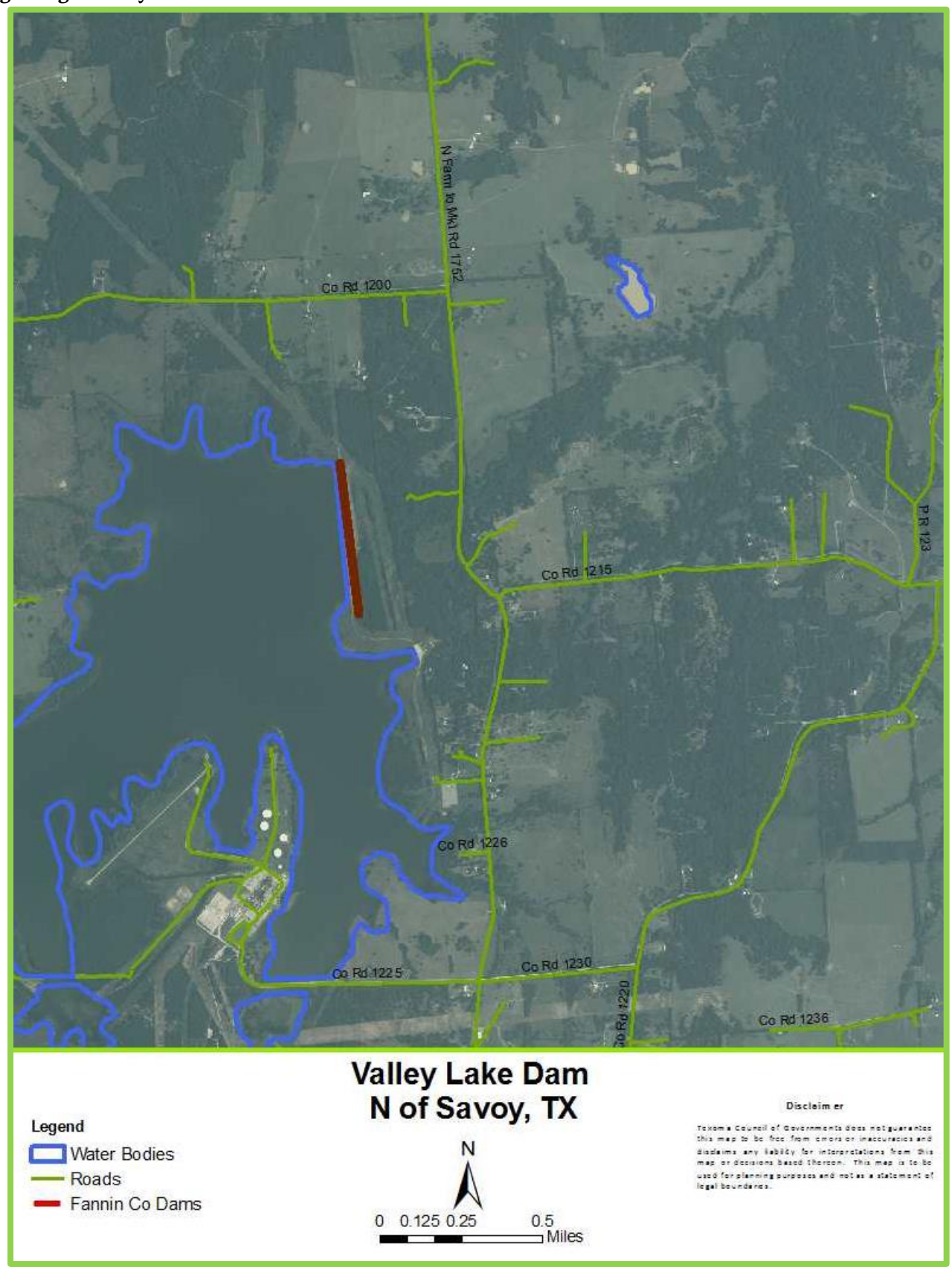
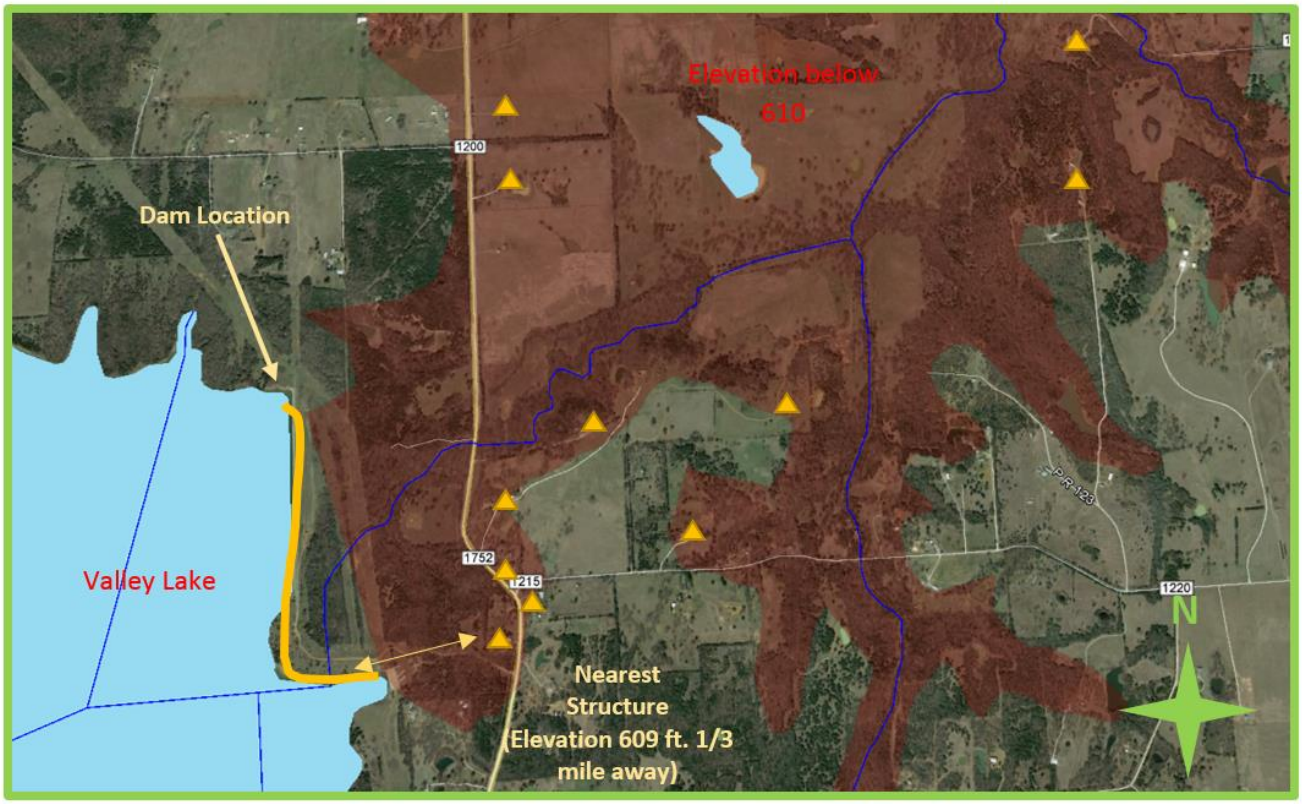


Figure 2h: Valley Lake Dam



Valley Lake, also known as Brushy Creek Reservoir, is on Brushy Creek, a tributary to the Red River. The lake is owned and operated by the Texas Power and Light Company for the purpose of condenser cooling and other power plant uses for its Valley Creek steam-electric generating station. The dam was completed in 1961 with a spillway elevation of 610 ft. The lake elevation is 561 ft. and the water in the lake is pumped in as needed from the neighboring Red River. The lake is not available for public use and is fenced and monitored.

There are currently no detail studies available for the Valley Lake Dam. The map above shows areas behind the dam with an elevation below spillway elevation. There are approximately 8 homes within 2 miles that are below the spillway elevation with the lowest being at 594 ft. The greatest impact from a dam failure would be damage CR 1752 that is ½ mile away. The road drops down to an elevation between 560 and 570 ft. for ¼ a mile. On residence could be isolated if the dam broke and wiped out part of CR 1752 road is destroyed.

3. Impact/Extent

The National Inventory of Dams is a registry of information about water barriers that are equal to or greater than 25 feet or impounds 50 acre-feet or more of water. The registry also includes structures that are over six feet in height, where failure would potentially cause damage downstream. Dam failure is a limited concern for residents in vicinity of dams in the county. According to the Dam Hazard Classifications in Table 3a and 3b Fannin County dams all have a low hazard potential. The greatest concern in the four dams that are at least 50ft high and/or impede 5,000 acre feet of water. Currently there are no jurisdictions that would be directly affected by the inundations of the dams in the county but with an extended heavy rain period a small dam failure could add to the flooding problems of jurisdictions downstream.

An Acre-Foot – is equal to 325,851 gallons of water.

Table 3a: Texas Dam Hazard Classification

Low-Hazard Potential (LHP)	•No loss of human life expected (no permanent habitable structures in the breach inundation area downstream of the dam); and minimal economic loss (located primarily in rural areas where failure may damage occasional farm buildings, limited agricultural improvements, and minor highways).
Significant-Hazard Potential (SHP)	•Loss of human life possible (one to six lives or one or two habitable structures in the breach inundation area downstream of the dam); or appreciable economic loss, located primarily in rural areas where failure may cause: damage to isolated homes; damage to secondary highways;damage to minor railroads; or interruption of service or use of public utilities, including the design purpose of the utility.
High-Hazard Potential (HHP)	•Loss of human life expected (seven or more lives or three or more habitable structures in the breach inundation area downstream of the dam); or excessive economic loss, located primarily in or near urban areas where failure would be expected to cause extensive damage to: public facilities; agricultural, industrial, or commercial facilities; public utilities, including the design purpose of the utility; main highways; or railroads used as a major transportation system.

Source: www.damsafetyaction.org

Table 3b: FEMA Dam Hazard Classification

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Source: FEMA "Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams", April 2004

Table 3c: National Inventory of Dams – Fannin County

Dam Name	River	Height (Feet)	Storage (Acre-Feet)	Drainage Area (Square Miles)	Year Completed	Owner Name
Pilot Groves WS Site 40 Dam	Bailey Cr	40	1,538	2.87	1969	Fannin SWCD
Pilot Groves WS Site 46 Dam	Tr-Bear Cr	34	447	0.78	1963	Fannin SWCD
Pilot Groves WS Site 47 Dam	Tr-Bear Cr	37	1451	3.15	1963	Fannin SWCD
Pilot Groves WS Site 39 Dam	Indian Cr	45	2361	3.16	1970	Fannin SWCD
Pilot Groves WS Site 38 Dam	DOG Cr	43	1847	3.24	1970	Fannin SWCD
Thornton Lake Pilot Grove WS	Bear Cr	36	1552	2.72	1963	Fannin SWCD
Lake Quail Haven Dam	Tr-Spoonamore Cr	30	900	0	1974	Red River Farm & Duck Club
Lake Bonham	Timber Cr	59	28,000	29	1969	Bonham WA
Corrigan Lake No 2 Dam	Tr-Sandy Cr	29	337	0	1970	Corrigan
Sandy Lake Corrigan Lake No 1	Sandy Cr	26	146	0	1960	Corrigan
Williams Lake Dam	Tr-Pickle Cr	25	499	0	1970	Williams
Taylor Dam	Davis Cr	24	326	0	1964	Taylor
Bonham State Park Dam	Tr-Bois D'Arc Cr	29	832	0.62	1935	Texas Parks & Wildlife Department
Canoe Lake Dam	Tr-Bois D'Arc Cr	25	683	0.35	1905	Canoe Lake Development
Caney Cr WS Site 2 Dam	Dameron Cr	35	1,173	39	1969	Fannin SWCD
Caney Cr WS Site 5 Dam	Hutchins Cr	37	1,632	0	1966	Fannin SWCD
Caney Cr WS Site 8 Dam	Tr-Caney Cr	23	618	0.98	1966	Fannin SWCD
Caney Cr WS Site 10 Dam	Pecan Branch	35	942	1.52	1967	Fannin SWCD
Caney Cr WS Site 11 Dam	Pecan Branch	31	684	0	1968	Fannin SWCD
Caney Cr WS Site 12 Dam	Tr-Post Oak Cr	24	407	0.85	1967	Fannin SWCD
Caney Cr WS Site 13 Dam	Tr-Caney Cr	29	611	0	1967	Fannin SWCD
Caney Cr WS Site 14 Dam	Wilhoit Branch	31	988	1.92	1968	Fannin SWCD
Caney Cr WS Site 15 Dam	Little Caney Cr	37	4,993	8.75	1967	Fannin SWCD
Brushy Cr Valley Lake Dam	Brushy Cr	55	20,000	8	1961	TU Electric
Coffee Mill Dam	Coffee Mill Cr	40	13,100	39	1969	USDA FS
Davy Crockett Dam	Sandy CR	44	6,000	11	1963	USDA FS
Fannin Dam	Tr-Red River	20	500	0	1938	USDA FS
Honey Grove Lake Dam	Tr-Honey Cr	23	450	0.53	1902	Honey Grove
Caney Cr WS Site 7 Dam	Post Oak Cr	35	2,273	4.06	1974	Fannin SWCD
Club Lake Dam	Tr-Bois D'Arc Cr	16	85	0	1944	Fin & Feather Club
Pilot Grove WS Site 51 Dam	Lee Cr	33	1,020	2.15	1982	Fannin SWCD
Pickard No 2	Tr-Merrill Cr	25	24	0.11	1968	Pickard
Max Ayers	Tr-Mc Clung Cr	27	71	0.23	1974	Ayers
Vernon D Hill	Tr-Pickle Cr	18	120	0	1979	Hill
Pickard No 1	Tr-Merrill Cr	29	17	0	1969	Pickard
Reid	Tr-North Sulphur	25	16	0	1957	Reid
Donaghey	Tr-Delba CR	27	35	0.01	1974	Donaghey
Diedrick	Tr-Honey Cr	25	24	0.03	1979	Diedrick
McMillan Dam	Tr-Bois D'Arc Cr	27	64	0.06	1969	McMillan
Woodson	Tr-North Sulphur	27	32	0	1979	Woodson
Lyndsay Lake Dam	Tr-North Sulphur	36	338	0	1982	Pecan Gap
J W Simmons Lake No 1Dam	Tr-Sanders Cr	18	56	0	1982	J Weldon Simmons
Lazwell Farm Dam	Tr-Sanders Cr	16	103	3	1989	J Weldon Simmons
Kirkptarick Levee	Collins Cr	12	92	0	1986	Kirkpatrick
Carpenter Lake Dam	Tr-Caney Cr	19	83	0	1970	Pannell
Klose Lake Dam	Tr-Brushy Cr	20	164	0	1966	Klose
No Name No 31	Tr-Brushy Cr	20	71	0	1965	-
Gilbert Lake Dam	Jacobs Cr	17	225	0	1970	Gilbert
Correa Lake Dam	Tr-Burr Oak Cr	27	248	0	1974	Correa
No Name No 32	Tr-Freeman Cr	23	372	0	1980	-

Dam Name	River	Height (Feet)	Storage (Acre-Feet)	Drainage Area (Square Miles)	Year Completed	Owner Name
No Name No 33	Tr-Freeman Cr	23	120	0	1977	-
Purdue Lake	Tr-Davis Cr	26	177	0	1977	-
Happy J Ranch Lake Dam	Tr-Bullard Cr	24	124	0.25	1973	Happy J Ranch
Altick Lake Dam	Tr-Bullard Cr	25	157	0	1980	Altick
No Name No 35	Tr-Honey Cr	30	224	0	1977	-
Fain Lake Dam	Tr-Pecan Cr	15	353	0	1977	Fain
No Name No 36	Tr-Valley Cr	26	163	0	1964	-
God's Delight Lake Dam	Tr-Valley Cr	15	81	0	1974	Christian Community of
Campbell Dam	Tr-North Sulphur	34	32	208	1990	Campbell
James R Phillips Dam	Tr-North Sulphur	28	56	425	1974	Phillips
Johnson Pooling Dam	Tr-Bear Cr	28	153	66	1986	Johnson Pooling
Lawrence Pickard Dam	Tr-North Sulphur	29	38	60	1978	Pickard
Milton Pooling Dam	Tr-Merrill Cr	24	113	492	1986	Milton Pooling

Source: National Inventory of Dams
The four dams that pose the greatest risk are highlighted in yellow.

Fannin County is home to 66 dams recorded with the National Inventory of Dams. There are four dams in the county that are at least 50 feet high and/or have storage of 5,000 acre feet or more. The failure of most of the dams in the county would result in damages primarily to the owner's property and many not be noticed at all. The failure of a dam of at least 50 feet high and/or storing over 5,000 feet of water could pose a threat to human life and the failure could result in significant damage to structures and the landscape below. In Fannin County there is limited development in areas behind these dams and the few structures are at elevations that are often higher than the dam.

According to local knowledge and map data there are currently no jurisdictions that would be threatened by a dam failure. Figures 2.a - h shows the locations, estimated inundation areas, and structures located in the vicinity. At this time, we do not have inundation data on any of the dams in Fannin County but have identified these studies as well as emergency action plans as mitigation measures for the future.

4. Previous Occurrences

There have been over 80 dam failures in Texas in the last twenty years. In 2010 alone four dams failed and 19 dams were overtopped but not breached. Fannin County's dam history has shown no documentation of a dam failure but the threat is always there.

5. Probability of Future Events

Minor dam failures occur often. However, most dam failures are minor and go unnoticed without any major effects on the population. Significant dam failures occur less frequently (approximately every 30 years or less). They are often a secondary effect of another hazard such as heavy rainfall. The classification of dam failures as a hazard for Fannin County represents the consequence of a potential failure and not the probability of a failure.

Dams are considered "Installations that contain dangerous forces" under International Humanitarian Law due to the massive impact of a possible destruction on the civilian population and the environment. Dam failures are comparatively rare, but can cause immense damage and loss of life when they occur. – www.wikipedia.org

6. Vulnerability

Texas' Dam Safety Program evaluates and regulates both public and private dams in the state. This program inspects barriers that pose a high or significant hazard and then makes recommendations to the proper corrective measures. The problem is that the State of Texas has over 7,400 dams to inspect, the most in the nation. Most infrastructure facilities, such as roads, bridges, and wastewater systems, are owned by public entities, 37 of Fannin County's dams are owned privately. These private owners are responsible for the financing of its upkeep, upgrade, and repair. The dam owner, whether private or public is held liable for making sure that the dam operates safely and properly.

Currently there are no jurisdictions that are vulnerable to a dam failure. Butwith the building of additional dams and levees amid the construction of the two proposed lakes a review of this plan will be necessary in the near future as the number of vulnerable infrastructures and critical facilities threatened will change.

7. Secondary Hazards

If a dam failure were to occur in Fannin County flooding would be the prominent secondary effect. If the dam failure is severe a large amount of water would enter the downstream waterways forcing them out of their banks. There may be significant environmental effects, as the resulting flood from the failure is likely to disperse debris and hazardous materials downstream that can damage local ecosystems. Debris carried downstream can block traffic flow, cause power outages, and disrupt local utilities such as water and wastewater. Most often with failures with barriers similar to those in Fannin County the damage will be minor with little to no secondary effects.

8. Overall Summary of Vulnerability and Impacts

Many dams in Texas have recently received upgraded hazard levels due to the increase in downstream development. In the future more dams will be constructed while at the same time existing dams will reach their designed life spans. This will expose the public to a greater risk from the dam failure hazard. TCEQ recognizing these issues has recently updated their Dam Safety Programs rules and regulations.

There is no record of dam failure occurring within the county and although the county has 4 high hazard dam, no detailed studies exist. Surge waves resulting from dam breaks have the potential to create major losses. Modern predictions of dam breaks rely on numerical predictions created using limited data.

Table 8: Summary

Community	Potential Severity of Impact	Probability of Future Events	Risk	Justification for Differences
Bonham	Major	Unlikely	Low	Bonham Lake is used owned and utilized as the water supply for City of Bonham.
Rural Areas	Major	Unlikely	Low	

**Only jurisdictions that identified Dam Failure as a hazard are listed.*

HAZARD PROFILE WORKSHEET	
HAZARD: Dam Failure	
POTENTIAL SEVERITY OF IMPACT:	
Substantial	• Multiple deaths • Complete shutdown of facilities for 30 days or more. • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited X	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

FREQUENCY OF OCCURRENCE:	SEASONAL PATTERN:
❑ Highly likely: Event probable in next year. ❑ Likely: Event probable in next 3 years. ❑ Occasional: Event possible in next 5 years. X Unlikely: Event possible in next 10 years.	Increased potential in a rainy spring season.

SOURCE DOCUMENTS:
National Inventory of Dams (NID), State Hazard Mitigation Plan, County Emergency Operations Plans, Flood Studies, Natural Resources and Conservation Service (NRCS), Volumetric Survey of Lake Bonham
DATA LIMITATIONS:
Limitations in reported losses and in quantifying long term economic losses Emergency Action Plans with detailed inundation maps are needed
PROBABLE DURATION & WARNING TIME
Duration can vary from a few hours to days depending on size and type of breach.
CASCADING POTENTIAL:
A dam failure could cause flooding, damage to crops, and destroy structures located behind and downstream.
EXISTING WARNING SYSTEMS:
Local news media and door to door evacuation if needed
PROGRESS SINCE EXISTING PLAN DEVELOPMENT
Additional CERT volunteers trained and ready to assist in response activities Upon closer review of the area behind the larger dams and utilizing both Texas and FEMA dam rating the potential severity of impact has been lowered

3.3 Structure and Property Assessment

Identifying what is vulnerable to a disaster not only provides insight into the potential post-disaster losses but calls attention to the need for protecting these structures and properties. Hazard Mitigation Plan Team (HMPT) members, assisted in the located of these facilities. GIS software, past incident dates, and HMPT input was used to determine which facilities were most vulnerable to hazards. Maps of these properties are available in Appendix B.

When assessing structure and properties seven types of structures and properties were identified:

1. **Residential Structures** - Any structure, movable or immovable, permanent or temporary, adapted for human residence, whether occupied or not. The plan identifies three categories of residential structures when assessing the vulnerability of properties:

   Single Family Homes – Site-built homes designed for one family unit.

   Manufactured Homes – Single family homes that are factory-assembled and moved to site.

   Multi-Family Homes – Structures designed to house multiple family units.

Table 3.3a: Occupied Residential Structures in Fannin County

Area	Single Family Homes	Total Single Family Values*	Manufactured Homes	Total Manufactured Values**	Total Value
Bailey	59	$6,490,000	8	$480,000	$6,970,000
Bonham	3,127	$343,970,000	194	$11,640,000	$355,610,000
Dodd City	81	$8,910,000	36	$2,160,000	$11,070,000
Ector	231	$25,410,000	48	$2,880,000	$33,570,000
Honey Grove	652	$71,720,000	47	$2,820,000	$74,540,000
Ladonia	208	$22,880,000	48	$2,880,000	$25,760,000
Leonard	797	$87,670,000	14	$840,000	$88,510,000
Ravenna	76	$8,360,000	21	$1,260,000	$9,620,000
Savoy	242	$26,620,000	23	$1,380,000	$28,000,000
Trenton	287	$31,570,000	6	$360,000	$31,930,000
Windom	85	$9,350,000	8	$480,000	$9,830,000
Unincorporated Areas	6,285	$691,350,000	1,564	$93,840,000	$785,190,000
Fannin County Total	12,130	$1,334,300,000	2,017	$121,020,000	$1,455,320,000

**Based on median home sales price of $110,000 for a single family home in Fannin County*
*** Based on state average of $60,000 for replacement*
Source: HAZUS, FEMA, THMP, Zillow, Fannin County Appraisal District, TX Dept. of Housing & Community Affairs, HUD & U.S. Census, 2000, 2008-2012 American Community Survey-5 Year Estimates, BEDCO

2. **Transportation System** - is the network of roads, streets, or any other structure which allows for vehicular moment. Fannin County's transportation system is comprised of over 2,000 miles of paved, concrete, and dirt or all-weather roads. The major thoroughfare is U.S 82 which runs east to west through the county. Fannin County is connected to Oklahoma by the Hwy 78 Red River Bridge. Since this bridge is the only connection to Oklahoma in the county it is a critical part of the Fannin County transportation system.

Table 3.3b: Critical Fannin County Transportation Assets

Properties	Description
Hwy 78 Red River Bridge	• 2,108 ft. • Only access to Oklahoma from Fannin County • National Register of Historical Places
Jones Field Airport (FOO)	• Only public airport in county • Asphalt runway 4,000 feet long & 75 feet wide • 24 enclosed hangers and 10 open hangers • Landing lights & fuel available • 1942-1944 Home of a contract flying school for the U.S. Army • Dedicated by City of Bonham at George Jones Airport 1929
US Highway 82	• Approximately 32 miles running east and west located in Fannin County • 2012 average daily traffic counts: Bonham-9,100, Honey Grove-4,300 and Savoy-2,500
US Highway 69	• 2012 average daily traffic counts: Trenton-3,900 and Leonard – 5,800
State Highway 11	• One of the original twenty-six state highways proposed in 1917 • 2012 average daily traffic counts: Randolph-1,500, Baily-1,550 and 1,450 northwest of Wolf City
State Highway 34	• Terminus at US Highway 82 in Honey Grove • 2012 average daily traffic count: Honey Grove-980 and Ladonia-970
State Highway 50	• Approximately 12 miles running north and south located in Fannin County • 2012 average daily traffic counts: Ladonia-940
State Highway 56	• 2012 average daily traffic counts: Bonham-9,500 , Ector-2,300, and Honey Grove-2,700
State Highway 78	• Approximately 30 miles running northeast and southwest located in Fannin County • 2012 average daily traffic counts: Bonham-6,900, Baily-1,700 and Leonard 2,700
Hwy 121	• Approximately 23 miles running northeast and southwest from Bonham to Trenton • 2012 average daily traffic counts: Bonham 9,500, Trenton-6,700 and Randolph 5,600

Source: Fannin County, HMPC, BEDCO, NCTCOG, & TXDOT

3. **Critical Infrastructures** – the array of assets and systems that, if disrupted, could threaten security, economy, public health and the safety of the residents they serve. Since September 11, 2001 critical infrastructures have been a top priority in homeland security planning. Critical infrastructures include: utility systems, public safety, communication systems, etc.

Table 3.3c: Critical Facilities and Properties in Fannin County

Critical Facility Name	Location	Facility Type	Structure Type	Value
Arledge Ridge Water Supply (510+ meters)	CR 4730, Leonard	Utilities	Water System	$3M
Bailey City Hall	101 N Main, Bailey	Administration	Wood Frame	$100K
Bailey Fire Dept.	Bailey	Public Safety	Metal Structure	$300K
Bailey Water Dept. (140+ meters)	PO Box 159,Bailey	Utilities	Water System	$100K
Bois D'Arc Municipal Utilities (1130+ customers)	NE corner of county	Utilities	Water System	$5M
Bonham City Hall	301 E 5th, Bonham	Administration	Masonry Structure	$1.5M
Bonham Fire (Jones Field)	2509 N Center, Bonham	Public Safety	Metal Structure	$350K
Bonham Fire Station (Downtown)	220 E 5th, Bonham	Public Safety	Masonry/Metal	$350K
Bonham Police Dept.	301 E 5th, Bonham	Public Safety	Masonry Structure	$350K
Bonham Water (4300+ meters)	514 Chestnut, Bonham	Utilities	Water System	
Bonham Water Authority (240+ meters)	Bonham	Utilities	Water System	$12M
Bonham Wastewater Facility	2501 Seven Oaks, Bonham	Utilities	Wastewater Treatment	$14M
Buster Cole State Jail (900+/- inmates)	3801 Silo Road, Bonham	Public Safety	Masonry Structure	$75M
Choice Moore Transfer Facility (1200+/- inmates)	1700 FM 87, Bonham	Public Safety	Masonry Structure	$100M
District # 1 Barn	Savoy	Administration	Metal Structure	$213K
District # 2 Barn	Leonard	Administration	Metal Structure	$376K
District # 3 Barn	Honey Grove	Administration	Metal Structure	$383K
District # 4 Barn	Bonham	Administration	Metal Structure	$246K
Dodd City Fire Dept.	380 Main St, Dodd City	Public Safety	Metal Structure	$100K
Dodd City Hall	304 S Chaney, Dodd City	Administration	Masonry Structure	$100K
Dodd City Water (230+ meters)	PO Box 129, Dodd City	Utilities	Water System	
Ector City Hall	206 N Main, Ector	Administration	Wood Frame	$100K
Ector Fire Dept.	Ector	Public Safety	Metal Structure	$300K
Ector Wastewater	PO Box 188, Ector	Utilities	Wastewater System	$1M
Ector Water (320+ customers)	PO Box 188, Ector	Utilities	Water System	$3M
Fannin County Courthouse	Bonham	Administration	Masonry Structure	$7M
Fannin County Electric Coop (8,370+ meters)	Countywide	Utilities	Electric Service	
Fannin County+ Sheriff's Dept. & Jail	2375 Silo Road, Bonham	Public Safety	Masonry Structure	$22M
Honey Grove City Hall (Police Dept.)	Honey Grove	Administration	Masonry Structure	$2M
Honey Grove Fire Dept.	Honey Grove	Public Safety	Metal Structure	$150K
Honey Grove Wastewater	633 6st St, Honey Grove	Utilities	Wastewater System	$1.5M
Honey Grove Water (760+ meters)	633 6th St, Honey Grove	Utilities	Water System	$6M

Critical Facility Name	Location	Facility Type	Structure Type	Value
Ladonia City Hall	100 Center Plaza, Ladonia	Administration	Masonry Structure	$100K
Ladonia Fire Dept.	Ladonia	Public Safety	Metal Structure	$100K
Ladonia Wastewater Dept.	Ladonia	Utilities	Wastewater System	$1M
Ladonia Water (330+ meters)	PO Box 5, Ladonia	Utilities	Water System	$3M
Leonard City Hall (Police & Fire)	111 Collins, Leonard	Administration	Masonry Structure	$500K
Leonard Wastewater	Leonard	Utilities	Wastewater System	$2M
Leonard Water (830+ meters)	PO Box 1270, Leonard	Utilities	3 Water System	$6M
Ravenna City Hall	103 N Main, Ravenna	Administration	Frame Structure	$50K
Ravenna Fire Dept.	106 Sycamore, Ravenna	Public Safety	Metal	$75K
Red River Regional Hospital	504 Lipscomb, Bonham	Health Care	Masonry Structure	$3M
Sam Rayburn Memorial Center	1201 E 9th, Bonham	Health Care	Masonry Structure	$42M
Savoy City Hall (Police)	405 E Hayes, Savoy	Administration	Masonry Structure	$200K
Savoy Fire Dept.	Savoy	Public Safety	Metal Structure	$200K
Savoy Wastewater	Savoy	Utilities	Wastewater System	$1M
Savoy Water (360+ meters)	PO Box 176,Savoy	Utilities	Water System	$3M
SW Fannin County SUD (1971 meters)	8046 W Hwy 56, Savoy	Utilities	Water System	$20M
Trenton City Hall (Police)	216 Hamilton, Trenton	Administration	Masonry Structure	$150K
Trenton Fire Dept.	Trenton	Public Safety	Masonry Structure	$150K
Trenton Wastewater	Trenton	Utilities	Wastewater System	$400K
Trenton Water (350+ meters)	PO Box 44, Trenton	Utilities	Water System	$3M
TXU-Valley Plant	Bonham	Utilities	Electric Service	$3.3M
White Shed Water District (940 meters)	Ivanhoe	Utilities	Water System	$10M
Windom City Hall	510 Maple, Windom	Administration	Masonry Structure	$500K
Windom Wastewater	Windom	Utilities	Wastewater System	$1M
Windom Water (130+ Meters)	Windom	Utilities	Water System	$1.5M

Source: Chamber of Commerce, HMPC, TX Dept. of Criminal Justice, TCEQ & local businesses

4. **<u>Historic, Cultural, & Natural Resource Areas</u>** – this includes structures, sites, cultural and historic places, wild life preserves, and parks.

Table 3.3d: Historic, Cultural, & Natural Resource Facilities and Properties in Fannin County

Historic, Cultural, & Natural Resource Area Name	Location	Description	Value
Bertha Voyer Memorial Library	500 N 6th Street, Honey Grove	• 23,000 books and 11,000 audio pieces • 2014 Finalist of Best Small Library in America	$1M +
Bonham Public Library	305 E 5th, Bonham	• Books, Periodicals, Etc.	$2M +
Bonham State Park	South of Bonham off of FM 271 on Park Road	• 261 acre park • Constructed in 1930's by the (CCC) • 65 acre lake • Day use and overnight camping	$1M +
Caddo National Grasslands	Bois D'Arc Creek (Unit #1) Ladonia (Unit #2)	• Wildlife Management Area • Administered by U.S. Forestry • Unit #1 13,360 acres - 6 land tracks • Unit #2 2,780 - 12 land tracks	$30M +
Creative Arts Center	200 W 5th, Bonham	• Dedicated to the teaching & appreciation of the arts	$1M +
Fannin County Multi-Purpose Complex	Hwy 56 & FM 87	• 27,000 sq. ft. multipurpose building • 31,000 sq. ft. open livestock pavilion	$1.5M +
Fannin County Museum of History	327 N Main, Bonham	• Located in a 1900 Railroad Depot • National Registry of Historic Places	$1M+
Fort Inglish Village	Hwy 56, Bonham	• First building built in Bonham in 1837 • One of four forts built for Indian protection	$1M +
Lake Bonham	FM 273/Rec Road 3	• 1,282 acre City of Bonham owned lake	$3M +
Lake Fannin Wilderness Park	Near Telephone	• Registered on Register of Historical Places	$3M +
Leonard Public Library	102 S Main, Leonard	• Over 19,000 volumes	$1M +
Sam Rayburn House Museum	Hwy 82 W, Bonham	• Built in 1916 as Sam Rayburn's farm home • Opened as a Museum in 1975 • Administered by Texas Historical Commission	$1M +
Sam Rayburn Library	800 W Sam Rayburn Dr., Bonham	• Established as a library & museum in 1957 • Became a division of the Center for American History in 1991 • National Register of Historic Places	$1M +

Source: Chamber of Commerce, Fannin County Appraisal District, HMPT, & local businesses

5. **Economic Elements** – consists of major employers and retail districts could cause significant impact to the local economy.

Table 3.3e: Economic Elements in Fannin County

Economic Element Name	Location	Employees	Business Type	Structure Type	Annual Payroll
Bonham School District	Bonham	320	Education	Masonry	$7M
Buster Cole State Jail/Choice Moore Unit	Bonham	498	Correctional Facility	Masonry	$12M
Fannin County	Bonham	125	Government	Masonry	$3M
Clayton Homes	Bonham	200	Manufacturing	Metal	$4M
City of Bonham	Bonham	125	Government	Masonry	$3M
Mc Craw Oil/Kwik Check	Bonham	464	Oil/Gas	Masonry	$9M
Red River Regional Hospital	Bonham	170	Health Care	Masonry	$6M
Sam Rayburn Memorial	Bonham	600	Health Care	Masonry	$10M
Texas State Veterans Home	Bonham	170	Health Care	Masonry	$5M
Voluntary Purchasing Groups	Bonham	100	Manufacturing	Masonry	$2M
Wal-Mart Supercenter	Bonham	288	Retail	Masonry	$4M

Source: Chamber of Commerce, HMPC, BEDCO, Census, & local businesses

6. **High Density and Special Consideration Areas** – local areas with a high population density or with a population that may be more vulnerable to losses. This section includes schools, mobile home communities and senior care and living facilities.

Table 3.3f: High Density & Special Consideration Areas in Fannin County

High Density & Special Consideration Area	Location	Facility Type	Population
American Homestead Village	Old Silo Road, Bonham	Mobile Home Park	70 units
Bonham High School	1717 N Center, Bonham	Education	551 students
Bonham Nursing & Rehabilitation	709 W 5th, Bonham	Assisted Living	65 bed facility
Clyde W Cosper Texas State Veterans Home	1300 Seven Oaks, Bonham	Assisted Living	160 bed facility
Dodd City ISD	602 N Main, Dodd City	Education	360 students/ 49 staff
Ector ISD	Eagle & Main, Ector	Education	251 students
Evans Elementary	1717 N Center, Bonham	Education	445 students
Fannindel ISD	601 W Main, Ladonia	Education	196 students/47 staff
Finley-Oates Elementary	1717 N Center, Bonham	Education	543 students
Hofmann Care Home	1405 N Cedar Street, Bonham	Assisted Living	15 units
Honey Grove ISD	540 6th, Honey Grove	Education	585 students/ 88 staff
Honey Grove Nursing Center	1303 E Main, Honey Grove	Assisted Living	101 bed facility
Leonard ISD	#1 Tiger Alley, Leonard	Education	900 students/ 105 staff
Leonard Manor	902 E Hackberry, Leonard	Assisted Living	78 bed facility
Mulligan Care Center	105 N Main, Savoy	Assisted Living	119 bed facility
Red River Regional Hospital	504 Lipscomb, Bonham	Hospital	25 bed facility
Rather Junior High	1717 N Center	Education	326 students
Sam Rayburn ISD	9363 E FM 273, Ivanhoe	Education	520 students/ 65 staff
Sam Rayburn Memorial VA Center	1201 E 9th, Bonham	Hospital	368 bed facility

High Density & Special Consideration Area	Location	Facility Type	Population
Savoy ISD	302 W Hayes, Savoy	Education	280 students / 48 staff
Seven Oaks Nursing & Rehabilitation	901 Seven Oaks, Bonham	Assisted Living	108 bed facility
The Woodmore	1200 W Russell Avenue, Bonham	Assisted Living	48 apartments
Tower View Mobile Home Park	1125 W 12th, Bonham	Mobile Home Park	42 units
Trenton ISD	500 S Ballantine, Trenton	Education	540 students/ 90 staff

Source: www.schoolsk-12.com, school districts, www.publicschoolsreport.com, DADS, HMPT, local schools, and assisted living facilities

7. **Hazardous Material Facilities** – facilities that store or use potentially hazardous materials, such as corrosives, explosives, and toxins.

Table 3.3g: Hazardous Material Facilities in Fannin County

Hazardous Material Facility	Location	Type of Hazard
Cooper Propane Co	1502 W Main, Honey Grove	Propane and other gases
Cooperative Gin Company	1005 5th Street, Honey Grove	Fertilizer & chemicals
Genetic Seed & Chemical	2620 N Center, Bonham	Fertilizer & chemicals
M & M Fertilizer Co	520 S Center, Bonham	Fertilizer & chemicals
McGraw Oil Company	2207 N Center, Bonham	Propane and other gases
Voluntary Purchasing Group VPG	230 FM 87, Bonham	Fertilizer & chemicals
Wal-Mart Supercenter	2021 N Hwy 121, Bonham	Paints, chemicals, cleaners, etc.

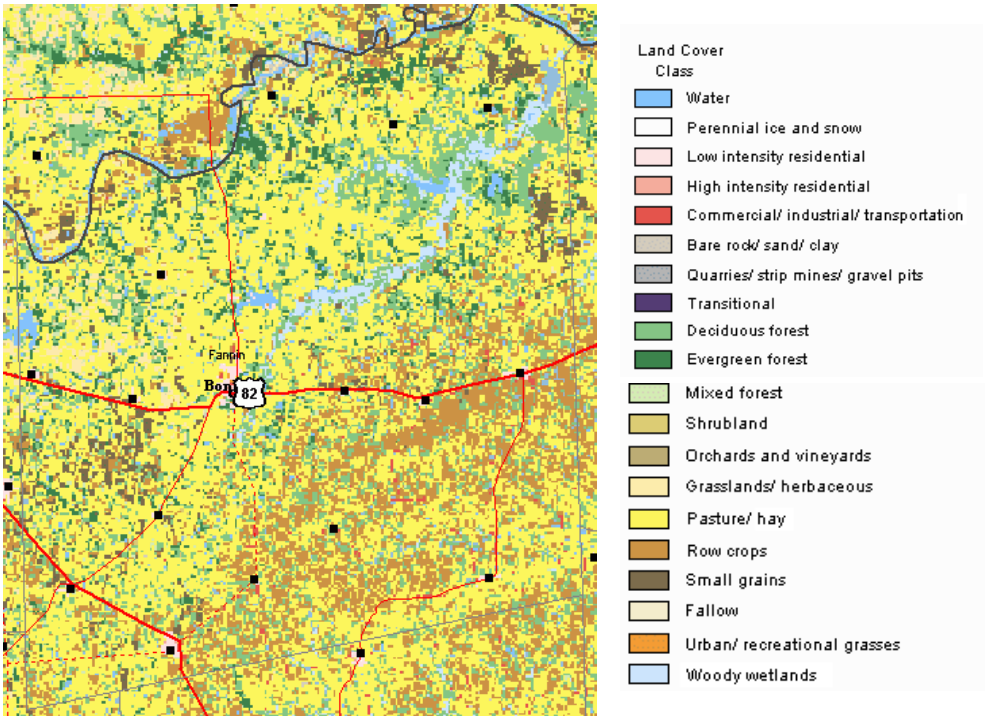
Source: Chamber of Commerce, HMPT, & local businesses

3.4 Land Use

Fannin County, Texas is a rural county located in north Texas near the Texas-Oklahoma border. The county is a lightly populated agricultural area with Bonham being the seat and the main source of employment. The county's land use includes residential, light industrial and commercial but is predominantly agricultural with vast hay and pasture land. Row crops can be found more prominently in the eastern half of the county and deciduous trees are found near the lakes, creeks, streams, and residential areas. According to the USDA's 2012 Census of Agriculture Fannin County increased the number of farms from 1,252 in to 2007 to 1,445 farms in 2012.

The county is not expected to undergo development pressure and does not anticipate any changes in land use within the next 5 years, but with the addition of two large reservoirs changes could occur within the next 10 years. The potential relocation of a major employer to the county would alter the land-use patterns surrounding that area or the early completion of the two proposed lakes. This development cannot be forecasted at this time but would necessitate an update to this plan.

Figure 3.4: Land Use



3.5 Development Trends

Fannin County grew steadily from the Civil War to the turn of the 20th Century. Agriculture was the main source of income with cotton and corn being the leading crops. In 1900 the county had a population of 51,793. After the turn of the century the population slowly decreased. The depression brought a loss of farm values of over 40% and pushed a decline in the number of farms. Cotton and corn production dropped sharply during the 1950's and took with it a large part of the population. The population and number of farms continually decline until only 22,705 people resided in the county in 1970. During this period the corn and cotton farms were changing to cattle ranches. The population slowly started to rebound in the 1970's with an increase in manufacturing, banking, retail, and cattle farms. According to the 1990 Census the population was up to 24,804 and by the 2010 Census the population was 33,915.

Table 3.5: Population & Population Projections

Community	1990	2000	2010	2015 (Projected)
Fannin County	24,804	31,242	33,915	35,804
Bailey	187	213	289	
Bonham	7,338	9,990	10,127	
Dodd City	350	419	369	
Ector	497	600	695	
Honey Grove	1,681	1,746	1,668	
Ladonia	658	667	612	
Leonard	1,744	1,846	1,990	
Ravenna	180	215	209	
Savoy	877	850	831	
Trenton	655	662	635	
Windom	269	245	199	

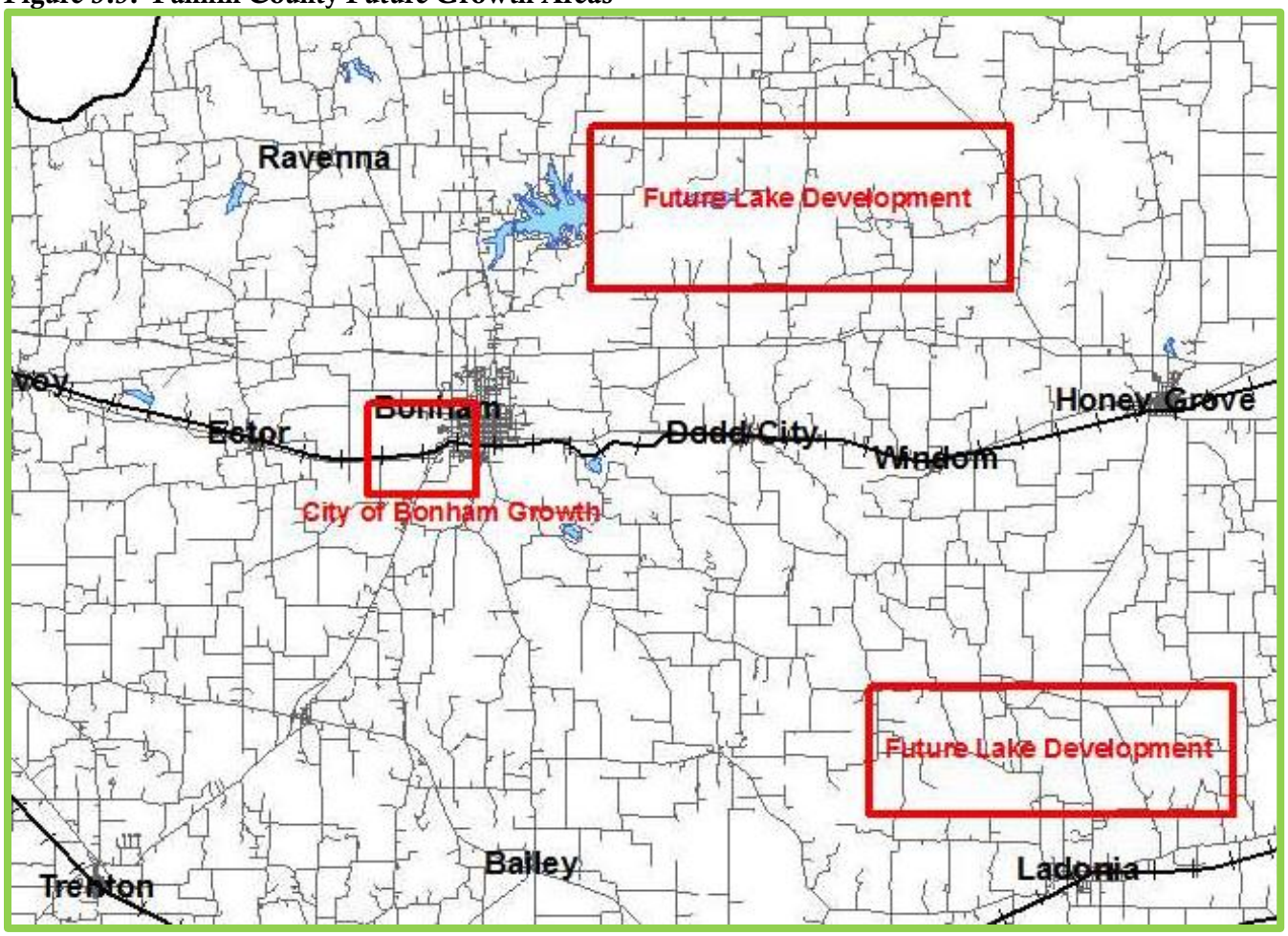
Source: U.S. Census Bureau

Future growth areas are seen along Hwy 82 and Hwy 121 on the west side of the City of Bonham. The recent development in the area includes Wal-Mart Super Center, Bonham High School, Fannin County Sheriff's Office and County Jail and the current construction of two chain hotels. This area of the county is also where the Sam Rayburn Memorial Veteran's Center, Choice Moore Transfer Facility, and the Buster Cole State Jail are located. Future growth areas are projected in the southwest corner of the county due to the growth of the Dallas Metroplex-.

The growth in the county is being encouraged on the local and county level with the Bonham Economic Development Corporation working to encourage industry, business, retail and tourism in the county. The Bonham Chamber of Commerce welcomes visitors with open arms and provides them with everything from county and local street maps to historic points of interest. The growth is also being prepared for with planning of upgrades to the street, water and wastewater systems.

Because Fannin County is vulnerable to a variety of hazards, local governments must make a commitment to prepare for the management of these types of events. Fannin County is committed to ensuring that county and local officials become informed leaders regarding community hazards so that they are better prepared to set and direct policies for emergency management and response for the future.

Figure 3.5: Fannin County Future Growth Areas



3.6 Potential Dollar Loss & Impact

Potential dollar loss was estimated for each hazard based on losses recorded from previous natural hazard events. The total recorded loss was divided by the number of events to obtain an average potential dollar loss per event. An attempt was made to estimate losses for all hazards profiled in this plan, however due to limited resources, detailed data for estimating specific potential dollar loss for many of the natural hazards were not available. All jurisdictions realize the importance of having good local data and have proposed Mitigation Actions to develop a database of hazard information. This information will be useful as a planning mechanism and benefit cost analysis tool when applying for grants.

Thunderstorms (Including Wind & Lightning)

Fannin County had 47 strong thunderstorm/high wind events recorded between 2002 and 2012 resulting in over $1.5 million in damages. Therefore, based on this data, it is concluded that the county can experience an average of over $150,000 each year from strong thunderstorm events.

Winter Storms

The County has experienced 28 significant winter storms of varied intensities that consisted of snow and/or ice between 1994 and 2011. Snow-blocked and ice-covered roads not only make travel dangerous, but the removal and clearing of snow and ice can be costly. Downed electrical lines and the resulting loss of power to homes, businesses, and water systems not only increase hardships and hinder recovery, but can also increase potential dollar losses during and after winter storm events. Sufficient data for calculating potential loss is not available since winter storm events are regional and therefore damages are for event-wide totals. Mitigation strategies to collect better data will assist in future disaster declarations.

Extreme Heat

County-specific data pertaining to dollar loss resulting from extreme heat was not found. Therefore, estimates for potential loss could not be derived. Such loss is likely to include livestock and crop damage, but it is most likely to be associated with drought, rather than extreme heat. Areas of the county with an increased elderly population are also more vulnerable to extreme heat and may not have adequate home cooling for such events.

Hailstorm

According to the NCDC, Fannin County has experienced over 70 large-hail events since 1980. Some of these events were insured, but for others a dollar amount was never recorded; therefore, at this time we are not able to calculate an average event cost. It must also be noted that dollar loss specific to hail damages recorded for areas outside municipalities within the county is not always available, so crop damage due to hail may not be accurately recorded in the NCDC, and thus, not accurately reflected in the estimated potential dollar loss per event.

A worst case scenario would be a large hail event over the southwest corner of the city. This zone contains new car dealership, which consistently has 700-800 vehicles, and is the area with the greatest population of resident over 65. These residents are more likely to own their home thus not required to be insured. Noninsured hail damage could have devastating effects on residents who are on fixed monthly incomes and are living at or near the poverty line.

In 2012 the wheat and corn crops grown in Fannin County were worth over $6 million dollars. A hail event in the eastern part of the county could completely wipe out those crops. Hail as small as marbles can totally destroy wheat and corn crops but the damage is often not immediate. Damage to corn leaves has a direct impact on the production yield and bruising of the stalk allows infections and molds to overtake and destroy the plant.

Drought

The National Climatic Data Center reports that Texas has had at least 15 droughts from 1980 to 2009 resulting in over $185 billion in damages. Severe drought can have severe consequences on the economy, health and public safety due to the fact that one hazard - drought - can lead to others, such as massive wildfires.

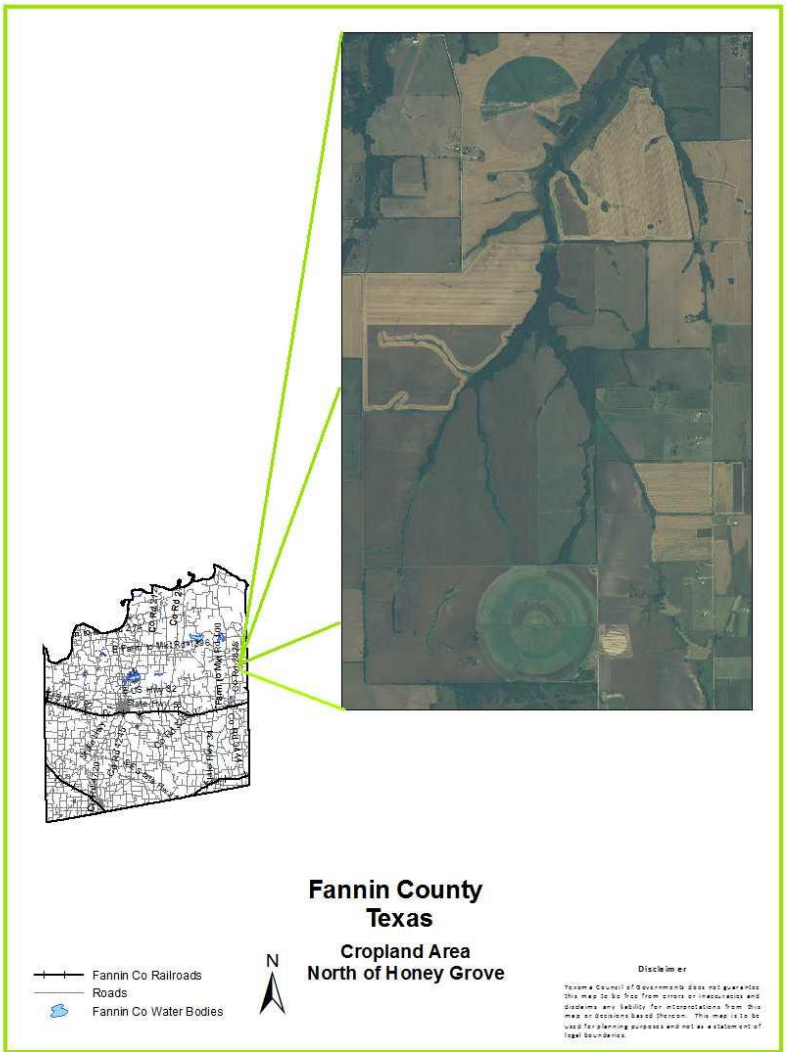
The primary impact of drought in Fannin County is reduced crop yields and damage to rangeland. According the USDA there were over 70,000 head of cattle in Fannin County. The cost of supplemental feeding due to a drought can be enormous and the effects to the local and regional economy of having to reduce herds can be devastating. Table 3.6a below shows 2012 Fannin County crop production and value. In a severe drought year the production would be severely diminished and the local economy could suffer with the omitted income. Since drought events are regional in nature and can vary in magnitude greatly over small distances the potential dollar loss is difficult to estimate and has not been calculated in this plan. As a mitigation action local producers are encouraged to do yearly acreage reports at the Fannin County Farm Service Agency and to invest in crop insurance programs.

Table 3.6a: 2012 Crop Yield & Loan Value

Crop	Harvested* (Acres)	Yield (Bushels/Acre)	Total Production (Bushels)	Loan Rate (Price per Bushel)	Total Loan Rate Value
Corn	11,480	91.4	1,049,000	$1.95	$2,045,550
Oats	630	65.1	41,000	$1.39	$56,990
Sorghum	5,300	89.6	475,000	$1.95	$926,250
Soybeans	9,100	16.2	147,000	$5.00	$735,000
Wheat	26,400	61.2	1,616,000	$2.94	$4,751,040
					$8,514,830

** Additional acres may have been planted and were not harvested due to grazing, hay, etc.*
Source: USDA

Figure 3.6a: Crop Farm Areas



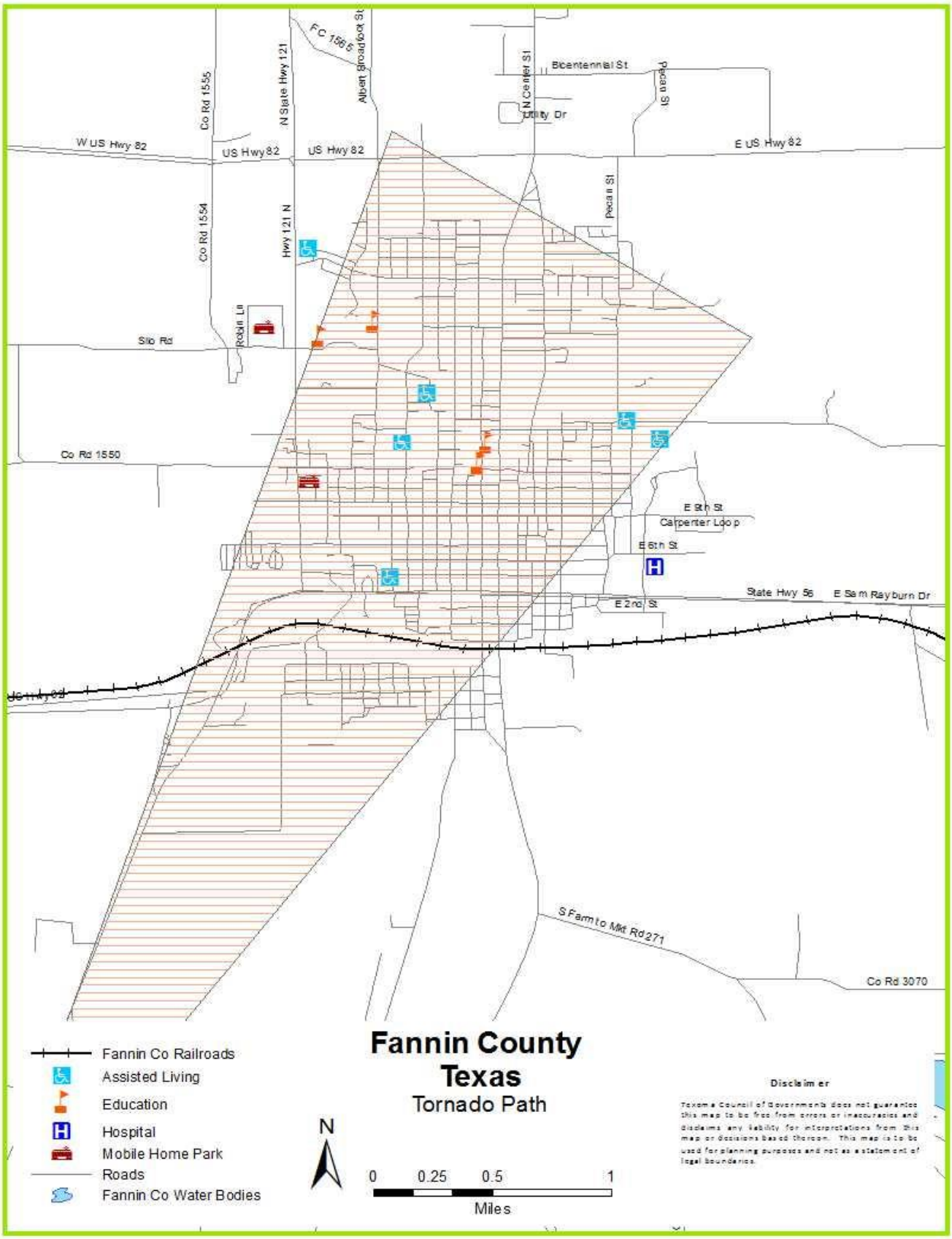
Tornadoes

Texas ranks number one in frequency, deaths, and costs of damage from tornadoes. Between 1950 and 1995 there were 478 fatalities and 7,554 injuries reported as the result of tornado events. The costs of tornadoes throughout the state during this period were $1,986,918,400 producing a yearly cost of $3.94 per person in damages. The risk of death from a tornado in Texas is 1 in 1,054,267 and the risk of an injury in any given year is 1 in 66,712.

Fannin County had reported over $6 million in damages from 47 tornadoes between 1955 and 2012. That is an average of over $100,000 in damages a year or nearly $130,000 per tornado. The average cost per person per year is $3.34. Other potential losses that are hard to estimate include economic impact from damaged businesses that fail to reopen and infrastructure disruption. The largest expenses are for repairs to public facilities and clean up and disposal of debris.

A worst case scenario would be an EF3 or greater tornado on the west side of the City of Bonham. This type of event would have a potential dollar loss in the millions with multiple fatalities and injuries. The VA Hospital, two correctional facilities, a high school, and several other highly populated facilities are located within a two mile stripe.

Figure 3.6b: Fannin County Worst Case Tornado Scenario



Expansive Soils

The majority of issues with Expansive Soils in Fannin County are to residential foundations. Foundation work is expensive and can often be required more than once. The cost of such work can run from $1,000 to over $10,000 to correct the problem. No records of specific incidences of structure losses or injuries due to expansive soils within the county were found.

Flood

According to the National Climatic Data Center (NCDC), Fannin County has 40 documented notable flood events in the 18-years from 1996 to 2012. This gives an average of 2.2 large floods occurring in Fannin County each year. Most floods are of small consequence and occur in rural areas where dollar amounts are often unavailable. Over $500,000 in damages, averaging $27,500 per event, have been reported since 1996. Since improvements in Fannin County have been directed away from flood plains an estimated population of less than 200 people was found to live in flood zones within the county and additional communities have joined the NFIP. When compared to the county's total population, this resulted in less than 1% of the population living within a flood zone. GIS was used to help associate population and housing with flood zones to obtain this estimate. FEMA's Map Service Center was used to identify flood zones for most of the county.

The county has had no reported deaths caused by flash flooding. Fannin County Emergency Management concludes that county citizens who live in affected areas are aware of the dangers, thus resulting in the low human casualty rate. It is important to stress flood education and that even one inch of flood water in a home can cause considerable damage as shown in Table 3.6b.

Table 3.6b: Estimated Flood Damages to 1,000 sq. ft. Dwelling

Amount of Water	Damages	Cost $
1 inch	Drywall, Carpet & Flooring, Baseboards & Moldings, Furniture, etc.	$10,600 +
5 inches	Drywall, Carpet & Flooring, Baseboards & Moldings, Furniture, Electronics, etc.	$17,310 +
12 inches	Drywall, Carpet & Flooring, Baseboards & Moldings, Furniture, Electronics, Appliances, Cabinetry, Electrical System, AC/Furnace etc.	$27,150 +

Source: www.floodsmart.gov

According to HAZUS and THMP, Fannin County has very limited development in flood areas. Table 3.6c attempts to estimate the proportion and value of buildings, and the population that are located in the 100-year floodplain. The number of structures listed in the table is an approximate number based on visits to the floodplain, THMP, and GIS data.

Table 3.6c: Floodplain Structures

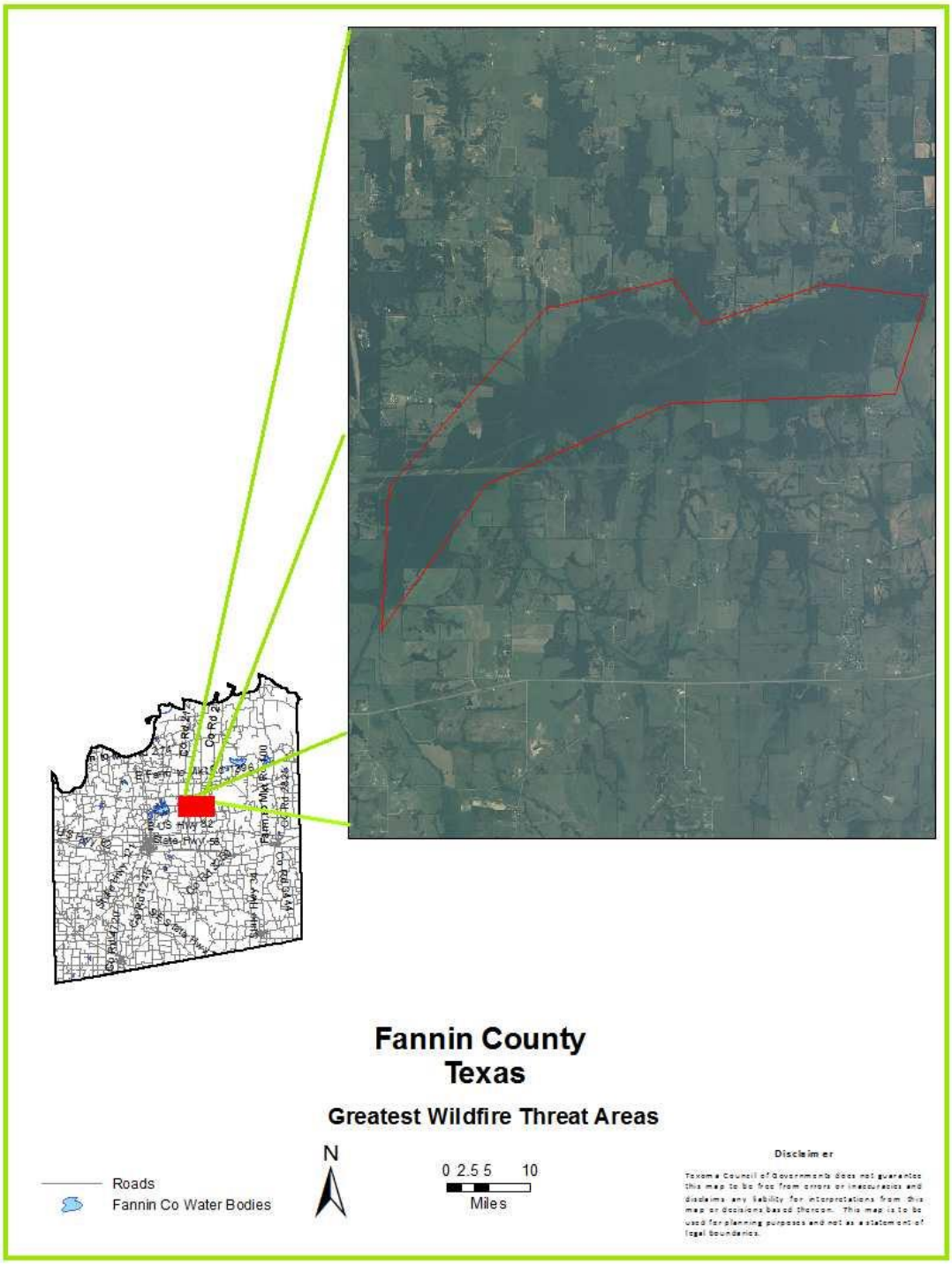
Location	Description
Lake Bonham	• Approximately 125 residential structures (Average assessment @ 200K) = $25M+ • Approximately 3 businesses (2,500 sq. ft. HAZUS Recreation/Restaurant Replacement Cost of $162.8 per sq. ft. =$407K each) = $1.7M
City of Bonham	• Approximately 35 residential structures (Average assessment $95K each) = $3.3M+ • Approximately 40 residential structures contents value (50% of value = $47K) = $1.8M+ • Approximately 2 warehouses (15,000 sq. ft. Replacement cost of $70.5 per sq. f.t = $1M each) = $2M
Other areas of County	• Less than 50 residential structures (County average home value of $92K each) < $4M • Less than 50 residential structures (HAZUS Res1 50% of value = $40K each) < $2M

** These are estimates based on HAZUZ, THMP, Fannin County Appraisal District, & Aerial Photography*

Wildfire

There is an increased risk to life and property to homes constructed in or near the wildland interface or intermix areas. Homes in these areas are most often single family homes. Due to the nature of wildfires and the limits of firefighting capabilities during a wildfire, a home or structure that catches fire is considered destroyed. Data on wildfires events and damages in Fannin County is a combination structure and automobile fires; therefore no estimate is available at this time on potential dollar damages. Future plans will have access to better data and local departments are being encouraged to better document responsive activities.

Figure 3.6c: Fannin County Worst Case Wildfire Scenario



Human-Caused

No records of specific incidences of terrorism within the county were found; therefore potential dollar loss could not be estimated. All identified Transportation Assets, Critical Facilities, Economic Elements, and High Density Areas are potential terrorist targets. A wide-spread terror campaign could have a potential cost in the millions, results in mass deaths and injuries, and could cripple the local economy for years.

Hazardous material accidents in Fannin County are usually associated with the transportation of a hazardous product through the county. Information on past occurrences and costs of these events were not found. Therefore potential dollar loss could not be estimated.

Earthquake

There is only a 10% chance in 50 years that an earthquake at the severity level of two will occur within the county. There are no significant past damages recorded, therefore potential dollar loss was not estimated.

Dam Failure

Although there is no record of dam failure occurring within the county the threat of a dam failure is growing due to the increased development downstream. The surge that results from a dam break has the potential to create major losses. An acre-ft. or 325,851 gallons of water would cover an acre of land with a foot of water. Data and inundation studies are limited therefore potential dollar loss for dam failure was not estimated.

Table 3.6d: Structures Vulnerable to Dam Failure

Dam	Vulnerable Structures or Properties	Damages
Valley View Dam	• Less than 10 Residential Structures	• Less than $2M residential structure damages • Up to 10 lives endangered • Approximately 4,000 ft. of FM 1752 could be washed away cost could be up $10M depending upon the amount of base destroyed.
Lake Bonham Dam	• Less than 10 Residential Structures	• Less than $2M residential structure damages • Up to 10 lives endangered
Lake Crockett Dam	• Less than 5 Residential Structures	• Less than $1M residential structure damages • Up to 6 lives endangered
Coffee Mill Dam	• Less than 5 Residential Structures	• Less than $1M residential structure damages • Up to 6 lives endangered

** These are estimates based on available FIRMS, Elevation Maps & Aerial Photography*

CHAPTER FOUR – MITIGATION STRATEGY

4.1 Hazard Mitigation Goals and Objectives

The goals and objectives for Fannin County Multi-Jurisdiction Hazard Mitigation Plan are many: the obvious benefits to individuals both financially and emotionally following a disaster, the benefits to government both financially and politically, and the benefits to private business. The overall goals and objectives of the plan established by the Hazard Mitigation Planning Team (HMPT) after Hazard Identification are:

Goal 1 – Protect the life, health and safety of Fannin County residents and minimize potential impacts for existing and future development from natural hazards.

- **Objective 1.1** - Promote the use of early warning systems to alert people of severe weather, such as thunderstorms, floods, and tornadoes.
- **Objective 1.2** - Promote the installation of tornado safe rooms in homes and public facilities.
- **Objective 1.3** - Develop and promote outreach strategies to educate residents, businesses, and local school groups about local hazards, mitigation strategies, and emergency preparedness.
- **Objective 1.4** – Develop back up plans for critical infrastructures and properties.
- **Objective 1.5** - Develop and regulate development to ensure growth will not increase risk to life or property.

Goal 2 – Facilitate a sustainable economy by protecting agriculture, businesses, infrastructure, and other economic activities from natural hazards.

- **Objective 2.1** - Promote importance of having crop, homeowner, flood, and other insurance.

Goal 3 - Support the goals and objectives established in the State Hazard Mitigation Plan

- **Objective 3.1** - Incorporate the State Plan in the development of the Fannin County Multi-Jurisdictional Hazard Mitigation Plan.
- **Objective 3.2** - Continue to conduct studies and assessment of risks and incorporate results into future updated plans.
- **Objective 3.3** - Increase public and private understanding of the goals and objectives of the state and local plans.

4.2 Comprehensive Range of Mitigation Actions

Throughout the mitigation planning process, mitigation activities were evaluated at various public meetings and planning committee meetings. At various intervals, members of the planning committee met and communicated via email and telephone to develop and discuss mitigation activities for the hazards identified in this plan based upon the STAPLEE criteria and to develop comprehensive range of mitigation actions, measures and projects. Alternative projects for each project was considered but the ones selected were the most cost effective and within financial reach. The actions selected were preventative measures, structural projects, property protection actions, emergency services or public education and awareness measures.

Table 4.2: Mitigation Actions

Mitigation Actions	Description	Projects	Objective Addressed
Preventative Measures	Keep hazards from occurring or getting worse.	• Building, zoning & planning codes • Code enforcement • Comprehensive Planning • NFIP participation, projects and regulations • Tree and brush trimming	Objective 1.1, 1.2, 1.3, 1.4, & 1.5
Structural Projects	Usually designed by engineers or architects and are physical projects.	• Storm water detention, channel modifications, drainage improvements • Levees and dams • School, community and individual safe rooms • Debris removal	Objective 1.2 & 1.5
Property Protection Actions	Modifications to existing buildings or properties subject to damage from various hazard events.	• Enhanced building codes with emphasis on strengthening structures • Installation of Safe Rooms • Hail resistant roofing • Insurance • Installing of storm shutters and storm windows • Burying utility lines • Backup power supplies • Installing smoke alarms and security systems	Objective 1.2, 1.3, 1.4, 1.5, 2.1, 3.1, 3.2, & 3.3
Emergency Services	Threat recognition and protection of people during and after a hazard event.	• Warning sirens & NOAA weather radios • Instant alerts via TV, social media, text, email, etc. • Telephone trees & door-to-door notification • Activating Emergency Operations Center (EOC) • Closing roadways • Holding children at school or in class (lockdown) • Evacuation & Shelters • Security • Emergency supplies • CERT	Objective 1.1, 1.2, 1.3, & 1.4
Public Information & Education	Advise and educate citizens, property owners, businesses and local officials about hazards and ways to prevent or minimize impact.	• Flood Insurance Rate Maps (FIRMS) education • Hazardous material sites & routes identification • All hazard information • Public service announcements • Educational workshops, trainings and seminars • News articles, pamphlets and handouts • CERT	Objective 1.2, 1.3, 1.4, 1.5, 2.1, 3.1, 3.2, & 3.3

4.3 Prioritization

Once mitigation projects were recommended by the mitigation team, they were organized by action category in Table 4.3.and prioritized using the STAPLEE method, cost benefit and number of hazards mitigated. A score of 1=exceeds requirements, 2=meets requirements, or 3=does not completely meet requirement, was given for each category. Note that these priorities are subject to change and that jurisdictions are not obligated to implement. It is also important to note that additional mitigation actions will be included as more of the public become involved, as the plan is updated, and as funding becomes available to the Fannin County and the entities within.

S – Social: Mitigation actions will only be viable is socially accepted by the community.

T – Technical: Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.

A – Administrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

P – Political: Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.

L – Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

E – Economical: Budget constraints can significantly deter the implementation of mitigations actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.

E – Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Table 4.3a: Summary of Fannin County Mitigation Actions.

Actions	S	T	A	P	L	E	E	Cost Benefit (> 1)	Hazards Mitigated (All 12 =1,3-10 =2, <3 =3)	Total	Priority
Preventative Measures	1	1	1	1	1	1	1	1	1	9	1
Structural Projects	2	3	2	1	1	3	1	1	2	16	5
Property Protection Actions	2	2	2	1	1	2	1	1	2	14	4
Emergency Services	1	2	2	1	1	2	1	1	2	13	3
Public Information & Education	1	2	1	1	1	1	1	1	1	10	2

Action #1: Preventative Measures

Projects: By updating planning mechanisms and taking preventative protective measures "an ounce of prevention" can be "worth a pound of cure".

Description: By updating and enforcing local building, zoning and planning codes residential and commercial structures can reduce their vulnerability to most hazards. Preventative maintenance projects such as tree trimming and brush removal can reduce the effects of winter storms, tornados, thunderstorms, floods and wildfires. Continued and increased participation in the NFIP will assist in reduction in loss from flooding.

Funding & Cost: Planning and zoning updates can be done with local budgets. Vegetation removal can be costly if it is the responsibility of the city.

Benefits: Local structures are built stronger and not located in or near flood hazard areas. There are reductions in fire fuels, the storm drainage system is not blocked with debris and tree limbs are not falling on property or utility lines.

Responsible Party: Local officials, property owners and public works personnel will be the responsible for implementation.

Action #2: Public Awareness & Education

Projects: Develop and conduct a multi-hazard seasonal public awareness program providing citizens and business with accurate information describing risk and vulnerability to natural hazards, implemented on an annual basis. This project would include other programs such as: Water Conservation, Storm Safety, Fire Safety, Neighborhood Watch, Flood Wise, etc. All 12 hazards could be mitigated with this action.

Description: Public awareness and education of local hazard risks and of methods to reduce those risks. This information can be delivered in multiple cost-effective ways such as social, print and digital media, public signs, safety programs, trainings and educational giveaways.

Funding & Cost: The cost of programs will run $5K to $10K annually depending upon printing and mailing costs, level of volunteer participation, and scope and frequency of events. Source of funding include local budget, private and commercial donations, grants, etc.

Benefits: Reduction in damages for a relatively low cost is the primary benefit.

Responsible Party: Fannin County EOC, Fire Departments, American Red Cross, Chamber of Commerce, Local Jurisdictions and School Districts will be responsible for implementation.

Action #3: Emergency Services

Projects: Increase emergency response personnel and ensure proper training and equipping of first responders, increase emergency notification venues and increase security measures.

Description: The goal is to have CERT members located in all communities throughout the county. Local employers and housing developments are encouraged to have CERT certified individuals to respond quickly to local events. There is a need to increase the number of trained and equipped volunteer fire fighters and police officers to provide faster and heightened first response in emergency situations. Increase emergency information venues by adding and improving existing storm sirens and providing phone and media alert services. Also enhance school and critical infrastructure security measures with additional cameras, screening points and limiting access.

Funding & Cost: Cost for 50 additional trained and equipped CERT participants could be as high as $10,000. Homeland security funds, AFG grants, donations and local budgets will be utilized for funding. Additional first responders will primarily be volunteers. Grants will be sought to fund additional equipment and due to limited funding most training will be very low to no cost. Costs for the increase emergency notification venues is dependent upon the program and is often absorbed in local budgets. Enhanced security is expensive so most jurisdictions are increasing security as local budgets allowed. These security upgrades are considered a high priority when budgets are developed.

Benefits: Local trained responders are available immediately, increased emergency event preparation time and increased protections of vulnerable populations.

Responsible Party: Fannin County EMC, fire departments, police departments, school administration and city officials.

Action #4: Property Protection

Projects: Protect property and prevent future hazards by incorporating hazard mitigation in long range county planning and development activities, prevent economic damage by being properly insured and ensuring backup plans, procedures and equipment are in place.

Description: Conduct annual tabletop disaster exercises with county law enforcement, EMC's, and other emergency response agencies. Review annually existing Emergency Operation Plans (EOP). Work together with neighboring counties and local council of government to encourage multi-jurisdictional emergency plans and to develop a hazard event database. Obtain Storm Ready Certification from the National Weather Service which denotes a certain level of warning, severe weather-spotting and communications capability.

Funding & Cost: Less than $25,000 and existing staff time and budgets for the planning component but backup power systems start at $10,000 and go up depending on size. Many jurisdictions do not have available funds so grants applications will be required.

Benefits: Interoperability, emergency plans and backup power for critical infrastructure.

Responsible Party: County Emergency Coordinator, local emergency agencies and local jurisdictions.

Action #5: Structural Projects

Projects: Road elevation, bridge and culvert upgrades and safe rooms.

Description: Improvements to county roads including elevation in flood areas, bridge replacement and enlarging of culverts to allow quicker removal of storm water. Also the addition of residential safe rooms in both new and existing constructions and school safe rooms that are may utilized by the public after school hours.

Funding & Cost: Approximately $200K in road improvements currently needed. These funds will come from the county budget and from the Texas Department of Transportation. Residential safe rooms run $5-6K and school safe rooms cost >$450K. HMGP and PDM grants will be required to assist with the funding of safe rooms.

Benefits: The results of these projects will be quick removal of storm water without backup flooding and safe areas during tornados and severe thunderstorms.

Responsible Party: Fannin County EMC

Local jurisdictions identified mitigation projects for each local jurisdiction. These actions included projects that were currently being implemented and those being planned in the near future.

High Priority – These actions are currently being planned or budgeted for implementation within the next year, are projects that will meet multiple goals and objectives, and benefits exceed the cost of implementation and/or the action is needed to maintain NFIP compliance.

Medium Priority – These actions meet at least one goal and objective and benefits exceed costs, but resources may be a limiting factor and/or plans are to implement these actions within the next three years as funding allows.

Low Priority – These actions meet at least one goal and objective and benefits exceed costs, but the resources for the actions may not be currently available or they may be dependent on the completion of a high priority action.

High Cost – Existing funding levels are not adequate to cover the costs of the project and would require an increase in revenue through an alternative source, such as a grant, to implement.

Medium Cost – The project could possibly be implemented with existing funding but would require a reapportionment of the budget or would have to be spread out of multiple years.

Low Cost – Project can be implemented at a low cost using existing budget, local staff and/or volunteers.

Local jurisdictions are operating on inadequate budgets, limited staff, and with many positions being filled by volunteers. These restrictions were incorporated into the construction of mitigation actions for each jurisdiction. This resulted in actions that were primarily public education and awareness which are cost beneficial and can be done on a continual basis after initial implementation. The mitigation actions will be implemented by the City Council and monitored by the local mayors or managers. With limited resources the responsibilities will be shared between City Council, local staff, and community volunteers. County implementation will be organized by the County Commissioner Court and the Emergency Management Coordinator.

Table 4.3b: Summary of Local Jurisdictions Mitigation Projects – Fannin County

Hazard	Priority	Fannin County Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Apply for grants and possible incorporation of local funds to modernize local storm sirens and add additional sirens to ensure adequate coverage is all areas of the community.	Med-Grants/Budgets	1 to 3 years	EMC, City Councils, & Fire Departments
Thunderstorms	High	Explore and complete the requirements & benefits of partaking in the NWS Storm Ready Program.	Low-Budget	1 to 3 years	EMC & City Councils
Thunderstorms	High	Survey and remove hazardous trees from drainage systems throughout the county.	Med/Budgets	1 to 3 years	County Commissioners & Public Works
Thunderstorms	Medium	Educate residents on the importance of NOAA weather radios in school, homes and businesses and how to operate them properly.	Low-Budget/Donations	1 to 3 years	EMC & Fire Departments
Winter Storms	High	Grow the Fannin County CERT program by working with local businesses to encourage employee participation. Explore possible donation sources for CERT supplies.	Low-Budget/Grants/ Donations	< 1 year	EMC & Volunteers
Winter Storms	Medium	Implement countywide vegetation management. Educate the public on ability to reduce the loss of property and facilitate emergency response by trimming trees near roadways and power lines.	Med-Budget	1 to 3 years	EMC & County Commissioners
Winter Storms	Medium	Apply for funding to purchase auxiliary power sources for critical facilities. This would include the purchase of mobile generators for use throughout the county to support the continuity of government and critical facilities in times of power outages.	High-Budget/Grants	1 to 3 years	EMC & City Councils
Extreme Heat	Medium	Work with County Extension agent on providing education on Xeriscaping.	Low-Budget	1 to 3 years	EMC & Extension Staff
Extreme Heat	Medium	Work with local schools, churches and businesses to establish the ability to set up emergency cooling shelters quickly when needed.	Low-Budget	1 to 3 years	EMC & CERT
Extreme Heat	Medium	Work with Fannin County service organizations to host a local fan drive as their community service project. These fans would be kept on the local level for quicker distribution.	Low-Donations	1 to 3 years	EMC & CERT
Hailstorm	Medium	Apply for funding to purchase auxiliary power sources for critical facilities. This would include the purchase of mobile generators to be where needed though out the county.	High-Budget/Grants	1 to 3 years	EMC & City Councils
Hailstorm	High	Apply for grants and possible incorporation of local funds to modernize local storm sirens and add additional sirens to ensure adequate coverage in all areas of the community.	Med-Grants/Budget	1 to 3 years	EMC & County Fire Departments

Hazard	Priority	Fannin County Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Hailstorm	Medium	Provide public education at local fairs and events on the importance of NOAA weather radios in homes and businesses.	Low-Budget	1 to 3 years	EMC & Volunteers
Hailstorm	High	Grow the Fannin County CERT program by working with local businesses to encourage employee participation. Explore possible donation sources for CERT supplies.	Low-Donations/Budget/ Grants	< 1 year	EMC & Volunteers
Drought	High	Document daily weather variables and damages to support future disaster assistance requests.	Low-Budget	< 1 year	EMC
Drought	High	Work with local media to stress water conservation methods.	Low-Budget	< 1 year	EMC
Drought	Medium	Work with County Extension Agent, Master Gardener Group and local nurseries on the utilizing of drought resistance vegetation in landscaping.	Low-Budget	1 to 3 years	EMC & Local Staff
Tornado	High	Work with local media to publish and air public safety information prior to storm peak season on how to be prepared.	Low-Budget	< 1 year	EMC
Tornado	High	Work with local jurisdictions to apply for additional Multi-Jurisdictional FEMA Safe Room Rebate program and high vulnerable populations to apply for a Safe Room Project	High-Grants	< 1 year	EMC & Elected Officials
Tornado	High	Modernization of storm sirens to ensure adequate coverage is all areas of the community and educate residents on the importance of NOAA weather radios in homes and businesses.	Med-Grants/Budget	1 to 3 years	EMC & County Fire Departments
Tornado	High	Work with local officials and the NWS to become a "Storm Ready" designated community.	Low-Budget	< 1 year	EMC & City Councils
Expansive Soil	High	Review county roads standards and ensure that methods to reduce soil expansion are used in areas with extremely expansive soils. These methods such as kneading, compacting, and treating of soils with non-swell additives will extend the life of the roadways.	Med-Budget	1 to 3 years	County Commissioners
Expansive Soil	High	Regular maintenance, such as sediment and debris clearance, is needed so that the drainage systems may carry out its designed function.	Med-Budget	1 to 3 years	County Commissioners
Expansive Soil	High	Publicize that the local NRCS office is available to assist residents of ways to limit damages from soil expansion and attrition.	Low-Budget	1 to 3 years	District Soil Conservationist
Flood	High	Turn Around Don't Drown Campaign to be aired through the media to educate people on the dangers of driving through flood waters.	Low-Budget	1 to 3 years	EMC & Local Media
Flood	High	Develop a zoning plan around the future Lower Bois D'Arc Lake area. This would allow for the restrictions of building in floodplain areas. (NFIP)	Med-Budget	1 to 3 years	Fannin County Commissioner's Court
Flood	High	Regular maintenance, such as sediment and debris clearance, is needed so that the stream or waterway may carry out its designed function.	Med-Budget	1 to 3 years	County Staff
Flood	High	As work begins on the two planned lakes identify areas where flooding is a problem and submit to FEMA for future updating of county floodplain maps.	Low-Budget	3 to 5 years	EMC

Hazard	Priority	Fannin County Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Flood	High	Utilize local funds to improve county bridges and roadways to decrease flooding potential.	High-Budget	<1 year	County Staff
Flood	Medium	Apply for assistance in establishing a Certified Countywide Floodplain Manager position. Funding on the continuation of the position would be from permit fees and local budgets. The focus of this role would be to mitigate flooding and protect the floodplain countywide. (NFIP)	High-Budget/Grants	3 to 5 years	EMC & County Staff
Flood	High	Clear rural creeks of obstructions while retaining vegetation to prevent erosion in waterways.	Med-Budget	<1 year	EMC & County Staff
Flood	Medium	Inform residents of mitigation activities they can implement in their homes such as elevation of appliances above expected flood levels. The information would be provided by, publications, & booths at community events.	Low-Budget	1 to 3 years	EMC
Wildfire	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget/Grants/ Donations	<1 year	EMC & Volunteers
Wildfire	Low	Develop and implement a program between fire jurisdictions and water supply agencies to provide water availability in areas of high WUI threat.	Low-Budget	3 to 5 years	VFDs & Utility Districts
Wildfire	High	Work with local volunteer fire departments to ensure that NIMS compliancy is met.	Low-Budget	<1 year	EMC
Wildfire	Medium	Educate community on the Fire Wise Program & how to protect your home by establishing a defensible space and fuel reduction management.	Low-Budget	1 to 3 years	Local Fire Departments
Wildfire	Medium	Clear all dead-end segments of county roads in high fire hazard areas to provide a turn-around sufficient for wildland fire equipment.	High-Budget	1 to 3 years	Local Fire Departments
Human-Caused	High	Develop printed materials, utilize existing materials, conduct workshops, and encourage residents to have family disaster plans that include emergency evacuation procedures & shelter-in-place emergency guidelines.	Low-Budget	1 to 3 years	EMC
Human-Caused	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget/Grants/Donat	<1 year	EMC & Volunteers
Human-Caused	Medium	Create media program to use disaster anniversaries, such as 9/11 & the Fannin County Tornado event in April 1919 to remind the public on safety & security measures.	Low-Budget	1 to 3 years	EMC
Earthquake	Medium	Develop printed materials, utilize existing materials, conduct workshops, and encourage residents to have family disaster plans that include emergency evacuation procedures & shelter-in-place emergency guidelines.	Med-Budget	1 to 3 years	EMC & Volunteers
Earthquake	Low	Develop an earthquake plan and post an earthquake evacuation route map in the Fannin County Courthouse. This plan would also include information and training for county staff on when to evacuate, when to shelter in place and how to handle visitors to the facility in the event of an earthquake.	High–Grants/Local Budget	3 to 5 years	EMC

Hazard	Priority	Fannin County Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Earthquake	Med	Develop an inventory of public and commercial structures that may be particularly vulnerable to earthquake damage. Work with owners and civil engineers are ways to strengthen these structures from earthquake damage.	Med-Budget	3 to 5 years	EMC
Earthquake	High	Adopt and enforce updated building code provisions to reduce earthquake damage risk.	Low-Budget/Grants/Donat	<1 year	EMC & Volunteers
Earthquake	Medium	Implement countywide vegetation management. Educate the public on ability to reduce the loss of property and facilitate emergency response by trimming trees near roadways and power lines.	Med-Budget	1 to 3 years	EMC & County Staff
Dam Failure	Medium	Educate property owners near high hazard dams of the potential of a dam failure. Inform them of signs to watch for that might signal a weakening of the dam and who to contact if suspicious activity is spotted.	Low-Budget	1 to 3 years	EMC
Dam Failure	Medium	Development emergency action plans to include detailed inundation maps for 4 dams over 50ft and/or impeding over 5,000 acre-feet within the county.	High-Grants	3 to 5 years	EMC
Dam Failure	High	Adopt real-estate disclosure requirements for the re-sale of property located within projected dam failure inundation areas.	Low-Budge	<1 year	County Commissioners
Dam Failure	High	Create zoning restriction and new lakes to prevent development in risk areas near the dams.	Med–Budget	1 to 3 years	Commissioners Court & Zoning Committee
Dam Failure	Medium	Periodic evaluation of dams in the county and work with property owners to develop action plans for private dams.	High-Budget	1 to 3 years	EMC

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3c: Summary of Local Jurisdictions Mitigation Projects – City of Bailey

Hazard	Priority	City of Bailey Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Low	Apply for grant funding to improve emergency communications system and training for emergency responder.	High-Grants	3 to 5 years	Elected Officials & County EMC
Thunderstorms	Medium	Apply for a grant to purchase and install a storm siren.	High-Grants	1 to 3 years	Elected Officials & County EMC
Thunderstorms	Medium	Educate residents on the importance of NOAA weather radios. Work with local businesses to offer weather radios at a reduced cost. Look for foundation grants that provide NOAA weather radios for limited resource populations.	Low-Budget/Donations	1 to 3 years	VFD
Winter Storms	Medium	Apply for funding to purchase auxiliary power sources for critical facilities. This would include the purchase of mobile generators for use to support the continuity of government and critical facilities in times of power outages.	Med-Grants	1 to 3 years	Elected Officials & County EMC

Hazard	Priority	City of Bailey Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Winter Storms	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low–Budget	<1 year	County EMC, Local Staff & Volunteers
Winter Storms	High	Develop Memorandums of Understandings (MOUs) with SNAP Center & Churches to allow for the utilization of facilities as a Warming Shelter in Winter Storms. This shelter would then be used in events of power outages, rolling blackouts, and/or inadequate residential heating.	Low-Budget	< 1 year	Local Staff, CERT, Churches, & Volunteers
Extreme Heat	Low	Purchase and installation of radiant barrier in city hall attic, cool roofing that would reflect the sunlight and heat, weather stripping, and planting of shade trees at all city owned properties.	High-Budget	3 to 5 years	Local Staff, Elected Officials, and Volunteer Groups
Extreme Heat	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	<1 year	County EMC, Local Staff, and Volunteers
Extreme Heat	High	Develop Memorandums of Understandings (MOUs) with SNAP Center & Churches to allow for the utilization of facilities as a Cooling Shelter in Extreme Heat events. This shelter would then be used in events of power outages, rolling blackouts, and/or inadequate residential cooling.	Low-Budget	<1 year	Local Staff, CERT, Churches, & Volunteers
Extreme Heat	High	Develop program and process for monitoring vulnerable populations during extreme heat. These populations would include but are not limited to the elderly, disabled, and those without adequate air conditioning.	Low-Budget	<1 year	VFD & Local Staff
Hailstorm	Medium	Apply for a grant to fund the purchase and installation of a Storm Warning System. This is a farming community and a storm warning system would give time for the sheltering of equipment.	High-Grants	1 to 3 years	VFD
Hailstorm	High	Develop & maintain a weather database containing daily weather variables including local hail reports with size and cost of local damages. This information would be utilized to request agricultural disasters and to verify crop losses.	Low-Budget	< 1 year	Local Staff
Hailstorm	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low–Budget	<1 year	County EMC & Local Staff
Drought	High	Implement drought water conservation regulations. These regulations would be printed on the back of water bills in drought situations along with other conservation tips.	Low-Budget	< 1 year	Local Staff & Elected Officials
Drought	Medium	Prepare sample ordinances on water conservation. These ordinances would be put into place when drought conditions are present and local water supply is limited.	Low-Budget	1 to 3 years	Local Staff & Elected Officials
Drought	Low	Acquired by MOUs emergency water supply with multiple neighboring public and private water districts.	Med-Budget	> 5 years	Elected Officials

Hazard	Priority	City of Bailey Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Tornado	Medium	Work with local jurisdictions and county to apply for a Multi-Jurisdictional FEMA Safe Room Rebate Program.	High-Grants	1 to 3 years	Elected Officials & County EMC
Tornado	Medium	Apply for a grant to fund the purchase and installation of a Storm Warning System. This is a farming community and a storm warning system would give time for local producers to take cover.	High-Grants	1 to 3 years	Elected Officials & County EMC
Tornado	Medium	Educate residents on the importance of NOAA weather radios. Work with local businesses to offer weather radios at a reduced cost. Look for foundation grants that provide NOAA weather radios for limited resource populations.	Low-Budget	1 to 3 years	VFD
Tornado	Low	Apply for grant funding to improve the emergency communications system and training for emergency responders.	High-Grants	3 to 5 years	Elected Officials & County EMC
Expansive Soil	Expansive Soils is not an identified hazard for the City of Bailey.				
Flood	High	Develop a Storm Drainage System. (NFIP) Bailey does not have an organized storm drain system.	High-Budget/Grants	3 to 5 years	Elected Officials
Flood	High	Work with TXDOT in the planning of the Highway 11 Improvement Project to include raising the roadway, inserting a larger culvert, and digging out the creek that causes the flooding problem.	Low-Volunteers	<1 year	Fire Department and Local Staff
Flood	Low	Apply for grant funds for water rescue training and equipment for local fire department.	High-Grants & Donations	3 to 5 years	Fire Department
Flood	High	Record information on flood areas for use when county floodplain maps are updated. (NFIP)	Low-Budget	<1 year	Local Staff
Wildfire	Medium	Develop and implement Citywide brush & debris disposal program to include trimming of trees near power and lines and reduction of overgrowth in vacant areas.	Med-Budget	1 to 3 years	City Staff/County CERT
Wildfire	Low	Use GIS mapping of wildfire hazard areas to facilitate city planning decisions such as zoning, development, and infrastructure growth.	High-Budget, Donations, and Grants	3 to 5 years	VFD/City Staff & Elected Officials
Wildfire	High	Clear all dead-end segments of county roads in high fire hazard areas to provide a turn-around sufficient for wildland fire equipment.	Med-Budget	<1 year	EMC & Local Staff
Human-Caused	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	<1 year	County EMC
Human-Caused	Medium	Educate residents on the Seven Signs of Terrorism.	Low-Budget	1 to 3 years	Local Staff & VFD
Human-Caused	Medium	Work with TCOG to promote annual Household Hazardous Waste Collection.	Low-Budget	< 1 year	TCOG & Local Staff
Earthquake	Earthquake is not an identified hazard for the City of Bailey.				
Dam Failure	Dam Failure is not an identified hazard for the City of Bailey.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3d: Summary of Local Jurisdictions Mitigation Projects – City of Bonham

Hazard	Priority	City of Bonham Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Implement citywide vegetation management. Tree trimming and removal program to reduce the loss of property and facilitate emergency response.	Med-Budget	1 to 3 years	City Council & Staff
Thunderstorms	High	Educate residents on the importance of NOAA weather radios. Work with local businesses to possibly offer radios at a reduced cost.	Low–Budget	<1 year	Fire Department
Thunderstorms	Medium	Develop a relationship with local manufactured home park owners to partner in a community safe room and possibly apply for grant funds to fund a residential safe room rebate program.	High-Grants	3 to 5 years	EMC & City Staff
Winter Storms	High	Create MOUs and partnership to enable the establishment of heating/warming centers for vulnerable populations and for stranded motorist/travelers.	Low-Budget	<1 year	EMC, PD & FD
Winter Storms	High	Implement a tree trimming program that routinely clears tree limbs hanging in the right-of–way	Low-Budget	<1 year	EMC & City Staff
Winter Storms	High	Provide a link from website, radio announcements, and cable program overrides to notify the public of local road conditions, business and government closures, warming shelters that have been activated, and winter weather survival tips.	Low-Budget	<1 year	EMC & City Staff
Extreme Heat	High	Develop an outreach plan to notify vulnerable populations during periods of extreme heat of availability and location of cooling centers.	Low-Budget	<1 year	City Staff
Extreme Heat	High	Work with Bonham service organizations to host a local fan drive as their community service project. These fans would be kept on the local level for quicker distribution.	Med-Donations	1 to 3 years	City Staff
Extreme Heat	High	Work with Civic Center, Schools, and Churches to provide a cooling shelter for local residents who may not have access to adequate air conditioning.	Low-Budget	<1 year	EMC
Hailstorm	Medium	Expansion and increase in regular testing of Emergency Warning System to ensure citywide coverage and coverage surrounding Lake Bonham.	Med-Budget	1 to 3 years	EMC & City Staff
Hailstorm	High	Enforcement of International Building Codes to ensure that new construction is safe and is built to withstand normal weather events.	Low-Budget	<1 year	City Inspector
Hailstorm	Medium	Establish Community Emergency Notification Program with web signup.	Med-Budget	1 to 3 years	EMC & City Staff
Drought	High	Work with North Texas Municipal Water District to secure ample water for future growth. This would include MOUs to use water from the future lake as a backup supply for the city.	Low-Budget	<1 year	Elected Officials & City Staff
Drought	High	Public awareness campaign before and during a drought event on water conservation practices and rainwater collecting. This public education would be posted on city website, posted on water bills, and presented at public fairs and events.	Low-Budget	<1 year	City Staff

Hazard	Priority	City of Bonham Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Drought	Medium	Prepare a drought preparedness action guide and emergency plan that includes all jurisdictions and water suppliers within Fannin County.	Med-Budget	1 to 3 years	City Staff, EMC, & Water Districts
Tornado	Medium	Develop a relationship with local manufactured home park owners to partner in a community safe room and apply for grant funds to fund a residential safe room rebate program.	High-Budget	3 to 5 years	EMC, PD, & FD
Tornado	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	<1 year	County EMC
Tornado	Medium	Expansion and increase in regular testing of Emergency Warning System to ensure citywide coverage and coverage surrounding Lake Bonham.	Med-Budget	1 to 3 years	EMC & City Staff
Expansive Soil	Expansive Soil is not an identified hazard for the City of Bonham.				
Flood	Medium	Utilize local funds to improve city streets and drainage features to decrease flooding potential.	High-Budget	3 to 5 years	City Staff
Flood	Low	Raise elevation of roads in and near floodplain that have a history of water obstruction.	High-Budget	3 to 5 years	City Staff
Flood	Medium	Establish a floodplain manager for the city to regulate floodplain development and provide public information concerning flood areas. (NFIP)	High-Budget	3 to 5 years	Elected Officials & City Staff
Wildfire	Medium	Create a citywide brush removal and disposal program to increase trimming of trees and reduce vegetation on vacant lots.	Med-Budget	1 to 3 years	Public Works
Wildfire	High	Educate & empower residents about the importance of having an Emergency Preparedness Kit. Education will inform the public on what is needed in the kit and on how to shelter in place.	Low-Budget	<1 year	EMC & Local Staff
Wildfire	High	Create and present a public education to local residents on how to create a defensible space around homes.	Low-Budget	<1 year	Fire Department
Wildfire	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	<1 year	County EMC
Human-Caused	Medium	Expansion, update, and regular testing of Emergency Warning System to ensure citywide coverage and coverage surrounding Lake Bonham.	Med-Budget	1 to 3 years	EMC & City Staff
Human-Caused	High	Continuation and support of the Fannin County CERT program. Encourage local residents to participate in training.	Low-Budget	<1 year	County EMC
Human-Caused	High	Encourage NIMS training to all local employees and officials.	Low-Budget	1 to 3 years	EMC
Earthquake	Earthquake is not an identified hazard for the City of Bonham.				

Hazard	Priority	City of Bonham Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Dam Failure	Medium	Review and update of Lake Bonham Dam Emergency Plan and incorporate local residents views and concerns.	Med-Budget	1 to 3 years	City Staff
Dam Failure	Medium	Conduct a detailed dam failure risk analysis with a detailed inundation studies on the Lake Bonham Dam and include a worst case scenario table top exercise.	High-Budget	3 to 5 years	City EMC
Dam Failure	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	<1 year	County EMC

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3e: Summary of Local Jurisdictions Mitigation Projects - Dodd City

Hazard	Priority	Dodd City Mitigation Actions	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Purchase and install backup generator for City Hall and critical infrastructure.	High-Grants	3 to 5 years	Elected Officials
Thunderstorms	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low–Budget	<1 year	County EMC/Volunteers
Thunderstorms	Medium	Install lightning grade surge protection devices for city computer systems.	Med-Budget	1 to 3 years	Elected Officials
Winter Storms	High	Prior to winter storm event create MOUs with local churches to assist in the establishment of heating/warming centers for vulnerable populations and for stranded motorist/travelers.	Low-Budget	<1 year	County EMC, Churches, Volunteers, PD
Winter Storms	High	Apply for funding to purchase auxiliary power sources for critical facilities to ensure continuity of government.	High-Budget	3 to 5 years	County EMC
Winter Storms	High	Educate local community of the dangers of Carbon Monoxide Poisoning. Fannin County has a large elderly population who have gas cook stoves that are often utilized as a heat source in power outages. An education program on the dangers of this practice to be presented at the Sr. Citizens Center.	Low-Budget	<1 year	Volunteers
Extreme Heat	High	Prior to an extreme heat event create MOUs with local churches and schools to assist in the establishment of heating/warming centers for vulnerable populations and for stranded motorist/travelers.	Low–Budget	<1 year	County EMC, Churches, Volunteers, and Schools
Extreme Heat	High	Work with local service organizations and school clubs to conduct a "Fan Drive" to collect fans to be donated to local residents who lack adequate cooling.	Low-Donations	<1 year	Volunteers
Extreme Heat	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	<1 year	County EMC/Volunteers

Hazard	Priority	Dodd City Mitigation Actions	Cost (Potential Funding Source)	Timeline	Responsible Party
Hailstorm	High	Encourage all new structures to be built with hail resistant materials. This would be done by mailing safety information with water bills and brochures at city hall.	Low-Budget	<1 year	VFD
Hailstorm	Medium	Build a protective cover over outside HVAC units to protect from hailstorms.	Med-Budget	1 to 3 years	Local Staff
Hailstorm	Medium	Apply for a grant to fund the purchase and installation of a Storm Warning System. This is a farming community and a storm warning system would five time for the sheltering of equipment.	High-Budget & Grants	3 to 5 years	Local Staff
Drought	Low	Improve water supply and delivery systems to save water. This would include replacing some of the old lines that are at the end of life and more likely to break with shifting soils caused by drought conditions	High-Budget & Grants	3 to 5 years	Local Staff
Drought	High	Expand drought contingency plan to include MOUs with the owners of the future reservoirs and water plants in the area.	Low–Budget	<1 year	Local Staff
Drought	High	Educate local producers of the availability of insurance for crop, hay & pasture loss. This would include advertising agriculture disaster intake opportunities available through the USDA Farm Service Agency.	Low-Budget & Disaster Funds	<1 year	County FSA Office
Tornado	Medium	Apply for grant to build community safe room.	High-Grants	1 to 3 years	Elected Officials
Tornado	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low-Budget	1 to 3 years	Local Staff, County EMC, & Volunteers
Tornado	Medium	Educate residents on the importance of NOAA weather radios. Work with local businesses to offer weather radios at a reduced cost. Look for foundation grants that provide NOAA weather radios for limited resource populations.	Med-Budget	3 to 5 years	VFD
Expansive Soil	Medium	Replace and update wastewater pipes that are vulnerable to shifting soils.	High-Budget	3 to 5 years	Local Staff
Expansive Soil	Medium	Remove debris from city owned drainage vessels to ensure water is able to run off and not stand near structure foundations	Med–Budget	1 to 3 years	County Extension Agent
Expansive Soil	Medium	Develop and maintain a method for documenting local events for future disaster declarations. Use GIS technology to map these reported locations to identify higher risk areas that may have other underlying issues such as groundwater seepage.	Med-Budget	1 to 3 years	Local Staff
Flood	High	Establish public awareness program of availability & need of flood insurance by disseminating brochures in public places such as City Hall. (NFIP)	Low-Budget	<1 year	Local Staff
Flood	Medium	Partner with the county to establish a Certified Countywide Floodplain Manager position. The positions would answer questions, monitor floodplain areas, identify new areas of concern, and provide public education on flood mitigation. (NFIP)	High-Budget	3 to 5 years	EMC & Local Officials
Flood	Medium	Develop a Storm Drainage System. (NFIP) Bailey does not have an organized storm drain system. The current system consists of a few old collapsed tinhorns that forces the water to cover the streets.	High-Budget & Grants	3 to 5 years	Elected Officials & County EMC

Hazard	Priority	Dodd City Mitigation Actions	Cost (Potential Funding Source)	Timeline	Responsible Party
Wildfire	Medium	Clear all dead-end segments of county roads in high fire hazard areas to provide a turn-around sufficient for wildland fire equipment.	Low-Budget	3 to 5 years	VFD & Local Officials
Wildfire	Medium	Develop and implement Citywide brush & debris disposal program to include trimming of trees near power and lines and reduction of overgrowth in vacant areas.	Med-Budgets	3 to 5 years	Local Utility Company
Wildfire	High	School and community education program to include the Fire Wise program.	Low–Budget	<1 year	VFD
Human-Caused	High	Expand the Fannin County CERT program. Work with local businesses to encourage employee participation and start local chapters.	Low–Budget	<1 year	County EMC
Human-Caused	Medium	Educate public on how to Shelter in Place and having a home emergency kit.	Low-Budget	< 1 year	VFD
Human-Caused	High	Work with TCOG and promote biennial Household Hazardous Waste collection.	Low-Budget	<1 year	TCOG
Earthquake	Earthquake is not an identified hazard for Dodd City.				
Dam Failure	Dam Failure is not an identified hazard for Dodd City.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3f: Summary of Local Jurisdictions Mitigation Projects - Dodd City ISD

Hazard	Priority	Dodd City ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Med	Designate areas and construct a multi-purpose community shelters to accommodate students and local residents during disasters and severe weather events.	High-Budget, Grants, & Bonds	3 to 5 years	Admin/County EMC
Thunderstorms	High	Utilize NOAA weather radios, social media, and "school messenger" program to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Thunderstorms	High	Build relationships with county law enforcement to have current campus plans and incorporate first responders into school emergency drills and exercises. These exercises will familiarize the law enforcement with the layout of the school and locations sheltering locations to find students in a rescue operation.	Low–Budget	<1 year	Admin
Winter Storms	Medium	Apply for funding assistance for the purchase of auxiliary power supply for the cafeteria to lessen the economic impact of power outages of food spoilage.	High–Grant	3 to 5 years	Admin
Winter Storms	High	Utilize NOAA weather radios, social media, and "school messenger" program to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin

Hazard	Priority	Dodd City ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Winter Storms	High	Work with nearby communities and first responders to allow for the utilizing of school facilities as a heating shelter for local residents without adequate heating and/or stranded travelers.	Low–Budget	<1 year	Admin
Extreme Heat	High	Work with nearby communities and first responders to allow for the utilizing of school facilities as a cooling shelter for local residents who may not have sufficient cooling in their homes.	Low–Budget	<1 year	Admin
Extreme Heat	High	Conduct training for all staff on the signs and symptoms of heat stroke during the in-service training prior to the start of the new school year.	Low–Budget	<1 year	School Nurse
Extreme Heat	Medium	Apply for funding assistance for the purchase of auxiliary power supply to lessen the impact of power outages of food spoilage. In extreme heat events the area has been known to suffer from rolling blackouts do to the increase power usage in the region.	High–Grant	3 to 5 years	Admin
Hailstorm	Medium	Consider roof slope, decking and gauge metal in all roofing of new constructions to minimize the of weather hazards.	High-Budget	3 to 5 years	Admin
Hailstorm	Medium	Utilize NOAA weather radio to obtain latest weather information this will allow time for the sheltering of equipment that would be extremely vulnerable to hail events.	Low–Budget	1 to 3 years	Admin/Maintenance
Hailstorm	Medium	Apply for funding assistance for the purchase of auxiliary power supply to lessen the economic impact of power outages of food spoilage. A large hail event can cause down power lines and damage transformers cause power outages.	High–Grant	3 to 5 years	Admin
Drought	Medium	Create a program that utilizes the use of low water native or drought resistant vegetation in landscaping.	Med–Budget	1 to 3 years	Admin/Maintenance
Drought	Med	Replace outdated bathroom facilities with low water flush units.	High–Budget	3 to 5 years	Maintenance
Drought	High	Classroom education on water conservation and rainwater harvesting practices.	Low–Budget	<1 year	Admin/Teache
Tornado	Medium	Apply for funding assistance with the construction of a School/Community Storm Safe Room. This would be a multi-purpose building that would be made available to the public after school hours in emergency events.	High–Grants & Bonds	3 to 5 years	Admin
Tornado	High	Conduct severe weather/emergency drills with students and faculty on school days that end with "5" and to continually improve evacuation times. Having a set pattern to drill events allows for the distinguishing between drills and actual events. Invite first responders to partake in these drills to provide feedback for improvements.	Low–Budget	<1 year	Admin/Teachers
Tornado	High	Utilize NOAA weather radios, social media, and "school messenger" program to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Expansive Soil	Low	Special soil preparation and engineering methods used in foundation construction of new school facilities.	High–Budget	3 to 5 years	Admin

Hazard	Priority	Dodd City ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Expansive Soil	Medium	Reroute plumbing to above ground in areas where expansive soil has caused breaks.	High–Budget	3 to 5 years	Maintenance
Expansive Soil	High	Increase existing drainage pathways and clear any blockages to stop water from pooling around structures.	Low–Budget	<1 year	Maintenance
Flood	High	Classroom education and programs such as "Turn around Don't Drown".	Low–Budget	< 1 year	Admin/Teache
Flood	High	Utilize NOAA radios and "school messenger" program to obtain latest weather information and for the quickest relay of school information to the public.	Low–Budget	<1 year	Admin
Flood	High	Increase and maintain existing drainage pathways and clear any blockages to stop water from pooling.	Low–Budget	<1 year	Maintenance
Wildfire	High	Local fire departments provide fire safety education to students.	Low–Budget	<1 year	Bonham FD
Wildfire	High	Keep all vegetation near campus structures short and controlled.	Low–Budget	<1 year	Maintenance
Wildfire	High	Conduct severe weather/emergency drills with students and faculty on school days that end with "5" and to continually improve evacuation times. Having a set pattern to drill events allows for the distinguishing between drills and actual events. Invite first responders to partake in these drills to provide feedback for improvements.	Low–Budget	<1 year	Admin/ Teachers
Human-Caused	Low	Enhancement of security systems and controlling access to facilities.	High–Budget	3 to 5 years	Admin
Human-Caused	High	Practice "Predator Inside& Predator Outside" drills.	Low–Budget	<1 year	Admin
Human-Caused	Low	Enhancement of campus security including controlling campus access additional cameras.	High-Budget	3 to 5 years	Admin
Earthquake	Earthquake is not an identified hazard for Dodd City ISD.				
Dam Failure	Dam Failure is not an identified hazard for Dodd City ISD.				

Table 4.3g: Summary of Local Jurisdictions Mitigation Projects – City of Ector

Hazard	Priority	City of Ector Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Implement citywide vegetation management. Tree trimming and removal program to reduce the loss of property and facilitate emergency response.	Med-Budget	1 to 3 years	City Council & Staff
Thunderstorms	Medium	Educate residents on the importance of NOAA weather radios.	Med–Budget	1 to 3 years	VFD
Thunderstorms	Medium	Relocation of existing siren equipment and additional siren equipment to ensure adequate coverage.	Med -Grant	1 to 3 years	VFD
Winter Storms	Medium	Implement citywide vegetation management. Tree trimming and removal program to reduce the loss of property and facilitate emergency response.	Med-Budget	1 to 3 years	City Council & Staff
Winter Storms	High	Work with nearby communities, schools, churches and first responders to allow for the utilizing of school facilities as a heating shelter for local residents without adequate heating and/or stranded travelers due to winter storms.	Low-Budget	<1 year	Staff

Hazard	Priority	City of Ector Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Winter Storms	High	Education targeting the elderly about the dangers of carbon monoxide poisoning. In rural areas elderly residents with gas cook stoves often rely on the stove for an alternative heating source in winter storms and are unaware of the dangers of carbon monoxide poisoning from this activity.	Low-Budget	<1 year	VFD
Extreme Heat	High	Work with local churches and school administration to allow for the utilizing of facilities for a cooling center for in extreme heat events. This would provide relief for local residents who may not have adequate cooling in their homes.	Low-Budget	<1 year	City Council & Staff
Extreme Heat	High	Provide education to local residents in utility bill mailings about how planting trees can assist in the cooling of homes during summer heat and other utility cost cutting tips.	Low-Budget	<1 year	Staff
Extreme Heat	High	Work with community service organizations and school clubs to host a local fan drive. The collection of fans would be dispersed in the local community to those without adequate air conditioning.	Low-Donations	<1 year	City Council & Staff
Hailstorm	Low	Provide covered shelter for critical city vehicles and equipment to reduce or eliminate hail damage.	Med–Budget	3 to 5 years	Staff
Hailstorm	High	Educate new residents of likelihood of a hail event in the area and the importance of being properly insured and using hail impact resistant roofing in new constructions.	Low-Budget	<1 year	Staff
Hailstorm	High	Develop & maintain a daily weather database to include local damages. This information will then be shared with the county Emergency Management Coordinator for use in disaster declaration requests.	Low-Budget	<1 Year	Staff
Drought	High	Create & implement a Water Conservation Plan when drought conditions are projected. Public information on conservation practices prepared in advance to be provided in utility bills during drought event.	Low-Budget	<1 year	Public Works
Drought	Medium	Develop and implement MOUs to use water from the future lake as a backup supply for the city and replacing inadequate fire hydrants and risers.	Med-Budget	3 to 5 years	City Council & Staff
Drought	High	Publish and distribute information on water conservation practices, and watering restrictions provided in utility bills.	Low-Budget	<1 year	Staff
Drought	High	Develop & maintain a daily weather database to include local damages. This information will then be shared with the county Emergency Management Coordinator for use in disaster declaration requests.	Low-Budget	<1 year	Staff
Tornado	Medium	Relocation of existing siren equipment and additional siren equipment to ensure adequate coverage.	Med-Grants	1 to 3 years	County EMC & Volunteers
Tornado	Medium	Implement citywide vegetation management. Tree trimming and removal program to reduce the loss of property and facilitate emergency response in tornadic events.	Med-Budget	1 to 3 years	City Council & Staff
Tornado	High	Educate residents on the importance of NOAA weather radios.	Low-Budget	<1 year	VFD
Tornado	Medium	Work with other jurisdictions & Fannin County to apply for a Multi-Jurisdictional FEMA Safe Room Rebate program to install residential in-ground safe rooms.	High-Grant	3 to 5 years	City Council & County EMC

Hazard	Priority	City of Ector Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Expansive Soil	High	Regular updating of building codes and continual education of the public, realtors, and home inspectors. Education program to include landscaping measures, such as xeriscaping, drainage systems or ground sloping that can mitigate foundation damage.	Low-Budget	<1 year	City Council
Expansive Soil	Low	Improvements to storm drains and drainage ways to prevent blockage that causes water backup and pooling around structures. These improvement include installation of larger culverts, placing catch grates over large storm drains and frequent monitoring.	High-Budget	3 to 5 years	Staff
Expansive Soil	High	In dry weather events use soaker hoses around city owned structures to keep the soil around foundations from drying out therefore limiting soil contraction and expansion.	Low-Budget	< year	Staff
Flood	Medium	Improvements and maintenance efforts to keep storm drains and drainage ways clear. These improvements would include replacing collapsed culverts, enlarging storm drains and installing grates over drains to catch debris.	Med-Budget	1 to 3 years	Staff
Flood	High	Document new flood areas for flood map updates. When updated floodplain maps are complete reevaluate Hazard Mitigation Plan to incorporate any changes to the floodplain. (NFIP)	Low-Budget	<1 year	City Council & County EMC
Flood	Low	Acquire flood prone properties for use as park areas. (NFIP)	High–Grant	3 to 5 years	City Council
Wildfire	Medium	Create and implement new city ordinances and codes to control vegetation growth on vacant lots, fence rows, and properties adjoining the city to reduce fuels for wildfires.	Med-Budget	1 to 3 years	City Council & Staff
Wildfire	Medium	Replace inadequately sized water lines with lines of sufficient size to provide proper fire protection.	Med-Budget	1 to 3 years	VFD
Wildfire	High	Public education on the Fire Wise Program & how to protect your home by establishing a defensible space and fuel reduction management. This public education would be done by school programs and public notices on water bills.	Low-Budget	<1 year	VFD
Wildfire	High	Develop local agreements with landowners within the response area to obtain permission to cut fences to access wildfires and free trapped livestock. Also agreements with landowners about utilizing ponds, creeks, and swimming pools for emergency water supply.	Low-Budget	<1 year	City Council, Staff, & Volunteers
Human-Caused	High	Assist in expanding the Fannin County CERT program and explore the possibility of forming a local CERT to assist in mitigating all hazards.	Low-Budget	<1 year	County EMC & Volunteers
Human-Caused	High	Work with TCOG and promote the biennial Household Hazardous Waste pickup.	Low-Budget	<1 year	Staff
Human-Caused	High	Work with Fannin County EMC to utilize Code Red for localized emergency notification.	Low-Budget	<1 year	Staff & County EMC
Earthquake	High	Develop an inventory of public and commercial structures that may be particularly vulnerable to earthquake damage. Consult with owners and civil engineers are ways to strengthen these structures from earthquake damage.	Low-Budget	<1 year	Staff
Earthquake	High	Develop printed materials, utilize existing materials, conduct workshops, and encourage residents to have family disaster plans that include emergency evacuation procedures & shelter-in-place emergency guidelines.	Low-Budget	<1 year	VFD

Hazard	Priority	City of Ector Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Earthquake	High	Establish a public awareness program that earthquakes can happen and how to harden residential structures to reduce damages.	Low-Budget	<1 years	County EMC & Staff
Earthquake	Medium	Updating of local building codes and continual education of the public, realtors, and home inspectors. New structures will be built to withstand small scale earthquakes.	High-Budget	3 to 5 years	City Council
Dam Failure	Dam Failure is not an identified hazard for the City of Ector.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3h: Summary of Local Jurisdictions Mitigation Projects – Ector ISD

Hazard	Priority	Ector ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Develop a patterned schedule of severe weather/emergency drills with students and faculty and continually improve evacuation times. Having a set pattern to drill events allows for the distinguishing between drills and actual events.	Low–Budget	<1 year	Admin
Thunderstorms	Medium	Apply for assistance in the funding of a school and/or Community Safe Room.	High–Grants	3 to 5 years	Admin
Thunderstorms	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Winter Storms	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Winter Storms	Medium	Apply for funding assistance to purchase of auxiliary power supply to lessen the economic impact of power outages of food spoilage.	High-Budget	3 to 5 years	Admin
Winter Storms	High	Work with nearby communities and first responders to allow for the utilizing of school facilities as a heating shelter for local residents without adequate heating and/or stranded travelers.	Low–Budget	<1 year	Admin/
Extreme Heat	High	Work with nearby communities and first responders to allow for the utilizing of facilities as a cooling shelter by local vulnerable populations that do not have adequate cooling.	Low–Budget	<1 year	Admin/VFD/ PD
Extreme Heat	Med	Provide training to staff and students on the signs and symptoms of heat stroke. Outside activities such as athletic training will be rescheduled to the coolest part of the day and/or moved indoors.	Med–Budget	1 to 3 years	Admin/School Nurse

Hazard	Priority	Ector ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Extreme Heat	Low	Apply for funding to assist with the purchase of auxiliary power supply to lessen the impact of power outages of food spoilage. Extreme heat results in increased power use resulting in rolling blackouts and blown transformers.	High-Budget	3 to 5 years	Admin
Hailstorm	Low	Consider roof slope, decking and gauge metal in all roofing of new constructions to minimize the hailstorm damage.	High-Budget	3 to 5 years	Admin
Hailstorm	Low	Provide covered shelter for district vehicles and equipment to protect from hail.	High–Budget	3 to 5 years	Admin
Hailstorm	High	Develop & maintain a daily weather database to include local damages. This information will then be shared with the county Emergency Management Coordinator for use in disaster declaration requests.	Low–Budget	<1 year	Admin
Drought	Medium	When landscaping campus grounds plant native and/or drought-tolerant grasses, ground covers, shrubs and trees.	Med–Budget	1 to 3 years	Admin/ Maintenance
Drought	Medium	Replace outdated bathroom facilities with low water flush units that use half the water of older models.	Med–Budget	1 to 3 years	Maintenance
Drought	High	Classroom education on water conservation and rainwater harvesting practices.	Low–Budget	<1 year	Teachers
Tornado	Medium	Apply for assistance in the funding of a school and/or community Safe Room.	High–Grants	3 to 5 years	Admin
Tornado	High	Develop a patterned schedule of severe weather/emergency drills with students and faculty and continually improve evacuation times. Involve local law enforcement in these drill so that they will be familiar with sheltering location in case of rescue is needed.	Low–Budget	<1 year	Admin
Tornado	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Expansive Soil	Low	Special soil preparations and construction methods to limit the damage from expansive soils in campus additions.	High–Budget	3 to 5 years	Admin
Expansive Soil	High	Set a schedule to monitor soil and foundations for early signs of damage. Use soaker hoses to prevent future damage form shrinking and swelling soils.	Low–Budget	<1 year	Maintenance
Expansive Soil	Medium	Increase drainage pathways and clear any blockages to stop water from pooling.	Med–Budget	1 to 3 years	Maintenance
Flood	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Flood	High	Classroom education and programs such as “Turn around Don’t Drown”.	Low–Budget	<1 year	Teachers
Flood	Medium	Increase drainage pathways and clear any blockages to stop water from pooling.	Medium–Budget	1 to 3 years	Maintenance

Hazard	Priority	Ector ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Wildfire	High	Local fire departments provide fire safety inspections of campus.	Low–Budget	<1 year	Fire Department
Wildfire	High	Keep all vegetation near campus structures short and controlled.	Low-Budget	<1 year	Maintenance
Wildfire	High	Fire safety and prevention program to be presented to students.	Low–Budget	<1 year	Teachers
Human-Caused	Medium	Enhance campus and transportation security systems and control and regulate access to facilities.	High–Budget	1 to 3 years	Admin
Human-Caused	High	Student education on personal and community safety to include programs such as stranger dangers, when to call 911 and how to identify and report suspicious activity.	Low–Budget	1 to 3 years	Teachers
Human-Caused	High	Host local first responder training focused on school violence.	Low-Budget	<1 year	Admin
Earthquake	Earthquake is not an identified hazard for Ector ISD.				
Earthquake	Dam Failure is not an identified hazard for Ector ISD.				

Table 4.3i: Summary of Local Jurisdictions Mitigation Projects – Fannindel ISD

Hazard	Priority	Fannindel ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate the drills.	Low-Budget	<1 year	Administration
Thunderstorms	Medium	Purchase and install emergency generators to protect critical facilities form power outrages resulting from thunderstorms.	High–Grants	3 to 5 years	Admin
Thunderstorms	Low	Develop a written Continuity of Operations Plan (COOP). This would include how to account for each student after and emergency event.	Med-Budget	3 to 5 years	Administration
Thunderstorms	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low-Budget	<1 year	Administration
Thunderstorms	High	Provide County Sheriff and local first responders with campus plans and information on sheltering locations within the school.	Low-Budget	<1 year	Administration
Winter Storms	Medium	Apply for funds to purchase alternate power sources to lessen the impact of power outages.	High-Grants	3 to 5 years	Administration
Winter Storms	Medium	Develop a written Continuity of Operations Plan (COOP) that describes the backup plan for school operations in the event the school was not useable for an extended time due to winter storm damage.	Med-Budget	1 to 3 years	Administration

Hazard	Priority	Fannindel ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Winter Storms	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low-Budget	<1 year	Administration
Extreme Heat	High	Classroom and staff education on recognizing the signs and symptoms of heat stroke.	Low-Budget	1 to 3 years	Teachers
Extreme Heat	Medium	Apply for assistance to purchase alternate power sources to lessen the impact of power outages.	High-Grants	3 to 5 years	Administration
Extreme Heat	High	Establish the school as a cooling center for local relief for vulnerable populations who lack adequate cooling in extreme heat events.	Low-Budget	<1 year	Administration
Hailstorm	Low	Provide shelter for school vehicles and equipment to prevent costly hail damage.	High-Budget	3 to 5 years	Administration
Hailstorm	Medium	Apply for assistance to purchase alternate power sources to lessen the impact of power outages.	High-Grants	3 to 5 years	Administration
Hailstorm	Low	Roof slope, decking, and covering will be considered in future construction projects.	High-Grants	3 to 5 years	Administration
Drought	High	Apply for and utilize rainwater harvesting grants. These grants teach students how to conserve water and utilize creative ways to collect rainwater.	Low-Budget	<1 year	Teachers
Drought	Medium	Replace toilets as required with low water flush units.	Med-Budgets	1 to 3 years	Maintenance
Drought	Medium	When landscaping campus grounds plant native and/or drought-tolerant grasses, ground covers, shrubs and trees.	Med-Budget	1 to 3 years	Teachers
Tornado	Medium	Apply for assistance in the funding of a school and/or Community Safe Room.	High–Grants	3 to 5 years	Admin
Tornado	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate these procedures.	Low-Budget	<1 year	Administration
Tornado	High	Develop a written Continuity of Operations Plan (COOP). This would include how to account for each student after and emergency event.	Low-Budget	<1 year	Administration
Tornado	High	Acquire and utilize a NOAA Weather Radio for quicker and more localized emergency weather notifications.	Low-Budget	<1 year	Administration
Expansive Soil	Expansive Soil is not an identified hazard for Fannindel ISD.				
Flood	High	Acquire and utilize a NOAA Weather Radio for quicker and more localized emergency weather notifications.	Low-Budget	<1 year	Administration
Flood	High	Provide County Sheriff and local first responders with campus plans and information on sheltering locations within the school.	Low-Budget	<1 year	Administration
Flood	High	Food Safety Education such as "Turn Around Don't Drown".	Low-Budget	<1 year	Teachers

Hazard	Priority	Fannindel ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Wildfire	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate these procedures.	Low-Budget	<1 year	Administration
Wildfire	High	Provide Fire Safety Education to students.	Low-Budget	<1 year	Teachers
Wildfire	Medium	Use landscaping to keep a clear fire zone around structures.	Med-Budget	1 to 3 years	Maintenance
Human-Caused	High	Practice severe weather/emergency drills with students and faculty	Low-Budget	<1 year	Administration
Human-Caused	High	Develop a written Continuity of Operations Plan (COOP).	Low-Budget	<1 year	Administration
Human-Caused	High	Provide County Sheriff and local first responders with campus plans and information on sheltering locations within the school.	Low-Budget	<1 year	Administration
Earthquake	Earthquake is not an identified hazard for Fannindel ISD.				
Dam Failure	Dam Failure is not an identified hazard for Fannindel ISD.				

Table 4.3j: Summary of Local Jurisdictions Mitigation Projects – City of Honey Grove

Hazard	Priority	City of Honey Grove Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Notify new and existing residents of the Countywide CODE RED system.	Low–Budget	<1 year	City Staff
Thunderstorms	Medium	Purchase and utilize and emergency notification system specifically for the City of Honey Grove for emergency notifications and important city notices.	High – Budget	3 to 5 years	City Staff
Thunderstorms	Medium	Backup generator for City Hall.	High–Budget/Grants	3 to 5 years	City Staff
Thunderstorms	High	Work with local media including the local "Weekly Gazette" to publish and air public safety information prior to storm tornado season.	Low-Budget	<1 year	City Staff
Winter Storms	Medium	Purchase and utilize and emergency notification system specifically for the City of Honey Grove for emergency notifications and important city notices.	High–Budget	3 to 5 years	City Staff
Winter Storms	Medium	Apply for backup generator for critical facilities.	High–Budget/Grants	3 to 5 years	City Staff
Winter Storms	High	Vegetation management to include public education about proper trimming and disposal of vegetation and maintenance of vegetation near city streets and properties to reduce susceptibility to frozen precipitation.	Low-Budget	<1 year	City Staff
Extreme Heat	High	Identify vulnerable populations such as the homebound and elderly without adequate cooling systems. Local first responders will call and/or drop by these residents to ensure their wellbeing during extreme heat events. The results of these visits will establish if there is a need to set up a cooling shelter.	Low–Budget	<1 year	VFD/ City Staff/Local Churches
Extreme Heat	High	Work with local churches and school administration to set up a cooling center for in extreme heat events.	Low-Budget	<1 year	Local Staff
Extreme Heat	High	Work with local media including the local "Weekly Gazette" to do publish public safety information on Extreme Heat.	Low-Budget	<1 year	City Staff

Hazard	Priority	City of Honey Grove Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Hailstorm	High	Notify new and existing residents of the Countywide CODE RED system and how to sign up for this free service.	Low–Budget	< 1 year	City Staff
Hailstorm	Medium	Purchase and utilize and emergency notification system specifically for the City of Honey Grove. This system would be used for emergency notifications and important city notices.	High–Budget	3 to 5 years	City Staff
Hailstorm	High	Work with local media including the local "Weekly Gazette" to do publish public safety information.	Low-Budget	<1 year	City Staff
Drought	Medium	Convert landscaping on City property to drought-tolerant plants.	Med - Budget	1 to 3 years	City Staff
Drought	High	Evaluate and update of Honey Grove's Water Conservation Plan.	Low-Budget	<1 year	City Staff
Drought	High	Public information on water conservation practices and watering restrictions provided in utility bills.	Low–Budget	<1 year	City Staff
Tornado	Low	Partner with local school district to apply for a School/Community Safe Room grant.	High–Grant	3 to 5 years	City Staff
Tornado	High	Notify new and existing residents of the Countywide CODE RED system and provide information on how to sign up for this free service.	Low–Budget	<1 year	City Staff
Tornado	Medium	Purchase a backup generator for City Hall to ensure continuity of government.	High–Budget/Grants	3 to 5 years	City Staff
Tornado	Medium	Work with other jurisdictions and county to apply for a FEMA Residential Safe Room Rebate Program	Medium-Grant	1 to 3 years	Elected Officials &
Tornado	High	Storm Shelter Awareness Campaign to work with private and public shelter owners to make existing shelters available for neighbors and create maps to identify these locations.	Low-Budget	<1year	City Staff
Expansive Soil	Expansive Soil is not an identified hazard for the City of Honey Grove.				
Flood	Medium	Storm drainage cleaning and enhancements to be implemented to keep debris from hampering drainage. These enhancements will include installing larger culverts and grates to keep large debris from getting lodged in culverts.	Med-Budget	1 to 3 years	Local Staff
Flood	High	Work with local media including the local "Weekly Gazette" to do publish public safety information such as "Turn around don't drown".	Low-Budget	<1 year	City Staff
Flood	High	Public awareness of NFIP & of availability and need of flood insurance. (NFIP)	Low-Budget	<1 year	Local Staff
Flood	High	Document local areas that flood and that are not identified as floodplain for future floodplain updates. (NFIP)	Low–Budget	<1 year	Local Staff
Wildfire	Low	Apply for grants to assist the volunteer fire department & first responders with equipping and training. The equipment would include personal protective wear and to ensure responder safety and vehicles for a better local response and for mutual aid events and smoke alarms for distribution to those in need.	High- Grants	3 to 5 years	VFD/Local Staff
Wildfire	High	Fire awareness program in local schools. This would include tops such as "stop drop and roll" and how to protect your home by creating a "defensible space".	Low–Budget	<1 year	VFD

Hazard	Priority	City of Honey Grove Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Wildfire	High	Work with local media including the local "Weekly Gazette" to do publish fire safety information. This would be done in conjunction with fire prevention week, placement of burn bans, and high hazard holidays.	Low-Budget	<1 year	City Staff
Human-Caused	High	Distribute information on the importance of when and how to "Shelter in Place".	Low–Budget	<1 year	City Staff
Human-Caused	High	Work with TCOG and promote the bi-annual "Household Hazardous Waste Collection".	Low–Budget	<1 year	City Staff
Human-Caused	High	Distribute safety information at community events such as the yearly "Davy Crockett Day" Celebration.	Low–Budget	<1 year	City Staff
Earthquake	Earthquake is not an identified hazard for City of Honey Grove.				
Dam Failure	Dam Failure is not an identified hazard for the City of Honey Grove.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3k: Summary of Local Jurisdictions Mitigation Projects - Honey Grove ISD

Hazard	Priority	Honey Grove ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate these procedures. Work to improve evacuation time in an orderly manner and develop a quick and reliable method to ensure each student is accounted for.	Low–Budget	<1 year	Admin/Teachers
Thunderstorms	Medium	Purchase and install emergency generators to protect critical facilities form power outrages resulting from thunderstorms.	High–Grants	3 to 5 years	Admin
Thunderstorms	High	Maintain and expand agreement with neighboring districts for continuity of operations in an emergency event. This would allow school to continue in the event the current location was damaged or destroyed by severe weather. Conduct an exercise to test.	Low–Budget	<1 year	Admin
Thunderstorms	High	Utilization of severe weather warning devices and the restricting of outside activities when lightening is within 10 mile range. Educate staff and students on the 30-30 rule and how to avoid dangerous locations in thunderstorms.	Low–Budget	1 to 3 years	Admin
Winter Storms	Med	Apply for grant assistance with the purchase of additional auxiliary power supply to lessen the impact of power outages.	High–Grant	3 to 5 years	Admin
Winter Storms	High	Trim trees near roofs, entrances, and walkways on the school campus. In winter storm events snow and/or ice can build on branches and cause breakage. This breakage can destroy roofs, block exits, and cause personal injury.	Low–Budget	<1 year	Admin
Winter Storms	High	After a winter storm event have conduct a detailed inspection of facilities. This could identify weakened roofs, skylight leaks, and cracked or busted plumbing. This inspection can help with insurance claims and identify small problems that left unnoticed could escalate.	Low–Budget	<1 year	Admin

Hazard	Priority	Honey Grove ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Extreme Heat	Medium	When landscaping campus grounds us low water, native, heat tolerant, and/or drought resistant shrubs.	Med–Budget	1 to 3 years	Admin
Extreme Heat	High	Classroom education on the signs, symptoms, and treatment of heat stroke and the dangers of skin cancer.	Low–Budget	1 to 3 years	School Nurse
Extreme Heat	Medium	Apply for funding assistance options for the purchase of additional auxiliary power supply to lessen the impact of power outages.	High–Grant	3 to 5 years	Admin
Hailstorm	Low	Consider roof slope, decking and gauge metal in all roofing of new constructions and in the replacement of current structures to minimize the of weather hazards and reduce insurance premiums	High-Budget	3 to 5 years	Admin
Hailstorm	Medium	Provide protective covering for school vehicles and equipment to reduce damage from a major hail event.	Med–Budget	1 to 3 years	Admin/Maintenance
Hailstorm	Low	Apply for funding assistance for the purchase of additional auxiliary power supply to lessen the impact of power outages	High–Grant	3 to 5 years	Admin
Drought	Medium	When landscaping campus grounds us low water native or drought resistant vegetation.	Med–Budget	1 to 3 years	Admin/Maintenance
Drought	Medium	Replace outdated bathroom facilities with low water flush units.	Med–Budget	1 to 3 years	Maintenance
Drought	High	Classroom education on water conservation and rainwater harvesting practices.	Low–Budget	< 1 year	Admin/Teachers
Tornado	Medium	Apply for assistance in the funding of a school and/or community Safe Room.	High–Grants	3 to 5 years	Admin
Tornado	High	Classroom education program to on Tornado safety procedures and when and where to take shelter.	Low–Budget	< 1 year	Admin/Teachers
Tornado	High	Expand agreement with neighboring districts for continuity of operations in an emergency event. This would allow school to continue in the event the current location was damaged or destroyed by severe weather. Conduct an exercise to test.	Low–Budget	< 1 year	Admin
Expansive Soil	Low	Special soil preparations and the use of floating slabs in new construction to limit the damage from expansive soils.	High-Budget	3 to 5 years	Admin
Expansive Soil	Medium	Utilization of French Drains to keep water moving away from buildings.	Med–Budget	1 to 3 years	Maintenance
Expansive Soil	Medium	Maintain, upgrade, and expand drainage pathways and clear any blockages to stop water from pooling around foundations.	Med–Budget	1 to 3 years	Maintenance
Flood	Medium	Classroom education and programs such as "Turnaround Don't Drown".	Med–Budget	1 to 3 years	Admin/Teachers
Flood	Medium	Utilization of French Drains to keep water moving away from buildings.	Med–Budget	1 to 3 years	Maintenance
Flood	Medium	Expand drainage pathways and clear any blockages to stop water from pooling.	Med–Budget	1 to 3 years	Maintenance
Wildfire	High	Local fire departments provide fire safety education to students.	Low–Budget	< 1 year	Honey Grove FD
Wildfire	High	Keep all vegetation near campus structures short and controlled.	Med–Budget	1 to 3 years	Maintenance

Hazard	Priority	Honey Grove ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Wildfire	High	Campus is located near pasture/farmland work with landowner to insure that fencerows are clear of vegetation.	Low–Budget	< 1 year	Admin
Human-Caused	Medium	Continue enhancement of security systems and controlling access to facilities.	High–Budget	< 1 year	Admin
Human-Caused	High	Continue exchange of information with first responders on campus blue-prints and other emergency information.	Low–Budget	<1 year	Admin
Human-Caused	High	Maintain agreement with neighboring districts for continuity of operations in an	Low-Budget	<1 year	Admin
Earthquake	Earthquake is not an identified hazard for Honey Grove ISD.				
Dam Failure	Dam Failure is not an identified hazard for Honey Grove ISD.				

Table 4.3l: Summary of Local Jurisdictions Mitigation Projects – City of Ladonia

Hazard	Priority	City of Ladonia Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Modernize and expand storm sirens to ensure adequate coverage in all areas of the city and continue weekly testing of sirens.	Med–Budget & Grants	1 to 3 years	VFD/City Staff
Thunderstorms	Medium	Citywide brush & debris disposal to encourage proper trimming and disposal of vegetation.	Med–Budget	3 to 5 years	City Staff/ County CERT
Thunderstorms	High	Educate resident on the importance of NOAA weather radios in homes and businesses. Work with local businesses and service organizations to offer radios at a low cost to local residents.	Low–Budget	>1 year	VFD/City Staff
Thunderstorms	High	Provide public with information concerning the agreement with First Methodist Church for basement utilization as a community storm shelter. Appoint key holders for facility in the community for ease of access.	Low–Budget	> 1year	City Staff
Winter Storms	Medium	Public awareness campaign concerning the risks of CO2 poisoning with the use of unconventional winter heating sources such as gas cook stoves, outdoor grills indoors, generators, etc..	Low-Budget	3 to 5 years	VFD/City Staff
Winter Storms	High	Educate resident on the importance of NOAA weather radios in homes and businesses.	Low–Budget	1 to 3 years	VFD/City Staff
Winter Storms	Medium	Purchase emergency generators for utilities.	High–Grants	3 to 5 years	City Staff
Extreme Heat	Medium	Purchase emergency generators for utilities.	High–Grants	3 to 5 years	City Staff
Extreme Heat	High	Work with Fannindel ISD and their service organizations to conduct a "Fan Drive" to collect fans for distribution to local without sufficient cooling.	Low–Donations	<1 year	City Staff/School Staff
Extreme Heat	High	Continue coordination between Police Department, Fire Department, and community to check on elderly or others that are vulnerable during extreme heat events.	Low-Budget	< 1 year	City Staff/VFD
Hailstorm	Medium	Modernize and expand storm sirens to ensure adequate coverage in all areas of the city and continue weekly testing of sirens.	Med–Budget & Grants	1 to 3 years	VFD/City Staff
Hailstorm	High	Educate resident on the importance of NOAA weather radios in homes and businesses.	Low–Budget	<1 year	VFD/City Staff
Hailstorm	Medium	Purchase emergency generators for utilities.	High–Grants	3 to 5 years	City Staff

Hazard	Priority	City of Ladonia Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Drought	High	Work with the water board at the future Lake Ralph Hall reservoir to negotiate an agreement for the use of the water in emergency situations.	Low–Budget	1 to 3 years	City Staff
Drought	High	Update local drought contingency plan on a yearly basis to include new development.	Low–Budget	< 1 year	City Staff
Drought	High	Use of utility bills, city marquis, website and flyers to alert citizens of water restrictions and burn bans.	Low–Budget	< 1 year	City Staff
Tornado	Medium	Modernize and expand storm sirens to ensure adequate coverage in all areas of the city and continue weekly testing of sirens.	Med – Budget & Grants	1 to 3 years	VFD/City Staff
Tornado	High	Provide public with information concerning the agreement with First Methodist Church for basement utilization as a community storm shelter.	Low–Budget	< 1 year	City Staff
Tornado	High	Educate resident on the importance of NOAA weather radios in homes and businesses.	Low–Budget	1 to 3 years	VFD/City Staff
Tornado	Medium	Purchase emergency generators for city owned utilities.	High–Grants	3 to 5 years	City Staff
Expansive Soil	High	Work with Fannin County Extension Agent to educate the public on the importance of sufficient moisture and adequate drainage to limit foundation damage.	Low–Budget	<1 year	City Staff
Expansive Soil	Medium	Ensure good site planning by reviewing development plans, meeting with developers, making site inspections and encouraging the use of going beyond standard codes to ensure safety from hazards.	Med–Budget	1 to 3 years	City Staff
Expansive Soil	High	Utilize soaker hoses around foundations of city owned structures to minimize soil shrinking.	Low-Budget	<1 year	City Staff
Flood	Low	When Lake Ralph Hall is constructed reevaluate Hazard Mitigation Plan to incorporate changes to the floodplain. (NFIP)	Med–Budget	3 to 5 years	City Staff
Flood	Medium	Bi-annual storm drainage cleaning program to be implemented to keep debris from hampering drainage and causing flooding in heavy rain events.	Med–Budget	1 to 3 years	City Staff
Flood	High	Develop and conduct workshops for community members on NFIP programs, mitigation and potential assistance with flood issues.	Low–Budget	< 1 year	City Staff
Wildfire	Medium	Citywide brush & debris disposal to encourage proper trimming and disposal of vegetation. This includes working with owners of vacant lots to keep vegetation growth to a minimum.	Med–Budget	1 to 3 years	City Staff/ County CERT
Wildfire	Medium	Establish and implement ordnances to regulate development and land use in wildfire high-risk areas.	Medium–Grants	1 to 3 years	VFD
Wildfire	High	Develop a process to have hydrants flow ratings checked semi-annually to provide adequate fire protection to critical facilities.	High–Budget	< 1 year	VFD/City Staff
Human-Caused	Medium	Purchase emergency generators for utilities.	High–Grants	3 to 5 years	City Staff
Human-Caused	Medium	Educated public on the "Seven Signs of Terrorism" and how to shelter in place.	Low–Budget	<1 year	VFD/City Staff
Human-Caused	High	Work with TCOG and promote the biennial "Household Hazardous Waste Collection".	Low–Budget	< 1 year	TCOG/City Staff

Hazard	Priority	City of Ladonia Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Earthquake	High	Develop a debris management plan to include a citywide brush and debris disposal program to encourage proper trimming and disposal of vegetation.	Low–Budget	<1 year	City Staff
Earthquake	Medium	Reinforcement retrofits for city owned structures that protect against not just minor earthquakes but wind and tornado damage.	Med–Budget	1 to 3 years	City Staff
Earthquake	High	Public awareness and education that earthquakes can happen and the importance of having a 72-hour disaster kit and how to shelter in place	Low–Budget	<1 year	City Staff
Dam Failure	Dam Failure is not an identified hazard for City of Ladonia.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3m: Summary of Local Jurisdictions Mitigation Projects – City of Leonard

Hazard	Priority	City of Leonard Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Modernize and expand local storm sirens to ensure adequate coverage is all areas of the community.	Med-Budget	<1 year	City Manager
Thunderstorms	High	Educate residents on the importance of NOAA weather radios in homes and businesses and work with local business to offer these radios at reduced price.	Low-Budget	<1 year	City Manager
Thunderstorms	High	Complete requirements to be a NWS Storm Ready Program.	Low-Budget	<1 year	City Manager
Thunderstorms	High	Encourage local residents to join the Fannin County CERT program. Work to get enough residents to take CERT training that a local CERT chapter may be formed. Having these trained volunteers locally can improve emergency response capabilities for search and rescue, evacuation, and damage assessments.	Low-Budget	<1 year	County EMC & Volunteers
Winter Storms	High	Work with local private and public agencies to set up a warming shelter for vulnerable populations during extended winter storm events. This shelter would be provide services for both local residents that lack adequate heating and travelers that may be stranded due to hazardous road conditions.	Low-Budget	<1 year	City Manager
Winter Storms	High	Encourage local residents to join the Fannin County CERT program. Work to get enough residents to take CERT training that a local CERT chapter may be formed. Having these trained volunteers locally can improve emergency response capabilities for search and rescue, evacuation, and damage assessments.	Low-Budget	<1 year	County EMC & Volunteers
Winter Storms	High	Public Awareness campaign concerning the risks of carbon monoxide poisoning from the use of unconventional winter heating sources such as gas cook stoves, outdoor grills indoors, generators, etc..	Low-Budget	<1 year	City Staff
Extreme Heat	High	When landscaping city properties use native, low water and heat tolerant vegetation.	Low-Budget	<1 year	City Manager

Hazard	Priority	City of Leonard Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Extreme Heat	High	Work with Leonard ISD extracurricular organizations and local home health agencies to host a local fan drive as their community service project. These fans would be kept on the local level for quicker distribution.	Low-Budget	<1 year	City Manager
Extreme Heat	High	In an Extreme Heat event notify residents by local media and signs of the availability of Cooling Shelters to be set up at both the City Hall and the First Baptist Church in Leonard.	Low-Budget	<1 year	City Staff
Hailstorm	Medium	Modernize local storm sirens to ensure adequate coverage is all areas of the community and educate residents on the importance of NOAA weather radios in homes and businesses.	High – Budget/Grants	3 to 5 years	City Manager
Hailstorm	Low	Construct covering for city owned vehicles and equipment to protect from hail damage.	High-Budget	3 to 5 years	City Manager
Hailstorm	High	Provide local residents education about the availability of shingle products designed to resist damage from impact and high winds.	Low-Budget	<1 year	City Building Inspector
Hailstorm	High	Work with local crop, auto, business, & residential insurance agents to educate the community on the importance of hail coverage.	Low-Budget	<1 year	County Extension Agent
Drought	High	When landscaping city properties use native, low water and heat tolerant vegetation.	Low-Budget	<1 year	City Manager & City Council
Drought	High	Local water conservation education will be provided through bill inserts and local media to encourage environmentally healthy water uses year round.	Low-Budget	<1 year	Public Works Dept.
Drought	High	Formation of joint water projects with neighboring jurisdictions to ensure ample water for all Fannin County residents.	Low-Budget	<1 year	City Manager
Tornado	Medium	Expand local storm sirens to ensure adequate coverage is all areas of the community and educate residents on the importance of NOAA weather radios.	High–Budget/Grants	3 to 5 years	City Manager
Tornado	Medium	Work with other jurisdictions & Fannin County to apply for the FEMA Safe Room Rebate program. When program is granted to the county work to notify and assist with the sign up of local citizens.	High-Grants	3 to 5 years	City Manager & County EMC
Tornado	High	Complete requirements to be a NWS Storm Ready Program.	Low-Budget	<1 year	City Manager
Tornado	High	Encourage local residents to join the Fannin County CERT program. Work to get enough residents to take CERT training that a local CERT chapter may be formed. Having these trained volunteers locally can improve emergency response capabilities for search and rescue, evacuation, and damage assessments.	Low-Budget	<1 year	City Manager & County EMC
Expansive Soil	High	Ensure good site planning by reviewing development plans, meeting with developers, making site inspections, and encouraging the use of going beyond standard building codes to ensure safety from hazards.	Low-Budget	<1 year	City Staff
Expansive Soil	Low	Replace and update wastewater pipes that are vulnerable to shifting soils.	High-Grant	3 to 5 years	Public Works
Expansive Soil	High	Install French drains around city owned structure to ensure that water doesn't pool around foundations.	Low-Budget	1 to 3 years	Public Works

Hazard	Priority	City of Leonard Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Flood	Medium	Replace city owned culverts that have collapsed and are causing water to back up and pool on city streets.	Med-Budget	<1 to 3 years	Public Works
Flood	High	Install French drains around city owned structure to ensure that water doesn't pool around foundations.	Med-Budget	1 to 3 years	Public Works
Flood	High	Active participation in the NFIP program and educate citizens on the availability of flood insurance. (NFIP)	Low-Budget	<1 year	City Manager
Flood	Low	Work with engineers to improve drainage patterns in and around the community and to develop a master drainage plan. (NFIP)	High–Budget/Grants	3 to 5 years	City Manager
Wildfire	High	Local fire department to work to provide public education at local schools during Fire Safety Week. This would include information about the importance of having a family evacuation plan that has been practiced.	Low-Budget	<1 year	Fire Department
Wildfire	High	Public Education campaign to educate community on the Fire Wise program & how to protect your home by establishing a defensible space. This program would include presentations to civic groups and education printed on water bills.	Low-Budget	<1 year	Fire Department
Wildfire	Medium	Establish and implement ordnances to regulate development and land use in wildfire high-risk areas.	Med–Budget	1 to 3 years	Public Works
Wildfire	High	Identify and develop solution for areas of town where fire apparatus doesn't have room to turn around due to trees, dead end streets, and or narrow corridors	Low-Budget	<1 year	Fire Department
Human-Caused	Medium	Protect water and wastewater infrastructure from unauthorized entry. This will be done by regular police monitoring and high fences.	Med-Budget	1 to 3 years	Public Works
Human-Caused	High	Work with TCOG and promote the biennial Household Hazardous Waste pickup.	Low-Budget	<1 year	City Manager
Human-Caused	High	Regular maintenance and practice drills on the proper protocol for a Hazardous Material Event.	Low Budget	<1 year	Fire Department
Earthquake	Earthquake is not an identified hazard for the City of Leonard.				
Dam Failure	Dam Failure is not an identified hazard for the City of Leonard.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3n: Summary of Local Jurisdictions Mitigation Projects – Leonard ISD

Hazard	Priority	Leonard ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Thunderstorms	Medium	Apply for assistance with the construction of a School Safe Room.	High–Grants	3 to 5 years	Admin

Hazard	Priority	Leonard ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Maintain and expand agreement with neighboring districts for continuity of operations in an emergency event. This would allow school to continue in the event the current location was damaged or destroyed by severe weather. Conduct an exercise to test.	Low–Budget	<1 year	Admin/Campus Security
Thunderstorms	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate these procedures. Work to improve evacuation time in an orderly manner and develop a quick and reliable method to ensure each student is accounted for.	Low–Budget	<1 year	Admin/Campus Security
Winter Storms	Medium	Apply for funding assistance for the purchase of an auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High–Grant	3 to 5 years	Admin
Winter Storms	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Winter Storms	High	Trim trees near roofs, entrances, and walkways on the school campus. In winter storm events snow and/or ice can build on branches and cause breakage. This breakage can destroy roofs, block exits, and cause personal injury.	Low–Budget	<1 year	Admin
Extreme Heat	High	Establish the school as a cooling center for local relief for vulnerable populations who lack adequate cooling in extreme heat events.	Low–Budget	<1 year	Admin
Extreme Heat	High	Classroom and staff education on recognizing the signs and symptoms of heat stroke.	Low–Budget	<1 year	School Nurse
Extreme Heat	Medium	Plant shade trees around school. The shade will assist in the cooling of the school and will provide shade for the playground area. Temperatures in the shade can be significantly cooler then outside of the shade.	Med–Grant	1 to 3 years	Admin
Hailstorm	Low	Consider roof slope, decking and gauge metal in all roofing of new constructions to minimize the of weather hazards.	High-Budget	3 to 5 years	Admin
Hailstorm	Low	Provide covered areas for school vehicles and equipment to reduce costly hail damage.	High–Budget	3 to 5 years	Admin
Hailstorm	Low	Construct covered walkways along high use pathways for student protection and equipment transport from building to building.	High–Grant	3 to 5 years	Admin
Drought	High	When landscaping campus grounds use low water native or drought resistant vegetation.	Low–Budget	<1 year	Admin/Maintenance
Drought	Medium	Replace outdated bathroom facilities with low water flush units and faucets with aerators to decrease water consumption.	Med–Budget	3 to 5 years	Maintenance
Drought	High	Classroom education on water conservation and rainwater harvesting practices.	Low–Budget	<1 year	Teachers
Tornado	Medium	Apply for assistance with the construction of a School Safe Room.	High–Grants	3 to 5 years	Admin

Hazard	Priority	Leonard ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Tornado	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate these procedures. Work to improve evacuation time in an orderly manner and develop a quick and reliable method to ensure each student is accounted for.	Low–Budget	<1 year	Admin
Tornado	High	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin/Campus Security
Expansive Soil	Medium	Special soil preparation and engineering methods used in foundation construction of new school facilities.	High–Budget	1 to 3 years	Admin
Expansive Soil	Medium	Utilize sprinklers to minimize cracking around track and building foundations.	Med–Budget	1 to 3 years	Admin
Expansive Soil	High	Clear drainage pathways and blockages to stop water from pooling.	Low–Budget	<1 year	Maintenance
Flood	Medium	Classroom education and programs such as "Turnaround Don't Drown".	Low–Budget	<1 year	Teachers
Flood	Medium	Utilize NOAA weather radios and social media to obtain latest weather information and for the quickest relay of school information to students, parents, staff and other concerned individuals. With increasing availability and use of the internet in rural areas, the use of social media for emergency notifications will be an effective means of communication with parents.	Low–Budget	<1 year	Admin
Flood	High	Maintain drainage pathways and clear any blockages to stop water from pooling.	Low–Budget	<1 year	Maintenance
Wildfire	High	Local fire departments provide fire safety education to students.	Low–Budget	<1 year	Fire Dept.
Wildfire	High	Keep all vegetation near campus structures short and controlled.	Med–Budget	<1 year	Maintenance
Wildfire	High	Practice severe weather/emergency drills with students and faculty. Incorporate first responders into drill to familiarize them with the campus and to evaluate these procedures. Work to improve evacuation time in an orderly manner and develop a quick and reliable method to ensure each student is accounted for.	Low–Budget	<1 year	Admin
Human-Caused	Med	Enhancement of security systems and controlling access to facilities.	High–Budget	1 to 3 years	Admin
Human-Caused	High	Continue exchange of information with first responders on campus blue-prints and other emergency information.	Low-Budget	<1 year	Admin
Human-Caused	High	Student education on personal and community safety to include programs such as stranger dangers, when to call 911 and how to identify and report suspicious activity.	Low-Budget	<1 year	Admin
Earthquake	Earthquake is not an identified hazard for Leonard ISD.				
Dam Failure	Dam failure is not an identified hazard for Leonard ISD.				

Table 4.3o: Summary of Local Jurisdictions Mitigation Projects – Ravenna

Hazard	Priority	City of Ravenna Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Backup generator for City Hall and critical infrastructure.	High-Grants	1 to 3 years	Town Trustees
Thunderstorms	Medium	Install lightning grade surge protection devices for city computer systems.	Medium -Budget	1 to 3 years	Town Trustees
Thunderstorms	High	Encourage local residents for participate in the Fannin County CERT program.	Low – Volunteers	<1 year	County EMC
Winter Storm	Medium	Purchase backup generator for City Hall and critical infrastructure.	High-Grants	1 to 3 years	Town Trustees
Winter Storm	High	Encourage local residents for participate in the Fannin County CERT program.	Low–Volunteers	< 1 year	County EMC
Winter Storm	High	Public Awareness campaign concerning the risks of carbon monoxide poisoning from the use of unconventional winter heating sources such as gas cook stoves, outdoor grills indoors, generators, etc..	Low-Budget	<1 year	VFD
Extreme Heat	High	Conduct a water drive to collect bottled water to be given to the local fire department for hydration in battling fire in extreme heat.	Low-Budget	<1 year	Town Trustees
Extreme Heat	High	Public education to remind residents of special needs of pets and livestock in Extreme Heat events.	Low-Budget	<1 year	VFD
Extreme Heat	High	Locate public facilities that can function as cooling shelters during extreme heat events. Establish a partnership and/or a MOU for the use of the facility and inform the public when the shelters are operable.	Low-Budget	<1 year	VFD
Hailstorm	Low	Apply for grant for a community weather siren. Since this is a farming community there is a high likelihood of residents being outside when severe weather strikes.	High-Grants	3 to 5 years	VFD
Hailstorm	Med	As replacement is needed and/or as funds become available replace current windows, skylights, and/or glass doors with shatter resistant glass in city owned facilities.	Med– Budget	1 to 3 years	Town Trustees
Hailstorm	High	Distribute emergency preparedness information to improve public awareness of hailstorm hazards and methods by which people can protect themselves, their property and their community.	Low-Budget	<1 years	VFD
Drought	High	Heighten public awareness on actions they can take to conserve water. Prepare materials in advance in the event of the need for water rationing in the community.	Low-Budget	<1 year	VFD
Drought	Medium	Establish and implement a program to utilize native, low water and heat tolerant vegetation when landscaping new developments.	Med-Budget	1 to 3 years	Town Trustees
Drought	High	Develop a city-wide conservation and drought contingency plan. Assign a committee to keep this plan current.	Low–Volunteers	< 1 year	Town Trustees & County EMC
Drought	High	Work with Fire Department to develop contingency plans for firefighting during periods when drought conditions may produce decreased water pressure and supply.	Low-Budget	<1 year	VFD
Tornado	Low	Work with other jurisdictions & Fannin County to apply for a Multi-Jurisdictional FEMA Residential Safe Room Rebate program. Many residents live in manufactured homes and/or have homes that would not withstand tornadic winds. Residential salerooms are the best chance for survival from a direct hit.	High-Grants	3 to 5 years	Town Trustees & County EMC

Hazard	Priority	City of Ravenna Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Tornado	Med	As replacement is needed and/or as funds become available replace current windows, skylights, and/or glass doors with shatter resistant glass in city owned facilities.	Med-Budget	1 to 3 years	Town Trustees
Tornado	Medium	Purchase backup generator for City Hall and critical infrastructure.	High-Grants	1 to 3 years	Town Trustees
Tornado	Low	Apply for grant for a community weather siren. Since this is a farming community there is a high likelihood of residents being outside when severe weather strikes.	High-Grants	3 to 5 years	VFD
Expansive Soil	High	Develop and maintain a method for documenting local events for future disaster declarations.	Low-Budget	s<1 year	Town Trustees
Expansive Soil	Medium	Install French drains around city owned structure to ensure that water doesn't pool around foundations.	Med-Budget	3 to 5 years	Town Trustees
Expansive Soil	Medium	Ensure that large drainage areas and culverts are clear of debris to prevent back up of water around foundations. Replace collapsed or inadequate sized culverts to allow runoff to continue down the drainage way.	Med-Budget	3 to 5 years	County Commissioner
Expansive Soil	Low	Work with Fannin County Extension Agent to educate the public on the importance for proper drainage and how that the non-uniform runoff from roof may result in localized heave.	Low-Budget	3 to 5 years	Extension Agent
Flood	Medium	Replace city owned culverts that have collapsed and are causing water to back up and pool on city streets.	Med-Budget	3 to 5 years	County Commissioner
Flood	Medium	Install French drains around city owned structure to ensure that water doesn't pool around foundations.	Med-Budget	3 to 5 years	Town Trustees
Flood	High	Develop and distribute information about the availability and need for flood insurance.	Low-Budget	<1 year	Town Trustees
Flood	High	Document flooding areas and any needed information for the future updating of county floodplain maps. (NFIP)	Low-Budget	<1 year	Town Trustees & County EMC
Wildfire	High	Work with landowners to control the spread of the Eastern Red Cedar. The Eastern Red Cedar promotes wildfire spread and limits accessibility for fire vehicles.	Low-Volunteers	<1 year	County EMC
Wildfire	Low	Public education on the Fire Wise Program & how to protect your home by establishing a defensible space. This program to be presented to civic organizations and school programs.	Low–Budget	<1 year	VFD
Wildfire	Medium	Replace inadequately sized water lines and fire hydrants to provide proper fire protection within the community.	High-Budget	1 to 3 years	Water District
Human-Caused	High	Assist local volunteer fire department in member drive.	Low-Budget	<1 year	Town Trustees
Human-Caused	High	Educate public on how to Shelter in Place.	Low-Budget	<1 year	VFD
Human-Caused	High	Work with TCOG and promote the annual Household Hazardous Waste pickup.	Low-Budget	<1 year	VFD
Earthquake	Earthquake is not an identified hazard for Ravenna.				
Dam Failure	Dam Failure is not an identified hazard for Ravenna.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3p: Summary of Local Jurisdictions Mitigation Projects – Sam Rayburn ISD

Hazard	Priority	Sam Rayburn ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	1 to 3 years	Admin
Thunderstorms	Medium	Construction of a School Safe Room.	High-Grants	3 to 5 years	Admin/Teachers
Thunderstorms	High	Provide county law enforcement and first responders with campus plans and incorporate them into emergency drills and exercises. This will allow them to familiarize themselves with sheltering locations and to provide feedback and suggestions for improvement.	Low-Budget	<1 year	Admin
Winter Storms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Grant	1 to 3 years	Admin
Winter Storms	Medium	Install awning and protective cover over walkways to protect students from the elements.	High-Budget	3 to 5 years	Admin/Maintenance
Winter Storms	High	Work with nearby communities and first responders to allow for the utilizing of facilities as a heating or cooling shelter.	Low-Budget	<1 year	Admin
Extreme Heat	High	Work with nearby communities and first responders to allow for the utilizing of facilities as a heating or cooling shelter.	Low – Budget	<1 year	Admin
Extreme Heat	High	Train all staff on the signs and symptoms of heat stroke.	Low-Budget	<1 Year	School Nurse
Extreme Heat	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Grant	1 to 3 years	Admin
Hailstorm	Medium	Consider roof slope, decking and gauge metal in all roofing of new constructions to minimize the of weather hazards.	High-Budget	3 to 5 years	Admin
Hailstorm	Medium	Install awning and protective cover over walkways to protect students from the elements.	High–Budget	3 to 5 years	Admin/Maintenance
Hailstorm	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Grant	1 to 3 years	Admin
Drought	High	Work with Fannin County Master Gardeners to increase the utilization of xeriscaping on the campus grounds.	Low – Budget	<1 year	Admin/Maintenance
Drought	Medium	Replace outdated bathroom facilities with low water flush units.	Med-Budget	3 to 5 years	Maintenance
Drought	High	Classroom education on water conservation and rainwater harvesting practices.	Low-Budget	<1 year	Admin/Teachers
Tornado	Medium	Construction of a School Safe Room.	High-Grants	3 to 5 years	Admin
Tornado	High	Provide county law enforcement and first responders with campus plans and incorporate them into emergency drills and exercises. This will allow them to familiarize themselves with sheltering locations and to provide feedback and suggestions for improvement.	Low-Budget	<1 year	Admin
Tornado	High	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	Low-Budget	<1 year	Admin/Teachers

Hazard	Priority	Sam Rayburn ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Expansive Soil	Medium	Special soil preparations and the use of floating slabs in new construction to limit the damage from expansive soils.	High-Budget	3 to 5 years	Admin
Expansive Soil	Medium	Installation of French Drains and Pumps to keep water moving away from buildings.	High-Budget	1 to 3 years	Admin
Expansive Soil	High	Improve drainage pathways to allow for the maximum drainage and clear any blockages to stop water from pooling.	Low-Budget	<1 year	Maintenance
Flood	Medium	Classroom education and programs such as "Turnaround Don't Drown".	Low-Budget	1 to 3 years	Admin/Teachers
Flood	Medium	Installation of French Drains and Pumps to keep water moving away from buildings.	High-Budget	1 to 3 years	Admin
Flood	High	Improve drainage pathways to allow for the maximum drainage and clear any blockages to stop water from pooling.	Low-Budget	<1 year	Maintenance
Wildfire	High	Local fire departments provide fire safety education to students.	Low-Budget	<1 year	Bonham FD
Wildfire	High	Keep all vegetation near campus structures short and controlled.	Low-Budget	<1 year	Maintenance
Wildfire	High	Provide county law enforcement and first responders with campus plans and incorporate them into emergency drills and exercises. This will allow them to familiarize themselves with the campus and to provide feedback and suggestions for improvement.	Low-Budget	<1 year	Admin
Human-Caused	Med	Enhancement of security systems and controlling access to facilities.	High-Budget	1 to 3 years	Admin
Human-Caused	High	Provide county law enforcement with campus plans and incorporate them into emergency drills and exercises.	Low-Budget	<1 year	Admin
Human-Caused	High	Equip each classroom with "Shelter in Place" supplies.	Low-Budget	<1 year	Admin
Human-Caused	High	Work with first responders to provide emergency building access.	Low-Budget	<1 year	Admin
Earthquake	Earthquake is not an identified hazard for Sam Rayburn ISD.				
Dam Failure	Dam Failure is not an identified hazard for Sam Rayburn ISD.				

Table 4.3q: Summary of Local Jurisdictions Mitigation Projects –Savoy

Hazard	Priority	City of Savoy Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Acquire backup power supply to support the continuation of government and critical infrastructure.	Med-Budget	1 to 3 years	Public Works
Thunderstorms	Medium	Work with other jurisdictions & Fannin County to apply for a Multi-Jurisdictional FEMA Residential Safe Room Rebate program. Many residents live in manufactured homes and/or have homes that would not withstand tornadic winds.	High-Grant	3 to 5 years	City Admin & County EMC
Thunderstorms	Low	Upgrade the emergency notification system to provide city-wide coverage.	Med-Budget/Grant	3 to 5 years	Public Works

Hazard	Priority	City of Savoy Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Winter Storms	High	Public Awareness campaign concerning the risks of carbon monoxide poisoning from the use of unconventional winter heating sources such as gas cook stoves, outdoor grills indoors, generators, etc..	Low-Budget	<1 year	Public Works
Winter Storms	Medium	Acquire backup power supply to support the continuation of government and critical infrastructure.	Med-Budget	1 to 3 years	City Admin
Winter Storms	High	Work with local private and public agencies to set up a warming shelter for vulnerable populations during extended winter storm events. This shelter would be provide services for both local residents that lack adequate heating and travelers that may be stranded due to hazardous road conditions.	Low-Donations	<1 year	City Admin, Schools & Churches
Extreme Heat	High	Public Education via water bills, social media, and webpage on how to identify and treat heat stroke.	Low-Budget	<1 year	Public Works
Extreme Heat	High	Work with local private and public agencies to set up a cooling shelter for vulnerable populations during extreme heat events. This shelter would be provide services for local residents that have inadequate cooling in their homes.	Low-Donations	<1 year	City Admin, Schools & Churches
Extreme Heat	High	Work with community service organization to conduct a fan drive and provide fans to residents without adequate cooling.	Low-Donations	<1 year	City Admin
Hailstorm	Low	Construct covering for city owned vehicles and equipment to protect from hail damage.	High-Budget	3 to 5 years	Public Works
Hailstorm	High	Provide local residents education about the availability of shingle products designed to resist damage from impact and high winds.	Low-Budget	<1 years	Public Works & County EMC
Hailstorm	High	Work with local crop, auto, business, & residential insurance agents to educate the community on the importance of hail coverage.	Low-Budget	<1 year	City Admin
Drought	High	Public information on water conservation practices and watering restrictions provided in utility bills.	Low-Budget	<1 year	Public Works
Drought	High	Develop a modified water rate structure to influence active water conservation techniques.	Low-Budget	<1 year	Public Works
Drought	High	When landscaping city properties use native, low water and heat tolerant vegetation.	Low-Budget	<1 year	Public Works
Tornado	Medium	Acquire backup power supply to support the continuation of government and critical infrastructure.	Med-Budget	1 to 3 years	Public Works
Tornado	Medium	Upgrade the emergency notification system to provide city-wide coverage.	Med-Budget/Grant	1 to 3 years	Public Works
Tornado	Medium	Work with other jurisdictions & Fannin County to apply for a Multi-Jurisdictional FEMA Residential Safe Room Rebate program. Many residents live in manufactured homes and/or have homes that would not withstand tornadic winds. Residential salerooms are the best chance for survival from a direct hit.	High-Grant	3 to 5 years	City Admin & County EMC
Expansive Soil	Expansive Soil is not an identified hazard for Savoy.				

Hazard	Priority	City of Savoy Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Flood	High	Public Education via water bills, social media, and webpage to promote flood safety. This would include "Turn around don't drown" and flood safety tips.	Low-Budget	<1 year	Public Works
Flood	High	Acquire and utilize a NOAA Weather Radio for better emergency notification.	Low-Budget	<1 Year	City Admin
Flood	Medium	Updating and replacing of damaged appurtenances in the city storm drainage system to insure the maximum drainage flow. (NFIP)	High-Budget	3 to 5 years	Public Works
Wildfire	High	Public Education via water bills, social media, and webpage.	Low-Budget	<1 year	Public Works & VFD
Wildfire	High	Citywide cleanup and hazardous fuels reduction.	Low-Budget	<1 year	Public Works & VFD
Wildfire	Medium	Apply for grants and solicit donations to purchase first responder safety gear and equipment enhancements. This would include wildland fire equipment.	High-Grants and Donations	1 to 3 years	VFD
Human-Caused	High	Public Education via water bills, social media, and webpage.	Low-Budget	<1 year	City Admin
Human-Caused	High	Develop a neighborhood or community watch program.	Low-Budget	<1 year	Police Dept.
Human-Caused	High	Evaluate the security of critical infrastructure and develop ways to secure and reduce risk of human-caused incident.	Low to High – Budget/Grants	<1 year	Public Works
Earthquake	Earthquake is not an identified hazard for Savoy.				
Dam Failure	Dam Failure is not an identified hazard for Savoy.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3r: Summary of Local Jurisdictions Mitigation Projects – Savoy ISD

Hazard	Priority	Savoy ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Provide county law enforcement and first responders with campus plans and incorporate them into emergency drills and exercises. This will allow them to familiarize themselves with sheltering locations and to provide feedback and suggestions for improvement.	Low-Budget	<1 year	Admin
Thunderstorms	Medium	Apply for assistance in the funding of a school and/or community Safe Room.	High-Grants	3 to 5 years	Admin
Thunderstorms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	Admin/VFD/PD
Winter Storms	High	Work with local officials and county to utilized school an emergency warming shelter for local residents and stranded motorists.	Low-Budget	<1 year	Admin/VFD/PD
Winter Storms	Medium	Use school buses to assist local long-term care facility to relocate residents to a warming shelter.	Low-Budget	<1 year	Admin
Winter Storms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	Maintenance
Extreme Heat	High	Work with nearby communities and first responders to allow for the utilizing of facilities as a cooling shelter by local vulnerable populations.	Low–Budget	<1 year	Admin/VFD/PD
Extreme Heat	High	Train coaches and other staff on the signs and symptoms of heat stroke.	Low–Budget	<1 year	School Nurse

Hazard	Priority	Savoy ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Extreme Heat	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High–Budget	3 to 5 years	Admin
Hailstorm	Low	Consider roof slope, decking and gauge metal in all roofing of new constructions to minimize the hailstorm damage.	High-Budget	3 to 5 years	Admin
Hailstorm	Medium	Install awning and protective cover over walkways to protect students from the elements.	Med–Budget	1 to 3 years	Admin
Hailstorm	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	Maintenance
Drought	Medium	When landscaping campus grounds plant native and/or drought-tolerant grasses, ground covers, shrubs and trees.	Low-Budget	1 to 3 years	Maintenance
Drought	Medium	Replace outdated bathroom facilities with low water flush units that use half the water of older models.	High-Budget	3 to 5 years	Maintenance
Drought	High	Classroom education on water conservation and rainwater harvesting practices.	Low-Budget	1 to 3 years	Admin/Teachers
Tornado	Medium	Apply for assistance in the funding of a school and/or community Safe Room.	High-Grants	3 to 5 years	Admin
Tornado	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	Maintenance
Tornado	High	Work with County EMC to start a Savoy ISD Teen CERT program in the high school and incorporating safety and emergency management into the high school curriculum.	Low-Budget	<1 year	Admin/County EMC
Expansive Soil	High	Improve and maintain drainage pathways and clear any blockages to stop water from pooling around structures.	Low-Budget	<1 year	Maintenance
Expansive Soil	High	Maintain drainage pathways and clear any blockages to stop water from pooling.	Low-Budget	<1 year	Maintenance
Expansive Soil	High	Monitor soil and foundations for early signs of damage and ensure that when building new campus constructions proper techniques are used to prevent slab damage from expansive soils.	Low-Budget	1 to 3 years	Maintenance
Flood	Flooding is not an identified hazard for Savoy ISD.				
Wildfire	High	Local fire departments provide fire safety education to students.	Low-Budget	<1 year	Bonham FD
Wildfire	High	Keep all vegetation near campus structures short and controlled.	Med-Budget	<1 year	Maintenance
Wildfire	High	Provide county law enforcement and first responders with campus plans and incorporate them into emergency drills and exercises. This will allow them to familiarize themselves with the campus and to provide feedback and suggestions for improvement.	Low-Budget	<1 year	Admin/Teachers
Human-Caused	Medium	Continue to enhance campus and transportation security systems and control and regulate access to facilities.	High-Budget	1 to 3 years	Admin
Human-Caused	Medium	Research the possibility of starting a Savoy ISD Teen CERT program in the high school and incorporating safety and emergency management into the high school	Low-Budget	1 to 3 years	Admin/County EMC
Human-Caused	High	Host local first responder training focused on school violence.	Low-Budget	<1 year	Admin

Hazard	Priority	Savoy ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Earthquake	Earthquake is not an identified hazard for Savoy ISD.				
Dam Failure	Dam Failure is not an identified hazard for Savoy ISD.				

Table 4.3s: Summary of Local Jurisdictions Mitigation Projects – Trenton

Hazard	Priority	City of Trenton Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Grants	3 to 5 years	City Staff
Thunderstorms	Medium	Apply for a Multi-Jurisdictional FEMA Residential Safe Room rebate program.	High-Grants	3 to 5 years	County EMC
Thunderstorms	High	Work with local newspaper "The Trenton Tribune" to run severe weather safety tips prior to peak season.	Low-Budget	<1 year	City Staff
Winter Storms	High	Public Awareness campaign concerning the risks of carbon monoxide poisoning from the use of unconventional winter heating sources such as gas cook stoves, outdoor grills indoors, generators, etc..	Low-Budget	<1 year	VFD
Winter Storms	High	Local first responders organize outreach to vulnerable populations who may need assistance obtaining medicine supplies during winter storm events.	Low-Budget	<1 year	Police/VFD/ City Staff
Winter Storms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	Police/VFD/City Staff
Extreme Heat	High	Local first responders organize outreach to vulnerable populations and those at high-risk of death in extreme heat events.	Low-Budget	<1 year	Police/VFD/ City Staff
Extreme Heat	High	Work with community service organizations and clubs to host a local fan drive as a community service project.	Low-Donations	<1 year	City Staff
Extreme Heat	High	Work with local Churches & Schools to open a cooling shelter for local residents.	Low-Budget	<1 year	City Staff
Hailstorm	High	Work with local newspaper "The Trenton Tribune" to run severe weather safety tips prior to peak season.	Low–Budget	<1 year	City Staff
Hailstorm	Low	Construct covering for city owned vehicles and equipment to protect from hail damage.	High-Grants	3 to 5 years	City Staff
Hailstorm	Medium	Apply for a grant to fund the purchase and installation of a Storm Siren.	High-Grants	1 to 3 years	VFD/City Staff
Drought	High	Implement drought water conservation regulations.	Low-Budget	<1 year	Elected Officials
Drought	High	Print water conservation techniques on utility bills.	Low-Budget	<1 year	City Staff
Drought	High	Work with local newspaper "The Trenton Tribune" to run water conservation tips.	Low-Budget	<1 year	City Staff
Tornado	High	Work with local newspaper "The Trenton Tribune" to run severe weather safety tips prior to peak season.	Low–Budget	<1 year	City Staff
Tornado	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Grants	3 to 5 years	Mayor & County EMC
Tornado	Medium	Apply for a grant to fund the purchase and installation of a Storm Siren.	High-Grants	1 to 3 years	VFD/City Staff
Expansive Soil	Expansive Soils is not an identified hazard for the City of Trenton.				

Hazard	Priority	City of Trenton Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Flood	High	Improvements and clearing of storm drainage system to reduce the impact of heavy rain events. (NFIP)	Low-Budget	<1 year	City Staff
Flood	Medium	Install French drains around city owned structure to ensure that water doesn't pool around foundations.	Medium-Budget	1 to 3 years	City Staff
Flood	High	Work with local newspaper "The Trenton Tribune" to run flood safety information.	Low-Budget	<1 year	City Staff
Wildfire	High	Provide Public Education via water bills, social media, and webpage.	Low-Budget	<1 year	City Staff
Wildfire	High	Citywide cleanup and hazardous fuels reduction.	Low-Budget	<1 year	City Staff
Wildfire	Medium	Increase volunteer fire department capabilities by obtaining additional training and equipment through FEMA programs.	High-Grants	1 to 3 years	VFD
Human-Caused	High	Work with local newspaper "The Trenton Tribune" to increase awareness of hazards and the importance of having the ability and knowledge to "Shelter in Place".	Low–Budget	<1 year	City Staff
Human-Caused	High	Work with Fannin County EMC to enhance "Neighborhood Watch" program with emphasis and education on the "Seven Signs of Terrorism".	Low-Budget	<1 year	City Staff
Human-Caused	High	Continue to allow local residents to make anonymous tips via a drop box.	Low–Budget	<1 year	City Staff
Earthquake	Earthquake is not an identified hazard for the City of Trenton.				
Dam Failure	Dam Failure is not an identified hazard for the City of Trenton.				

NFIP – This action is to ensure continual NFIP compliance.

Table 4.3t: Summary of Local Jurisdictions Mitigation Projects – Trenton ISD

Hazard	Priority	Trenton ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Provide county law enforcement and first responders with campus plans and incorporate them into emergency drills and exercises. This will allow them to familiarize themselves with sheltering locations and to provide feedback and suggestions for improvement.	Low-Budget	<1 year	Admin
Thunderstorms	Medium	Apply for assistance with the costs of a Storm Shelter.	High-HMGP	1 to 3 years	Admin
Thunderstorms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	Admin
Winter Storms	High	Utilize social media, TV, and Radio for winter weather closings and delays.	Low-Budget	<1 year	Admin
Winter Storms	High	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	Low-Budget	<1 year	Admin
Winter Storms	High	Work with City of Trenton and allow for the use of facilities as heating or cooling shelter in extreme weather events.	Low-Budget	<1 year	Admin
Extreme Heat	High	Work with City of Trenton and allow for the use of facilities as heating or cooling shelter in extreme weather events for local vulnerable populations.	Low-Budget	<1 year	Admin

Hazard	Priority	Trenton ISD Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Extreme Heat	High	Plant shade trees around school. The shade will assist in the cooling of the school and will provide shade for the playground area. Temperatures in the shade can be significantly cooler then outside of the shade.	Low-Budget	<1 year	Admin
Extreme Heat	High	Train staff and classroom education on the signs and symptoms of heat stroke.	Low-Budget	<1 year	Admin/Teachers
Hailstorm	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 year	Admin
Hailstorm	Low	Install awning and protective cover over walkways to protect students from the elements.	Med-Budget	1 to 3 years	Admin
Hailstorm	Medium	When replacing or upgrading structures consider hail resistant materials if budget allows.	Med-Budget	1 to 3 years	Admin
Drought	High	Plant native, low water, and drought resistant vegetation to reduce use	Low-Budget	<1 year	Admin
Drought	High	Adopt ordinances to prioritize or control water use, particularly for emergency situations.	Low-Budget	<1 year	Admin
Drought	Medium	Replace outdated bathroom facilities with low –volume units for water conservation.	Med-Budget	3 to 5 years	Maintenance
Tornado	High	Provide Fannin County Sheriff with campus plans and information on sheltering locations within the school.	Low-Budget	<1 year	Admin
Tornado	Medium	Apply for funding assistance to build a school/community safe room.	High-Grants	1 to 3 years	Admin
Tornado	Low	Acquire alternate form of emergency communication such as two way radios.	High-Grants/Budget	3 to 5 years	Admin
Expansive Soil	Expansive Soil is not an identified hazard for Trenton ISD.				
Flood	Flooding is not an identified hazard for Trenton ISD.				
Wildfire	Wildfire is not an identified hazard for Trenton ISD.				
Human-Caused	High	Continue to utilize smartphone Instant Alert Network application for staff notification of emergency events.	Med – Budget	< 1 year	Admin
Human–Caused	High	Continue to require all extracurricular teaches and coaches to have CPR required training.	Low – Budget	<1 year	Admin
Human-Caused	High	Continue to increase campus security to human –caused hazards by fencing campuses, installing security vestibules at main entrances and decreasing outsider entrances.	High – Budget	<1 year	Admin
Human-Caused	High	Provide Fannin County Sheriff with campus plans and information on sheltering locations within the school.	Low – Budget	<1year	Admin
Earthquake	Earthquake is not an identified hazard for Trenton ISD.				
Dam Failure	Dam Failure is not an identified hazard for Trenton ISD.				

Table 4.3u: Summary of Local Jurisdictions Mitigation Projects – Windom

Hazard	Priority	City of Windom Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Thunderstorms	High	Distribute emergency preparedness information related to weather hazards in water bills.	Low-Budget	<1 year	VFD & Volunteers
Thunderstorms	Medium	Acquire an emergency backup generator for City Hall and critical infrastructure.	High-Budget	3 to 5 years	Elected Officials
Thunderstorms	Low	Apply for a Multi-Jurisdictional FEMA Residential Safe Room Rebate program.	High-Grant	3 to 5 years	County EMC
Winter Storms	High	Utilize social media as well as TV and Radio for winter weather closings and delays.	Low-Budget	<1 year	VFD & Volunteers
Winter Storms	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen the impact of power outages.	High-Budget	3 to 5 years	VFD & Volunteers
Winter Storms	High	Work with Trenton ISD for the use of facilities as heating or cooling shelter in extreme weather events.	Low-Budget	<1 year	VFD & Volunteers
Extreme Heat	High	Train city employees on basic first aid and how to identify and treat heat stroke.	Low-Budget	<1 year	Staff
Extreme Heat	High	Create a directory of public places that would be open as a cooling shelter in an extreme heat event and obtain MOUs to expedite the opening when needed.	Low-Budget	<1 year	Staff & Volunteers
Extreme Heat	Medium	Acquire auxiliary power supply to allow for continuity of necessary operations to lessen	High-Budget	3 to 5 years	Staff
Hailstorm	Low	Construct covering for city owned vehicles and equipment to protect from hail damage.	High-Budgets	3 to 5 years	Volunteers
Hailstorm	Medium	Acquire a backup generator for City Hall and critical infrastructure.	High-Grant	3 to 5 years	Elected Officials
Hailstorm	High	Work with local crop, auto, business, & residential insurance agents to educate the community on the importance of hail coverage. Encouraging the purchasing of crop insurance.	Low-Budget	<1 year	VFD & Volunteers
Drought	Medium	When landscaping city properties use native, low water and heat tolerant vegetation.	Medium-Budget	1 to 3 years	Staff
Drought	High	Distribute emergency preparedness information related to water conservation and water restrictions on the back of water bills.	Low-Budget	<1 year	VFD & Volunteers
Drought	High	Educate local producers of the availability of insurance for pasture loss and drought assistance through the USDA's Farm Service Agency.	Low-Budget	<1 year	Staff
Tornado	High	Distribute emergency preparedness information related to weather hazards in water bills	Low-Budget	<1 year	Elected Officials
Tornado	Medium	Acquire an emergency backup generator for City Hall and critical infrastructure.	High-Budget	3 to 5 years	VFD & Volunteers
Tornado	Low	Apply for a Multi-Jurisdictional FEMA Residential Safe Room Rebate program.	High-Grant	3 to 5 years	County EMC
Expansive Soil	Medium	Special soil preparations and the use of floating slabs in new construction to limit the damage from expansive soils.	Med-Budget	3 to 5 years	Staff
Expansive Soil	Medium	Installation of French Drains and Pumps to keep water moving away from buildings.	Med-Budget	3 to 5 years	Staff
Expansive Soil	High	Improve drainage pathways to allow for the maximum drainage and clear any blockages to stop water from pooling.	Low-Budget	<1 year	Staff
Flood	High	Pass and enforce ordinances that regulate dumping in streams, ditches, and low areas.	Low-Budget	<1 year	Elected Officials & County
Flood	Medium	Install French drains around city owned structure to ensure that water doesn't pool around foundations.	Med-Budget	3 to 5 years	Staff

Hazard	Priority	City of Windom Mitigation Projects	Cost (Potential Funding Source)	Timeline	Responsible Party
Flood	High	Public education on the availability and need for flood insurance printed on water bills. (NFIP)	Low-Budget	<1 year	County EMC & Volunteers
Wildfire	Low	Public education on the Fire Wise Program & how to protect your home by establishing a defensible space. This program to be presented to civic organizations and school programs.	Low – Budget	<1 year	VFD
Wildfire	Medium	Enhance local fire department capabilities by acquiring personal protective gear and additional apparatus.	High-Grant	3 to 5 years	VFD
Wildfire	High	Control vegetation growth on vacant lots and along fence rows separating residential areas from farm land.	Low-Budget	1 to 3 years	Staff
Wildfire	Medium	Replace inadequately sized water lines and fire hydrants to provide proper fire protection within the community.	High-Budget	3 to 5 years	Staff
Human-Caused	High	Education program on personal emergency preparedness.	Low-Budget	<1 year	VFD & Volunteers
Human-Caused	High	Educate public on how to Shelter in Place and having a home emergency kit.	Low-Budget	<1 year	VFD & Volunteers
Human-Caused	High	Work with TCOG and promote the annual Household Hazardous Waste pickup.	Low-Budget	<1 year	Elected Officials
Earthquake	Earthquake is not an identified hazard for the City of Windom.				
Dam Failure	Dam Failure is not an identified hazard for Dam Failure.				

NFIP – This action is to ensure continual NFIP compliance.

4.4: Cost-Benefit Review

Cost-Benefit review for natural disaster projects is extremely difficult. Since the exact damages or even path of destruction cannot be planned in advanced, there is little to no way of calculated an expenditure of $x.xx would lead to potential savings of $x.xx. Less tangible mitigation strategies such as public education or improvements in county codes cost relatively little to implement. There is no way to quantify the number of more informed decisions, and hence number of dollars in reduced losses that could occur following these types of programs.

For example, a mother driving home with her children reaches a flooded road way. She contemplates just going through, the water doesn't look that deep, or turning around and going the long way home. She recalls seeing an ad in the local paper that said, "Turn around, don't drown." Her ten year old son has just had flood awareness at school, and asks her to take the other way home. The mother turns around and goes the long way home.

Was the money spent worth the investment? Maybe the family would have driven right through and made it home safe and sound with net economic loss of $0.00. Maybe the water was moving a little faster than she thought, and the family vehicle washed down river, resulting in at least damage to the vehicle, and more likely a rescue scenario involving several agencies and expense at a cost of approximately $50,000. The extreme end to our scenario would have the family drown. Quantifying the loss of human life, especially children, has been and will continue to be a fiercely heated legal debate. For this discussion, the loss of life is 6.6 million each, the emergency responders attempted rescue and retrieval at a cost of $50,000.

When working with planning team members from each jurisdiction all mitigation ideas t were reviewed to ensure cost effectiveness. The Benefit-Cost Analysis (BCA) tool was not used due to lack of cost estimate information. Only mitigation measures were listed in the plan that would obviously have a cost benefit ratio of one or greater. Measures that were low to no cost with a greater return or that would have an estimated BCA of 3 or greater were prioritized higher than others. The Benefit-Cost Analysis (BCA) will be used to evaluate the proposed the higher cost mitigation strategies to justify funding in local budget processes. This tool will also be used when applying for grant funds to show that actions are cost effective.

4.5: Effects of Mitigation Actions on Existing/Future Building and Infrastructure

The majority of the actions to be implemented within a year are public education and awareness. Education will allow residents to make better choices such as not building a home in WUI or flood hazard areas. This education would also educate them on how to make existing structures more resilient to hazards both man-made and natural. This would include individual activates such as how to maintain defensible space to protect from wildfire to the importance of having flood insurance even when not located in a flood hazard area.

The increased and regularly maintained building codes proposed by several jurisdictions would provide property protection to new residential, commercial and public structures from hazards. Encouraging local resident to build code plus is great but when the jurisdictions make themselves the example the message seems to be much clearer. Using the goals of the Hazard Mitigation Plan the local jurisdictions plan to lead by example and go a step farther than is necessary to mitigate against threats. Existing structures will be affected as well with the proposed mitigation strategies. As older structures are demolished the updated building codes will go into effect with the new structure being subject to current codes.

Table 4.5: Effects on Existing/Future Buildings and Infrastructure of Hazard Mitigation Actions

Action or Project	Effects on Existing/Future Buildings and Infrastructure
Code Plus or Building Codes	**Minimize potential impacts for existing development from hazards.** • Existing infrastructure will be expected to implement new codes as remodeling and updates are planned. **Minimize potential impacts for future development from hazards.** • Results in new constructions that are more resilient to weather hazards. • Critical infrastructure built code plus will have a longer life expectancy.
Safe Room Projects	**Minimize potential impacts for existing development from hazards.** • Retrofitting existing structures to contain a safe room can also provide extra support for existing structure. **Minimize potential impacts for future development from hazards.** • New structures with built in safe rooms are the ideal choice. With education and possible grant funding more new construction will include a safe room in the plans. Future public facilities will be encouraged to incorporate a safe room or a reinforced concrete area into construction plans.
Floodplain Management	**Minimize potential impacts for existing development from hazards.** • Existing structures that may experience multiple flooding events should be bought out, elevated, etc. to reduce future occurrences. **Minimize potential impacts for future development from hazards** • New road and bridges will be constructed at an elevation to prevent reoccurring flood damage when possible. This will extend their useful life but will add cost to the project. • Strict enforcement of floodplain ordinances will reduce flood damages.
Public Education & Awareness	**Minimize potential impacts for existing development from hazards.** • Owners of existing structures will be educated on how to maintain a defensible space and protect their home from wildfire whether built in the WUI or not. **Minimize potential impacts for future development from hazards.** • Awareness and Education can have a structural impact on old and new structures. If you are aware of hazards prior to construction you can incorporate mitigation in the planning process. The mitigation then would include better site development and construction methods.
Local Dam Evaluations	**Minimize potential impacts for existing development from hazards.** • Existing dams will be studied and evaluated with the purpose identifying and correcting safety issues **Minimize potential impacts for future development from hazards.** • Future high hazard dams need to have an Emergency Operation Plan informing the public of the risks of the dam.

CHAPTER FIVE – Previous Plan

5.1 Plan Progress

As part of the plan update process, this chapter includes the progress of the top prioritized projects Fannin County selected to achieve in their previous plan. Representatives of each of the entities that participated in the previous plan were asked to reevaluate their measures based on progress and updated risk and vulnerability. They were asked to provide feedback regarding completion, addition and deletion measures and projects. Table 5.1 shows some of the progress highlights of the top three projects in the previous plan. All three of these projects are being continued in this plan update.

Table 5.1: Previous Plan Progress

Previous Mitigation Projects and Status	Progress
Public Awareness & Education (Ranked #1)	• 911 and public safety giveaways at schools, health fairs and community events • Public workshop on the benefits of having an approved mitigation plan • Fire education in schools and at community events • Provided safety information on local water bills, city signs and websites • Countywide phone notification service in place • Local jurisdictions provided water conservation programs • Updated existing storm sirens throughout the county and added an additional siren in the Lake Bonham area and near the Veterans Administration Hospital facilities
Planning for Tomorrow (Ranked #2)	• Presentation on school safe room to school superintendents • Fannin County completed a COOP plan for county government • HMGP funded rebate program assisted in the installation of >100 residential safe rooms • Application for AFG grants to update VFD equipment • Additional NIMs training for first responders • Local exercise and drills with first responders to ensure preparedness and interoperability • Transition to P25 compliant communications equipment • County received zoning authority from state legislature around the Lower Bois D'Arc lake to ensure that development is not in flood or hazard areas • Local entities looked at hazard mitigation actions when planning local budget and future capital improvement plans • Regular testing of emergency alert systems throughout the county
Community Emergency Response Team (CERT) (Ranked #3)	• Trained and equipped >100 CERT members • Conducted CERT train the trainer courses • Utilized local CERT members to assist law enforcement with event traffic, search and rescue and other emergency operations • Periodic checks on local elderly during extreme heat, winter storms and extended loss of power events

5.2 Progress Limitations

Limited progress has been made since the previous mitigation plan due to funding and limited resources. Mitigation projects rely heavily on grant programs. These grant programs have seen significant reductions in available funds and local jurisdictions have limited resources. With 16.1% of Fannin County's population living in poverty local jurisdictions are unable to increase tax revenues to fund mitigation projects.

5.3 Risk & Development Changes

An evaluation of land uses and development trends was conducted as part of both the initial plan and this plan update (Section 3.5). Current growth has been very limited and has not significantly influenced hazard risk. Future growth around the two proposed lakes along with the projected development in southwest Bonham will make significant changes in flood risk, vulnerable population distribution and critical infrastructure placement. These will be areas focused on in future updates.

CHAPTER SIX – ADOPTION, IMPLEMENTATION, & MAINTENANCE & MONITORING

6.1 Plan Adoption

Formal plan adoption is a required part of the planning process and demonstrates Fannin County and the local jurisdictions commitments to fulfilling the mitigation goals and objectives outlined in the plan. Texoma Council of Governments (TCOG) will facilitate the adoption process of the Mitigation Plan.

Upon completion of the plan and the review and approval of the HMPT the county submitted the plan for State and FEMA approval. When approval has been received the plan will be presented for local adoption. Adoption will occur with a resolution that will be added in Annex F.

6.2 Plan Implementation

Mitigation is only successful when it is incorporated within the day-to-day functions and priorities of government and development. This integration is accomplished by constant, pervasive and energetic efforts to network, identify and highlight the multi-objective, "win-win" benefits to each project. With adoption of this plan the HMPT, led by the Fannin County EMC, will have the following duties:

- Act as a forum for hazard mitigation issues
- Pursue the implementation of high priority, low/no-cost recommended actions
- Keep the concept of mitigation in the forefront of community
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to assist the community in implementing the Plan's recommended actions for which no current funding exists
- Monitor and assist in implementation and update this Plan
- Inform and solicit input from the public

The Committee will not have any powers over County staff; it will be purely an advisory body. Its primary duty is to see that the plan is successfully carried out and that it is kept alive by monitoring and updates.

6.3 Plan Maintenance & Monitoring

The Fannin County Multi-Jurisdiction Hazard Mitigation Plan should be a living document. Continuous maintenance, monitoring, and plan participation is needed to insure that it remains an active and relevant document. The plan maintenance and monitoring process includes annual evaluations, revisions or updates as needed by the county. The plan will be updated and resubmitted for State and Federal review every five years. Fannin County's Department of Emergency Management, along with the HMPT will be responsible for evaluating and updating the plan. Plan updates or revisions will be submitted to the Fannin County Board of Commissioners and the local jurisdictions for adoption.

6.4 Plan Evaluating

The County Emergency Management Director and the County's HMPT will evaluate the Natural Hazard Mitigation Plan every year to determine the effectiveness and/or progress of mitigation actions and the implementation of other actions.

Plan evaluation should address the following questions:

- What was accomplished?
- Did outcome of mitigation actions occur as expected?
- Do objectives address current and expected hazardous conditions?
- Has the nature or magnitude of risks changed?
- Has there been any disasters and if yes what needs were identified?
- Are the current resources appropriate for implementing mitigation actions?
- Are there any implementation problems, such as technical, political, legal, or coordination issues with other agencies?
- Are there new funding sources to consider?
- Did outcome of mitigation actions occur as expected?
- What elements of the plan have been incorporated into other planning mechanisms?
- What new jurisdictions or agencies should be invited for future updates?
- How can public participation be increased?

The HMPT and Emergency Management Director will have three months from the date of the evaluation meeting, to update the plan with any changes needed and acquire multi-jurisdictional approval. The county will resubmit the plan for State and Federal review as needed but at least once every five years.

6.5 Plan Updating

The multi-hazard plan will be kept on record at the Fannin County Emergency Management (EMC) Office in Bonham and the Public Safety Department at TCOG. Digital copies will be located at each jurisdiction. Fannin County EMC will ensure that regular review and update of the plan by the county planning team. It is highly encouraged that the HMPT has an annual scheduled meeting that occurs at the same period of time each year. The county EMC will be responsible for contacting the HMPT, scheduling the review, and the posting of notices and agendas. Scheduling the annual reviews is important because the plan is to be reviewed and revised on a minimum five-year cycle to ensure it is a living document.

During the annual review meeting, the team will review the goals and action items to determine their relevance to changing situations in the county, as well as changes in State or Federal policy, and to ensure that they are addressing current and expected conditions. The team will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of their projects and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised. With the occurrence of future natural disasters, additional mitigation projects may be developed and added to the plan. The HMPT will then have 90 days to update and make changes to the plan and acquire county local jurisdiction approval. The updated plan, as approved by the county and jurisdictions, will be submitted to the State Hazard Mitigation Officer. After State approval, the plan will be sent to FEMA for approval.

6.6 Incorporation into Existing and Future Planning Mechanisms

When county commissioners and local officials are considering capital improvements, they will use this plan in conjunction with the existing EOP to improve future development and safety within the county. Budgeting for future capital improvements will also contribute to realization of the goals in the Hazard Mitigation Plan. Emergency managers will be encouraged to work with the county commissioners and local jurisdictions to secure high-hazard areas for low risk uses. County government and local jurisdictions will incorporate goals and objectives of the Hazard Mitigation Plan into community plans, plan revisions and updates. Local jurisdictions will incorporate actions that meet Hazard Mitigation Plan Goals into Capital Improvement Plans, Economic Development Activities, and Grant Submittals. The data provided in the risk assessment will be used as supporting data and justification for grant applications.

Table 6.6: Incorporation into Existing & Future Planning Mechanisms

Planning Mechanism	How Incorporated
Emergency Operation Plan (EOP)	Will become Appendix P of the Fannin County EOP.
Planning Committee Ordinances	Will use the Hazard Mitigation Plan as support for floodplain management actions.
Grant Applications	Data and maps will be used as supporting documentation in grant applications.
Budget	When constructing budgets Hazard Mitigation Actions will be funded as budget allows. Projects will be evaluated to see if they meet the Hazard Mitigation goals and objectives.
Comprehensive Planning	Future projects will be examined to incorporate Hazard Mitigation Actions.
Employee Job Description	When updating employee job descriptions the city may include Hazard Mitigation Actions as job duties.
Building and Zoning Ordinances	A variety of building and zoning regulations are used to restrict the uses of land and establish building specifications. Prior to land use, zoning changes or development permitting the city will review the hazard mitigation plan and other hazard analysis to ensure compatible land use.
Comprehensive Land Use Plan	A land use plan is intended to identify land use issues and to make recommendations on how to address these issues. When applicable the city will incorporate Hazard Mitigation Actions in the development and extent of the regulations
Capital Improvement and Strategic Plans	Will incorporate mitigation goals and actions when updating and plans.
Fire Plan	The Hazard Mitigation Plan will be used as a resource for the development of future Fire Plans.
City Ordinances	When updating city ordinances Hazard Mitigation will be a priority.
Day to Day Operations	Incorporate Hazard Mitigation Actions in daily operations and all projects.
Community Service	Hazard Mitigation Actions can be projects supported by community service organizations.
School Emergency Plans	Use the hazard analysis in the hazard mitigation plan to know vulnerability to all hazards.
Economic Development	Avoidance of identified high hazard areas when assisting new business in finding a location.

6.7 Continued Public Participation

While the HMPT represents the public to some extent, the public will be able to directly comment on and provide feedback about the plan. Fannin County is dedicated to generating public interest in the updates of the Multi-Jurisdictional Hazard Mitigation Plan. Efforts to do so may include:

- Distributing information about the existence and purpose of the Hazard Mitigation Plan to community groups, units of County government, and other public gatherings
- Questionnaires may periodically being made available to the public to collect information on what mitigation activities the citizens would like to see implemented
- Posting information about the Hazard Mitigation Plan on the County's Web page, along with an email address for questions and input

Listed below is the contact information of the County Emergency Management Director, who is responsible for keeping track of public comments on the plan. Copies of the plan will be available online and at each jurisdiction. The public will also be invited to, and included in, the HMPT's annual evaluation of the plan. This meeting will provide the public with a forum for which they can express their concerns, opinions, or ideas about the plan.

Fannin County EMC
2375 Silo Road
Bonham, TX 75418
903-640-8484
dbrewer@fanninco.net

Here's the 5 day forecast. To be honest, after tomorrow, your guess is as good as mine!

Appendix A

Acronyms & Definitions

Acronyms:

ASDSO	Association of State Dam Safety Officials
BCA	Benefit-cost Analysis
BCR	Benefit-cost Ratio
CCP	Citizen Corps Program
CDBG	Community Development Block Grant (HUD)
CERT	Community Emergency Response Team
CIA	Central Intelligence Agency
COG	Council of Governments
DFIRM	Digital Flood Insurance Rate Map
DOD	Department of Defense
DMA 2000	Disaster Mitigation Act of 2000
DSHS	Department of State Health Services
EMC	Emergency Management Coordinator
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance Program
FSA	Farm Service Agency
GIS	Geographic Information System
HMGP	Hazard Mitigation Grant Program
HMPT	Hazard Mitigation Planning Team
KDBI	Keetch-Byram Drought Index
MAA	Mutual Aid Agreement

MOU	Memorandum of Understanding
NDSP	National Dam Safety Program
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NPDP	National Performance of Dams Program
NRCS	National Resource and Conservation Service
PDM	Pre-Disaster Mitigation Program (FEMA)
RFC	Repetitive Flood Claims Program
SRL	Severe Repetitive Loss
TCEQ	Texas Commission on Environmental Quality
TCOG	Texoma Council of Government
TDEM	Texas Department of Emergency Management
THMP	Texas Hazard Mitigation Package
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VFD	Volunteer Fire Department
WMD	Weapons of Mass Destruction

Definitions:

100-year flood – is a flood that has a 1-percent chance of being equaled or exceeded in any given year. This flood event is also referred to as the base flood. The term "100-year flood" can be misleading; it is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Therefore, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management to determine the need for flood insurance.

500-year flood – is a flood that has a 0.2-percent chance of being equaled or exceeded in any one year.

Base Flood – Flood that has a 1-percent probability of being equaled or exceeded in any given year. It is also known as the 100-year flood.

Base Flood Elevation (BFE) – Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The BFE is used as the standard for the National Flood Insurance Program.

Benefit-cost analysis (BCA) – Benefit-cost analysis is a systematic, quantitative method of comparing the projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Capability Assessment – An assessment that provides a description and analysis of a community or state's current capacity to address the threats associated with hazards. The capability assessment attempts to identify and evaluate existing policies, regulations, programs, and practices that positively or negatively affect the community or state's vulnerability to hazards or specific threats.

Community Rating System (CRS) – CRS is a program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specific activities, the insurance premiums of these policyholders in communities are reduced.

Critical Facility – Facilities that are critical to the health and welfare of the population and that are especially important following a hazard. Critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities.

Digital Flood Insurance Rate Maps (DFIRMs) – These maps are used to calculate the cost insurance premiums; establish flood risk zones and base flood elevations to mitigate against potential future flood damages to properties.

Fire Potential Index (FPI) – Developed by USGS and the U.S. Forest Service (USFS) to assess and map the potential for a fire hazard over broad, defined areas. Based on such geographic information, national policy makers and "on-the-ground" fire managers established priorities for prevention activities in the defined areas to reduce the risk of managed and wildfire ignition and spread.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas resulting from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Flood Depth – Height of the flood water surface above the ground surface.

Flood Hazard Area – Area shown to be inundated by a flood of a given magnitude on a map.

Flood Insurance Rate Map (FIRM) – Official maps of a community, prepared by the FEMA that shows both the special flood hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) – is a study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

Flood Mitigation Assistance (FMA) Program – A program created as a part of the National Flood Insurance Report Act of 1994. FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other NFIP insurance structures, with a focus on repetitive loss properties.

Floodplain – Any land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood.

Fuel Moisture (FM) Content - The quantity of water in a fuel particle expressed as a percent of the oven-dry weight of the fuel particle.

Hazard – A source of potential danger or an adverse condition that can cause harm to people or cause property damage. A natural hazard is a hazard that occurs naturally (such as flood, wind, and earthquake). A man-made hazard is one that is caused by humans (for example, a terrorist act or a hazardous material spill).

Hazardous Material Facilities – Facilities housing industrial and hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

Heat Index (HI) - The temperature the body feels when heat and humidity are combined. Higher humidity plus higher temperatures often combine to make us feel a perceived temperature that is higher than the actual air temperature.

Heavy Snow - Snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more in depth in 24 hours or less.

Infrastructure – The public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, transportation system (such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams).

Ice Storm – Term used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication.

Keetch-Byram Drought Index (KBDI) - A drought index designed for fire potential assessment. It is a number representing the net effect of transpiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers.

Lightning – A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds or between a rain cloud and the ground.

Mitigation Objectives – Strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

National Flood Insurance Program (NFIP) – Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 Code of Federal Regulations (CFR) §60.3.

Post-disaster mitigation – Mitigation actions taken after a disaster has occurred, usually during recovery and reconstruction.

Presidential Disaster Declaration – A post-disaster status that puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses, and public entities in the areas of human services, public assistance (infrastructure support), and hazard mitigation. If declared, funding comes from the President's Disaster Relief Fund and disaster aid programs of other participating federal agencies.

Public education and outreach programs – is any campaign to make the public more aware of hazard mitigation and mitigation programs, including hazard information centers, mailings, public meetings, etc.

Repetitive Loss Property – A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1,000 each have been paid within any 10-year period since 1978.

Replacement Value – is the cost of rebuilding a structure and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.

Risk – The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage.

Riverine – Of or produced by a river (for example, a riverine flood is one that is caused by a river overflowing its banks).

Scour – Removal of soil or fill material by the flow of floodwaters.

Special Flood Hazard Area (SFHA) – An area within a floodplain having a 1-percent or greater chance of flood occurrence in any given year (that is, the 100-year or base flood zone); represented on FIRMS as darkly shaded areas with zone designations that include the letter "A" or "V."

Stafford Act – The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law (PL) 100-107 was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.

Thunderstorm - A local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder. It forms from a combination of moisture, rapidly raising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze, or a mountain.

Tornado – A violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly.

Wildland/Urban Interface (WUI) - The area where houses and wildland vegetation coincide.

Wildland Fire Assessment System (WFAS) - An internet-based information system that provides a national view of weather and fire potential, including national fires danger, weather maps and satellite derived "Greenness" maps.

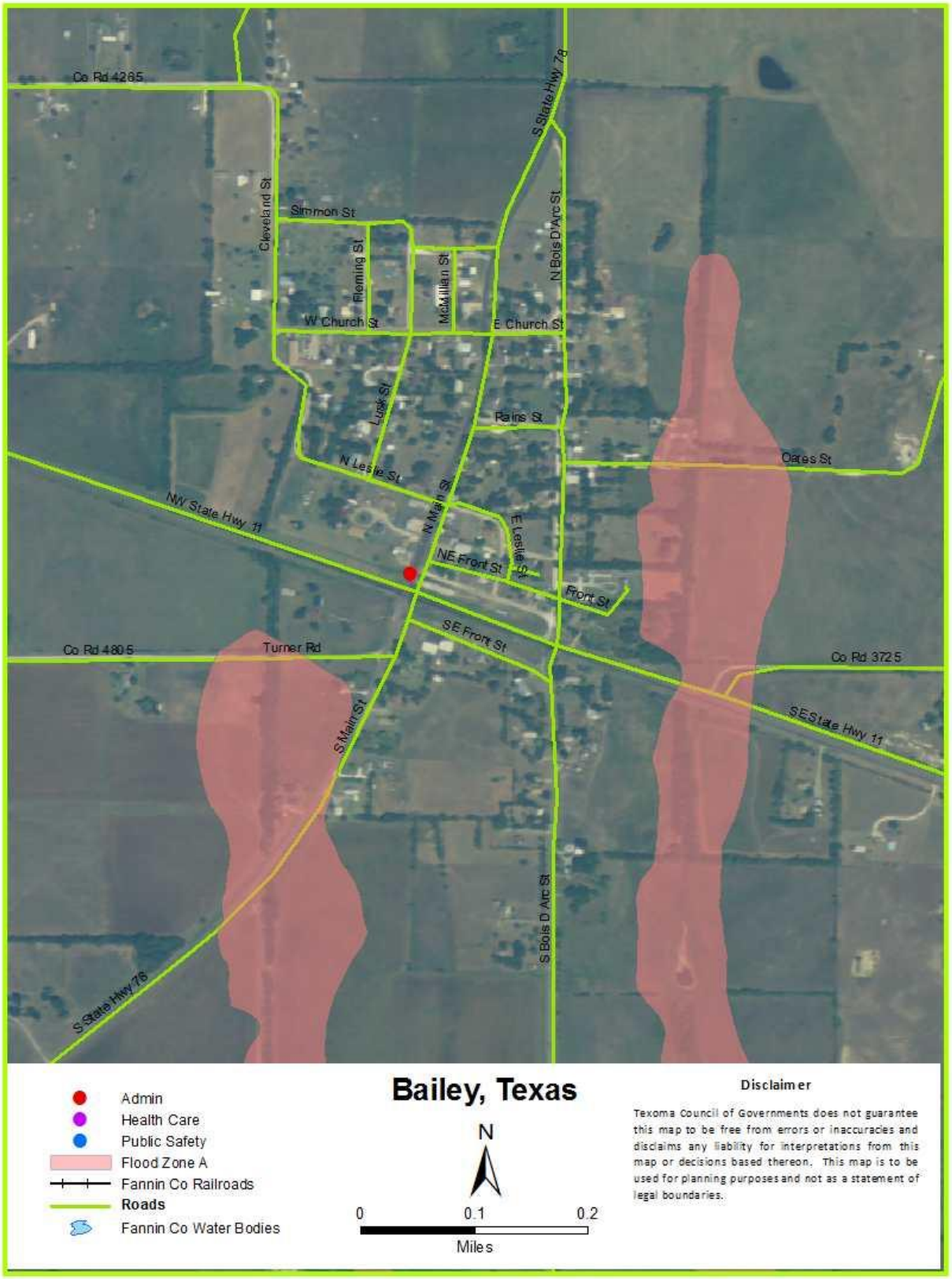
Wind Chill Index (WCI) - The temperature your body feels when the air temperature is combined with the wind speed.

Zoning Ordinance – Designation of allowable land use and intensities for a local jurisdiction.

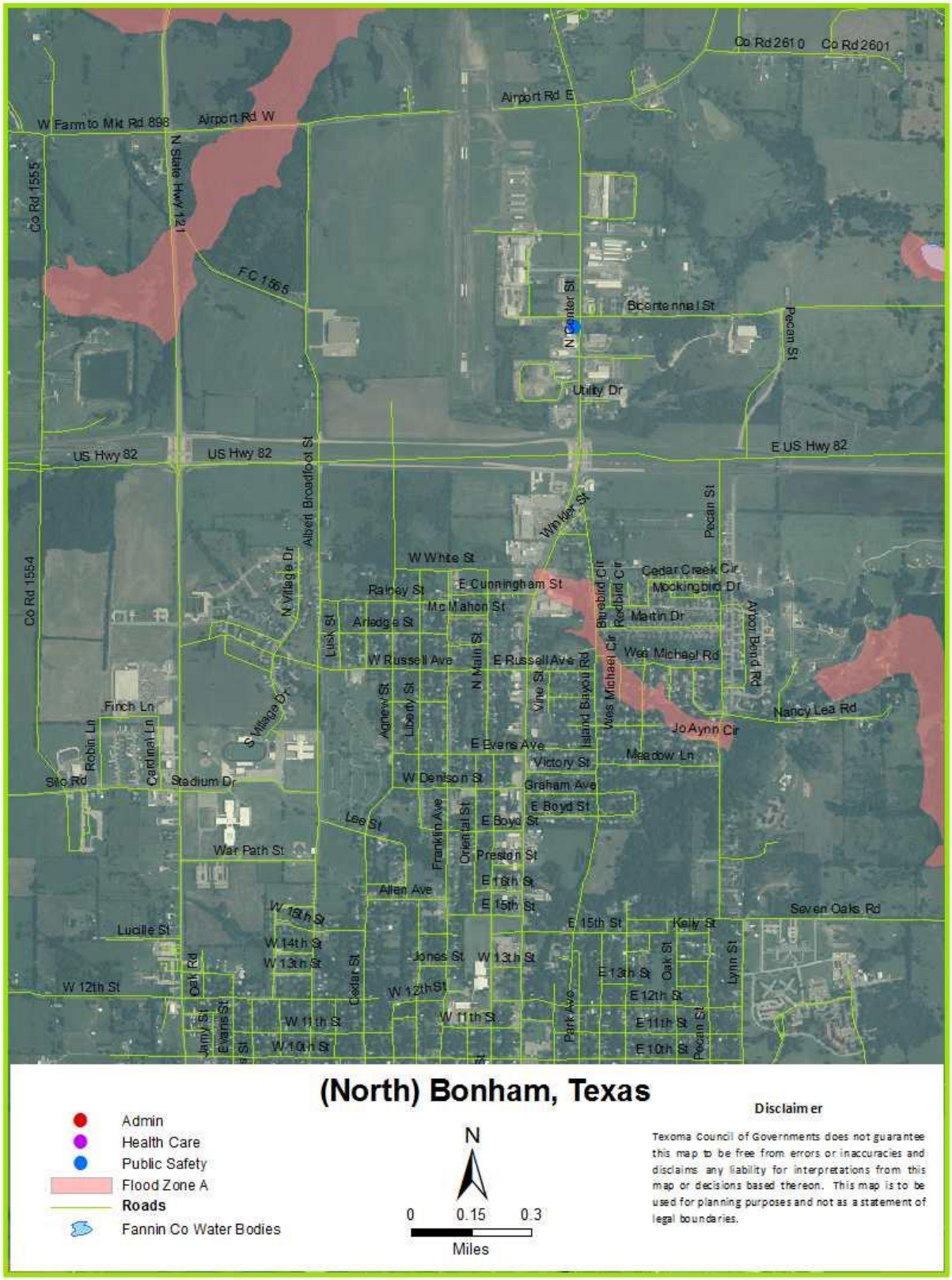
Appendix B

Maps

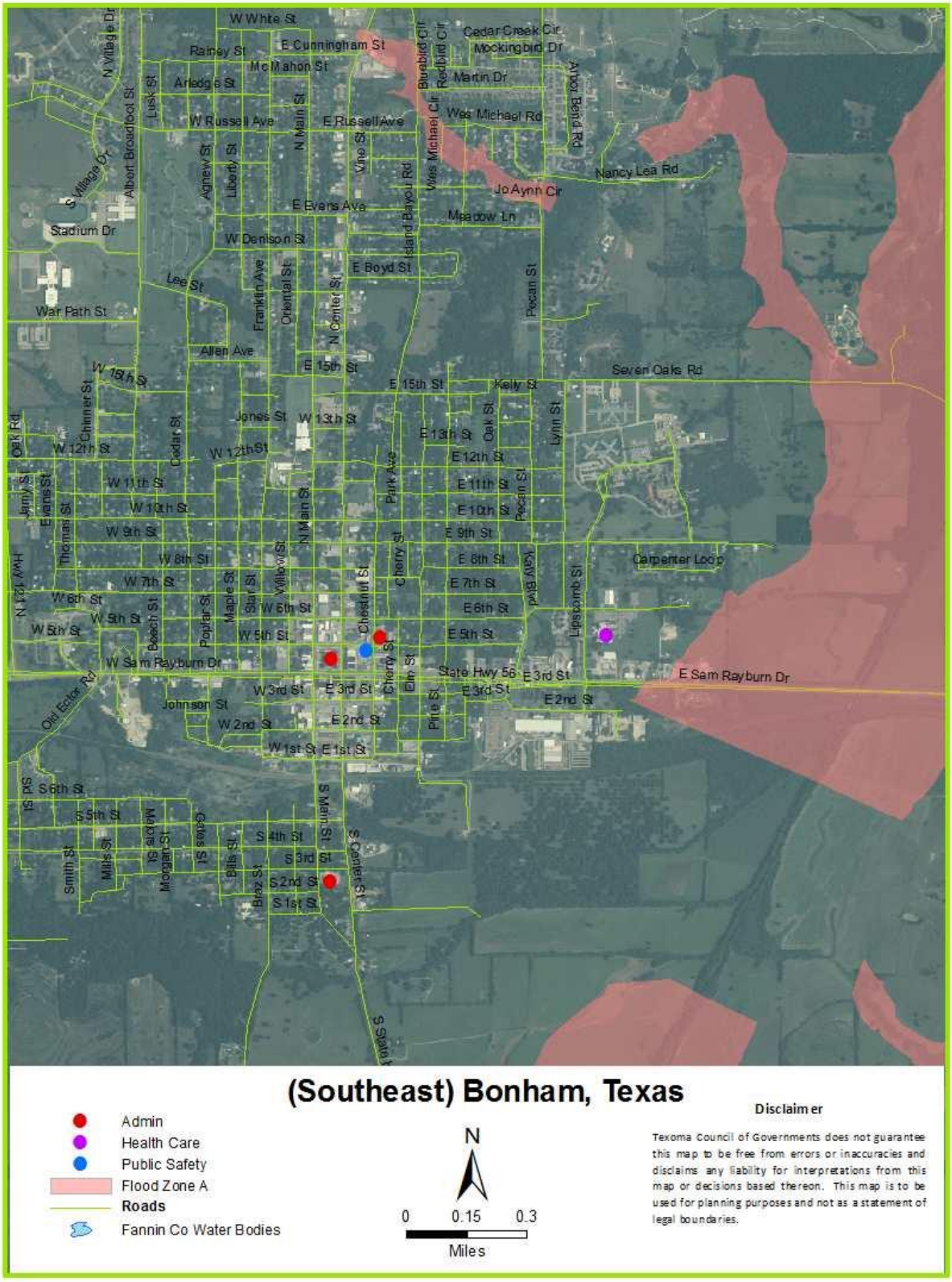
Jurisdictions: Bailey



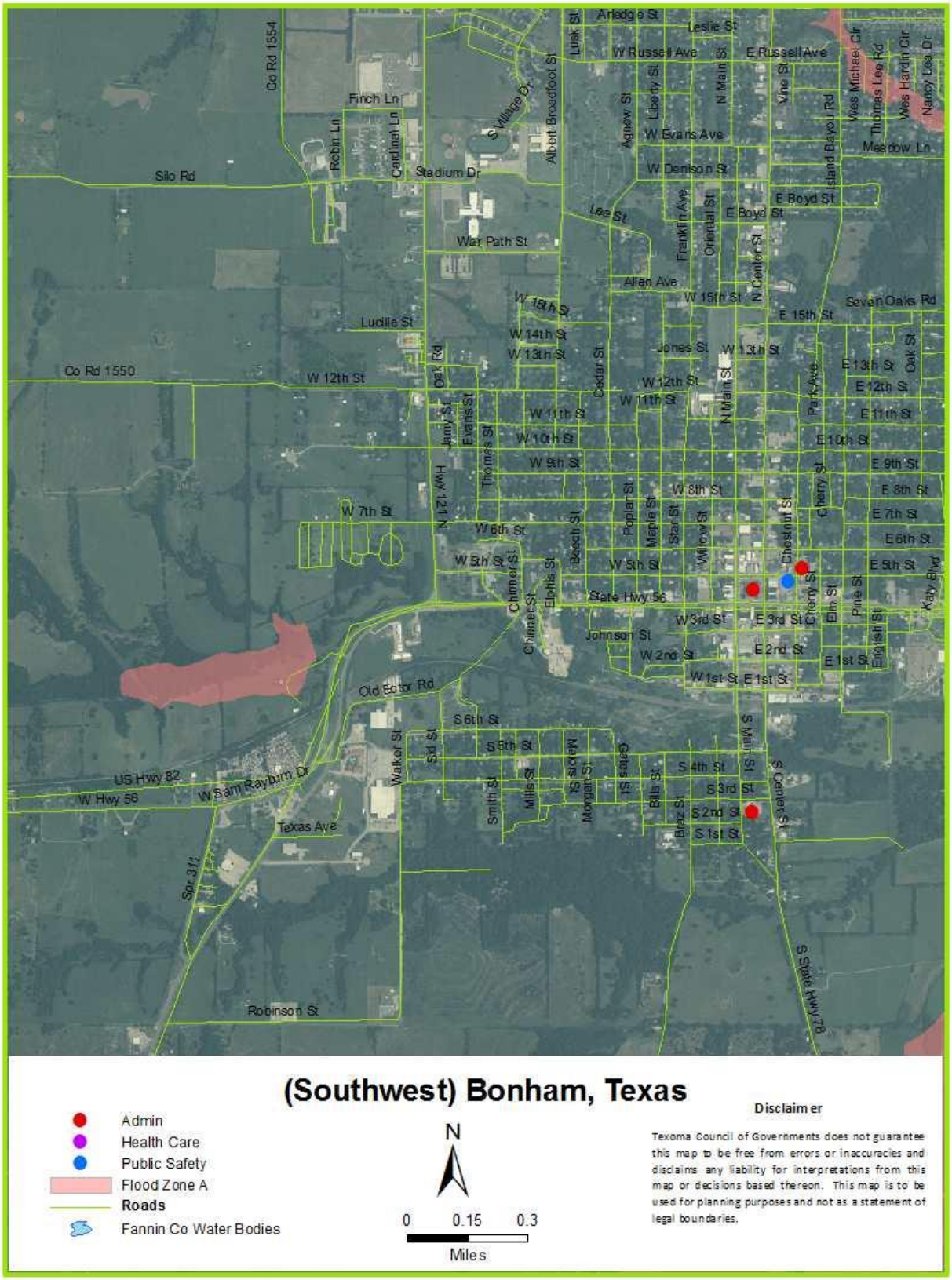
Jurisdictions: Bonham North



Jurisdictions: Bonham South East



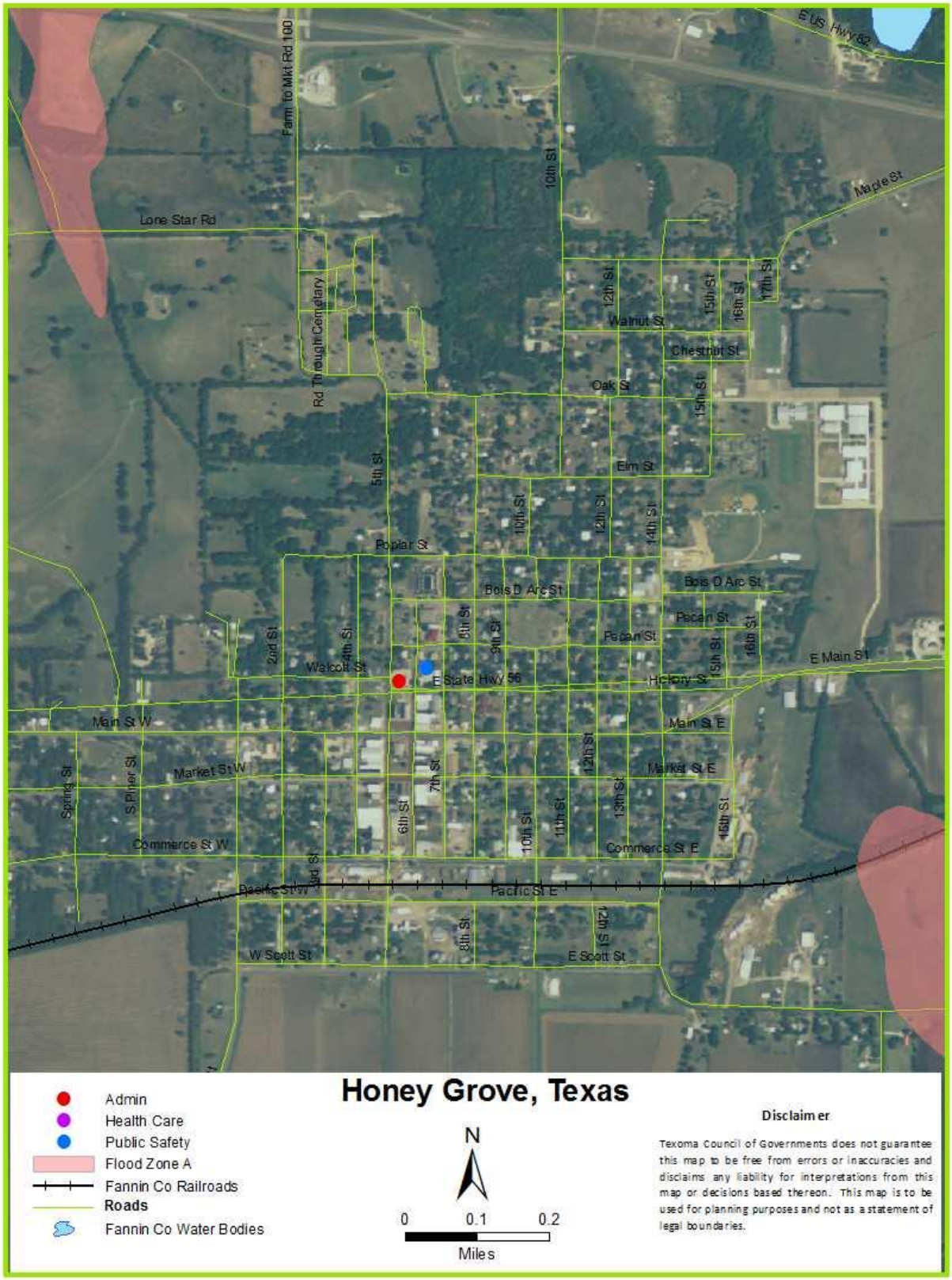
Jurisdictions: Bonham South West



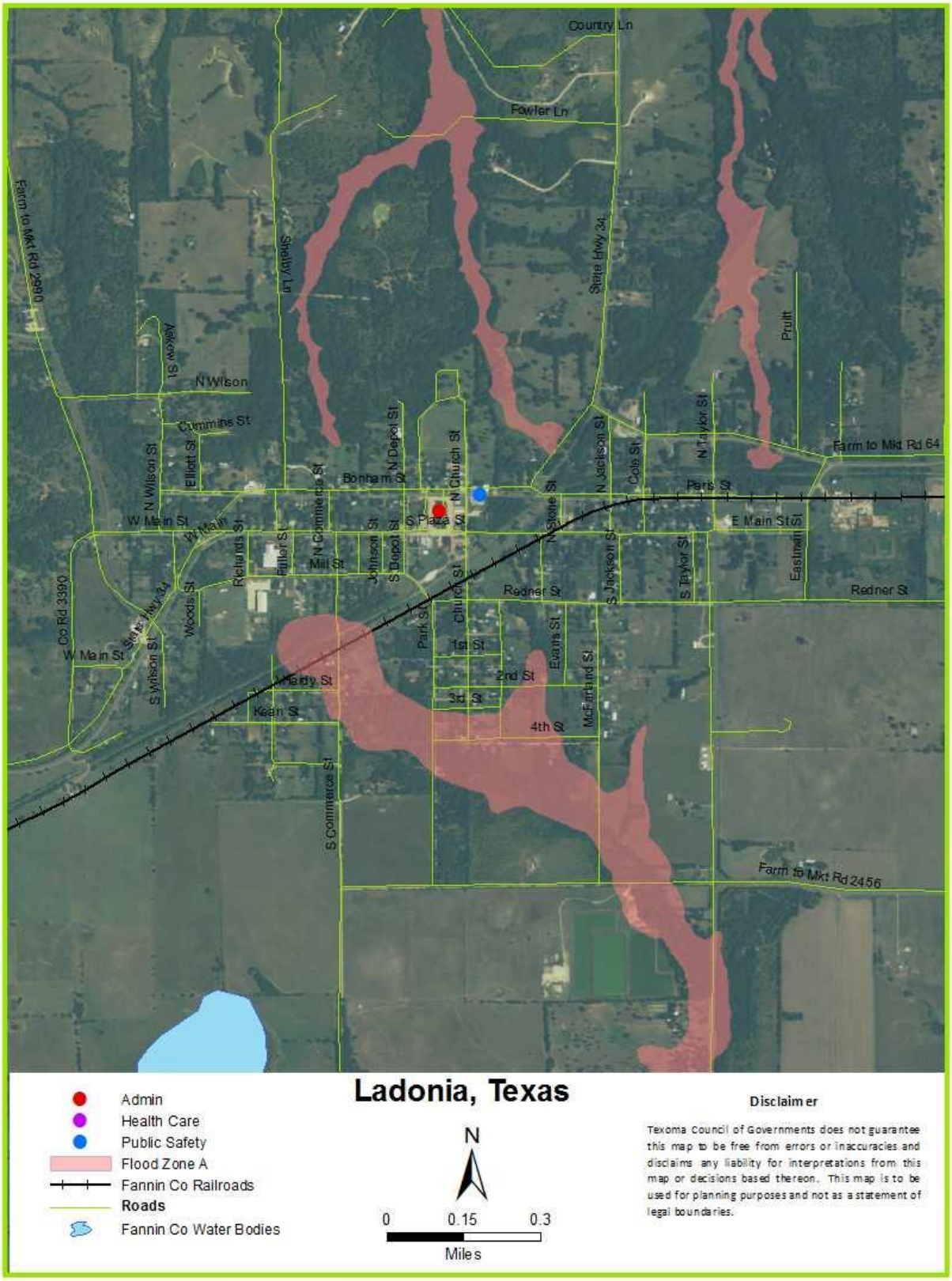
Jurisdictions: Dodd City

Jurisdictions: Ector

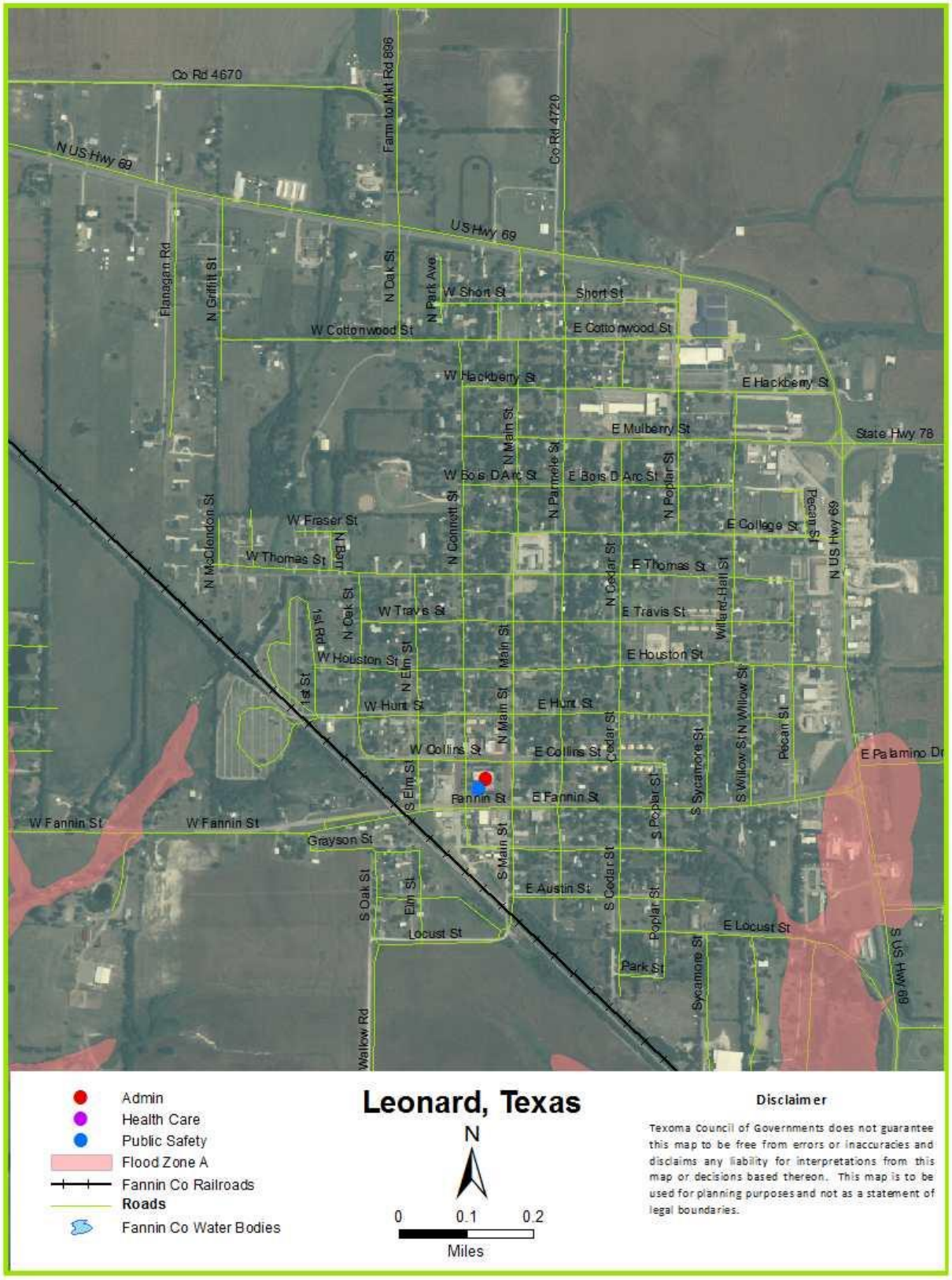
Jurisdictions: Honey Grove



Jurisdictions: Ladonia



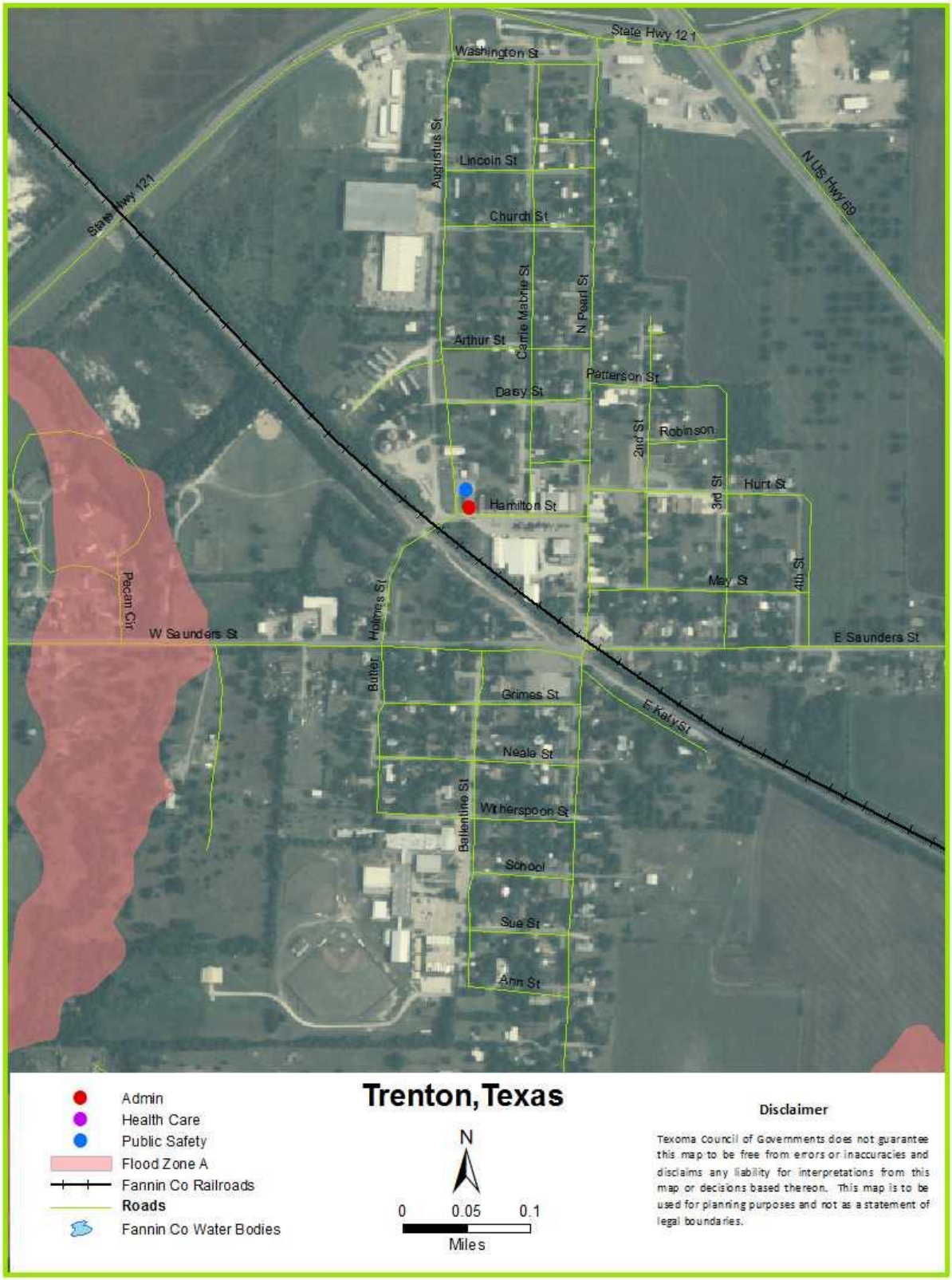
Jurisdictions: Leonard



Jurisdictions: Ravenna

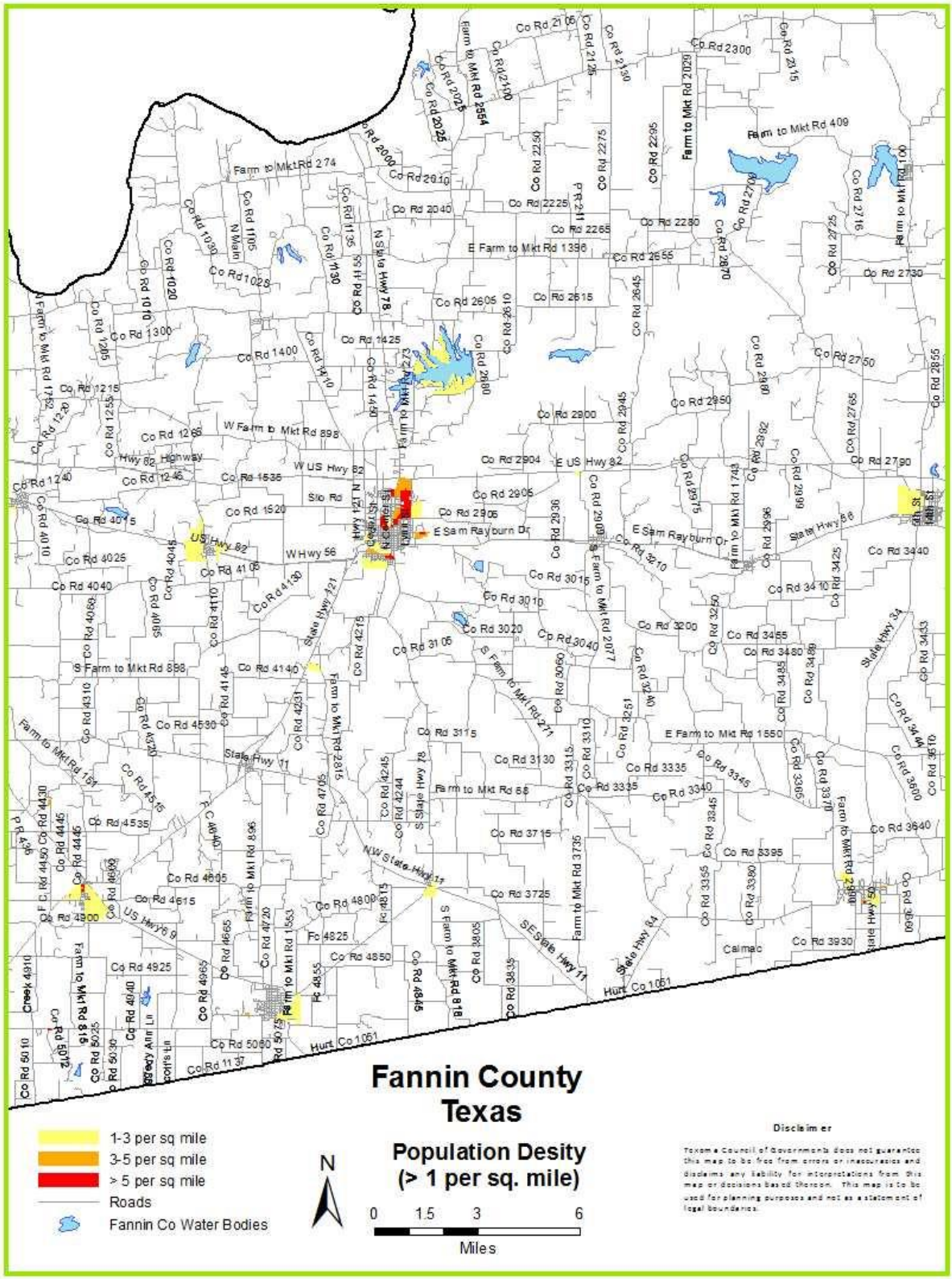
Jurisdictions: Savoy

Jurisdictions: Trenton

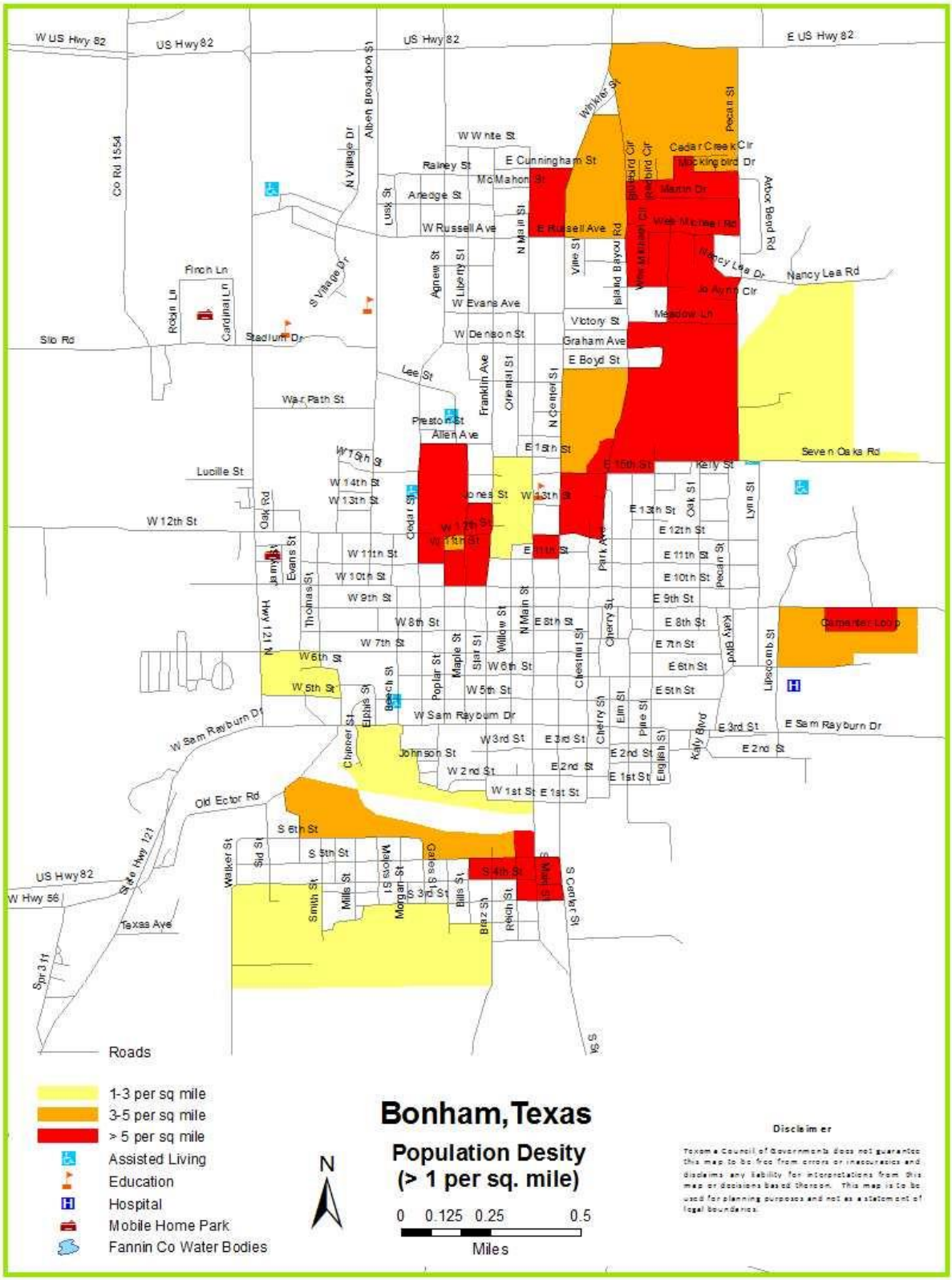


Jurisdictions: Windom

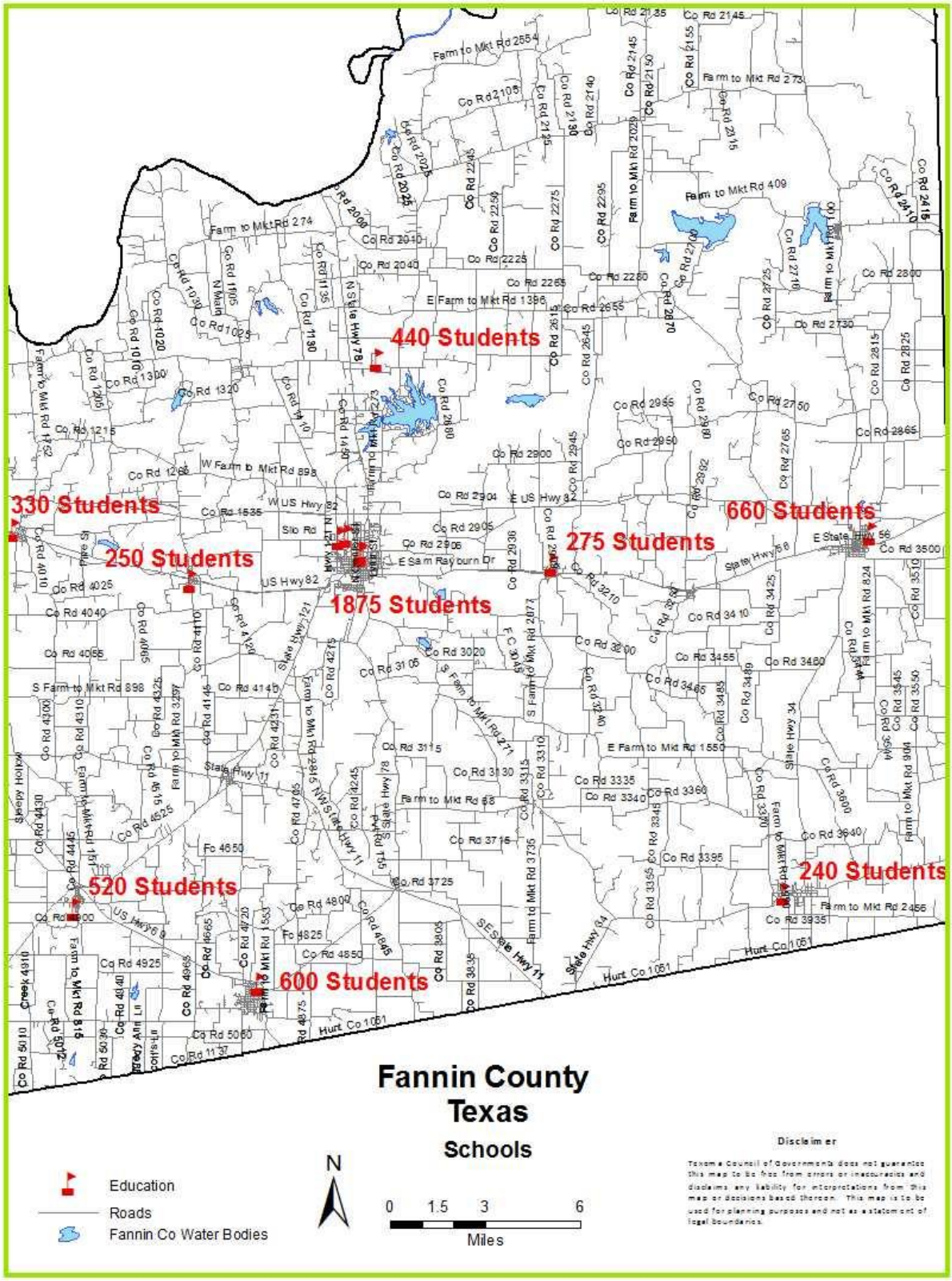
Countywide Population Density



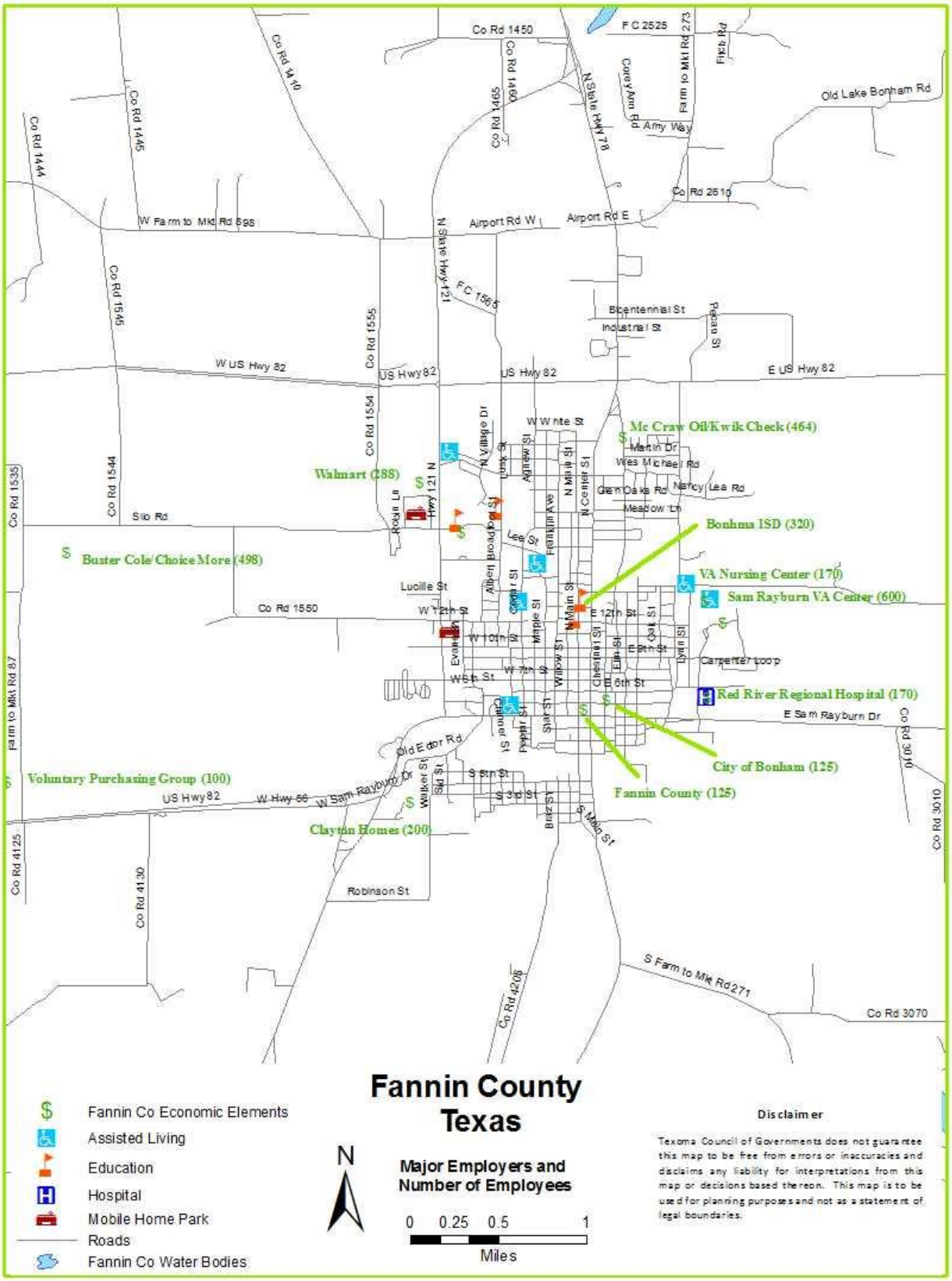
Bonham Population Density



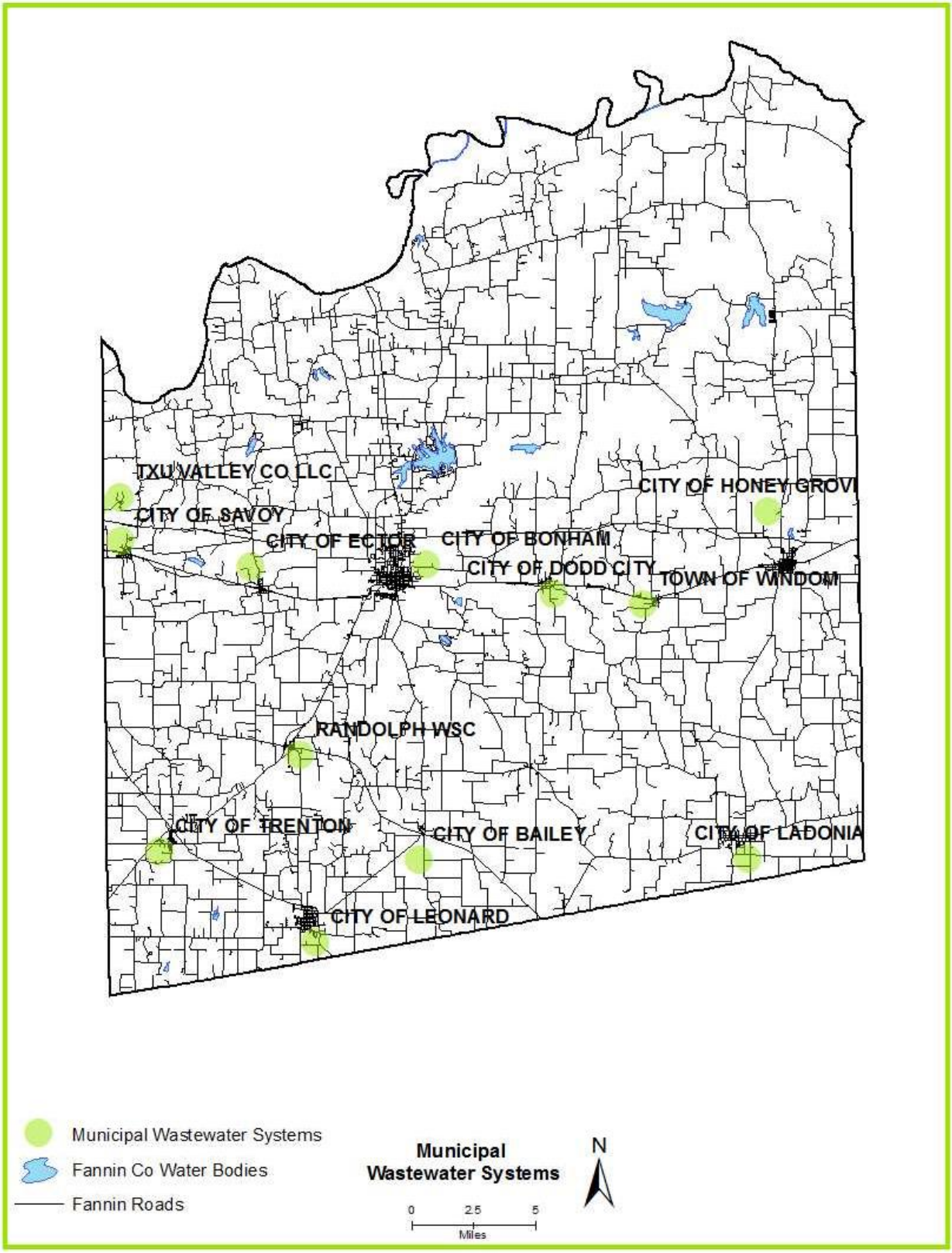
High Density & Special Consideration Areas: Countywide School Locations



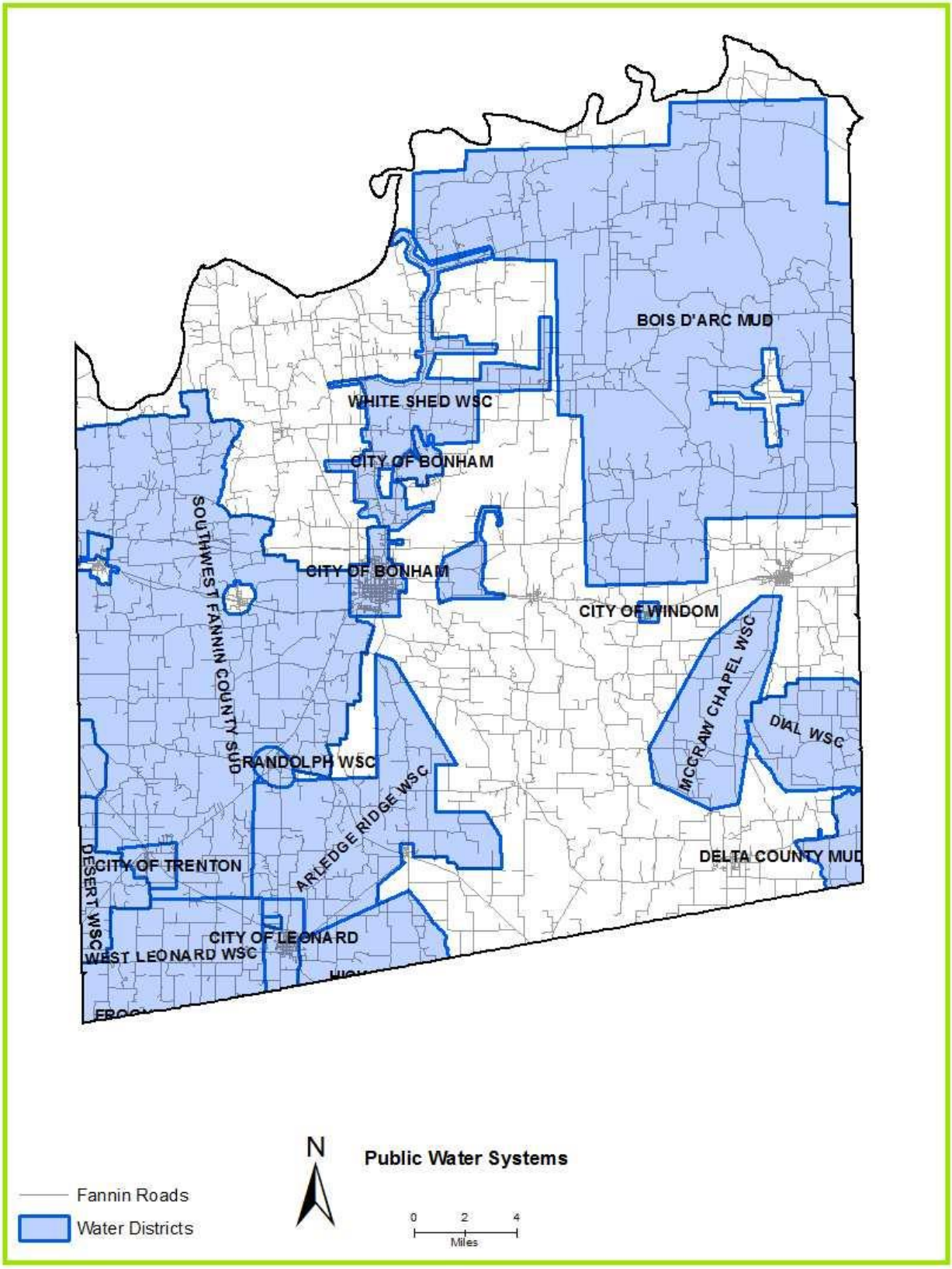
Economic Elements



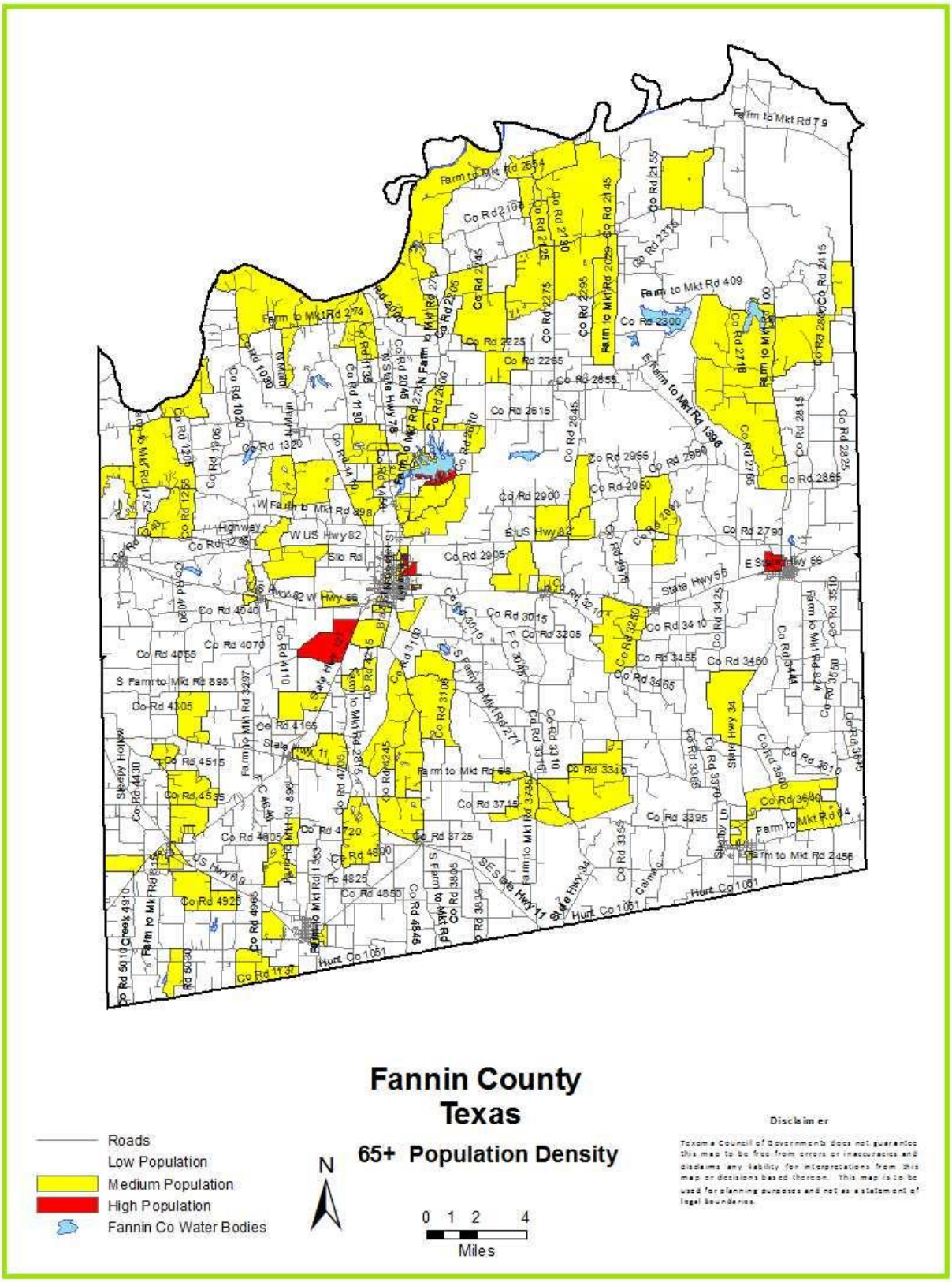
Critical Facilities: Municipal Wastewater Systems


TXU VALLEY CO LLC
CITY OF SAVOY
CITY OF ECTOR
CITY OF BONHAM
CITY OF HONEY GROVE
CITY OF DODD CITY
TOWN OF WINDOM
RANDOLPH WSC
CITY OF TRENTON
CITY OF BAILEY
CITY OF LADONIA
CITY OF LEONARD
Municipal Wastewater Systems
Fannin Co Water Bodies
Fannin Roads
Municipal
Wastewater Systems
N
0
2.5
5
Miles

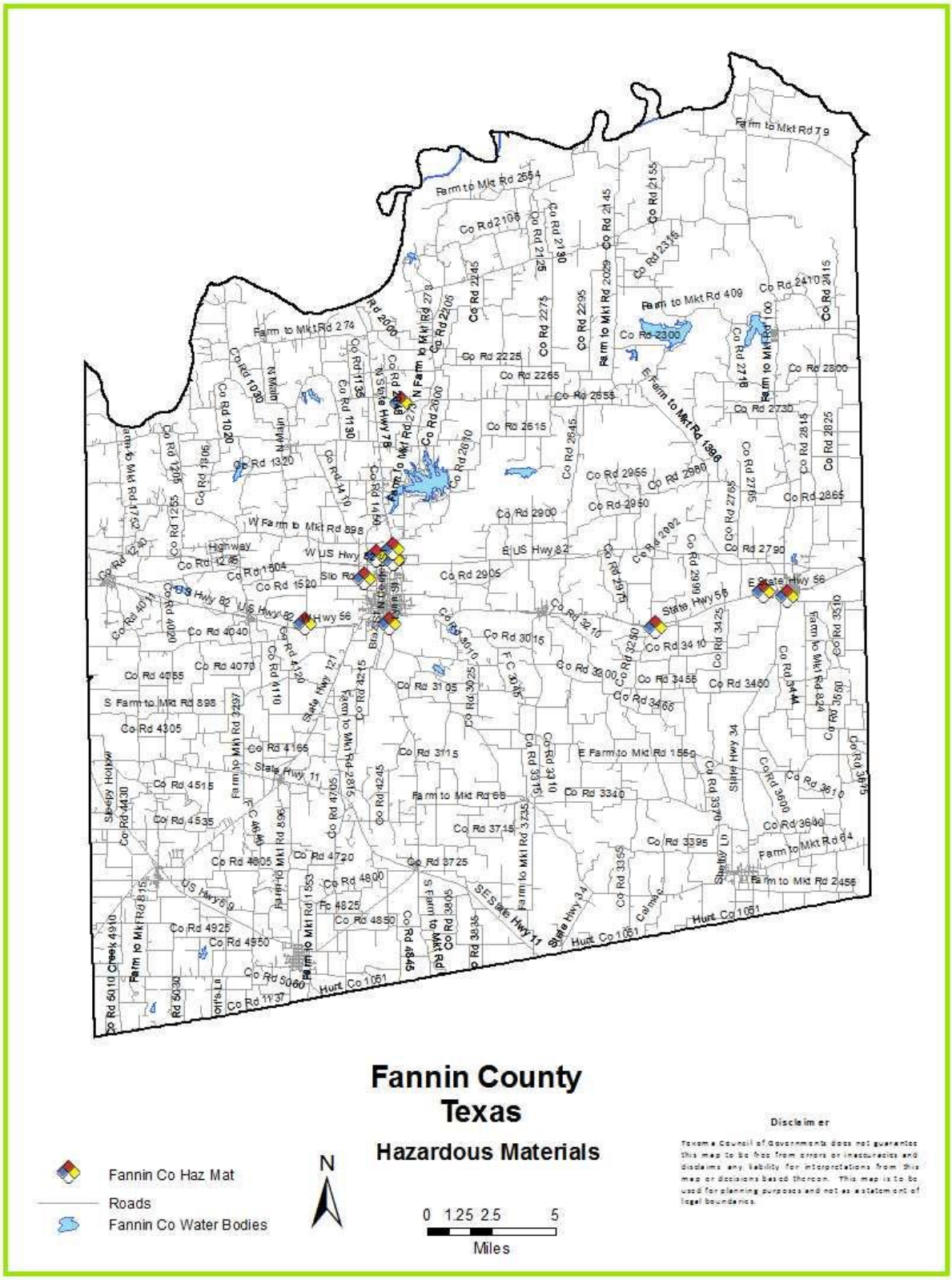
Critical Facilities: Public Water System



Countywide 65+ Population Density



Countywide Hazardous Material Facilities



Appendix C

Resources

Fannin County HMPT & TCOG would like to acknowledge and thank the information resources and the involved entities for attending planning team meetings, contributing information and/or involving the public to support the development of the Fannin County Multi-Jurisdiction Multi-Hazard Mitigation Plan.

Community Resources:

Policy, Plan, Document, etc.	Fannin County	Bailey	Bonham	Dodd City	Ector	Honey Grove	Ladonia	Leonard	Savoy	Trenton	Windom
Flood Insurance Study	X		X								
Floodplain Maps	X	X	X	X	X	X	X	X	X	X	X
Building Codes, Zoning Regulations and City Ordinances	X		X			X	X		X	X	
Emergency Operation Plan	X	X	X	X	X	X	X	X	X	X	X
Capital Improvements Plans or Strategic Plan			X								

X = has this resource and it was reviewed

Printed Resources:

Report on the Dam Safety Program at the Commission on Environmental Quality, May 08, State Auditor's Office, and No. 08- 032

Climatic Atlas of Texas, Texas Department of Water Resources (1983) By Thomas J. Larkin & George W. Bomar

Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies, April 2003, FEMA 386-3

Fires in TX: 2007

FEMA Mitigation Planning Guidance Update Info Bulletin, June 2014

Flood-Resistant Local Road Systems: A Report Based on Case Studies, January 2005, FEMA

Getting Started: Building Support for Mitigation Planning, April 2009, FEMA 386-1

Integrating Manmade Hazards into Mitigation Planning, September 2003, FEMA 386-7

Interviews and data from the Dam Safety Program, 2008, TCEQ

Local Emergency Management Planning Guide, GDEM-10, Revision4

Local Multi-Hazard Mitigation Planning Guidance, July 2008, FEMA

Mitigation Ideas: Possible Mitigation Measure by Hazard Type, September 2002, FEMA-R5

Multi-Jurisdictional Mitigation Planning: Mitigation Planning, August 2008, FEMA 386-8

National Drought Atlas, U.S. Corp of Engineers (USACE)

National Inventory of Dams, U.S. Army Corps of Engineers

Plan Review for Local Mitigation Plans, September 2012, IS-328

Renewing Texas Infrastructure: 2012 Texas Infrastructure Report Card, American Society of Civil Engineers, 2012

Soil Survey of Fannin Co, TX, 1988, USDA

State of Texas: Mitigation Handbook, June 2002, DEM21

Texas Drought History Reconstructed and Analyzed from 1698-to 1980, Journal of Climate, Vol.1, Issue 1, Stahle, David. Cleveland, Malcolm K. pp 59-74

Using Benefit-Cost Review in Mitigation Planning: State & Local Mitigation Planning How-To Guide, May 2007, FEMA 386-5

Watershed Program Facts and Figures for Texas; December 2007, Natural Resources Conservation Service

Local & County Resources:

Arledge Ridge Water Supply

Audit Report for City of Bonham

Bois D'Arc MUD

Bonham Chamber of Commerce

Bonham ISD

Bonham Nursing & Rehabilitation

Buster Cole Jail/ Choice Moore Correction Unit

City of Bailey

City of Bonham

City of Dodd City

City of Ector

City of Honey Grove

City of Ladonia

City of Leonard

City of Ravenna

City of Savoy

City of Trenton

City of Windom
Dodd City ISD
Ector ISD
Fannin County Appraisal District
Fannin County Farm Service Agency
Fannin County Commissioners
Fannin County Volunteer Fire Departments
Fannin County Sheriff's Department
Fannin County Office of Emergency Management
Fannindel ISD
Honey Grove ISD
Leonard ISD
Leonard Manor
Rayburn ISD
Red River Groundwater Conservation District
Red River Regional Hospital
Sam Rayburn House Museum
Sam Rayburn Library
Sam Rayburn ISD
Sam Rayburn Memorial VA Center
Savoy ISD
Seven Oaks Nursing & Rehabilitation
SW Fannin County MUD
Texas State Veterans Home
Trenton ISD
White Shed Water District

Other:

American Lifeline Alliance, www.americanlifelinesalliance.org
American Red Cross
American Society of Civil Engineers, www.asce.org
Association of State Floodplain Managers, www.floods.org
Association of State Dam Safety Officials, www.damsafety.org
Emergency Management Association of Texas, www.emat-tx.org
Environmental Protection Agency, www.epa.gov
Federal Emergency Management Agency (FEMA)
National Climatic Data Center (NCDC)
National Oceanic and Atmospheric Agency (NOAA)
National Weather Service (NWS)
Texas Commission on Environmental Quality, www.tceq.state.tx.us
Texas Commission on Fire Protection, www.tcfp.state.tx.us
Texas Department of Civil Emergency Management
Texas Department of Public Safety, www.txdps.state.tx.us
Texas Department of State Health Sources, www.dshs.state.tx.us
Texas Department of Wildlife Conservation

Texas Drought Indices, www.texaswaterinfo.net

Texas Geological Survey

Texas Hazard Mitigation Package, www.thmp.info

Texas Historical Society

Texas Interagency Coordination

Texas Park & Wildlife, www.tpwd.state.tx.us

Texas Science and Rivers Commission

Texas Water Resources Board

Texas Water Resources Institute

US Army Corps of Engineers (USACE)

US Drought Monitor, www.drount.unl.edu

US Fish and Wildlife Service

US Geological Survey

USDA-Natural Resources Conservation Services (NRCS), www.tx.nrcs.usda.gov

www.esri.com

www.silvis.forestwisc.edu

www.tamu.edu

www.texasonline.com

www.texasprepares.org

www.topozone.com

Appendix D

Public Involvement

Public Involvement

Public participation is a key component to any planning process and in the effective implementation of such plans. Agency participation offers an opportunity for impacted departments and organizations to provide expertise and insight into the planning process. Citizen participation offers citizens the chance to voice their ideas, interests, and concerns. The Fannin County Multi-Jurisdictional Hazard Mitigation plan incorporated an array of public input throughout the planning process. To accomplish this goal a six step process was used:

1. **Gain local support before plan starting the planning process:**
   Letters of support were received from the County Judge, City of Honey Grove and City of Ladonia. Memorandums of Understanding were approved and signed by the Fannin County, the 11 jurisdictions and 8 school districts during the first stages of the plan.
2. **Develop a planning team that was comprised of knowledgeable individuals from a variety of organizations and agencies:**
   See Table 2.4: Hazard Mitigation Planning Team pages 17-18.
3. **Conduct a Hazard Assessment Survey to identify concerns of local residents:**

(P1-Q1) In the past 10 years, which of the following types of natural hazard events have you or someone in your household experienced within Fannin County and how concerned are you about the following hazards impacting Fannin county?

Experienced

	Yes	No	Responses
Extreme heat	74.68% (59)	17.72% (14)	73
Drought	65.82% (52)	25.32% (20)	72
Flooding	21.52% (17)	62.03% (49)	66
Thunderstorms (wind & lightening)	**88.61% (70)**	8.86% (7)	77
Winter Storm	82.28% (65)	13.92% (11)	76
Tornado	53.16% (42)	39.24% (31)	73
Hailstorm	65.82% (52)	21.52% (17)	69
Wildfire	16.46% (13)	70.89% (56)	69
Technological (dam failures)	2.53% (2)	82.28% (65)	67
Earthquake	11.39% (9)	74.68% (59)	68
Expansive soils	27.85% (22)	58.23% (46)	68
Man-Made (hazardous materials...	16.46% (13)	72.15% (57)	70

	Not concerned	Somewhat concerned	Very concerned	Extremely concerned	Responses
Extreme heat	21.52% (17)	37.97% (30)	11.39% (9)	5.06% (4)	60
Drought	15.19% (12)	30.38% (24)	18.99% (15)	10.13% (8)	59
Flooding	41.77% (33)	27.85% (22)	1.27% (1)	2.53% (2)	58
Thunderstorms (wind & lightening)	21.52% (17)	31.65% (25)	17.72% (14)	11.39% (9)	65
Winter Storm	16.46% (13)	34.18% (27)	18.99% (15)	10.13% (8)	63
Tornado	13.92% (11)	22.78% (18)	20.25% (16)	20.25% (16)	61
Hailstorm	17.72% (14)	35.44% (28)	11.39% (9)	5.06% (4)	55
Wildfire	20.25% (16)	32.91% (26)	10.13% (8)	5.06% (4)	54
Technological (dam failures)	50.63% (40)	11.39% (9)	3.80% (3)	0.00% (0)	52
Earthquake	48.10% (38)	17.72% (14)	1.27% (1)	0.00% (0)	53
Expansive soils	32.91% (26)	20.25% (16)	7.59% (6)	2.53% (2)	50
Man-Made (hazardous materials...	21.52% (17)	30.38% (24)	11.39% (9)	3.80% (3)	53

Preparedness Level

	Not prepared	Somewhat prepared	Very Prepared	Extremely prepared	Responses
Extreme heat	7.59% (6)	29.11% (23)	8.86% (7)	6.33% (5)	41
Drought	17.72% (14)	24.05% (19)	6.33% (5)	2.53% (2)	40
Flooding	21.52% (17)	18.99% (15)	3.80% (3)	2.53% (2)	37
Thunderstorms (wind & lightening)	15.19% (12)	31.65% (25)	6.33% (5)	3.80% (3)	45
Winter Storm	16.46% (13)	27.85% (22)	5.06% (4)	6.33% (5)	44
Tornado	26.58% (21)	17.72% (14)	5.06% (4)	1.27% (1)	40
Hailstorm	16.46% (13)	17.72% (14)	10.13% (8)	0.00% (0)	35
Wildfire	24.05% (19)	15.19% (12)	3.80% (3)	0.00% (0)	34
Technological (dam failures)	31.65% (25)	6.33% (5)	1.27% (1)	1.27% (1)	32
Earthquake	31.65% (25)	8.86% (7)	1.27% (1)	0.00% (0)	33
Expansive soils	29.11% (23)	7.59% (6)	1.27% (1)	1.27% (1)	31
Man-Made (hazardous materials...	27.85% (22)	12.66% (10)	2.53% (2)	0.00% (0)	34

Total Answered Question:79 **Total Skipped Question:**9

(P1-Q2) Is your property located in a FEMA designated Floodplain?

	(Count)	(Percent)
Yes	4	5.13%
No	**46**	**58.97%**
Not sure	28	35.90%
	Total Answered Question:78	Total Skipped Question:10

(P1-Q3) Do you have Flood Insurance?

	(Count)	(Percent)
Yes	5	6.49%
No	**63**	**81.82%**
Not sure	9	11.69%
	Total Answered Question:77	Total Skipped Question:11

(P1-Q4) If you do not have Flood Insurance, why not?

	(Count)	(Percent)
Not located in Floodplain	**37**	**56.06%**
Too expensive	8	12.12%
Not necessary because it never fl...	5	7.58%
Never really considered it	15	22.73%
Other (please specify)	3	4.55%
	Total Answered Question:66	Total Skipped Question:22

Page 2:

(P2-Q5) Please explain any actions you have taken to make your home or neighborhood more resistant to hazards:

	(Count)	(Percent)
Comment	**18**	**100.00%**
	Total Answered Question:18	Total Skipped Question:70

(P2-Q6) Which of the following incentives would motivate you to take additional steps to better protect your family and home from a disaster? (Check all that apply)

	(Count)	(Percent)
Insurance discount	38	56.72%
Low interest rate loan	15	22.39%
Lower new home construction co...	6	8.96%
Mortgage discount	12	17.91%
Family protection	28	41.79%
Tax break or incentive	**42**	**62.69%**
None	11	16.42%
Other (please specify)	1	1.49%
	Total Answered Question:67	Total Skipped Question:21

(P2-Q7) Are you in favor of spending tax dollars on mitigation projects for the benefit of the entire community?

	(Count)	(Percent)
Yes	**49**	**73.13%**
No	18	26.87%
	Total Answered Question:67	Total Skipped Question:21

(P2-Q8) Do you feel that Tornado Safe Rooms or Shelters in the local schools are necessary?

	(Count)	(Percent)
Yes	**61**	**88.41%**
No	8	11.59%
	Total Answered Question:69	Total Skipped Question:19

(P2-Q9) In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?

	(Count)	(Percent)
Comment	34	100.00%
Total Answered Question:34	Total Skipped Question:54	

(P2-Q10) How long have you lived in Fannin County?

	(Count)	(Percent)
Less than 1 year	2	2.74%
1 to 5 years	11	15.07%
6 to 10 years	17	23.29%
11 to 20 years	18	24.66%
21 years or more	25	34.25%
Total Answered Question:73	Total Skipped Question:15	

4. **Solicit the assistance of the local media to announce plan progression and public input opportunities:** Newspapers, radio, and television stations were faxed flyers about the public meetings along with postings and tweets on websites and social media.

Fannin County Hazard Mitigation Plan Meeting Jan. 7
By Texoma Council of Governments
Jan 7, 2014

Print Email g+1 0 Recommend 0

The Fannin County Hazard Mitigation Plan Meeting is a public meeting scheduled at 6:30 p.m. on Tuesday, January 7, 2014 at the Darrell Hall Education Center located at 2505 N Center Street, Bonham, TX. This meeting will provide an overview of the Fannin County Hazard Mitigation Plan Update, and TCOG will lead a discussion about the hazards that are to be identified in the plan.

The Federal Disaster Mitigation Act of 2000 requires public input to have an approved hazard mitigation plan in order to qualify for federal funding from the following grant programs: Pre-Disaster Mitigation Competitive, Hazard Mitigation Grant Program and Flood Mitigation Assistance.

Citizens who are interested in participating but cannot attend the meeting may take the hazard mitigation survey at **http://www.surveyact.com/s/h6XFXEtFwubrCzEA**

** Source: North Texas e-News www.ntxe-news.com*

5. Create an opportunity for public review of the plan in all stages of development.

A "round table" proved to be the most effective format for generating public and team input on the project and stimulate "out of the box" problem solving therefore no formal meeting minutes were recorded. During meetings participants were encouraged to make notations on maps as discussion occurred and use other free-flowing processes for documentation of the meeting topics. Discussion included: past occurrences, personal experiences, economic impacts, currently susceptible areas, future development, future economic impacts, and future hazard occurrence predictions. Visits to local business and area attractions were used to generate input from those residents who were unable to attend meetings.

6. Conduct public input sessions where local citizens can express their opinions and get answers to any concerns:

Public workshops were held to give residents a forum to express their opinions and get answers to any concerns. All meeting attendees were encouraged to share their experiences and suggestions for future mitigation activities. A PowerPoint presentation was used to inform the participants on the progress of the plan and to inform them of the planning progress.

TCOG

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Fannin County Multi-Jurisdictional Mitigation Planning Team Meeting

« All Events

This event has passed.

FANNIN COUNTY MULTI-JURISDICTIONAL MITIGATION PLANNING TEAM MEETING

The Fannin County Multi-Jurisdictional Hazard Planning Team Meeting

"Fannin County Hazards"

This meeting will provide an overview of the Fannin County Hazard Mitigation Plan Update and a discussion of the hazards that are to be identified in the plan. If you cannot attend the public meeting but would like to participate a hazard survey is available at http://www.surveyact.com/s/h6XFXEtFwubrCzEA

January 7, 2014
6:30 pm
Darrell Hall Education Center
2505 N Center Street, Bonham, TX

TCOG

Public Safety
1117 Gallagher
Sherman, TX 75090

For additional information contact:
Stephanie Davidson at sdavidson@texoma.cog.tx.us or 903-813-3509 or CJ Durbin-Higgins at chiggins@texoma.cog.tx.us or 903-813-3552

Appendix E

Adoption

Resolution Adopting

The

Fannin County Multi-Jurisdictional Hazard Mitigation Plan

Resolution # _____

Whereas, _____ City Council or ISD recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adoption of an hazards mitigation plan is required as a condition of future grant funding of mitigation projects; and

Whereas, _____ City Council or ISD participated jointly in the planning process with the other local units of government and school districts within Fannin County , Texas to prepare an all hazards mitigation plan; and

Whereas, _____ City Council or ISD is aware that revisions and updating of the plan is critical for active and effective hazard mitigation and will monitor and record hazard related data and events that can be used to update the hazards mitigation plan.

Now, therefore, be it resolved, that _____ City Council or ISD, hereby adopts the Fannin County Multi-Jurisdictional Hazard Mitigation Plan in its entirety as an official plan and will undertake annual recording of hazard events, their impact duration and cost.

Be it further resolved, that _____ City Council or ISD, accepting the Fannin County Multi-Jurisdictional Hazard Mitigation Plan and approves the submission of adoption to the Federal Emergency Management Agency.

Approved this ____ day of _____, 201__

_____

Mayor

Attested by:

_____ (Seal)

SAMPLE