# Central Texas Council of Governments
# Regional Hazard Mitigation Action Plan

**Planning Participants: Milam County, Town of Buckholts, City of Cameron, City of Milano, City of Rockdale, and City of Thorndale**

***Mitigating Risk for a Safe, Secure, and Sustainable Future***

DRAFT: March 16, 2018

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# Section 1: Introduction



## Background

The Central Texas Council of Governments (CTCOG) was established by the Texas Legislature as a sub-region in December 1968 and gained full planning regional status in 1974. CTCOG is a voluntary association that encompasses thirty-seven jurisdictions, including seven counties and thirty cities, and was organized to promote area-wide planning and collaboration among local governments. CTCOG helps local communities work cooperatively to improve the conditions and well-being of citizens. CTCOG addresses concerns that include: economic development, emergency services, 9-1-1 addressing, homeland security, criminal justice, regional planning, regional transportation, regional demographics, GIS & mapping, housing assistance, aging services, and workforce services.

The CTCOG is committed to creating a disaster-resistant area in Central Texas. CTCOG took the lead in sponsoring the development of a comprehensive Hazard Mitigation Plan ("Plan") for the participating counties and cities. Although CTCOG's district covers a seven-county area, the Plan consists of three counties and their 19 jurisdictions. Table 1-1 lists the participating jurisdictions.

**Table 1-1. Participating Jurisdictions in the Planning Area**

| Participating Jurisdictions |
|---|
| **CTCOG** |
| **Bell County** |
| City of Bartlett |
| City of Belton |
| City of Harker Heights |
| City of Holland |
| City of Killeen |
| City of Little River Academy |
| City of Nolanville |
| City of Rogers |
| Village of Salado |

| Participating Jurisdictions |
|---|
| City of Temple |
| City of Troy |
| **Hamilton County** |
| City of Hamilton |
| City of Hico |
| **Milam County** |
| Town of Buckholts |
| City of Cameron |
| City of Milano |
| City of Rockdale |
| City of Thorndale |

In accordance with recent TDEM guidance, hazard mitigation plans are to be developed for each county. The CTCOG Regional Hazard Mitigation Plan was developed as three separate plans, one for each participating county and their jurisdictions. This Plan was developed specifically for Milam County, the Town of Buckholts, the City of Cameron, the City of Milano, the City of Rockdale, and the City of Thorndale. These jurisdictions provided valuable input into the planning process.

Milam County is located in east-central Texas 150 miles inland from the Gulf of Mexico. Milam County was created in 1834 as a municipality in Mexico and organized as a county in 1837. It is named for Benjamin Rush Milam, an early settler and a soldier in the Texas Revolution.

Milam County is bordered by Robertson, Burleson, Lee, Williamson, Bell, and Falls counties. Cameron is the county seat and is located 60 miles northeast of Austin and 140 miles south of Dallas. The present county covers 1,022 square miles of level to slightly rolling terrain at an elevation that ranges from 250 to 600 feet above sea level.

Texas is prone to extremely heavy rains and flooding with half of the world record rainfall rates (48 hours or less).[1] While flooding is a well-known risk, Milam County is susceptible to a wide range of natural hazards, including but not limited to extreme heat, drought, hail, and winter storms. These life-threatening hazards can destroy property, disrupt the economy, and lower the overall quality of life for individuals.

While it is impossible to prevent an event from occurring, the effect from many hazards to people and property can be lessened. This concept is known as hazard mitigation, which is defined by the Federal Emergency Management Agency (FEMA) as *sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.*[2] Communities participate in

[1] http://floodsafety.com/texas/regional_info/regional_info/austin_zone.htm
[2] http://www.fema.gov/hazard-mitigation-planning-resources

hazard mitigation by developing hazard mitigation plans. The Texas Division of Emergency Management (TDEM) has the authority to review and FEMA has the authority to approve hazard mitigation plans through the Disaster Mitigation Act of 2000.

Hazard mitigation activities are an investment in a community's safety and sustainability. It is widely accepted that the most effective hazard mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. Therefore, it is essential that a plan identify projected patterns of how future development will increase or decrease a community's overall hazard vulnerability.

## Scope

The focus of the Plan is to identify activities to mitigate hazards classified as "high" or "moderate" risk, as determined through a detailed hazard risk assessment conducted for Milam County and the participating jurisdictions. The hazard classification enables the County and participating jurisdictions to prioritize mitigation actions based on hazards which can present the greatest risk to lives and property in the geographic scope (i.e., planning area).

Throughout the plan "Milam County planning area" refers to the entire planning area including the unincorporated area of Milam County, the political border of the cities of Cameron, Milano, Rockdale, and Thorndale, and the Town of Buckholts. Similarly, the term "countywide" refers to the entire planning area including the unincorporated area of Milam County, the political border of the cities of Cameron, Milano, Rockdale, and Thorndale, and the Town of Buckholts.

## Purpose

The Plan was prepared by CTCOG, Milam County, participating jurisdictions, and H2O Partners, Inc. The purpose of the Plan is to protect people and structures and to minimize the costs of disaster response and recovery. The goal of the Plan is to minimize or eliminate long-term risks to human life and property from known hazards by identifying and implementing cost-effective hazard mitigation actions. The planning process is an opportunity for Milam County, the participating jurisdictions, stakeholders, and the general public to evaluate and develop successful hazard mitigation actions to reduce future risk of loss of life and damage to property resulting from a disaster in the Milam County planning area.

The Mission Statement of the Plan is, "*Maintaining a secure and sustainable future through the revision and development of targeted hazard mitigation actions to protect life and property.*"

Milam County, participating jurisdictions, and planning participants identified eleven natural hazards to be addressed by the Plan. The specific goals of the Plan are to:

- Minimize disruption to Milam County and the participating jurisdictions following a disaster;
- Streamline disaster recovery by articulating actions to be taken before a disaster strikes to reduce or eliminate future damage;
- Demonstrate a firm local commitment to hazard mitigation principles;
- Serve as a basis for future funding that may become available through grant and technical assistance programs offered by the State or Federal government. The Plan will enable Milam County and participating jurisdictions to take advantage of rapidly developing mitigation grant opportunities as they arise; and

- Ensure that Milam County and participating jurisdictions maintain eligibility for the full range of future Federal disaster relief.

## Authority

The Plan is tailored specifically for Milam County, participating jurisdictions, and plan participants including Planning Team members, stakeholders, and the general public who participated in the Plan development process. The Plan complies with all requirements promulgated by the Texas Division of Emergency Management (TDEM) and all applicable provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390), and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Additionally, the Plan complies with the Interim Final Rules for the Hazard Mitigation Planning and Hazard Mitigation Grant Program (44 CFR, Part 201), which specify the criteria for approval of mitigation plans required in Section 322 of the DMA 2000 and standards found in FEMA's "Local Mitigation Plan Review Guide" (October 2011), and the "Local Mitigation Planning Handbook" (March 2013). Additionally, the Plan is developed in accordance with FEMA's Community Rating System (CRS) Floodplain Management Plan standards and policies.

## Summary of Sections

Sections 1 and 2 of the Plan outline the Plan's purpose and development, including how Planning Team members, stakeholders, and members of the general public were involved in the planning process. Section 3 profiles the planning area's population and economy.

Sections 4 through 15 present a hazard overview and information on individual natural hazards in the planning area. The hazards generally appear in order of priority based on potential losses to life and property, and other community concerns. For each hazard, the Plan presents a description of the hazard, a list of historical hazard events, and the results of the vulnerability and risk assessment process.

Section 16 presents hazard mitigation goals and objectives. Mitigation actions for Milam County and the participating jurisdictions are presented in Section 17, while Section 18 identifies Plan maintenance mechanisms.

The list of planning team members and stakeholders is located in Appendix A. Public survey results are analyzed and presented in Appendix B. Appendix C contains a detailed list of critical facilities for the area, and Appendix D is dam locations. Appendix E contains information regarding workshops and meeting documentation. Capability Assessment results for Milam County and participating jurisdictions are located in Appendix F.[3]

[3] Information contained in some of these appendices are exempt from public release under the Freedom of Information Act (FOIA).

# Section 2: Planning Process



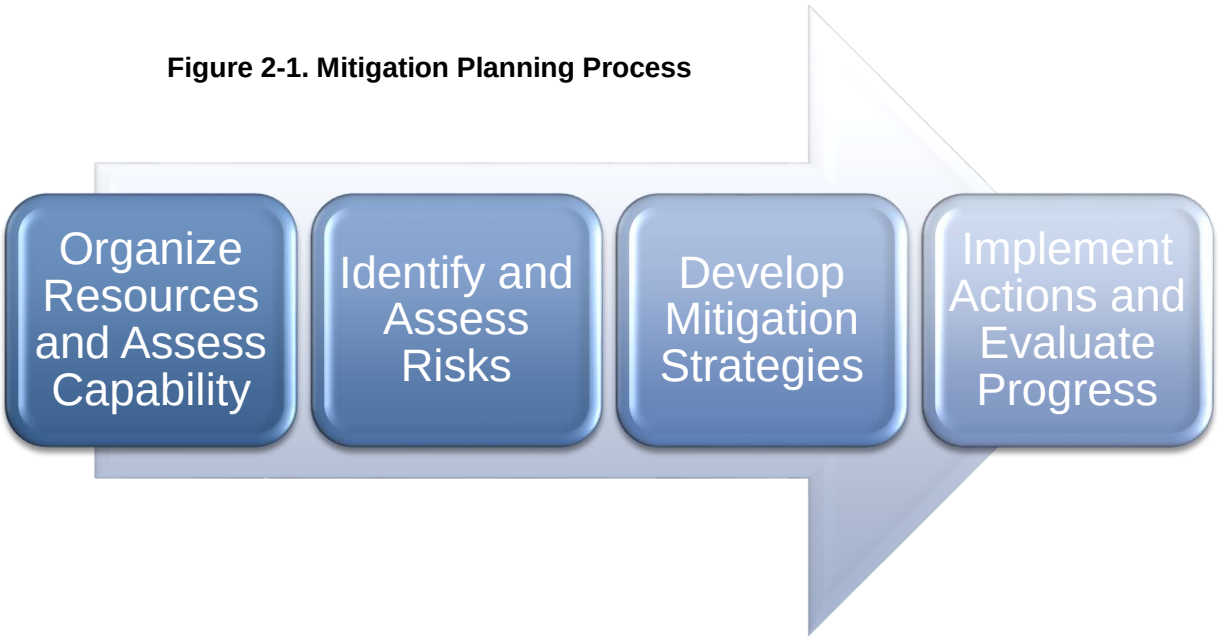
## Plan Preparation and Development

Hazard mitigation planning involves coordination with various constituents and stakeholders to develop a more disaster-resistant community. Section 2 provides an overview of the planning process including the identification of key steps and a detailed description of how stakeholders and the public were involved.

### Overview of the Plan

The Central Texas Council of Governments hired H2O Partners, Inc. (Consultant Team), to provide technical support and oversee the development of the Regional Plan. The Consultant Team used the FEMA "Local Mitigation Plan Review Guide" (October 1, 2011), and the Local Mitigation Planning Handbook" (March 2013) to develop the Plan. The overall planning process is shown in Figure 2-1 below.

**Figure 2-1. Mitigation Planning Process**




Milam County, participating jurisdictions, and the Consultant Team met in January 2017 to begin organizing resources, identify Planning Team members, and conduct a Capability Assessment.

## Planning Team

Key members of H2O Partners, Inc. developed the Plan in conjunction with the Planning Team. The Planning Team was established using a direct representation model. Some of the responsibilities of the Planning Team included: completing Capability Assessment surveys, providing input regarding the identification of hazards, identifying mitigation goals, and developing mitigation strategies. An Executive Planning Team consisting of key personnel from each of the participating jurisdictions as well as Milam County, shown in Table 2-1, was formed to coordinate planning efforts and request input and participation in the planning process. Table 2-2 reflects the Advisory Planning Team, consisting of additional representatives from area organizations and departments from the participating jurisdictions and Milam County that participated throughout the planning process.

**Table 2-1. Executive Planning Team**

| ORGANIZATION / DEPARTMENT | TITLE |
|---|---|
| CTCOG | Homeland Security/Criminal Justice Coordinator |
| Milam County | Homeland Security / EMC |
| Town of Buckholts | City Secretary |
| City of Cameron | City Manager |
| City of Milano | Mayor |
| City of Rockdale | City Manager |

| ORGANIZATION / DEPARTMENT | TITLE |
|---|---|
| City of Thorndale | City Administrator |

**Table 2-2. Advisory Planning Team**

| ORGANIZATION / DEPARTMENT | TITLE |
|---|---|
| Milam County | Commissioner Pct. #4 |
| Milam County | County Judge |
| Town of Buckholts | Mayor |
| City of Thorndale | City Secretary |
| CTCOG | Director of Planning & Regional Services |
| CTCOG | Homeland Security/Criminal Justice Coordinator |
| CTCOG | Senior Planner |
| CTCOG | Grant Coordinator |
| CTCOG | Emergency Services Director |

Additionally, a Stakeholder Group was invited to participate in the planning process via e-mail. The Consultant Team, Planning Team, and Stakeholder Group coordinated to identify mitigation goals, and develop mitigation strategies and actions for the Plan. Appendix A provides a complete listing of all participating Planning Team members and stakeholders by organization and title.

Based on results of completed Capability Assessment, Milam County and participating jurisdictions described methods for achieving future hazard mitigation measures by expanding existing capabilities. For example, several of the jurisdictions have an emergency manager on staff but no emergency operations plan or post disaster recovery plan in place. Other options for improving capabilities include the following:

- Establishing Planning Team members with the authority to monitor the Plan and identify grant funding opportunities for expanding staff.
- Identifying opportunities for cross-training or increasing the technical expertise of staff by attending free training available through FEMA and the Texas Division of Emergency Management (TDEM) by monitoring classes and availability through preparingtexas.org.
- Reviewing current floodplain ordinances for opportunities to increase resiliency such as modifying permitting or building codes.
- Developing ordinances that will require all new developments to conform to the highest mitigation standards.

Sample hazard mitigation actions developed with similar hazard risk were shared at the meetings. These important discussions resulted in development of multiple mitigation actions that are included in the Plan to further mitigate risk from natural hazards in the future.

The Planning Team developed hazard mitigation actions for mitigating risk from all of the hazards including potential flooding, hail, and extreme heat. The actions include but are not limited to drainage

improvement projects, hardening critical facilities and installing generators, working with Public Health Preparedness Coordinator to assist vulnerable populations, and educating citizens to practice hazard mitigation techniques.

## Planning Process

The process used to prepare the Plan followed the four major steps included at Figure 2-1. After the Planning Team was organized, a capability assessment was developed and distributed at the Kick-Off Workshop. Hazards were identified and assessed, and results associated with each of the hazards were provided at the Risk Assessment Workshop. Based on Milam County's identified vulnerabilities, specific mitigation strategies were discussed and developed at the Mitigation Strategy Workshop. Finally, Plan maintenance and implementation procedures were developed and are included in Section 18. Participation of Planning Team members, stakeholders, and the public at each of the workshops is documented in Appendix E.

At the Plan development workshops held throughout the planning process described herein, the following factors were taken into consideration:

- The nature and magnitude of risks currently affecting the community;
- Hazard mitigation goals to address current and expected conditions;
- Whether current resources will be sufficient for implementing the Plan;
- Implementation problems, such as technical, political, legal, and coordination issues that may hinder development;
- Anticipated outcomes; and
- How Milam County, participating jurisdictions, agencies, and partners will participate in implementing the Plan.

## Kickoff Workshop

The Kickoff Workshop was held at the Milam County Courthouse on January 24, 2017. The initial workshop informed County officials and key department personnel about how the planning process pertained to their distinct roles and responsibilities and engaged stakeholder groups including, but not limited to the American Red Cross, the Texas Forest Service, Texas A&M Agrilife (Milam County Office), and surrounding Independent School Districts. In addition to the kickoff presentation, participants received the following information:

- Project overview regarding the planning process;
- Public survey access information;
- Hazard Ranking form; and
- Capability Assessment survey for completion.

A risk ranking exercise was conducted at the Kickoff Workshop to get input from the Planning Team and stakeholders pertaining to various risks from a list of natural hazards affecting the planning area. Participants ranked hazards high to low in terms of perceived level of risk, frequency of occurrence, and potential impact.

## Hazard Identification

At the Kickoff Workshop, and through e-mail and phone correspondence, the Planning Team conducted preliminary hazard identification. The Planning Team in coordination with the Consultant Team reviewed and considered a full range of natural hazards. Once identified, the teams narrowed the list to significant hazards by reviewing hazards affecting the area as a whole, the 2013 State of Texas Hazard Mitigation Plan Update, and initial study results from reputable sources such as federal

and state agencies. Based on this initial analysis, the teams identified a total of eleven natural hazards which pose a significant threat to the planning area.

## Risk Assessment

An initial risk assessment for Milam County and the participating jurisdictions was completed in April 2017 and results were presented to Planning Team members at the Risk Assessment Workshop held on April 11, 2017. At the workshop, the characteristics and consequences of each hazard were evaluated to determine the extent to which the planning area would be affected in terms of potential danger to property and citizens.

Property and crop damages were estimated by gathering data from the National Center for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA). The assessment also examined the impact of various hazards on the built environment, including general building stock, critical facilities, lifelines, and infrastructure. The resulting risk assessment profiled hazard events, provided information on previous occurrences, estimated probability of future events, and detailed the spatial extent and magnitude of impact on people and property. Each participant at the Risk Assessment Workshop was provided a risk ranking sheet that asked participants to rank hazards in terms of the probability or frequency of occurrence, extent of spatial impact, and the magnitude of impact. The results of the ranking sheets identified unique perspectives on varied risks throughout the planning area.

The assessments were also used to set priorities for hazard mitigation actions based on potential loss of lives and dollar losses. A hazard profile and vulnerability analysis for each of the hazards can be found in Sections 4 through 15.

## Mitigation Review and Development

Developing the Mitigation Strategy for the Plan involved identifying mitigation goals and new mitigation actions. A Mitigation Workshop was held at the Milam County Courthouse on September 8, 2017. In addition to the Planning Team, stakeholder groups were invited to attend the workshop. Regarding hazard mitigation actions, Workshop participants emphasized the desire for flood and tornado projects. Additionally, the County and participating jurisdictions were proactive in identifying mitigation actions to lessen the risk of all the identified hazards included in the Plan.

An inclusive and structured process was used to develop and prioritize new hazard mitigation actions for the Plan. The prioritization method was based on FEMA's STAPLE+E criteria and included social, technical, administrative, political, legal, economic, and environmental considerations. As a result, each Planning Team Member assigned an overall priority to each hazard mitigation action. The overall priority of each action is reflected in the hazard mitigation actions found in Section 17.

Planning Team Members then developed action plans identifying proposed actions, costs and benefits, the responsible organization(s), effects on new and existing buildings, implementation schedules, priorities, and potential funding sources.

Specifically the process involved:

- Listing optional hazard mitigation actions based on information collected from previous plan reviews, studies, and interviews with federal, state, and local officials. Workshop participants reviewed the optional mitigation actions and selected actions that were most applicable to their area of responsibility, cost-effective in reducing risk, easily implemented, and likely to receive institutional and community support.
- Workshop participants inventoried federal and state funding sources that could assist in implementing the proposed hazard mitigation actions. Information was collected, including the program name, authority, purpose of the program, types of assistance and eligible projects,

conditions on funding, types of hazards covered, matching requirements, application deadlines, and a point of contact.

- Planning Team Members considered the benefits that would result from implementing the hazard mitigation actions compared to the cost of those projects. Although detailed cost-benefit analyses were beyond the scope of the Plan, Planning Team Members utilized economic evaluation as a determining factor between hazard mitigation actions.
- Planning Team Members then selected and prioritized mitigation actions.

Hazard mitigation actions identified in the process were made available to the Planning Team for review. The draft Plan was made available to the general public for review on Milam County's website with the chance to comment via sending an email to MilamHMAP@milamcounty.net.

# Review and Incorporation of Existing Plans

## Review

Background information utilized during the planning process included various studies, plans, reports, and technical information from sources such as FEMA, the United States Army Corps of Engineers (USACE), the U.S. Fire Administration, National Oceanic and Atmospheric Administration (NOAA), the Texas Water Development Board (TWDB), the Texas Commission on Environmental Quality (TCEQ), the Texas State Data Center, Texas Forest Service, the Texas Division of Emergency Management (TDEM), and local hazard assessments and plans. Section 4 and the hazard-specific sections of the Plan (Sections 5-15) summarize the relevant background information.

Specific background documents, including those from FEMA, provided information on hazard risk, hazard mitigation actions currently being implemented, and potential mitigation actions. Previous hazard events, occurrences, and descriptions were identified through NOAA's National Centers for Environmental Information (NCEI). Results of past hazard events were found through searching the NCEI. The USACE studies were reviewed for their assessment of risk and potential projects in the region. State Data Center documents were used to obtain population projections. The State Demographer webpages were reviewed for population and other projections and included in Section 3 of the Plan. Information from the Texas Forest Service was used to appropriately rank the wildfire hazard, and to help identify potential grant opportunities. Materials from FEMA and TDEM were reviewed for guidance on Plan Update development requirements.

## Incorporation of Existing Plans into the HMAP Process

A Capability Assessment was completed by key Milam County and participating jurisdictions' departments which provided information pertaining to existing plans, policies, ordinances and regulations to be integrated into the goals and objectives of the Plan. The relevant information was included in a master Capability Assessment, Appendix F.

Existing projects and studies were utilized as a starting point for discussing hazard mitigation actions among Planning and Consultant Team members. For example, the Town of Buckholts have a storm water management plan that they want to improve upon and then upgrade their drainage system to accommodate a higher flow capacity. Additionally, policies and ordinances were reviewed by several of the participating jurisdictions. These jurisdictions have included actions to develop and implement routine fire hydrant maintenance, burn ban ordinance, and fire prevention regulations. Other plans were reviewed, such as Emergency Operations Plans and Capital Improvement Plans, to identify any additional mitigation actions. Finally, the 2013 State of Texas Mitigation Plan Update, developed by TDEM, was discussed in the initial planning meeting in order to develop a specific group of hazards

to address in the planning effort. The 2013 State Plan Update was also used as a guidance document, along with FEMA materials, in the development of the Milam County Plan.

## Incorporation of the HMAP into Other Planning Mechanisms

Planning Team members will integrate implementation of the Plan with other planning mechanisms for Milam County, such as the Emergency Operations Plan. Existing plans for Milam County will be reviewed and incorporated into the Plan, as appropriate. This section discusses how the Plan will be implemented by Milam County and the participating jurisdictions. It also addresses how the Plan will be evaluated and improved over time, and how the public will continue to be involved in the hazard mitigation planning process.

Milam County and the participating jurisdictions will be responsible for implementing hazard mitigation actions contained in Section 17. Each hazard mitigation action has been assigned to a specific County and City department that is responsible for tracking and implementing the action.

A funding source has been listed for each identified hazard mitigation action and may be utilized to implement the action. An implementation time period has also been assigned to each hazard mitigation action as an incentive and to determine whether actions are implemented on a timely basis.

Milam County and the participating jurisdictions will integrate hazard mitigation actions contained in the Plan with existing planning mechanisms such as Storm Water Management Plans and ordinances, Emergency Operations or Management Plans, Evacuation Plans, and other local and area planning efforts. Milam County will work closely with area organizations to coordinate implementation of hazard mitigation actions that benefit the planning area in terms of financial and economic impact.

Upon formal adoption of the Plan, Planning Team members from Milam County and the participating jurisdictions will review existing plans along with building codes to guide development and ensure that hazard mitigation actions are implemented. Each of the jurisdictions will be responsible for coordinating periodic review of the Plan with members of the Advisory Planning Team to ensure integration of hazard mitigation strategies into these planning mechanisms and codes. The Planning Team will also conduct periodic reviews of various existing planning mechanisms and analyze the need for any amendments or updates in light of the approved Plan. Milam County and the participating jurisdictions will ensure that future long-term planning objectives will contribute to the goals of the Plan to reduce the long-term risk to life and property from moderate and high risk hazards. Within one year of formal adoption of the Plan, existing planning mechanisms will be reviewed and analyzed as they pertain to the Plan.

Planning Team members will review and revise, as necessary, the long-range goals and objectives in its strategic plan and budgets to ensure that they are consistent with the Plan.

Furthermore, Milam County will work with neighboring jurisdictions to advance the goals of the Plan as it applies to ongoing, long-range planning goals and actions for mitigating risk to natural hazards throughout the planning area.

Table 2-3 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts.

**Table 2-3. Examples of Methods of Incorporation**

| Planning Mechanism | Incorporation of Plan |
|---|---|
| Annual Budget Review | Various departments and key personnel that participated in the planning process for Milam County and participating jurisdictions will review the Plan and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the implementation schedule of the specific action. |
| Capital Improvement Plans | Milam County and participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County and City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments. |
| Comprehensive Plans | Milam County has a Long-term Comprehensive Development Plan in place. Since comprehensive plans involve developing a unified vision for a community, the mitigation vision and goals of the Plan will be reviewed in the development or revision of a Comprehensive Plan. |
| Floodplain Management Plans | Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 6 of this Plan discussing the people and property at risk to flood, will be reviewed and revised when Milam County updates their management plans or develops new plans. |
| Grant Applications | The Plan will be evaluated by Milam County and participating jurisdictions when grant funding is sought for mitigation projects. If a project is not in the Plan, an amendment may be necessary to include the action in the Plan. |
| Regulatory Plans | Currently, Milam County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, Economic Development, and Evacuation Plans. The Plan will be consulted when County and City departments review or revise their current regulatory |

| Planning Mechanism | Incorporation of Plan |
|---|---|
| | planning mechanisms, or in the development of regulatory plans that are not currently in place. |

Appendix F provides an overview of Planning Team members' existing planning and regulatory capabilities to support implementation of mitigation strategy objectives. Appendix F also provides further analysis of how each intends to incorporate hazard mitigation actions into existing plans, policies, and the annual budget review as it pertains to prioritizing grant applications for funding and implementation of identified hazard mitigation projects.

### Plan Review and Plan Update

As with the development of Plan, Milam County will oversee the review and update process for relevance and to necessary make adjustments. At the beginning of each fiscal year, Planning Team Members will meet to evaluate the Plan and review other planning mechanisms to ensure consistency with long-range planning efforts. In addition, planning participants will also meet twice a year, by conference call or presentation, to re-evaluate prioritization of the hazard mitigation actions.

## Timeline for Implementing Mitigation Actions

Both the Executive Planning Team (Table A-1, Appendix A) and the Advisory Planning Team (Table A-2, Appendix A) will engage in discussions regarding a timeframe for how and when to implement each hazard mitigation action. Considerations include when the action will be started, how existing planning mechanisms' timelines affect implementation, and when the action should be fully implemented. Timeframes may be general, and there will be short, medium, and long term goals for implementation based on prioritization of each action, as identified on individual Hazard Mitigation Action worksheets included in the Plan for Milam County and participating jurisdictions.

Both the Executive and Advisory Planning Team will evaluate and prioritize the most suitable hazard mitigation actions for the community to implement. The timeline for implementation of actions will partially be directed by Milam County's comprehensive planning process, budgetary constraints, and community needs. Milam County and the participating jurisdictions are committed to addressing and implementing hazard mitigation actions that may be aligned with and integrated into the Plan.

Overall, the Planning Team is in agreement that goals and actions of the Plan shall be aligned with the timeframe for implementation of hazard mitigation actions with respect to annual review and updates of existing plans and policies.

## Public and Stakeholder Involvement

An important component of hazard mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community as a whole provides the Planning Team with a greater understanding of local concerns and increases the likelihood of successfully implemented hazard mitigation actions. If citizens and stakeholders, such as local businesses, non-profits, hospitals, and schools are involved, they are more likely to gain a greater appreciation of the risks that hazards may present in their community and take steps to reduce or mitigate their impact.

The public was involved in the development of Milam County's Plan at different stages prior to official Plan approval and adoption. Public input was sought using three methods: (1) open public meetings;

(2) survey instruments; and (3) making the draft Plan available for public review at Milam County's website.

The draft Plan was made available to the general public for review and comment on the Milam County's website. The public was notified at the public meetings that the draft Plan would be available for review. No feedback was received on the draft Plan, although it was given on the public survey, and all relevant information was incorporated into the Plan.

The Plan will be advertised and posted on Milam County's website upon approval from FEMA, and a copy will be kept at the Homeland Security/EM Office.

## Stakeholder Involvement

Stakeholder involvement is essential to hazard mitigation planning since a wide range of stakeholders can provide input on specific topics and from various points of view. Throughout the planning process, members of community groups, local businesses, neighboring jurisdictions, schools, and hospitals were invited to participate in development of the Plan. The Stakeholder Group (Table A-3 in Appendix A, and Table 2-4, below), included a broad range of representatives from both the public and private sector and served as a key component in Milam County's outreach efforts for development of the Plan. Documentation of stakeholder meetings is found in Appendix E. A list of organizations invited to attend via e-mail is found in Table 2-4.

**Table 2-4. Stakeholder Working Group**

| AGENCY | TITLE |
|---|---|
| American Red Cross | Executive Director |
| Bartlett ISD | President |
| Buckholts ISD | Superintendent |
| Cameron ISD | Superintendent |
| Gause ISD | Superintendent |
| Grant Central Texas | Economic Development Corporation |
| Hamilton ISD | Superintendent |
| Holland ISD | Superintendent |
| Killeen ISD | Deputy Superintendent |
| Milano ISD | President |
| Rockdale ISD | Superintendent |
| Rogers ISD | Superintendent |
| Salado ISD | Superintendent |
| Temple ISD | Superintendent |
| Texas A&M Agrilife – Milam County Office | District Extension Administrator |

| AGENCY | TITLE |
|---|---|
| Texas Forest Service | Regional Fire Coordinator I |
| Thorndale ISD | Superintendent |
| Troy ISD | Superintendent |
| TX House Representative Hugh Shine | District Director |

Stakeholders and participants from neighboring communities that attended the Planning Team and public meetings played a key role in the planning process. For example, tornado was one of the major concerns to stakeholders, so several participating jurisdictions included an action to identify and retrofit locations as community safe rooms or build stand-alone community safe rooms.

## Public Meetings

A series of public meetings were held throughout the CTCOG planning area to collect public and stakeholder input, holding meetings in each of the three counties within the CTCOG. Topics of discussion included the purpose of hazard mitigation, discussion of the planning process, and types of natural hazards. Representatives from area neighborhood associations and area residents were invited to participate. Additionally, Milam County utilized social media sources including Facebook, Twitter, and the local media to increase public participation in the Plan development process. Documentation on the public meetings are found in Appendix E.

Public meetings were held on the following dates and locations:

- January 24, 2017, Central Texas Council of Governments Building
- April 12, 2017, Hamilton County Courthouse
- September 8, 2017, Milam County Courthouse

### Public Participation Survey

In addition to public meetings, the Planning and Consultant Teams developed a public survey designed to solicit public input during the planning process from citizens and stakeholders and to obtain data regarding the identification of any potential hazard mitigation actions or problem areas. The survey was promoted by local officials and a link to the survey was posted on Milam County's website. A total of 16 surveys were completed online. The survey results are analyzed in Appendix B. Milam County reviewed the input from the surveys and decided which information to incorporate into the Plan as hazard mitigation actions. For example, many citizens mentioned concerns about flooding and suggested improving the storm water drainage system. In response, several actions were added to the Plan to upgrade undersized drainage channels and culverts in flood prone areas. Additionally, citizens were concerned with wind damage and mentioned keeping trees trimmed. Many jurisdictions included an action to implement a tree trimming program that routinely cleans tree limbs hanging in right-of-ways and near power lines.

# Section 3: County Profile



## Overview

Milam County was originally created as a municipality that was known to the Mexican government as the Municipality of Viesca, but in 1835 the colony was renamed by Texas as the Municipality of Milam, in honor of Benjamin Rush Milam. It was during the first Congress of the Republic of Texas that the municipality came to be called Milam County. Presently, the County has a total area of 1,022 square miles, of which 1, 017.2 square miles is land and 4.8 square miles (0.5%) is water.

The County consists of several cities and towns, unincorporated communities and several ghost towns. The following cities and town are participating within this plan and are considered part of the planning area: the Town of Buckholts, the City of Cameron, the City of Milano, the City of Rockdale, and the City of Thorndale.

The southern and eastern portions of the county lie in the post oak savannah region of the state, and the northern and western portions lie in the blackland prairie.

The land is drained by the Brazos River, which forms the northeaster boundary of the county, by the Little River, which enters the county near the northwestern corner and winds to its mouth on the Brazos in the southeastern of the county, and by the San Gabriel River, which flows through the west central portion of the county to its mouth on the Little River.

Figure 3-1 shows the general location of Milam County, along with the Cities that are located within the County.

**Figure 3-1. Location of Milam County Planning Area**

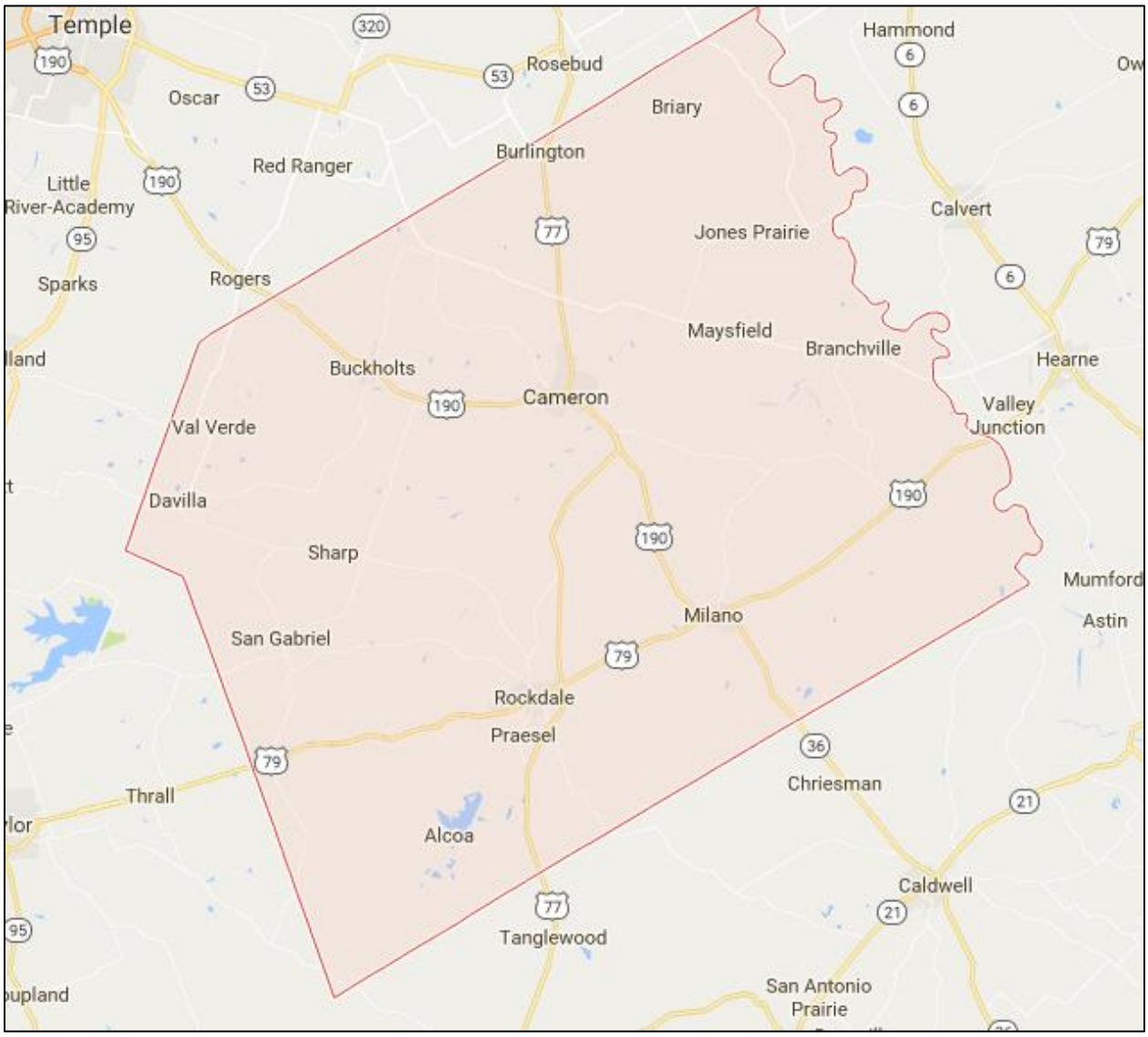
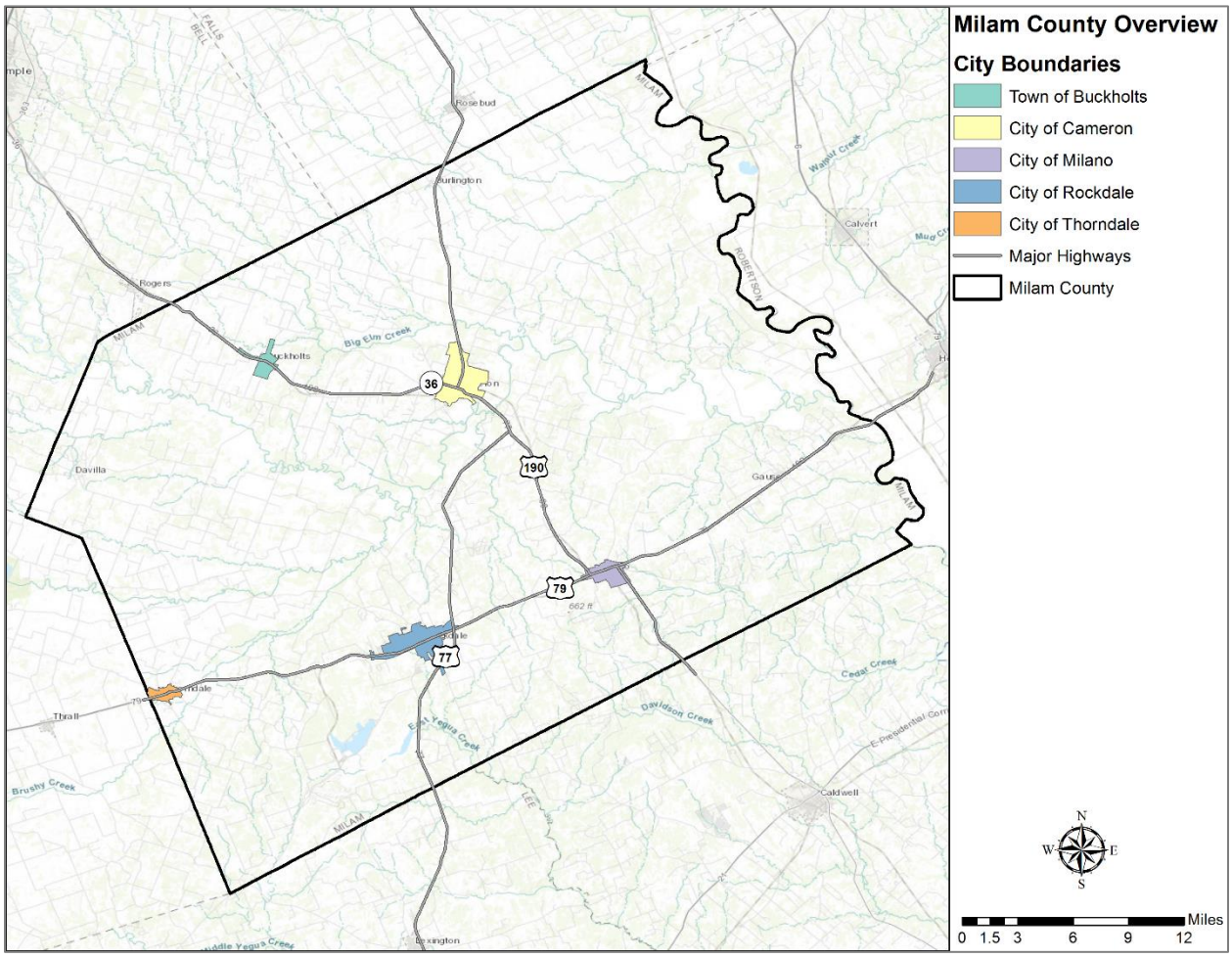



Figure 3-2 shows the Milam County Study Area, including the participating jurisdictions that are covered in the risk assessment analysis of the Plan.

**Figure 3-2. Milam County Planning Area**




Provided in Table 3-1 below is a listing of the jurisdictions in Milam County that participated in the Hazard Mitigation Plan.

**Table 3-1. Participating Jurisdictions**

| PARTICIPATING JURISDICTIONS |
|---|
| Milam County |
| Buckholts |
| Cameron |
| Milano |
| Rockdale |
| Thorndale |

# Population and Demographics

In the official Census population count, as of April 1, 2010, Milam County had a population of 24,757 residents. By July 2015, the number was estimated at 24,484, and by July 2016, the population was 24,871. Table 3-2 provides the population distribution by jurisdiction within Milam County based on the 2010 Census information.[1]

Between official U.S. Census population counts, the estimate uses a formula based on new residential building permits and household size. It is simply an estimate and there are many variables involved in achieving an accurate estimation of people living in a given area at a given time.

**Table 3-2. Population Distribution by Jurisdiction**

| JURISDICTION | TOTAL 2010 POPULATION | PERCENTAGE | ESTIMATED VULNERABLE OR SENSITIVE POPULATIONS | |
|---|---|---|---|---|
| | | | Elderly (Over 65) | Below Poverty Level |
| Buckholts | 515 | 2.1% | 70 | 190 |
| Cameron | 5,552 | 22.4% | 937 | 1,031 |
| Milano | 428 | 1.7% | 57 | 108 |
| Rockdale | 5,595 | 22.6% | 944 | 834 |
| Thorndale | 1,336 | 5.4% | 211 | 136 |
| Unincorporated Milam County | 11,331 | 45.8% | 2,086 | 1,393 |
| **MILAM COUNTY TOTAL** | **24,757** | **100%** | **4,305** | **3,692** |

## Population Growth

The official 2010 Milam County population is 24,757. Overall, Milam County experienced an increase in population between 1980 and 2010 by 8.91%, or an increase by 2,025 people. Cameron experienced a decrease in their population from 1980 to 2010, while the rest of the jurisdictions experienced a population growth. Between 2000 and 2010, Cameron, Milano, and Rockdale experienced a decrease in their population, while Buckholts, Thorndale, the unincorporated parts of the County, and the County as a whole experienced a population growth. Table 3-3 provides historic growth rates in Milam County.

**Table 3-3. Population for Milam County, 1980-2010**

| JURISDICTIONS | 1980 | 1990 | 2000 | 2010 | POP CHANGE 1980-2010 | PERCENT OF CHANGE | POP CHANGE 2000-2010 | PERCENT OF CHANGE |
|---|---|---|---|---|---|---|---|---|
| Buckholts | 388 | 335 | 387 | 515 | 127 | 32.73% | 128 | 33.07% |
| Cameron | 5,721 | 5,635 | 5,634 | 5,552 | -169 | -2.95% | -82 | -1.46% |
| Milano | 400 | 408 | 468 | 428 | 28 | 7.00% | -40 | -8.55% |
| Rockdale | 5,439 | 5,235 | 5,611 | 5,595 | 156 | 2.87% | -16 | -0.29% |
| Thorndale | 1,278 | 1,092 | 1,300 | 1,336 | 58 | 4.54% | 36 | 2.77% |
| Unincorporated Milam County | 9,506 | 10,241 | 10,838 | 11,331 | 1,825 | 19.20% | 493 | 4.55% |

[1] Source: http://www.census.gov/quickfacts/fact/table/milamcountytexas,US/PST045217

| JURISDICTIONS | 1980 | 1990 | 2000 | 2010 | POP CHANGE 1980-2010 | PERCENT OF CHANGE | POP CHANGE 2000-2010 | PERCENT OF CHANGE |
|---|---|---|---|---|---|---|---|---|
| COUNTY TOTAL | 22,732 | 22,946 | 24,238 | 24,757 | 2,025 | 8.91% | 519 | 2.14% |

# Future Development

To better understand how future growth and development in the County might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts. This section includes an analysis of the projected population change and economic impacts.

Population projections from 2010 to 2040 are listed in Table 3-4, as provided by the Office of the State Demographer, Texas State Data Center, and the Institute for Demographic and Socioeconomic Research. Population projections are based on a 0.5 scenario growth rate, which is 50 percent of the population growth rate that occurred during 2000-2010. This information is only available at the County level; however, the population projection shows an increase in population density for the County, which would mean overall growth for the County.

**Table 3-4. Milam County Population Projections**

| County | LAND AREA (SQ MI) | 2010 | | 2020 | | 2030 | | 2040 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Population | | | | | | | |
| | | Total Number | Density (Land Area, SQ MI) | Total Number | Density (Land Area, SQ MI) | Total Number | Density (Land Area, SQ MI) | Total Number | Density (Land Area, SQ MI) |
| Milam | 1,022 | 24,757 | 24.22 | 26,296 | 25.73 | 27,889 | 27.29 | 28,912 | 28.29 |

# Economic Impact

Building and maintaining infrastructure depends on the economy, and therefore, protecting infrastructure from risk due to natural hazards in the planning area is important to Milam County. Whether it's expanding culverts under a road that washes out during flash flooding, shuttering a fire station, or flood-proofing a wastewater facility, infrastructure must be mitigated from natural hazards in order to continue providing essential utility and emergency response services in a fast-growing planning area.

Major employers in the area are critical to the health of the economy, as well as effective transportation connectivity.

# Existing and Future Land Use and Development Trends

The City of Rockdale has a comprehensive city plan in place. The primary objectives of this plan is to: ensure efficient delivery of public services; coordinate public and private investment; minimize conflict between land uses; manage growth in an orderly manner, increase the cost-effectiveness of

public investments; and provide a rational and reasonable basis for making decisions about the community. As a vision of the City's future physical form, the Comprehensive City Plan sets forth a generalized pattern of land use areas and transportation corridors. It represents a long-range statement of public policy with respect to how the community should grow, develop and mature over time. It includes policies and recommendations relative to the development of various physical elements within the community such as transportation, land use, housing, parks and recreation, and urban design (e.g., development guidelines for the downtown area, etc.). It provides for the distribution and interrelationships of various land uses, as well as a basis for future development recommendations. These aspects of the plan are supported by a set of goals and objectives drawn from the desire and aspirations of citizens and business leaders, and are intended to help the City create an attractive living and working environment.

## Building Permits

Building permits indicate what types of buildings are being constructed and their relative uses. Table 3-5 lists the number of residential building permits for Milam County that have been granted between 2000 and 2016. The data includes all sizes of family homes for reported permits, as well as the construction costs, to show the potential increase in vulnerability of structures to the various hazards reviewed in the risk assessment. The increase in vulnerability can be attributed to the higher construction costs that would be factored into repairing or replacing a structure using current market values. Permits are reported annually in September; data reflects permits for consecutive years from 2010 to 2016 to demonstrate growth rates.

**Table 3-5. County Residential Building Permits[2]**

| Milam County | | | |
|---|---|---|---|
| **Year** | **Buildings** | **Units** | **Construction Cost** |
| 2000 | 8 | 10 | $770,000 |
| 2005 | 15 | 15 | $1,831,300 |
| 2010 | 3 | 3 | $561,000 |
| 2011 | 1 | 1 | $40,000 |
| 2012 | 3 | 3 | $510,000 |
| 2013 | 5 | 86 | $5,018,878 |
| 2014 | 10 | 10 | $237,500 |
| 2015 | 9 | 14 | $878,472 |
| 2016 | 8 | 12 | $1,441,755 |

[2] Source: http://censtats.census.gov/cgi-bin/bldgprmt/bldgdisp.pl

# Section 4: Risk Overview



## Hazard Description

Section 4 is the first phase of the Risk Assessment, providing background information for the hazard identification process and descriptions for the hazards identified. The Risk Assessment continues with Sections 5 through 15, which include hazard descriptions and vulnerability assessments.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, Milam County and the participating jurisdictions identified eleven natural hazards that are addressed in the Hazard Mitigation Plan. Of the hazards identified, ten natural hazards and one quasi-technological hazard (dam failure) were identified as significant, as shown in Table 4-1. The hazards were identified through input from Planning Team members and a review of the current 2013 State of Texas Hazard Mitigation Plan Update (State Plan Update). Readily available online information from reputable sources such as federal and state agencies were also evaluated and utilized to supplement information as needed.

In general, there are three main categories of hazards: atmospheric, hydrologic, and technological. Atmospheric hazards are events or incidents associated with weather generated phenomenon. Atmospheric hazards that have been identified as significant for the Milam County Planning area include extreme heat, hail, hurricane, lightning, thunderstorm wind, tornado, and winter storm (Table 4-1).

Hydrologic hazards are events or incidents associated with water related damage and account for over 75 percent of Federal disaster declarations in the United States. Hydrologic hazards identified as significant for the planning area include flood and drought.

Technological hazards refer to the origins of incidents that can arise from human activities, such as the construction and maintenance of dams. They are distinct from natural hazards primarily because they originate from human activity. The risks presented by natural hazards may be increased or decreased as a result of human activity, however they are not inherently human-induced. Therefore, dam failure is classified as a quasi-technological hazard and referred to as “technological,” in Table 4-1 for purposes of description.

For the Risk Assessment, the wildfire hazard is considered “other,” since a wildfire may be natural or human-caused, and is not considered atmospheric or hydrologic.

**Table 4-1. Hazard Descriptions**

| HAZARD | DESCRIPTION |
|---|---|
| **ATMOSPHERIC** | |
| **Extreme Heat** | Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period of time. |
| **Hail** | Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low- pressure front due to the rapid rising of warm air into the upper atmosphere and subsequent cooling of the air mass. |
| **Hurricane** | A hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher. |
| **Lightning** | Lightning is a sudden electrostatic discharge that occurs during an electrical storm. This discharge occurs between electrically charged regions of a cloud, between two clouds, or between a cloud and the ground. |
| **Thunderstorm Wind** | A thunderstorm occurs when an observer hears thunder. Radar observers use the intensity of the radar echo to distinguish between rain showers and thunderstorms. Lightning detection networks routinely track cloud-to-ground flashes, and therefore thunderstorms. |
| **Tornado** | A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. The destruction caused by tornadoes ranges from light to catastrophic, depending on the location, intensity, size, and duration of the storm. |
| **Winter Storm** | Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads, and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life. |
| **HYDROLOGIC** | |
| **Drought** | A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. |

| HAZARD | DESCRIPTION |
|---|---|
| **Flood** | The accumulation of water within a body of water, which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, and shallow flooding. |
| **OTHER** | |
| **Wildfire** | A wildfire is an uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase the risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors. |
| **TECHNOLOGICAL** | |
| **Dam Failure** | Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage if development exists downstream of the dam. |

Hazards that weren't considered significant and were not included in the Plan are located in Table 4-2, along with the evaluation process used for determining the significance of each of these hazards. Hazards not identified for inclusion at this time may be addressed during future evaluations and updates.

**Table 4-2. Other Hazards Deferred**

| HAZARD CONSIDERED | REASON FOR DETERMINATION |
|---|---|
| **Coastal Erosion** | The planning area is not located on the coast, therefore coastal erosion does not pose a risk. |
| **Earthquakes** | According to the State Plan, an earthquake occurrence for the planning area is considered exceedingly rare. Earthquake events are not considered to pose a risk to the planning area. There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of earthquakes and none is expected in the future. |
| **Expansive Soils** | There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of expansive soils and none is expected in the future. |

| HAZARD CONSIDERED | REASON FOR DETERMINATION |
|---|---|
| **Land Subsidence** | There are no historical occurrences of land subsidence for the planning area and it is located in an area where occurrences are considered rare. There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of land subsidence and none is expected in the future. |

# Natural Hazards and Climate Change

Climate change is defined as a long-term hazard which can increase or decrease the risk of other weather hazards. It directly endangers property due to sea level rise and biological organisms due to habitat destruction.

Global climate change is expected to exacerbate the risks of certain types of natural hazards impacted through rising sea levels, warmer ocean temperatures, higher humidity, the possibility of stronger storms, and an increase in wind and flood damages due to storm surges. While sea level rise is a natural phenomenon and has been occurring for several thousand years, the general scientific consensus is that the rate has increased in the past 200 years, from 0.5 millimeters per year to 2 millimeters per year.

Texas is considered one of the more vulnerable states in the U.S. to both abrupt climate changes and to the impact of gradual climate changes to the natural and built environments. Mega-droughts can trigger abrupt changes to regional ecosystems and the water cycle, drastically increase extreme summer temperature and fire risk, and reduce availability of water resources, as Texas experienced during 2011-2012.

Paleoclimate records also show that the climate over Texas had large changes between periods of frequent mega-droughts and the periods of mild droughts that Texas is currently experiencing. While the cause of these fluctuations is unclear, it would be wise to anticipate that such changes could occur again, and may even be occurring now.

# Overview of Hazard Analysis

The methodologies utilized to develop the Risk Assessment are a historical analysis and a statistical approach. Both methodologies provide an estimate of potential impact by using a common, systematic framework for evaluation.

Records retrieved from National Centers for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA) were reported for the Milam County Planning Area, including the participating jurisdictions. Remaining records identifying the occurrence of hazard events in the planning area and the maximum recorded magnitude of each event were also evaluated.

The use of geographic information system (GIS) technology to identify and assess risks for the Milam County planning area, and evaluate community assets and their vulnerability to the hazards.

The four general parameters that are described for each hazard in the Risk Assessment include frequency of return, approximate annualized losses, a description of general vulnerability, and a statement of the hazard's impact.

Frequency of return was calculated by dividing the number of events in the recorded time period for each hazard by the overall time period that the resource database was recording events. Frequency of return statements are defined in Table 4-3, and impact statements are defined in Table 4-4 below.

**Table 4-3. Frequency of Return Statements**

| PROBABILITY | DESCRIPTION |
|---|---|
| **Highly Likely** | Event is probable in the next year. |
| **Likely** | Event is probable in the next three years. |
| **Occasional** | Event is probable in the next five years. |
| **Unlikely** | Event is probable in the next ten years. |

**Table 4-4. Impact Statements**

| POTENTIAL SEVERITY | DESCRIPTION |
|---|---|
| **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 illnesses resulting in permanent disability. Complete shutdown of critical facilities for at least two weeks. More than 25 percent of property destroyed or with major damage. |
| **Minor** | Injuries and illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than one week. More than 10 percent of property destroyed or with major damage. |
| **Limited** | Injuries and 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. |

Each of the hazard profiles includes a description of a general Vulnerability Assessment. Vulnerability is the total of assets that are subject to damages from a hazard, based on historic recorded damages. Assets in the region were inventoried and defined in hazard zones where appropriate. The total amount of damages, including property and crop damages, for each hazard is divided by the total number of assets (building value totals) in that community to determine the percentage of damage that each hazard can cause to the community.

Hazard Vulnerability for Milam County was reviewed based on recent development changes that occurred throughout the County. To better understand how future growth and development in the County might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts.

Once loss estimates and vulnerability were known, an impact statement was applied to relate the potential impact of the hazard on the assets within the area of impact.

# Hazard Ranking

Table 4-5 portrays the results of the County's self-assessment for hazard ranking, based on the preliminary results of the risk assessment presented at the Risk Assessment Workshop. This table also takes into account local knowledge regarding frequency of occurrence and the potential impact of each hazard.

**Table 4-5. Hazard Risk Ranking**

| HAZARD | FREQUENCY OF OCCURENCE | POTENTIAL SEVERITY | RANKING |
|---|---|---|---|
| Extreme Heat | Highly Likely | Substantial | High |
| Flood | Highly Likely | Limited[1] | High |
| Hail | Highly Likely | Limited | High |
| Thunderstorm Wind | Highly Likely | Minor | High |
| Tornado | Likely | Substantial | High |
| Drought | Highly Likely | Limited | Moderate |
| Lightning | Highly Likely | Substantial | Moderate |
| Wildfire | Highly Likely | Minor | Moderate |
| Dam Failure | Unlikely | Substantial | Low |
| Hurricane | Unlikely | Minor | Low |
| Winter Storm | Highly Likely | Limited | Low |

[1] All jurisdictions except for the Town of Buckholts have a Limited potential severity. The Town of Buckholts has a Substantial potential severity.

# Section 5: Thunderstorm Wind



## Hazard Description

Thunderstorms create extreme wind events which includes straight line winds. Wind is the horizontal motion of the air past a given point, beginning with differences in air pressures. Pressure that is higher at one place than another sets up a force pushing from the high toward the low pressure; the greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated.

Thunderstorms are created when heat and moisture near the Earth's surface are transported to the upper levels of the atmosphere. By-products of this process are the clouds, precipitation, and wind that become the thunderstorm.

According to the National Weather Service (NWS), a thunderstorm occurs when thunder accompanies rainfall. Radar observers use the intensity of radar echoes to distinguish between rain showers and thunderstorms.

Straight line winds are responsible for most thunderstorm wind damages. One type of straight line wind, the downburst, is a small area of rapidly descending air beneath a thunderstorm. A downburst can cause damage equivalent to a strong tornado and make air travel extremely hazardous.

## Location

Thunderstorms wind events can develop in any geographic location, and are considered a common occurrence in Texas. Therefore, a thunderstorm wind event could occur at any location within Milam County's planning area, including all participating jurisdictions, as these storms develop randomly and are not confined to any geographic area within the County. It is assumed that the entire Milam County planning area is uniformly exposed to the threat of thunderstorms winds.

# Extent

The extent or magnitude of a thunderstorm wind event is measured by the Beaufort Wind Scale. Table 5-1 describes the different intensities of wind in terms of speed and effects, from calm to violent and destructive.

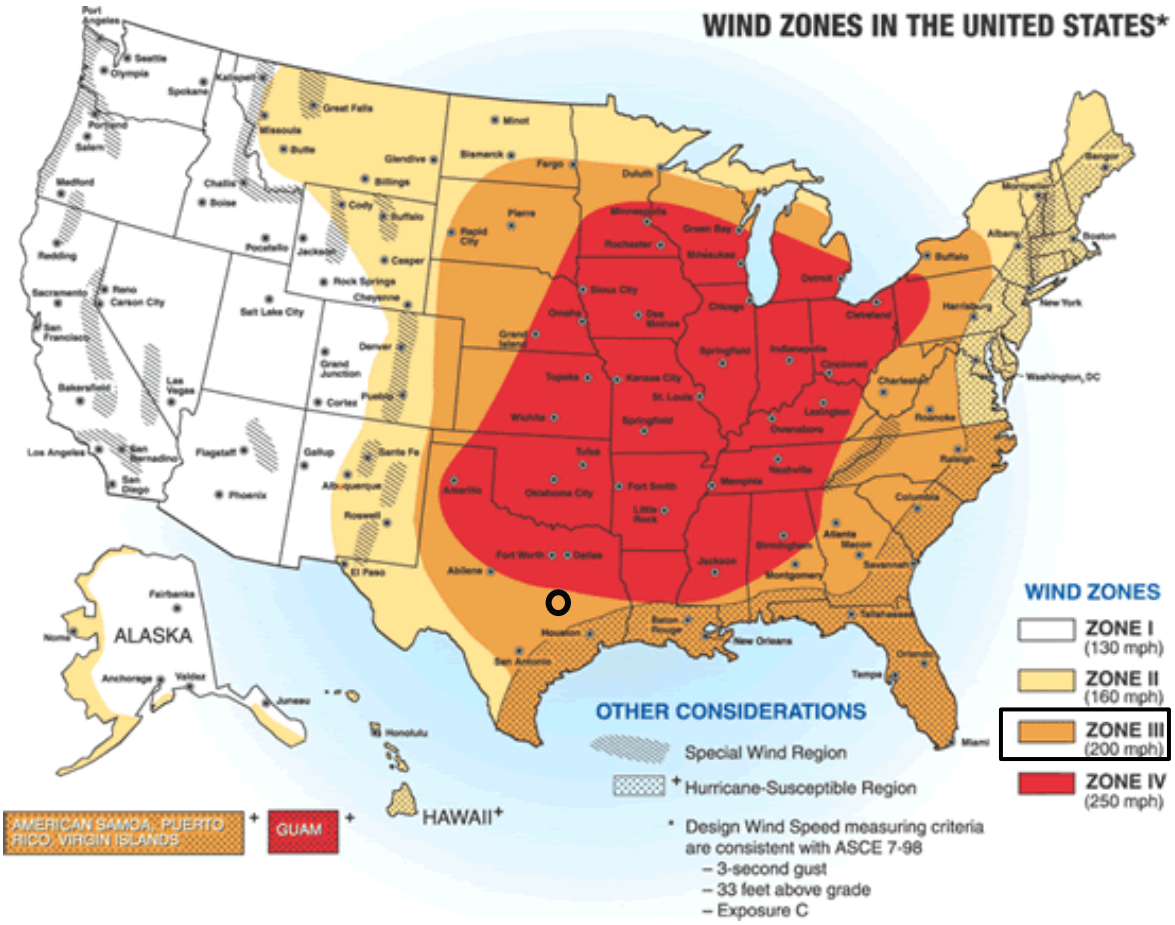
**Table 5-1. Beaufort Wind Scale**[1]

| FORCE | WIND (KNOTS) | WMO CLASSIFICATION | APPEARANCE OF WIND EFFECTS |
|---|---|---|---|
| **0** | Less than 1 | Calm | Calm, smoke rises vertically |
| **1** | 1-3 | Light Air | Smoke drift indicates wind direction, still wind vanes |
| **2** | 4-7 | Light Breeze | Wind felt on face, leaves rustle, vanes begin to move |
| **3** | 8-12 | Gentle Breeze | Leaves and small twigs constantly moving, light flags extended |
| **4** | 13-18 | Moderate Breeze | Dust, leaves and loose paper lifted, small tree branches move |
| **5** | 19-24 | Fresh Breeze | Small trees in leaf begin to sway |
| **6** | 25-31 | Strong Breeze | Larger tree branches moving, whistling in wires |
| **7** | 32-38 | Near Gale | Whole trees moving, resistance felt walking against wind |
| **8** | 39-46 | Gale | Whole trees in motion, resistance felt walking against wind |
| **9** | 47-54 | Strong Gale | Slight structural damage occurs, slate blows off roofs |
| **10** | 55-63 | Storm | Seldom experienced on land, trees broken or uprooted, "considerable structural damage" |
| **11** | 64-72 | Violent Storm | If experienced on land, widespread damage |
| **12** | 73+ | Hurricane | Violence and destruction |

Figure 5-1 displays the wind zones as derived from NOAA.

[1] Source: World Meteorological Organization

**Figure 5-1. Wind Zones in the United States**[2]




On average, the planning area experiences one to two thunderstorm wind events every year. The County is located in Zone III, meaning they can experience winds up to 200 mph. Milam County has experienced a significant wind event or an event with winds in the range of "Force 12" on the Beaufort Wind Scale with winds above 73 knots.

# Historical Occurrences

Tables 5-2, 5-3, and 5-4 depict historical occurrences of thunderstorm wind events for the Milam County planning area according to the National Centers for Environmental Information (NCEI) data. Since January 1955, 85 thunderstorm wind events are known to have impacted the Milam County planning area, based upon NCEI records. Table 5-3 presents information on known historical events impacting the Milam County planning area with resulting damages, injuries or fatalities. It is important to note that high wind events associated with other hazards, such as tornadoes, are not accounted for in this section.

The NCEI is a national data source organized under the National Oceanic and Atmospheric Administration. The NCEI is the largest archive available for climate data; however, it is important to

[2] Milam is indicated by the circle.

note that the only incidents recorded are those that are reported to the NCEI that have been factored into this risk assessment. In the tables that follow throughout this section, some occurrences seem to appear multiple times in one table. This is due to reports from various locations throughout the County. In addition, property damage estimates are not always available. When this occurs, estimates are provided. Where an estimate has been provided in a table for losses, the dollar amounts have been altered to indicate the damage in 2017 dollars.

**Table 5-2. Historical Thunderstorm Wind Events with Reported Damages, 1955-2017**

| MAXIMUM WIND SPEED RECORDED (MPH) | NUMBER OF REPORTED EVENTS |
|---|---|
| 0-30 | 20 |
| 31-40 | 0 |
| 41-50 | 1 |
| 51-60 | 36 |
| 61-70 | 9 |
| 71-80 | 3 |
| 81-90 | 1 |
| 91-100 | 0 |
| Unknown | 15 |

**Table 5-3. Historical Thunderstorm Wind Events, 1955-2017**[3]

| JURISDICTION | DATE | TIME | MAGNITUDE (MPH) | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|---|
| Milam Co | 12/10/1985 | 4:30 PM | 0 | 0 | 1 | 0 | 0 |
| Cameron | 9/20/1996 | 6:11 PM | Unknown | 0 | 0 | $3,095 | $0 |
| Rockdale | 11/7/1996 | 1:35 AM | Unknown | 0 | 0 | $3,095 | $0 |
| Milam County | 8/21/1997 | 5:30 PM | Unknown | 0 | 0 | $15,130 | $0 |
| Rockdale | 12/20/1997 | 9:40 PM | Unknown | 0 | 0 | $15,130 | $0 |
| Cameron | 2/25/1998 | 10:47 PM | Unknown | 0 | 0 | $2,980 | $0 |
| Rockdale | 5/11/1999 | 9:00 PM | Unknown | 0 | 0 | $292 | $0 |
| Milam County | 5/17/1999 | 6:54 PM | 71 | 0 | 0 | $1,458 | $0 |
| Milam County | 5/17/1999 | 8:05 PM | Unknown | 0 | 0 | $292 | $0 |
| Cameron | 8/14/1999 | 6:00 PM | Unknown | 0 | 0 | $146 | $0 |

[3] Only recorded events with fatalities, injuries or damages are listed. Magnitude is listed when available. Damage values are in 2017 dollars.

| JURISDICTION | DATE | TIME | MAGNITUDE (MPH) | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|---|
| Milam County | 3/10/2000 | 7:15 PM | Unknown | 0 | 0 | $4,231 | $0 |
| Rockdale | 3/10/2000 | 8:05 PM | Unknown | 0 | 0 | $2,820 | $0 |
| Cameron | 5/6/2001 | 6:15 PM | Unknown | 0 | 0 | $6,856 | $0 |
| Rockdale | 10/13/2001 | 12:04 AM | Unknown | 0 | 0 | $13,712 | $0 |
| Rockdale | 7/23/2003 | 10:07 AM | 60 | 0 | 0 | $2,640 | $0 |
| Buckholts | 4/10/2004 | 3:17 PM | 60 | 0 | 0 | $15,427 | $0 |
| Cameron | 8/11/2004 | 3:15 PM | 60 | 0 | 0 | $96,416 | $0 |
| Cameron | 11/23/2004 | 10:45 AM | 60 | 0 | 0 | $2,571 | $0 |
| Rockdale | 3/31/2005 | 6:56 PM | 58 | 0 | 0 | $1,243 | $0 |
| Rockdale | 5/8/2005 | 6:27 AM | 58 | 0 | 0 | $3,730 | $0 |
| Milam County | 4/18/2006 | 9:45 PM | 58 | 0 | 0 | $6,023 | $0 |
| Cameron | 4/20/2006 | 7:28 PM | 58 | 0 | 0 | $6,023 | $0 |
| Milam County | 5/6/2006 | 2:00 AM | 58 | 0 | 0 | $12,046 | $0 |
| Rockdale | 5/6/2006 | 1:30 AM | 58 | 0 | 0 | $6,023 | $0 |
| Milam County | 11/15/2006 | 11:00 AM | 53 | 0 | 0 | $12,046 | $0 |
| Milam County | 4/17/2008 | 11:05 PM | 58 | 0 | 0 | $1,128 | $0 |
| Milam County | 4/17/2008 | 11:20 PM | 58 | 0 | 0 | $2,256 | $0 |
| Milam County | 2/10/2009 | 10:30 PM | 75 | 0 | 0 | $16,979 | $0 |
| Milam County | 4/18/2009 | 6:15 AM | 70 | 0 | 0 | $4,528 | $0 |
| Rockdale | 4/26/2010 | 5:47 PM | 61 | 0 | 0 | $2,227 | $0 |
| Thorndale | 6/2/2010 | 7:26 PM | 63 | 0 | 0 | $16,705 | $0 |
| County | 2/1/2011 | 3:30 AM | 55 | 0 | 0 | $7,557 | $0 |
| Milano | 6/12/2012 | 4:25 PM | 49 | 0 | 0 | $4,231 | $0 |
| Milam County | 6/12/2012 | 4:35 PM | 58 | 0 | 0 | $21,154 | $0 |
| Milam County | 5/9/2013 | 2:09 PM | 64 | 0 | 0 | $0 | $2,085 |
| Milam County | 3/28/2014 | 3:23 PM | 58 | 0 | 0 | $3,077 | $0 |
| Rockdale | 5/23/2015 | 9:40 PM | 70 | 0 | 1 | $51,228 | $0 |
| Rockdale | 2/20/2017 | 12:35 AM | 58 | 0 | 0 | $10,000 | $0 |

| JURISDICTION | DATE | TIME | MAGNITUDE (MPH) | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|---|
| Milano | 2/20/2017 | 12:55 AM | 63 | 0 | 0 | $2,000 | $0 |
| Thorndale | 2/20/2017 | 12:35 AM | 90 | 0 | 0 | $8,000 | $0 |

**Table 5-4. Summary of Historical Thunderstorm Wind Events, 1955-2017**

| JURISDICTION | NUMBER OF EVENTS | MAGNITUDE (MPH) | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|
| Milam County | 42 | 75 | 0 | 1 | $107,905 | $2,085 |
| Town of Buckholts | 3 | 60 | 0 | 0 | $15,427 | $0 |
| City of Cameron | 16 | 70 | 0 | 0 | $118,087 | $0 |
| City of Milano | 3 | 63 | 0 | 0 | $6,231 | $0 |
| City of Rockdale | 16 | 70 | 0 | 1 | $112,140 | $0 |
| City of Thorndale | 5 | 90 | 0 | 0 | $24,705 | $0 |
| **TOTAL LOSSES** | **85** | **(Max Extent)** | **0** | **2** | **$386,580** | |

## Significant Events

**August 11, 2004 – Cameron**
During the afternoon hours on the 11th, severe thunderstorms developed across Milam County. Wind gusts estimated at 60 mph damaged homes, downed large trees onto cars, businesses, and houses, and power lines were blown down.

**May 23, 2015 – Rockdale**
For several days, a stalled cold front, combined with abundant moisture from the Gulf of Mexico combined to produce widespread rain and thunderstorms in Texas. Several rounds of strong to severe thunderstorms occurred during a four day period, producing flash flooding, and numerous reports of large hail. The Milam County emergency manager reported a mobile home was moved off the foundation piers on Green Street in Rockdale. Several trees were blown down, as were power lines. One Rockdale resident had a large tree fall through her home and she received minor head wounds.

**February 20, 2017 – Thorndale**
A large area of showers and thunderstorms associated with an upper level low pressure system rolled across North and Central Texas late Sunday into early Monday. Some severe storms occurred, producing wind damage and a few hail reports across mainly the southern half of the forecast area. A storm observer reported a tree that was approximately 40 feet tall fell down on a house in Thorndale.

# Probability of Future Events

Most thunderstorm winds occur during the months of March, April, May, and September. Based on available records of historic events, there have been 85 events in a 63 year reporting period, which provides a probability of occurrence of one to two events every year. Even though the intensity of

thunderstorm wind events is not always damaging for the Milam County planning area, the probability of occurrence for a thunderstorm wind event is highly likely. This means that an event is probable within the next year for the Milam County planning area, including all participating jurisdictions.

# Vulnerability and Impact

Vulnerability is difficult to evaluate since thunderstorm wind events can occur at different strength levels, in random locations, and can create relatively narrow paths of destruction. Due to the randomness of these events, all existing and future structures and facilities in the Milam County planning area could potentially be impacted and remain vulnerable to possible injury and property loss from strong winds.

Trees, power lines and poles, signage, manufactured housing, radio towers, concrete block walls, storage barns, windows, garbage recepticles, brick facades, and vehicles, unless reinforced, are vulnerable to thunderstorm wind events. More severe damage involves windborne debris; in some instances, patio furniture and other lawn items have been reported to have been blown around by wind and, very commonly, debris from damaged structures in turn have caused damage to other buildings not directly impacted by the event. In numerous instances roofs have been reported as having been torn off of buildings. Portable buildings typically used at commercial properties and schools would be more vulnerable to thunderstorm wind events than typical site built structures and could potentially pose a greater risk for wind-blown debris.

The US Census data indicates a total of 1,828 manufactured homes (approximately 16.1%) located in the Milam County planning area including all participating jurisdictions (Table 5-5). In addition, 53.9% (approximately 6,112 structures) of the residential structures in the Milam County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant wind events.

**Table 5-5. Structures at Greater Risk by Jurisdiction**

| JURISDICTION | MANUFACTURED HOMES | SFR STRUCTURES BUILT BEFORE 1980 |
|---|---|---|
| Milam County[4] | 1,828 | 6,112 |
| Town of Buckholts | 41 | 156 |
| City of Cameron | 177 | 1,790 |
| City of Milano | 26 | 98 |
| City of Rockdale | 316 | 1,504 |
| City of Thorndale | 115 | 422 |

The following critical facilities would be vulnerable to thunderstorm wind events in each participating jurisdiction:

[4] County totals includes all jurisdictions and unincorporated areas within the county.

**Table 5-6. Critical Facilities at Risk by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | Communications Tower, 8 Rural Water Supply Facilities, School |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations, School |
| City of Cameron | Airport (and 3 support facilities), 5 Government/Civic Facilities, Library, Museum, Animal Shelter, 2 Water Towers, Police Station, Fire Station, EMS (with support facility), Water Treatment Plant, Waste Water Treatment Plant, 3 Public Works Support Facilities, Sheriff's Office/County Jail, Communications Tower, 2 Funeral Homes, 2 Nursing Homes, Hospital, 2 Health Clinics, 4 Schools, Hike and Bike Trail Support Facilities |
| City of Milano | Fire Department, 3 Schools, Water Department, Civic Center, Community Center, EMS/Ambulance |
| City of Rockdale | Government Facility, Hospital, Nursing Home, 2 Police Stations, Fire Station, Water Treatment Plant, Waste Water Treatment Plant, 4 Schools, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, Police/Fire/EMS/Government Facility, 5 Schools, Fire Station Command Facility/Evacuation Center |

A thunderstorm wind event can also result in traffic disruptions, injuries and in rare cases, fatalities. Impact of thunderstorms winds experienced in the Milam County planning area has resulted in one injury and no fatalities. Impact of thunderstorm wind events experienced in the Milam County planning area, including all participating jurisdictions, would be "Minor," and injuries and illnesses would not result in permanent disability, the quality of life lost would be minor, and facilities would be shut down for more than 1 week. Overall, the average loss estimate (in 2017 dollars) is $386,580, having an approximate annual loss estimate of $6,136 (Table 5-7).

**Table 5-7. Potential Annualized Losses for Milam County**

| JURISDICTION | PROPERTY & CROP LOSS | ANNUAL LOSS ESTIMATES |
|---|---|---|
| Milam County | $107,905 | $1,713 |
| Town of Buckholts | $15,427 | $245 |
| City of Cameron | $118,087 | $1,874 |
| City of Milano | $6,231 | $99 |
| City of Rockdale | $114,225 | $1,813 |
| City of Thorndale | $24,705 | $392 |
| **Planning Area** | **$386,580** | **$6,136** |

## Assessment of Impacts

Thunderstorm wind events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- During exceptionally heavy wind events, first responders may be prevented from responding to calls, as the winds may reach a speed in which their vehicles and equipment are unsafe to operate.
- Thunderstorm wind events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.
- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the County and City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long- term loss in revenue.
- Some businesses not directly damaged by thunderstorm wind events may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to thunderstorm winds.
- Large scale wind events can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- The Brazos River is a popular tourist area. A large thunderstorm wind event could impact recreational activities, placing visitors in imminent danger, potentially requiring emergency services or evacuation.

- Recreational areas and parks may be damaged or inaccessible due to downed trees or debris, causing temporary impacts to area businesses.

The economic and financial impacts of thunderstorm winds on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the community, local businesses, and citizens will also contribute to the overall economic and financial conditions in the aftermath of any thunderstorm wind event.

# Section 6: Flood



## Hazard Description

Floods generally result from excessive precipitation. The severity of a flood event is determined by a combination of several major factors, including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

The primary types of general flooding are inland and coastal flooding. Due to Milam County's inland location, only inland flooding is profiled in this section. Inland or riverine flooding is a result of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Inland or riverine flooding is overbank flooding of rivers and streams, typically resulting from large-scale weather systems that generate prolonged rainfall over a wide geographic area, thus it is a naturally occurring and inevitable event. Some river floods occur seasonally when winter or spring rainfalls fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

## Location

The Flood Insurance Rate Map (FIRM) data provided by FEMA for Milam County shows the following flood hazard areas:

- Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance requirements and floodplain management standards apply.
- Zone AE: Areas subject to inundation by 1-percent-annual-chance shallow flooding. It is the base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.

- Zone X: Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.

Full flood zone delineations with elevations are only available in the City of Cameron. The Town of Buckholts, the City of Thorndale and the City of Rockdale all have limited flood hazard boundary maps where base flood elevations have not been determined. Milam County and the City of Milano have not been mapped. In order to enhance future risk assessments and improve floodplain management for participating jurisdictions, this data deficiency has been addressed with mitigation actions (Section 17) specifically developed to identify and fully study, flood hazard areas throughout the planning area. Both of these jurisdictions have developed narrative to describe known local flood hazard areas.

Milam County has several locally identified flood hazard areas that have been inundated in the past including: Highway 1600 outside of Buckholts; Highway 77 south of Cameron; FM 486 near Conoley at the Little River; County Roads on the northeast side of the county along the Brazos River and westward along the Pond Creek tributary; FM 1915 at Big Elm Creek, South Elm Creek and Little River; Highway 190 to FM 485 near Bear Creek; FM 437 at Donahue Creek; Highway 79 near the Town of Gause; FM 2027 at Pond Creek; and Donahue Creek at FM 402 near the town of Davilla.

The City of Milano also indicated several locally identified flood hazard areas that have been inundated in the past including: Portions of Highway 36 on the southeast side of the city; and Highway 79 in the downtown area.

Locations of flood zones in Buckholts, Cameron, Rockdale and Thorndale, based on the available Flood Insurance Rate Maps (FIRM) from FEMA are illustrated in Figures 6-1 to 6-6.

**Figure 6-1. Estimated Flood Zones in the Town of Buckholts**

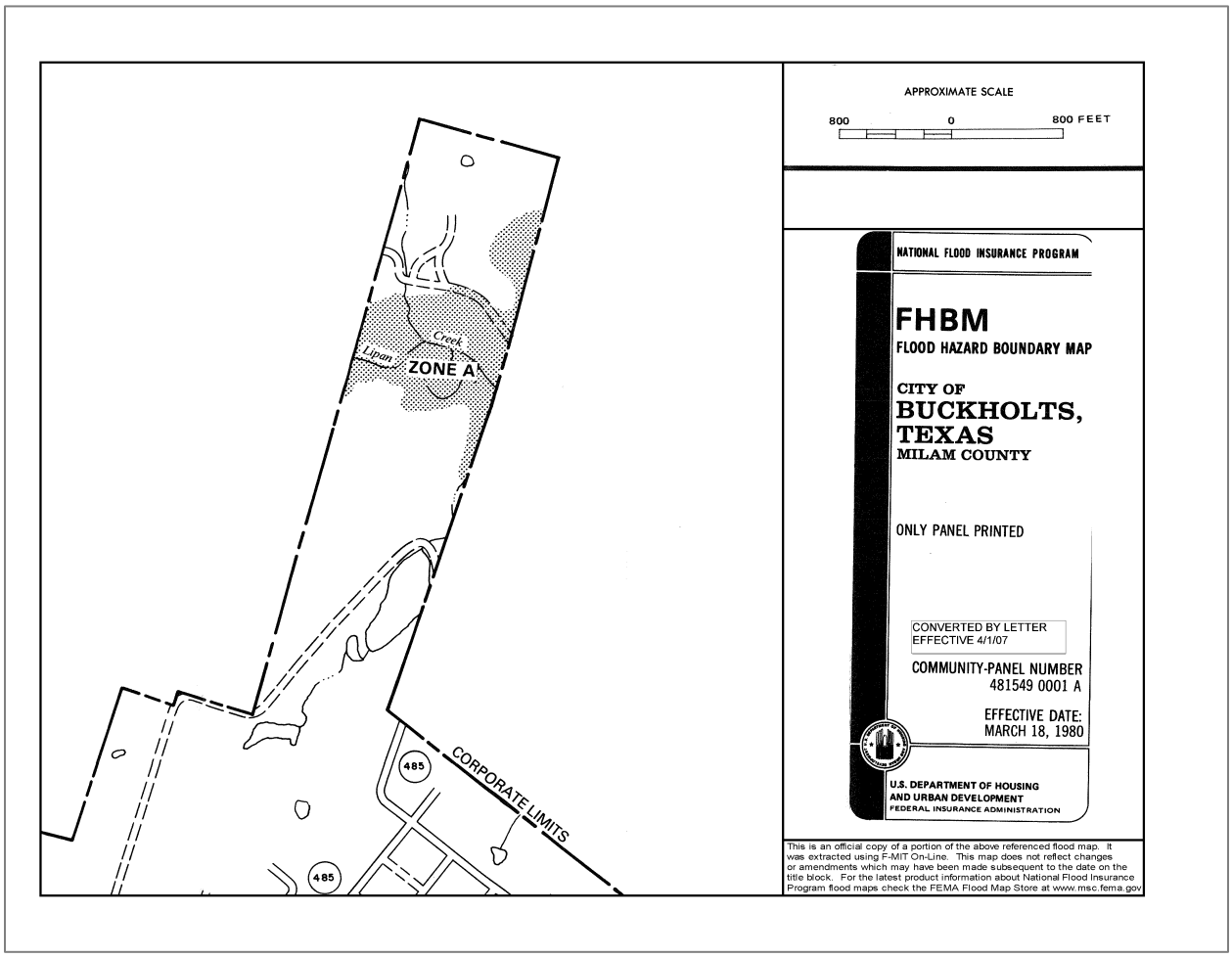


**Figure 6-2. Estimated Flood zones in the City of Cameron – North**

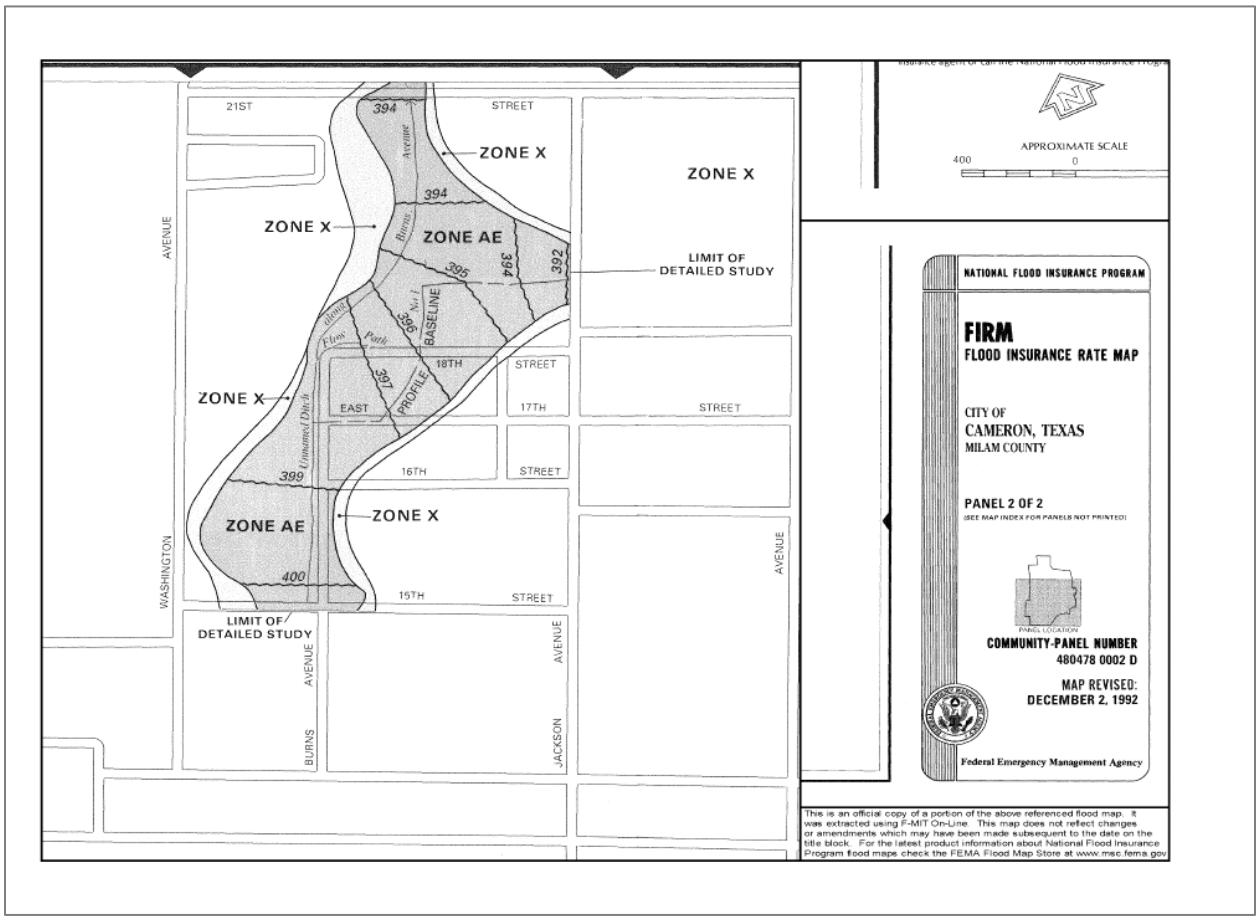


**Figure 6-3. Estimated Flood Zones in the City of Cameron – East**

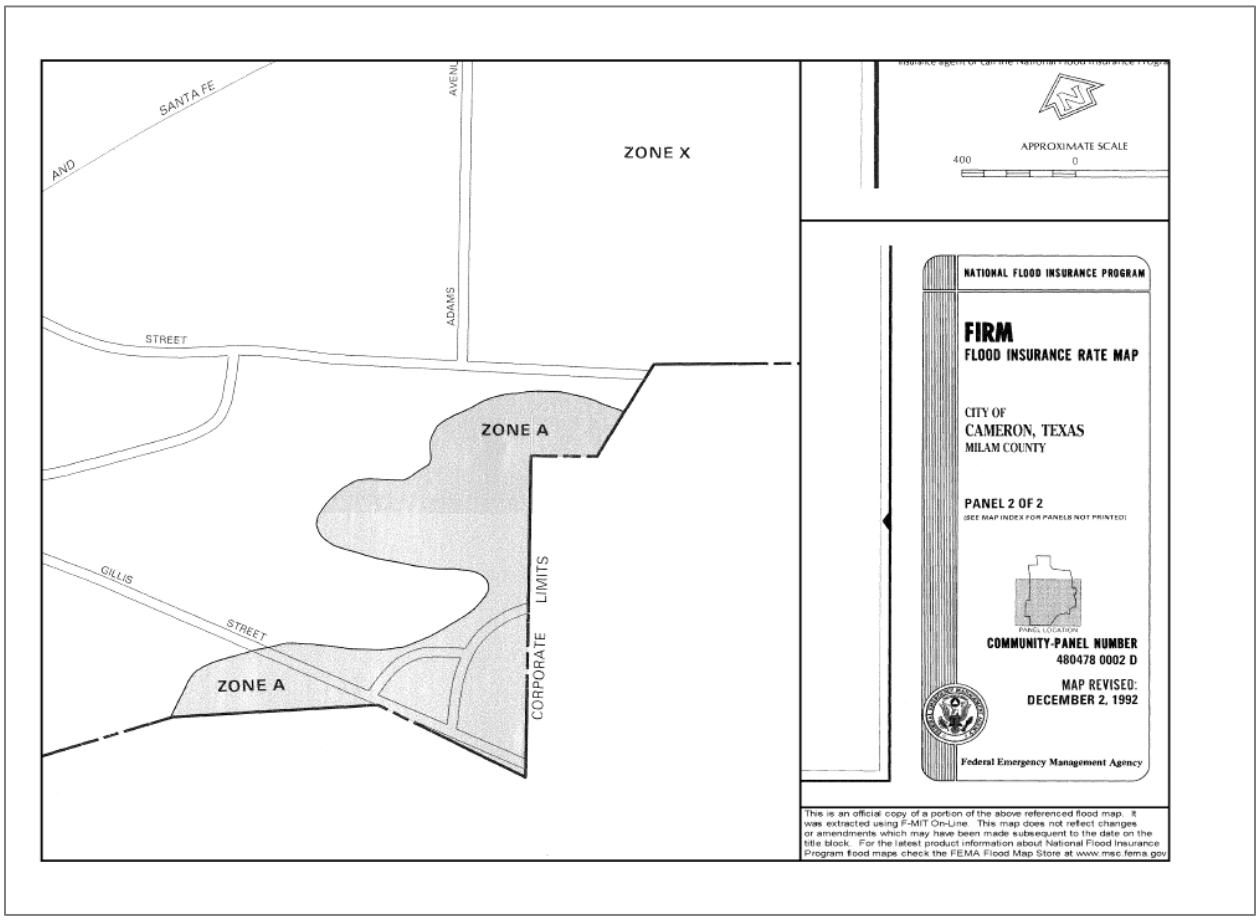


**Figure 6-4. Estimated Flood Zones in the City of Cameron – South**

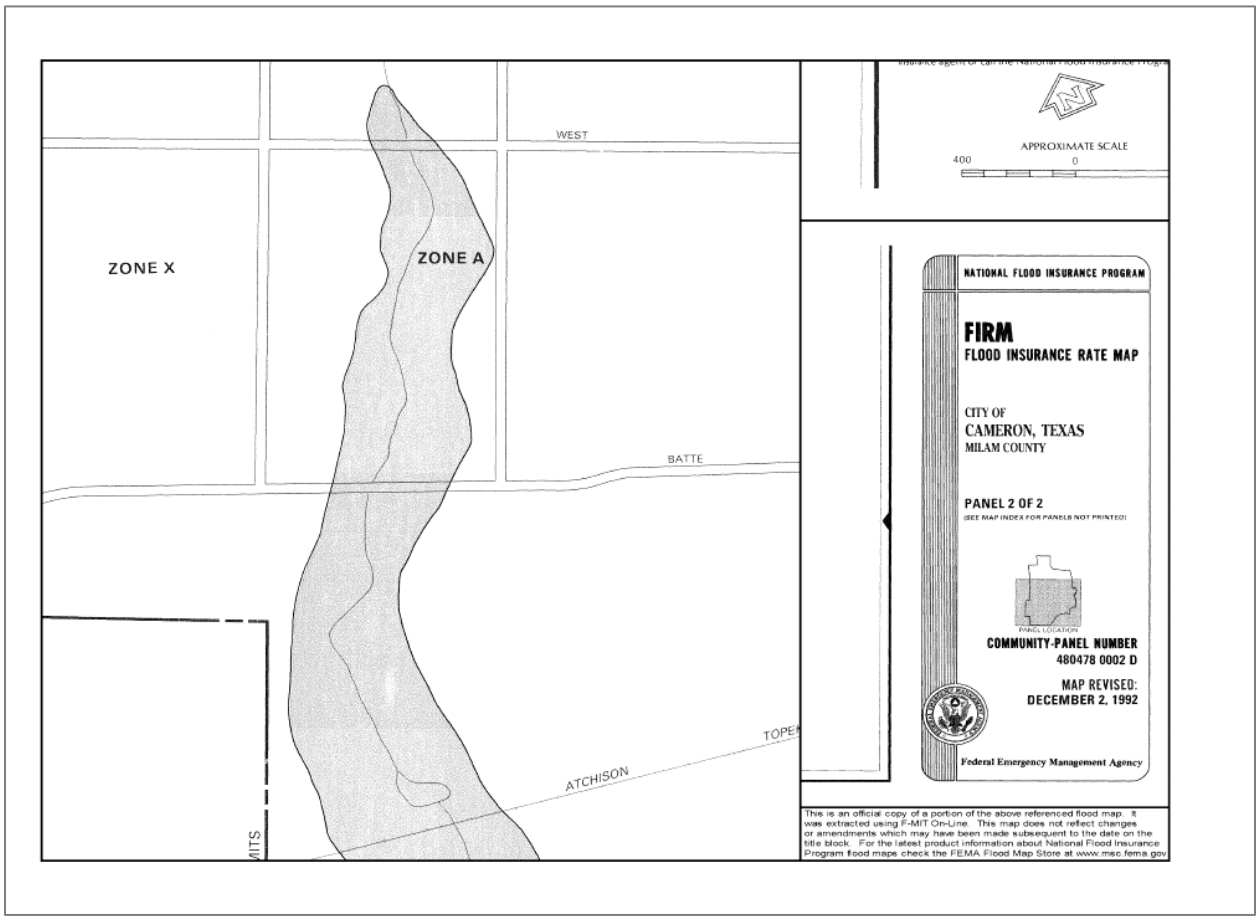
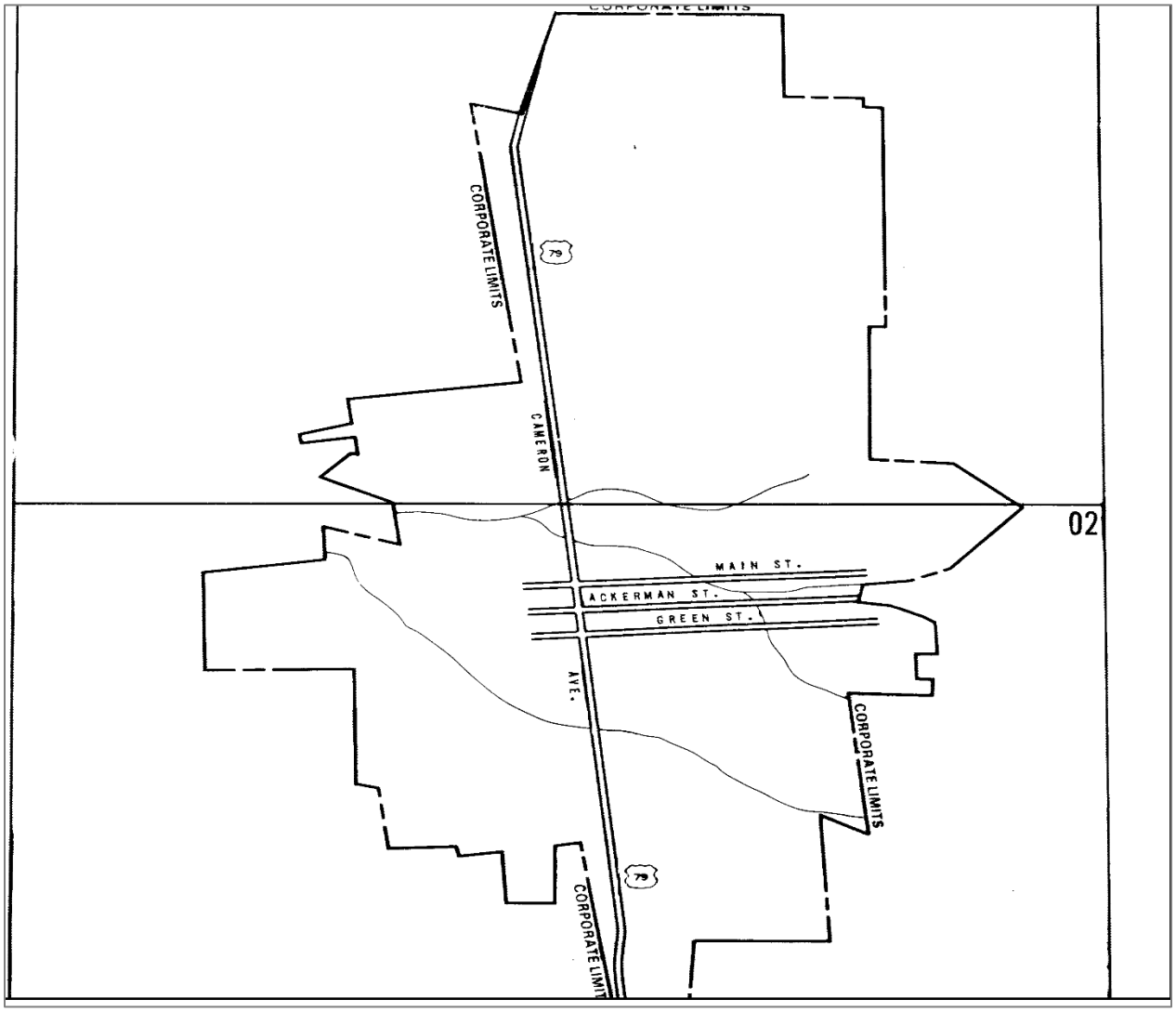
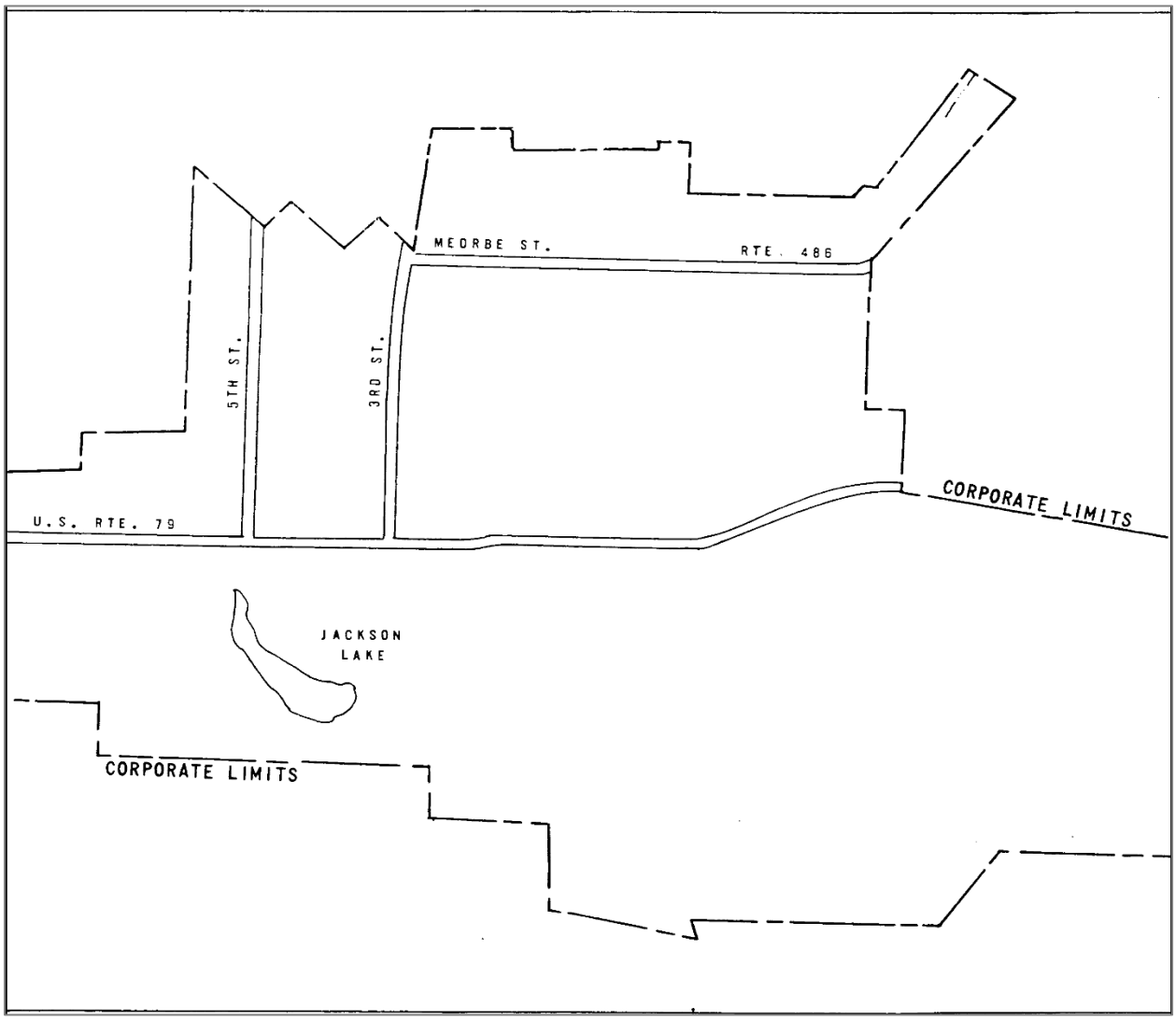


**Figure 6-5. Estimated Flood Zones in the City of Rockdale[1]**




[1] The City of Rockdale FEMA FIRM panels are not available in the map service center as there are no known Special Flood Hazard Areas (SFHA) identified within the corporate limits. The Rockdale index panel has an effective date of 2/27/1984.

**Figure 6-6. Estimated Flood Zones in the City of Thorndale[2]**




# Extent

The severity of a flood event is determined by a combination of several factors including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

Determining the intensity and magnitude of a flood event is dependent upon the flood zone and location of the flood hazard area in addition to depths of flood waters. Extent of flood damages can be expected to be more damaging in the areas that will convey a base flood. FEMA categorizes areas on

[2] The City of Thorndale FEMA FIRM panels are not available in the map service center as there are no known Special Flood Hazard Areas (SFHA) identified within the corporate limits. The Thorndale index panel has an effective date of 8/13/1976.

the terrain according to how the area will convey flood water. Flood zones are the categories that are mapped on Flood Insurance Rate Maps. Table 6-1 provides a description of FEMA flood zones and the flood impact in terms of severity or potential harm. Flood Zones A, AE, and X are the only hazard areas mapped in the region. Figures 6-1 through 6-6 should be read in conjunction with the extent for flooding in Tables 6-1, 6-2, and 6-3 to determine the intensity of a potential flood event.

**Table 6-1. Flood Zones**

| INTENSITY | ZONE | DESCRIPTION |
|---|---|---|
| HIGH | ZONE A | Areas with a one percent annual chance of flooding and a 26 percent 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 within these zones. |
| | ZONE A1-30 | These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a Base Flood Elevation (BFE) (old format). |
| | ZONE AE | The base floodplain where base flood elevations are provided. AE Zones are now used on the new format FIRMs instead of A1-A30 Zones. |
| | ZONE AO | River or stream flood hazard areas and areas with a one percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones. |
| | ZONE AH | Areas with a one percent annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones. |
| | ZONE A99 | Areas with a one percent 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 within these zones. |
| | ZONE AR | Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). 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. |
| MODERATE to LOW | ZONE X 500 | An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than one foot or with drainage areas less than one square mile; or an area protected by levees from 100-year flooding. |

Zone A is interchangeably referred to as the 100-year flood, the one-percent-annual chance flood, the Special Flood Hazard Area (SFHA), or more commonly, the base flood. This is the area that will convey

the base flood and constitutes a threat to the planning area. The impact from a flood event can be more damaging in areas that will convey a base flood.

Structures built in the SFHA are subject to damage by rising waters and floating debris. Moving flood water exerts pressure on everything in its path and causes erosion of soil and solid objects. Utility systems, such as heating, ventilation, air conditioning, fuel, electrical systems, sewage maintenance systems and water systems, if not elevated above base flood elevation, may also be damaged.

The intensity and magnitude of a flood event is also determined by the depth of flood waters. Table 6-2 below describes the category of risk and potential magnitude of an event in correlation to water depth. The water depths depicted in Table 6-2 are an approximation based on elevation data. Table 6-3 describes the extent associated with stream gauge data provided by the United States Geological Survey (USGS).

**Table 6-2. Extent Scale – Water Depth**

| SEVERITY | DEPTH (in feet) | DESCRIPTION |
|---|---|---|
| **BELOW FLOOD STAGE** | 0 to 15 | Water begins to exceed low sections of banks and the lowest sections of the floodplain. |
| **ACTION STAGE** | 16 to 23 | Flow is well into the floodplain, minor lowland flooding reaches low areas of the floodplain. Livestock should be moved from low lying areas. |
| **FLOOD STAGE** | 24 to 28 | Homes are threatened and properties downstream of river flows or in low lying areas begin to flood. |
| **MODERATE FLOOD STAGE** | 29 to 32 | At this stage the lowest homes downstream flood. Roads and bridges in the floodplain flood severely and are dangerous to motorists. |
| **MAJOR FLOOD STAGE** | 33 and above | Major flooding approaches homes in the floodplain. Primary and secondary roads and bridges are severely flooded and very dangerous. Major flooding extends well into the floodplain, destroying property, equipment, and livestock. |

**Table 6-3. Extent for Milam County[3]**

| JURISDICTION[4] | ESTIMATED SEVERITY PER FLOOD EVENT | PEAK FLOOD EVENT |
|---|---|---|
| Milam County | Moderate Flood Stage, 29 to 32 feet (29.9) | Major Flood Stage: Little River near the City of Cameron reached an overflow elevation of 49.5 feet in September of 1921. |
| Milam County | Below Flood Stage, 0 to 15 feet (13.1) | Action Stage: Little Pond Creek near the City of Burlington, reached an overflow elevation of 18.18 feet in April 2016. |
| Milam County | Moderate Flood Stage, 29 to 32 feet (30.2) | Major Flood Stage: Little River near the City of Rockdale reached an overflow elevation of 38.34 in December 1992. |
| Milam County | Flood Stage, 24 to 28 feet (24) | Major Flood Stage: Brushy Creek near the City of Rockdale reached an overflow elevation of 49.55 in September 1921. |
| Milam County | Flood Stage, 24 to 28 feet (26.8) | Major Flood Stage: San Gabriel River near the City of Rockdale reached an overflow elevation of 35.74 in December 1992. |
| Cameron | Action Stage, 16 to 23 feet (22.3) | Moderate Flood Stage: Big Elm Creek at SH 77 near the City of Cameron reached an overflow elevation of 27.71 feet in April of 2016. |

The range of flood intensity that the Milam County planning area can experience is high, or Zone A. Based on reporting from the USGS, a flood event can place the County at the extent of “Flood Stage” as shown in Tables 6-2 and 6-3. However, the Milam County planning area has experienced flooding over 49 feet. Based on historical occurrences the planning area, including all participating jurisdictions, could typically expect to experience up to 9 inches of rainfall within a 7 hour period, resulting in flash flooding

The data described in Tables 6-1 through 6-3, together with Figures 6-1 through 6-6, locally identified flood hazard areas and historical occurrences for the area, provides an estimated potential magnitude and severity for the County. For example the City of Cameron, as shown in Figure 6-2, has areas designated as Zone A and Zone AE. Reading this figure in conjunction with Table 6-1 means the area is an area of high risk for flood.

## Historical Occurrences

Historical evidence indicates that areas within the planning area are susceptible to flooding, especially in the form of flash flooding. It is important to note that only flood events that have been reported have been factored into this risk assessment, therefore it is likely that additional flood occurrences have gone unreported before and during the recording period. Table 6-4 identifies historical flood events that resulted in damages, injuries, or fatalities within the Milam County planning area, including all

[3] Severity estimated by averaging floods at certain stage level over the history of flood events. Severity and peak events are based on U.S. Geological Survey data.
[4] Severity is provided for jurisdictions where peak data was provided.

participating jurisdictions. Table 6-5 provides the historical flood event summary by jurisdiction. Historical Data is provided by the Storm Prediction Center (NOAA), NCEI database for Milam County.

**Table 6-4. Historical Flood Events, 1996-2017[5]**

| JURISDICTION | DATE | TIME | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|
| Cameron | 5/13/2004 | 7:09 AM | 0 | 0 | $3,303,845 | $0 |
| Buckholts | 1/13/2007 | 10:30 AM | 1 | 0 | $11,712 | $0 |
| Buckholts | 3/13/2007 | 12:00 AM | 0 | 0 | $11,712 | $0 |
| Thorndale | 5/1/2007 | 7:35 PM | 0 | 0 | $40,992 | $0 |
| Buckholts | 5/26/2007 | 10:00 AM | 0 | 0 | $117,120 | $0 |
| Cameron | 5/28/2007 | 5:25 AM | 0 | 0 | $11,712 | $0 |
| Milam County | 6/26/2007 | 11:00 PM | 0 | 0 | $11,712 | $0 |
| Rockdale | 7/12/2007 | 9:00 AM | 0 | 0 | $117,120 | $0 |
| Buckholts | 7/14/2007 | 5:03 AM | 0 | 0 | $936,960 | $0 |
| Rockdale | 5/24/2009 | 10:59 AM | 0 | 0 | $1,132 | $0 |
| Milam County | 9/12/2009 | 7:20 PM | 0 | 0 | $11,319 | $0 |
| Milam County | 9/13/2009 | 2:39 AM | 0 | 0 | $22,638 | $0 |
| Milam County | 9/13/2009 | 7:30 AM | 0 | 0 | $22,638 | $0 |
| Milam County | 10/26/2009 | 8:00 AM | 0 | 0 | $2,264 | $0 |
| Milam County | 2/3/2012 | 9:00 PM | 0 | 0 | $21,154 | $0 |
| Milam County | 2/4/2012 | 12:15 AM | 0 | 0 | $52,884 | $0 |
| Rockdale | 9/28/2013 | 11:44 PM | 0 | 0 | $104,242 | $0 |
| Milam County | 10/31/2013 | 5:00 AM | 0 | 0 | $104,242 | $0 |
| Thorndale | 10/31/2015 | 6:41 AM | 0 | 0 | $2,049 | $0 |
| Milam County | 4/17/2016 | 2:00 PM | 0 | 0 | $101,180 | $0 |
| Milam County | 5/19/2016 | 10:00 PM | 0 | 0 | $10,118 | $0 |
| Cameron | 5/23/2016 | 8:00 AM | 0 | 1 | $30,354 | $0 |

[5] Only recorded events with fatalities, injuries, and/or damages are listed, values are in 2017 dollars.

**Table 6-5. Summary of Historical Flood Events, 1996-2017**

| JURISDICTION | Number of Events | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| Milam County | 21 | 0 | 0 | $360,149 | $0 |
| Town of Buckholts | 5 | 1 | 0 | $1,077,504 | $0 |
| City of Cameron | 15 | 0 | 1 | $3,345,911 | $0 |
| City of Milano | 4 | 0 | 0 | $0 | $0 |
| City of Rockdale | 12 | 0 | 0 | $222,494 | $0 |
| City of Thorndale | 4 | 0 | 0 | $43,041 | $0 |
| **Total Losses** | **61** | **1** | **1** | **$5,049,099** | |

## Significant Events

**Flash Flood on May 13, 2004 – Milam County, Cameron**
Significant flooding was occurring in Cameron and surrounding towns. There were reports of numerous cars in ditches. Up to 11 inches of rain fell across the county, damaging over 250 homes and businesses. Damage estimates exceeded $3.3 million (2017 dollars).

**Flash Flood on January 13, 2007 – Milam County, Buckholts**
Cold air in place in combination with ample moisture and an upper level disturbance caused a mix of freezing rain and rain to fall across North Texas. Dozens of winter weather and flash flood incidents were reported with this event. In the Town of Buckholts a woman drowned after attempting to cross a flooded low-water crossing in her truck. The truck was found on January 15, but the woman's body was not located until the 18th. She was found off CR 147 near the Marak community. Water was also reported over roads near Davilla.

**Flash Flood on July 14, 2007 – Milam County, Buckholts, Cameron, Thorndale**
Highway 77 between Burlington and Cameron, FM 485 at CR 255 near Maysfield, and Highway 190 in Cameron were all flooded by about eight inches of water. FM 485 was partially washed out. Numerous roads were closed in the Buckholts/Cameron area including FM 1915 at Big Elm Creek, South Elm Creek, and Little River, FM 486 at Little River, and FM 1600 at Bear Creek. A dozen homes sustained water damage in Cameron, and four homes were flooded in the Thorndale-Thrall area. Four people were rescued from high water on the FM 2095 Snapdragon Bridge west of Hanover. One man refused help and elected to stay with the flooded vehicle.

**Flash Flood on April 17, 2016 – Milam County**
Up to 8 inches of rain resulted in flash flooding in Milam County; especially in the western portions of the county along many creeks, streams and rivers. A local newspaper specifically listed road closures at the following locations: FM 1915 at Big Elm Creek and also Little River, FM 1600 at Little River, FM 2269 at Big Elm Creek, FM 285 at North Elm Creek, FM 437 at Little River and also Donahue Creek, FM 487 at San Gabriel River, FM 908 at Brushy Creek, FM 486 at Little River and also Alligator Creek. The newspaper also listed pavement damage at the following locations: FM 1915 at Lipan Creek, FM 1600 at Bear/Little Bear Creek, FM 485 at North Elm Creek. At FM 486 at Alligator Creek, a car was

washed off the roadway, and the 2 occupants had to be rescued. Several other rescues were needed according to the county police chief.

## Probability of Future Events

Based on recorded historical occurrences and extent within the Milam County planning area, including all participating jurisdictions, flooding is highly likely and an event will likely occur within the next year.

## Vulnerability and Impact

A property's vulnerability to a flood depends on its location and proximity to the floodplain. Structures that lie along banks of a waterway are the most vulnerable and are often repetitive loss structures. The County and all participating jurisdictions encourage development outside of the floodplain. While the property damage impact for flood for the entire planning area is limited as facilities and services would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or suffer major damage. However, the past injury and fatality indicate a substantial impact with multiple deaths possible for some participating jurisdictions, depending on the scale of the storm.

Utilizing team input on locally identified flood hazard areas for Milam County and the City of Milano, the limited data flood maps for Buckholts, Rockdale and Thorndale, as well as the effective FIRM maps for the City of Cameron, it was determined that only three of the critical facilities identified in Appendix C are located in a known flood hazard area (Table 6-6). This data will be reviewed and updated upon completion of new Flood Insurance Rate Maps and/or completed Hydrology and Hydraulics (H&H) modeling within the planning area during the next plan update.

**Table 6-6. Critical Facilities in the Floodplain by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | None |
| Town of Buckholts | None |
| City of Cameron | Animal Shelter, Water Treatment Plant, Waste Water Treatment Plant |
| City of Milano | None |
| City of Rockdale | None |
| City of Thorndale | None |

Historic loss estimates due to flood are presented in Table 6-7 below. Considering 61 flood events over a 22-year period, frequency is approximately two to three events every year.

**Table 6-7. Potential Annualized Losses by Jurisdiction, 1996-2017**

| JURISDICTION | NUMBER OF EVENTS | DEATHS | INJURIES | PROPERTY & CROP LOSS | ANNUAL LOSS ESTIMATES |
|---|---|---|---|---|---|
| Milam County | 21 | 0 | 0 | $360,149 | $16,370 |
| Town of Buckholts | 5 | 1 | 0 | $1,077,504 | $48,977 |
| City of Cameron | 15 | 0 | 1 | $3,345,911 | $152,087 |
| City of Milano | 4 | 0 | 0 | $0 | $0 |
| City of Rockdale | 12 | 0 | 0 | $222,494 | $10,113 |
| City of Thorndale | 4 | 0 | 0 | $43,041 | $1,956 |
| Total | 61 | 1 | 1 | $5,049,099 | $229,504 |

The severity of a flooding event varies depending on the relative risk to citizens and structures located within each jurisdiction. Table 6-8 depicts the level of impact for Milam County and each participating jurisdiction.

**Table 6-8. Impact by Jurisdiction**

| JURISDICTION | IMPACT | DESCRIPTION |
|---|---|---|
| Milam County | Limited | Milam County could have injuries that would be treatable with first aid. Critical facilities would typically shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. |
| Town of Buckholts | Substantial | The Town of Buckholts could have limited property damage with critical facilities typically shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. However, the historical death resulting from flood indicates a substantial impact with multiple fatalities possible depending on the scale of the storm. |
| City of Cameron | Limited | The City of Cameron could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. |
| City of Milano | Limited | The City of Milano could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. |
| City of Rockdale | Limited | The City of Rockdale could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. |
| City of Thorndale | Limited | The City of Thorndale could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. |

## Assessment of Impacts

Flooding is the deadliest natural disaster that occurs in the U.S. each year, and it poses a constant and significant threat to the health and safety of the people in the entire Milam County planning area. Impacts to the planning area can include:

- Recreation activities at places such as the Brazos River may be unavailable and tourism can be unappealing for years following a large flood event, devastating directly related local businesses and negatively impacting economic recovery.
- Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm's way.
- Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.
- Health risks and threats to residents are elevated after the flood waters have receded due to contaminated flood waters (untreated sewage and hazardous chemicals) and mold growth typical in flooded buildings and homes.
- Significant flood events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Floods can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders are exposed to downed power lines, contaminated and potentially unstable debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities.
- Significant flooding can result in the inability of emergency response vehicles to access areas of the community.
- Critical staff may suffer personal losses or otherwise impacted by a flood event and unable to report for duty, limiting response capabilities.
- City or county departments may be flooded, delaying response and recovery efforts for the entire community.
- Private sector entities that the jurisdiction and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the flood may be negatively impacted while utilities are being restored or water recedes, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures substantially damaged by a flood may not be rebuilt for years and uninsured or underinsured residential structures may never be rebuilt, reducing the tax base for the community.

- Large floods may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Flooding may cause significant disruptions of clean water and sewer services, elevating health risks and delaying recovery efforts.
- The psycho-social effects on flood victims and their families can traumatize them for long periods of time, creating long term increases in medical treatment and services.
- Extensive or repetitive flooding can lead to decreases in property value for the affected community.
- Flood poses a potential catastrophic risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Flood related declines in production may lead to an increase in unemployment.
- Large floods may result in loss of livestock, potential increased livestock mortality due to stress and water borne disease, and increased cost for feed.

The overall extent of damages caused by floods is dependent on the extent, depth and duration of flooding, and the velocities of flows in the flooded areas. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a flood event.

## National Flood Insurance Program (NFIP) Participation

Flood insurance offered through the National Flood Insurance Program (NFIP) is the best way for home and business owners to protect themselves financially against the flood hazard. Milam County, Cameron, Rockdale, and Buckholts all participate in the NFIP and are in good standing. It is noted that while Milam County is a current participant in the NFIP, the unincorporated areas of the county are not mapped. The City of Rockdale and the Town of  are mapped with a limited study and no base flood elevations have been established.

The City of Milano and the Town of Thorndale do not currently participate in the NFIP. It should be noted that the City of Milano in not currently mapped. The City of Thorndale is mapped with a limited study but has no known Special Flood Hazard Areas (SFHA).

All participating jurisdictions currently have in place minimum NFIP standards for new construction and substantial improvements of structures.  All NFIP participants regulate development in the Special Flood Hazard Areas (SFHAs). These jurisdictions are considering adopting additional higher regulatory NFIP standards to limit floodplain development. The City of Milano and the City of Thorndale are considering joining the NFIP.

The flood hazard areas throughout the Milam County planning area are subject to periodic inundation, which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, of which adversely affect public safety.

These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed or otherwise protected from flood damage. Mitigation actions are included to address flood

maintenance issues as well, including routinely clearing debris from drainage systems and bridges and expanding drainage culverts and storm water structures to more adequately convey flood waters.

It is the purpose of Milam County and all participating jurisdictions to continue to promote the public health, safety and general welfare by minimizing public and private losses due to flood conditions in specific areas. All of the NFIP participating jurisdictions in the Plan are guided by their local Flood Damage Prevention Ordinance. These communities will continue to comply with NFIP requirements through their local permitting, inspection, and record-keeping requirements for new and substantially developed construction. Further, the NFIP program for both of the participating jurisdictions promotes sound development in floodplain areas and includes provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in floodplains;
- Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- Ensure that potential buyers are notified that property is in a flood area.

In order to accomplish these tasks, the Milam County planning area, including all participating jurisdictions, seek to follow these guidelines to achieve flood mitigation by:

- Restrict or prohibit uses that are dangerous to health, safety, or property in times of flood, such as filling or dumping, that may cause excessive increases in flood heights and/or velocities;
- Require that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction as a method of reducing flood losses;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters;
- Control filling, grading, dredging, and other development, which may increase flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

## NFIP Compliance and Maintenance

As mentioned, the Milam County planning area, including all participating jurisdictions, have developed mitigation actions that relate to either NFIP participation, maintenance or compliance. Compliance and maintenance actions can be found in Section 17.

Flooding was identified by the majority of the participating jurisdictions as a high risk hazard during hazard ranking activities at the Risk Assessment Workshop. As such, many of the mitigation actions were developed with flood mitigation in mind. A majority of these flood actions address compliance with the NFIP and implementing flood awareness programs. All jurisdictions recognize the need and are working towards adopting higher NFIP regulatory standards to further minimize flood risk in their community. In addition, all jurisdictions are focusing on NFIP public awareness activities. This includes promoting the availability of flood insurance by placing NFIP brochures and flyers in public libraries or public meeting places.

All participating jurisdictions in the NFIP have a designated floodplain administrator. The floodplain administrators in the planning area will continue to maintain compliance with the NFIP including continued floodplain administration, zoning ordinances, and development regulation. The floodplain ordinance adopted by each participating jurisdiction outlines the minimum requirements for development in special flood hazard areas.

## Repetitive Loss

The Severe Repetitive Loss (SRL) Grant Program under FEMA provides federal funding to assist states and communities in implementing mitigation measures to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential structures insured under the NFIP. The Texas Water Development Board (TWDB) administers the SRL grant program for the State of Texas. One of the goals of the FMA program is to reduce the burden of repetitive loss and severe repetitive loss properties on the NFIP through mitigation activities that significantly reduce or eliminate the threat of future flood damages.

Repetitive Loss properties are defined as structures that are:

- Any insurable building for which 2 or more claims of more than $1,000 each, paid by the National Flood Insurance Program (NFIP) within any 10-year period, since 1978;
- May or may not be currently insured under the NFIP.

Severe Repetitive Loss properties are defined as residential properties that are:

- Covered under the NFIP and have at least four flood related damage claim payments (building and contents) over $5,000.00 each, and the cumulative amount of such claims payments exceed $20,000; or
- At least two separate claim payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

In either scenario, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.[6] Table 6-9 shows repetitive loss and severe repetitive loss properties for the Milam County planning area, including all participating jurisdictions. There are no repetitive loss properties reported for the following jurisdictions: Town of Buckholts, City of Cameron, City of Milano, City of Rockdale, and City of Thorndale.

**Table 6-9. Repetitive Loss and Severe Repetitive Loss Properties**

| JURISDICTION | BUILDING TYPE | NUMBER OF STRUCTURES | NUMBER OF LOSSES |
|---|---|---|---|
| Milam County | Single Family | 1 | 4 |

[6] Source: Texas Water Development Board

# Section 7: Extreme Heat



## Hazard Description

Extreme heat is a prolonged period of excessively high temperatures and exceptionally humid conditions. Extreme heat during the summer months is a common occurrence throughout the State of Texas, and Milam County is no exception. The Milam County planning area, including all participating jurisdictions, typically experience extended heat waves. A heat wave is an extended period of extreme heat and is often accompanied by high humidity.

Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of citizens. The major human risks associated with severe summer heat include: heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and even heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirmed who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being.

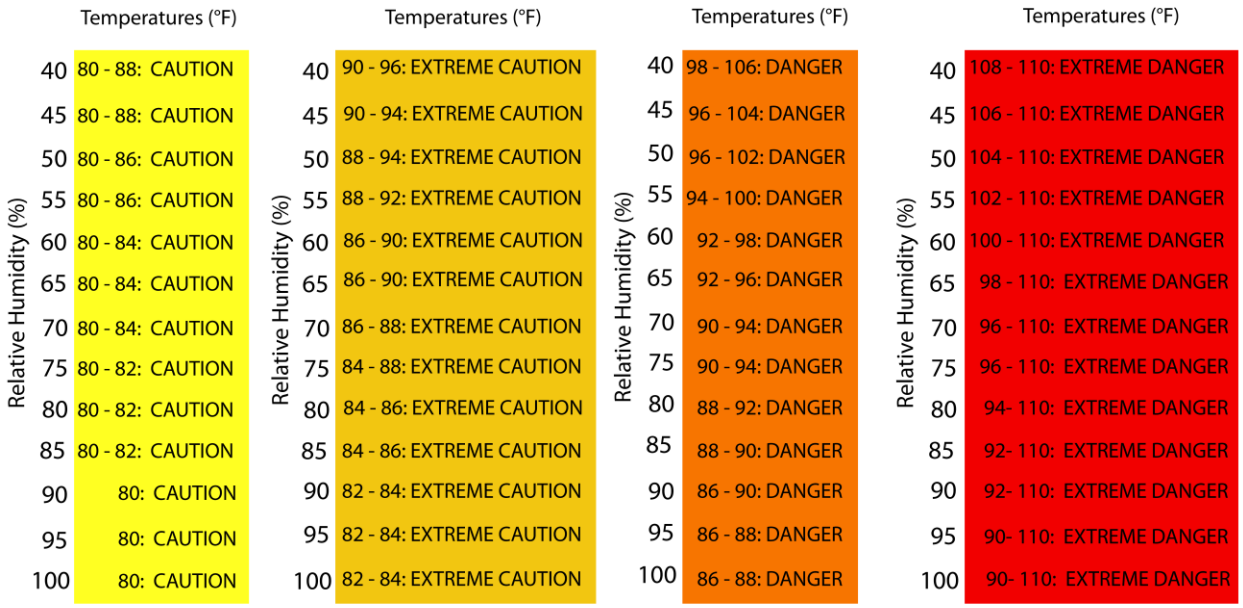
## Location

There is no specific geographic scope to the extreme heat hazard. Extreme heat could occur anywhere within the Milam County planning area, including all participating jurisdictions.

## Extent

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the “Heat Index” and is depicted in Figure 7-1. This index measures how hot it feels outside when humidity is combined with high temperatures.

**Figure 7.1 Extent Scale for Extreme Summer Heat[1]**




The Extent Scale in Figure 7-1 displays varying categories of caution depending on the relative humidity combined with the temperature. For example, when the temperature is at 90 degrees Fahrenheit (ºF) or lower, caution should be exercised if the humidity level is at or above 40 percent.

The shaded zones on the chart indicate varying symptoms or disorders that could occur depending on the magnitude or intensity of the event. “Caution” is the first category of intensity, and it indicates when fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps, or heat exhaustion are possible, and a “Danger” level means that these symptoms are likely. “Extreme Danger” indicates that heat stroke is likely. The National Weather Service (NWS) initiates alerts based on the Heat Index as shown in Table 7-1.

**Table 7-1. Heat Index and Warnings**

| CATEGORY | HEAT INDEX | POSSIBLE HEAT DISORDERS | WARNING TYPE |
|---|---|---|---|
| Extreme Danger | 125°F and higher | Heat stroke or sun stroke likely. | A heat advisory will be issued to warn that the Heat Index may exceed 105°F. |
| Danger | 103 – 124°F | Sunstroke, muscle cramps, and/or heat exhaustion are likely. Heatstroke possible with prolonged exposure and/or physical activity. | |
| Extreme Caution | 90 – 103°F | Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity. | An Excessive Heat Warning is issued if the Heat Index rises above 105°F at least 3 |

[1] Source: NOAA

| CATEGORY | HEAT INDEX | POSSIBLE HEAT DISORDERS | WARNING TYPE |
|---|---|---|---|
| Caution | 80 – 90°F | Fatigue is possible with prolonged exposure and/or physical activity. | hours during the day or above 80°F at night. |

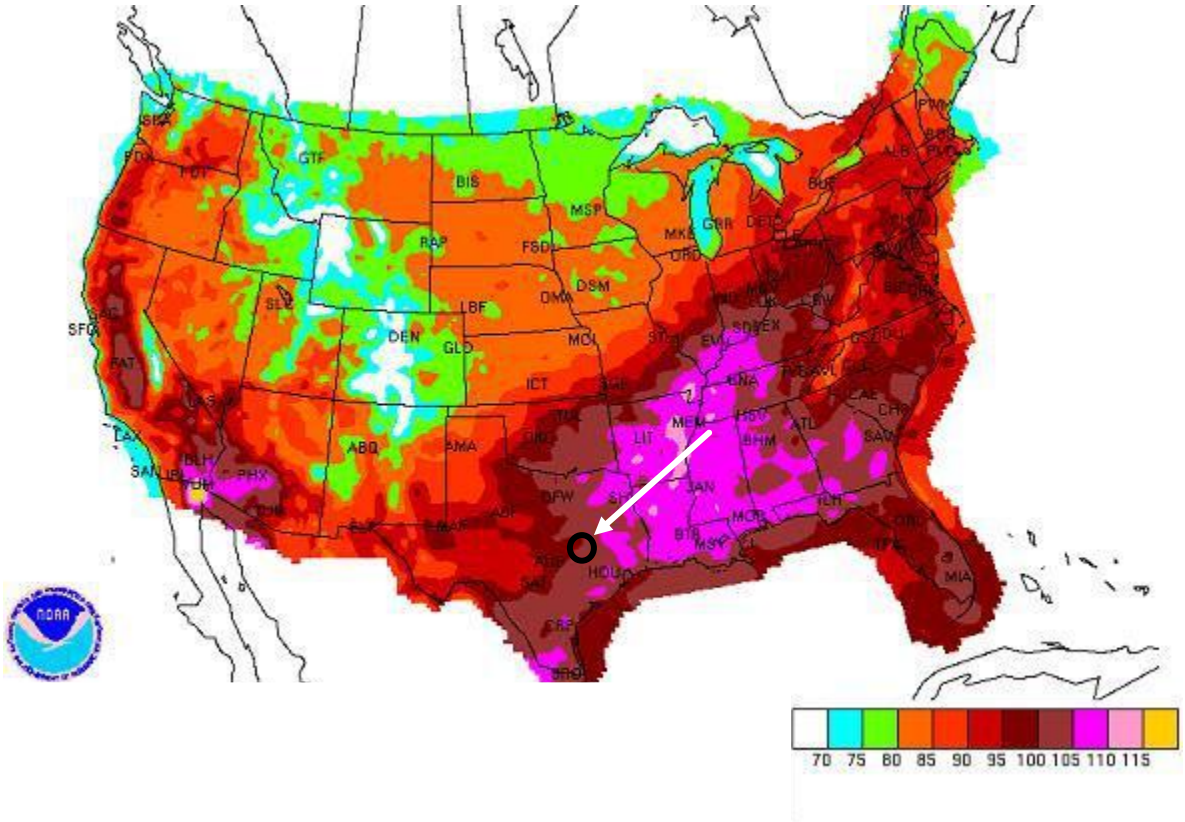
The southern and eastern portions of Milam County lie in the post oak savannah region of the state, and the northern and western portions lie in the blackland prairie. The land throughout the county in typically level to slightly rolling terrain at an elevation that ranges from 250 to 600 feet above sea level. The land is drained by the Brazos River, which forms the northeastern boundary of the county, by the Little River, which enters the county near the northwestern corner and winds to its mouth on the Brazos in the southeastern quadrant of the county, and by the San Gabriel River, which flows through the west central portion of the county to its mouth on the Little River. The climate is temperate; the average minimum temperature is 39° F in January, and the average high temperature is 96° in July.[2]

Due to its geography, and its warm, sunny, humid subtropical climate, the Milam County planning area, including all participating jurisdictions, can expect an extreme heat event each summer. Citizens, especially children and the elderly should exercise caution by staying out of the heat for prolonged periods when a heat advisory or excessive heat warning is issued. Also at risk are those working or remaining outdoors.

Figure 7-2 displays the daily maximum heat index as derived from NOAA based on data compiled from 1838 to 2015. The black circle shows the Milam County area. The colors brown and dark red indicate a daily maximum heat index of 95° to 105°F. Milam County, including all participating jurisdictions, could experience extreme heat from 90° to 105°F and should mitigate to the extent of "extreme caution," which can include sunstroke, muscle cramps, and heat exhaustion.

[2] Source: Texas State Historical Association, https://tshaonline.org/handbook/online/articles/hcm13

**Figure 7-2. Average Daily Maximum Heat Index Days[3]**




# Historical Occurrences

Every summer, the hazard of heat-related illness becomes a significant public health issue throughout much of the US. Mortality from all causes increases during heat waves, and excessive heat is an important contributing factor to deaths from other causes, particularly among the elderly. Table 7-2 depicts historical occurrences of mortality from heat from 1994 to 2008 from the Texas Department of State Health Services and 2009 through 2017 from the NCEI database.

**Table 7-2. Extreme Heat Related Deaths in Texas**

| YEAR | DEATHS |
|---|---|
| **1994** | 1 |
| **1995** | 12 |
| **1996** | 10 |
| **1997** | 2 |

[3] Source: NRDC and the black circle indicates the Milam County planning area.

| YEAR | DEATHS |
|---|---|
| **1998** | 66 |
| **1999** | 22 |
| **2000** | 71 |
| **2001** | 20 |
| **2002** | 1 |
| **2003** | 62 |
| **2004** | 53 |
| **2005** | 111 |
| **2006** | 104 |
| **2007** | 43 |
| **2008** | 66 |
| **2009** | 6 |
| **2010** | 4 |
| **2011** | 46 |
| **2012** | 3 |
| **2013** | 2 |
| **2014** | 0 |
| **2015** | 5 |
| **2016** | 6 |
| **2017** | 2 |

Because the Texas Department of State Health Services reports on total events statewide, previous occurrences for extreme heat are derived from the NCEI database. According to heat related incidents located solely within Milam County, there are five heat waves[4] on record for Milam County, including all participating jurisdictions (Table 7-3). Historical extreme heat information, as provided by the NCEI, shows extreme heat activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical extreme heat data for all participating jurisdictions are provided on a County-wide basis per the NCEI database. Only extreme heat events

[4] Even though the County experiences heat waves each summer, NCEI data only records events reported. Based on reports, only eight events are on record.

that have been reported have been factored into this Risk Assessment. It is likely additional extreme heat occurrences have gone unreported before and during the recording period.

**Table 7-3. Historical Extreme Heat Events, 1996-2017**

| JURISDICTION | DATE | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| Milam County | 7/1/1998 | 0 | 0 | $0 | $0 |
| Milam County | 8/1/1999 | 0 | 0 | $0 | $0 |
| Milam County | 7/1/2000 | 0 | 0 | $0 | $0 |
| Milam County | 8/1/2000 | 0 | 0 | $0 | $0 |
| Milam County | 9/1/2000 | 0 | 0 | $0 | $0 |
| **TOTALS** | | **0** | **0** | **$0** | **$0** |

### Significant Events

**July 7, 1998**
A prolonged excessive heat event continued across north Texas in July. This heat wave was the result of existing drought conditions combined with a persistent upper level ridge of high pressure. The average low of 80.8 degrees was the warmest average low for any month. The monthly average temperature of 91.6 degrees was the second warmest month on record. During July, the heat wave claimed at least 32 lives in north Texas, though no fatalities were reported in the Milam County planning area. Most of the fatalities were elderly, and many fatalities listed other complicating factors, such as heart disease and hypertension.

## Probability of Future Events

Average high temperatures for the planning area through the summer months indicate a probability of one event or more every year. This frequency supports a highly likely probability of future events.

## Vulnerability and Impact

There is no defined geographic boundary for extreme heat events. While the entire Milam County planning area, including all participating jurisdictions, is exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not likely to sustain significant damage from extreme heat events. Therefore, any estimated property losses associated with the extreme heat hazard are anticipated to be minimal across the area.

Extreme temperatures do however present a significant threat to life and safety for the population of the County as a whole. Heat casualties for example are typically caused by a lack of adequate air-conditioning or heat exhaustion. The most vulnerable population to heat casualties are the elderly or infirmed who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being.

Students and those participating in physical activity in the planning area are also susceptible as sporting events and practices are often held outside during early fall or late spring when temperatures are at the highest. Another segment of the population at risk are those whose jobs consist of strenuous labor outdoors. Additionally, livestock and crops can become stressed, decreasing in quality or in production, during times of extreme heat.

The population over 65 in the Milam County planning area is estimated at 20% of the total population and children under the age of 5 are estimated at 6.5%, or an estimated total of 6,591[5] potentially vulnerable residents in the planning area based on age (Table 7-4).

**Table 7-4. Populations at Greater Risk by Jurisdiction**

| JURISDICTION | POPULATION 65 AND OLDER | POPULATION UNDER 5 |
|---|---|---|
| Milam County[6] | 4,974 | 1,617 |
| Town of Buckholts | 105 | 34 |
| City of Cameron | 1,114 | 362 |
| City of Milano | 85 | 28 |
| City of Rockdale | 1,124 | 365 |
| City of Thorndale | 269 | 87 |

Extreme high temperatures can have significant secondary impacts, leading to droughts, water shortages, increased fire danger, and prompt excessive demands for energy. The possibility of rolling blackouts increases with unseasonably high temperatures in what is a normally mild month with low power demands.

Typically more than 12 hours of warning time would be given before the onset of an extreme heat event. Only minor property damage would result. The potential impact of excessive summer heat is considered “Substantial” resulting in multiple potential deaths for the Milam County planning area, including all participating jurisdictions.

In terms of vulnerability to structures, the impact from extreme heat would be negligible. It is possible that critical facilities and infrastructure could be shut down for 24 hours if cooling units are running constantly, leading to a temporary power outage. Less than ten percent of residential and commercial property could be damaged if extreme heat events lead to structure fires. Based on historical records over a 22-year period, annualized losses for the Milam County planning area are negligible.

## Assessment of Impacts

The greatest risk from extreme heat is to public health and safety. Potential impacts the community may include:

- Vulnerable populations, particularly the elderly and children under five, can face serious or life-threatening health problems from exposure to extreme heat including hyperthermia, heat cramps, heat exhaustion, and heat stroke (or sunstroke).

[5] U.S. Census Bureau 2016 data for Milam County

[6] County totals includes all incorporated jurisdictions and unincorporated areas.

- Response personnel, including utility workers, public works personnel, and any other professions where individuals are required to work outside, are more subject to extreme heat related illnesses since their exposure would typically be greater.
- High energy demand periods can outpace the supply of energy, potentially creating the need for rolling brownouts which would elevate the risk of illness to vulnerable residents.
- Highways and roads may be damaged by excessive heat causing asphalt roads to soften and concrete roads to shift or buckle.
- Vehicles engines and cooling systems typically run harder during extreme heat events resulting in increases in mechanical failures.
- Extreme heat events during times of drought can exacerbate the environmental impacts associated with drought, decreasing water and air quality and further degrading wildlife habitat.
- Extreme heat increases ground-level ozone (smog), increasing the risk of respiratory illnesses.
- Tourism and recreational activities predominant along the Brazos River area may be negatively impacted during extreme heat events, reducing seasonal revenue.
- Food suppliers can anticipate an increase in food costs due to increases in production costs and crop and livestock losses.
- Fisheries may be negatively impacted by extreme heat, suffering damage to fish habitats (either natural or man-made) and a loss of fish and/or other aquatic organisms due to decreased water flows or availability.
- Negatively impacted water suppliers may face increased costs resulting from the transport of water resources or development of supplemental water resources.
- Outdoor activities at Ledbetter Park and Sugarloaf Mountain may see an increase in injury or illness during extreme heat events.

The economic and financial impacts of extreme heat on the community will depend on the duration of the event, demand for energy, drought associated with extreme heat, and many other factors. The level of preparedness and the amount of planning done by the jurisdiction, local businesses, and citizens will impact the overall economic and financial conditions before, during, and after an extreme heat event.

# Section 8: Tornado



## Hazard Description

Tornadoes are among the most violent storms on the planet. A tornado is a rapidly rotating column of air extending between, and in contact with, a cloud and the surface of the earth. The most violent tornadoes are capable of tremendous destruction and have wind speeds of 250 miles per hour or more. In extreme cases, winds may approach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long.

The most powerful tornadoes are produced by "Supercell Thunderstorms." These thunderstorms are created when horizontal wind shears (winds moving in different directions at different altitudes) begin to rotate the storm. This horizontal rotation can be tilted vertically by violent updrafts, and the rotation radius can shrink, forming a vertical column of very quickly swirling air. This rotating air can eventually reach the ground, forming a tornado**.**

**Table 8-1. Variations Among Tornadoes**

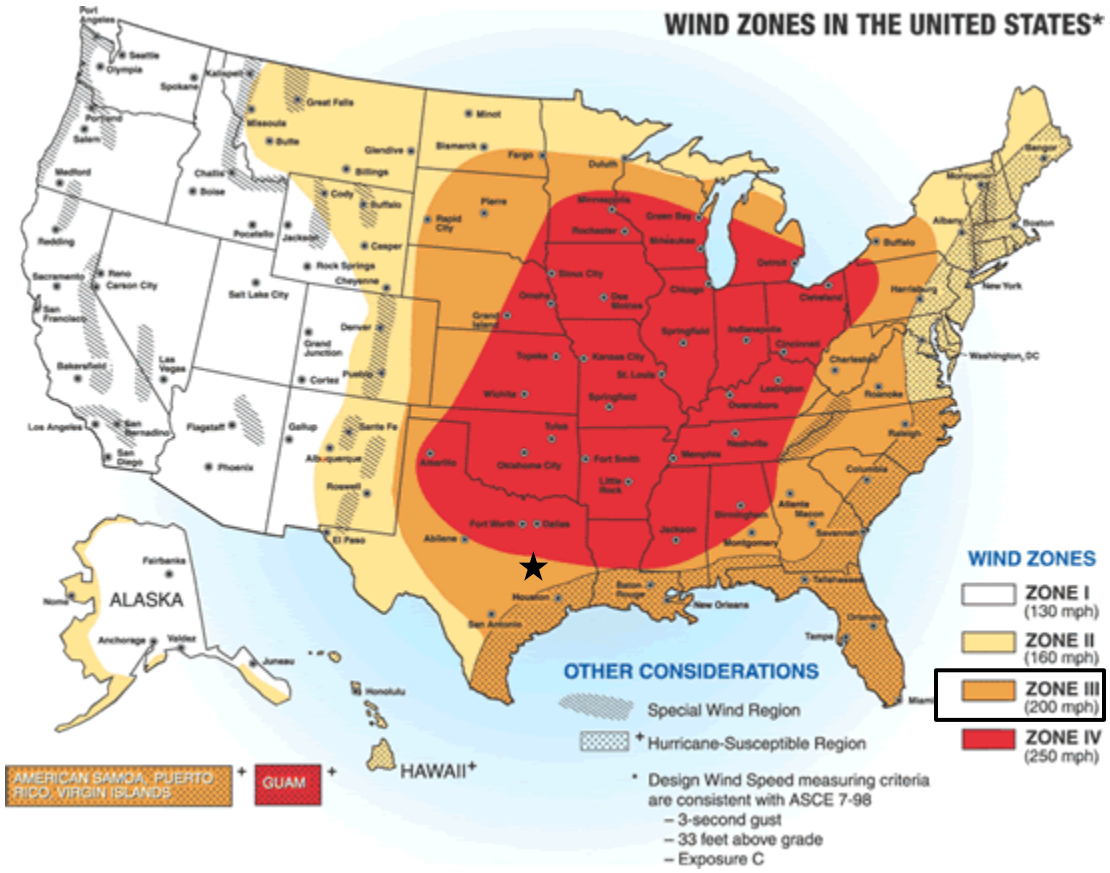
| WEAK TORNADOES | STRONG TORNADOES | VIOLENT TORNADOES |
|---|---|---|
| ➢ 69% of all tornadoes<br>➢ Less than 5% of tornado deaths<br>➢ Lifetime 1-10+ minutes<br>➢ Winds less than 110 mph | ➢ 29% of all tornadoes<br>➢ Nearly 30% of all tornado deaths<br>➢ May last 20 minutes or longer<br>➢ Winds 110 – 205 mph | ➢ 2% of all tornadoes<br>➢ 70% of all tornado deaths<br>➢ Lifetime can exceed one hour<br>➢ Winds greater than 205 mph |

## Location

Tornadoes do not have any specific geographic boundary and can occur throughout the County uniformly. It is assumed that the entire Milam County planning area including all participating

jurisdictions, are uniformly exposed to tornado activity. The entire Milam County planning area is located in Wind Zone III (Figure 8-1), where tornado winds can be as high as 200 mph.

**Figure 8-1. FEMA Wind Zones in the United States[1]**




# Extent

The destruction caused by tornadoes ranges from light to inconceivable, depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, such as residential homes (particularly mobile homes).

[1] Milam County is indicated by the star.

**Table 8-2. The Fujita Tornado Scale[2]**

| F-SCALE NUMBER | INTENSITY | WIND SPEED (MPH) | TYPE OF DAMAGE DONE | PERCENT OF APPRAISED STRUCTURE VALUE LOST DUE TO DAMAGE |
|---|---|---|---|---|
| **F0** | Gale Tornado | 40 – 72 | Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards. | None Estimated |
| **F1** | Moderate Tornado | 73 – 112 | The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; attached garages may be destroyed. | 0% – 20% |
| **F2** | Significant Tornado | 113 – 157 | Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated. | 50% – 100% |
| **F3** | Severe Tornado | 158 – 206 | Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted. | 100% |
| **F4** | Devastating Tornado | 207 – 260 | Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated. | 100% |
| **F5** | Incredible Tornado | 261 – 318 | Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles flying through the air in excess of 330 yards; trees debarked; steel reinforced concrete badly damaged. | 100% |

Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (Table 8-2). Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale (Table 8-3), which retains the same basic design and six strength categories as the previous scale. The newer scale reflects more refined assessments of tornado damage surveys, standardization, and damage consideration to a wider range of structures.

[2] Source: http://www.tornadoproject.com/fscale/fscale.htm

**Table 8-3. Enhanced Fujita Scale for Tornadoes**

| STORM CATEGORY | DAMAGE LEVEL | 3 SECOND GUST (MPH) | DESCRIPTION OF DAMAGES | PHOTO EXAMPLE |
|---|---|---|---|---|
| **EF0** | Gale | 65 – 85 | Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards. |  |
| **EF1** | Weak | 86 – 110 | The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; attached garages may be destroyed. |  |
| **EF2** | Strong | 111 – 135 | Considerable damage; roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated. |  |
| **EF3** | Severe | 136 – 165 | Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted. |  |
| **EF4** | Devastating | 166 – 200 | Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated. |  |
| **EF5** | Incredible | 200+ | Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles flying through the air in excess of 330 yards; trees debarked; steel reinforced concrete badly damaged. |  |

Both the Fujita Scale and Enhanced Fujita Scale should be referenced in reviewing previous occurrences since tornado events prior to 2007 will follow the original Fujita Scale. The largest magnitude reported within the planning area is F3 on the Fujita Scale, a “Severe Tornado.” Based on the planning areas location in Wind Zone III, the planning area, including all participating jurisdictions, could experience anywhere from an EF0 to EF5 depending on the wind speed.

The events in Milam County have been between EF0 and EF3 (Table 8-4). Therefore, the range of intensity that the Milam County planning area, including all participating jurisdictions, would be expected to mitigate is a tornado event that would be a low to severe risk, an EF0 to EF3.

## Historical Occurrences

Only reported tornadoes were factored into the Risk Assessment. It is likely that a high number of occurrences have gone unreported over the past 68 years.

Figure 8-2 identifies the locations of previous occurrences in the Milam County planning area from 1950 through 2017. A total of 19 events have been recorded by the Storm Prediction Center (NOAA) and NCEI databases for the Milam County planning area. The most significant event reported occurred in Milam County on May 25, 2015. The EF2 tornado and associated storm system was 400 yards wide and stayed on the ground for almost nine miles. The tornado caused substantial damage in the county, exceeding more than $717,000 in damages in 2017 dollars. The tornado resulted in 1 fatality and 6 injuries. It is important to note that some participating jurisdictions may not have a historical record of a tornado event occurring however they can still be impacted and have disrupted services such as fire, police and ems as well as disruption in other areas such as economy.

**Figure 8-2. Spatial Historical Tornado Events, 1950-2017**[3]

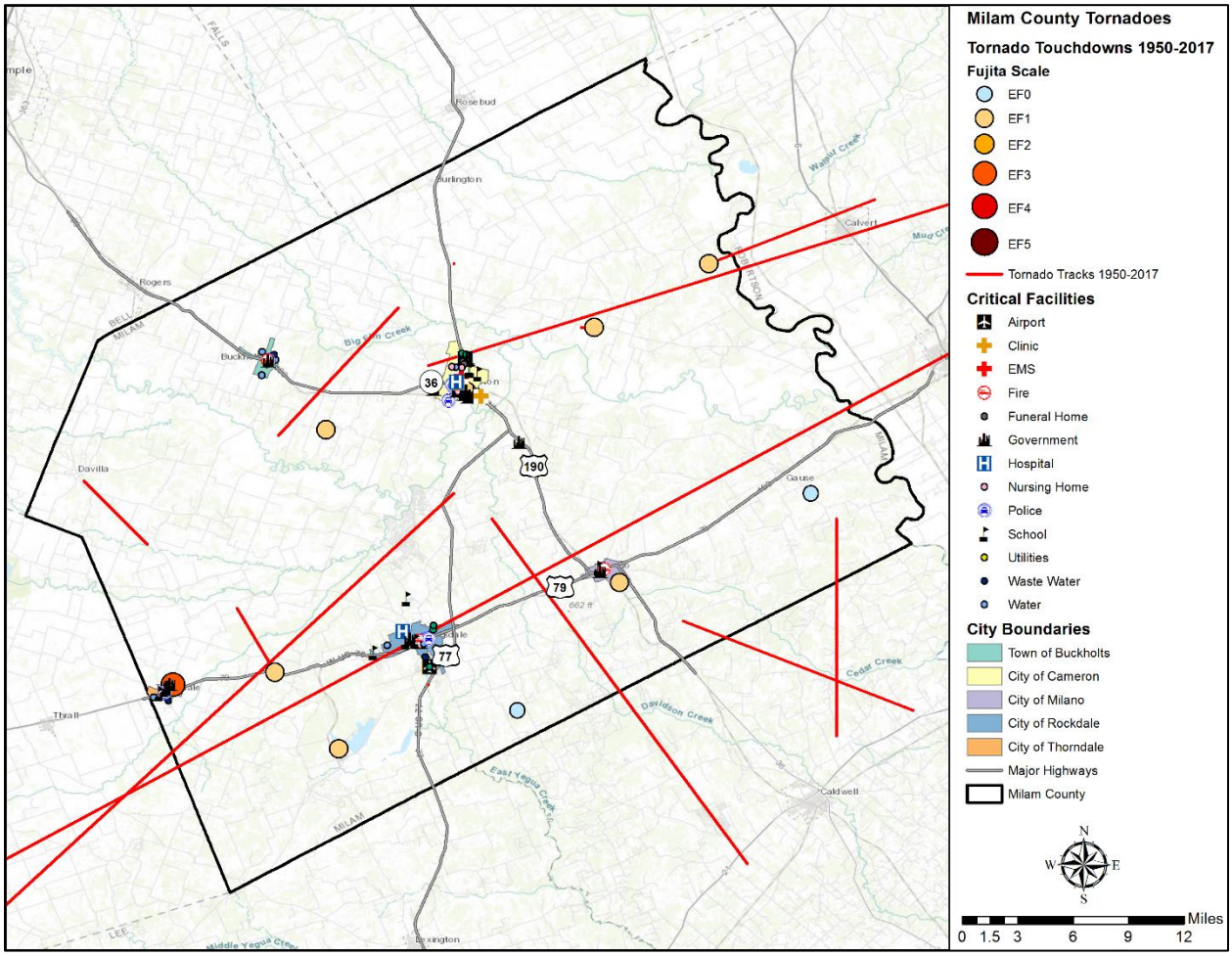



**Table 8-4. Historical Tornado Events, 1950-2017**[4]

| JURISDICTION | DATE | TIME | MAGNITUDE | DEATH | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|---|
| Milam County | 4/30/1954 | 6:30 AM | F3 | 0 | 0 | $2,256,868 | $0 |

[3] Source: NOAA Records
[4] Only recorded events with fatalities, injuries, and/or damages are listed.

| JURISDICTION | DATE | TIME | MAGNITUDE | DEATH | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|---|
| Milam County | 5/6/1955 | 7:30 PM | F2 | 0 | 0 | $2,265,289 | $0 |
| Milam County | 4/24/1957 | 12:00 PM | F0 | 0 | 0 | $2,160,489 | $0 |
| Milam County | 1/20/1973 | 9:00 PM | F1 | 0 | 0 | $136,734 | $0 |
| Milam County | 11/23/1973 | 12:00 PM | F1 | 0 | 0 | $136,734 | $0 |
| Milam County | 4/29/1975 | 3:45 PM | F2 | 0 | 0 | $1,128,434 | $0 |
| Milam County | 9/11/1977 | 3:45 PM | F0 | 0 | 0 | $100,181 | $0 |
| Milam County | 5/13/1980 | 1:30 PM | F1 | 0 | 0 | $736,769 | $0 |
| Milam County | 5/9/1981 | 2:00 PM | F2 | 0 | 0 | $667,874 | $0 |
| Milam County | 11/15/1987 | 12:30 PM | F2 | 0 | 0 | $5,344,168 | $0 |
| Milam County | 6/7/1989 | 6:40 PM | F2 | 0 | 0 | $4,895,948 | $0 |
| Milam County | 9/21/1992 | 6:40 PM | F1 | 0 | 3 | $43,271 | $0 |
| Cameron | 9/20/1996 | 6:11 PM | F1 | 0 | 0 | $108,341 | $0 |
| Milano | 9/20/1996 | 6:20 PM | F1 | 0 | 0 | $6,191 | $0 |
| Milam County | 6/26/2004 | 5:05 PM | F1 | 1 | 0 | $13,283 | $0 |
| Milam County | 5/25/2015 | 2:55 PM | EF2 | 1 | 6 | $717,195 | $61,474 |
| **TOTALS** | | | | **2** | **9** | **$22,308,089** | **$61,474** |

**Table 8-5. Summary of Historical Tornado Events, 1950-2017**

| JURISDICTION | Number of Events | MAGNITUDE | FATALITIES | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|
| Milam County | 17 | F3 | 2 | 9 | $20,603,237 | $61,474 |
| Town of Buckholts | 0 | N/A | N/A | N/A | N/A | N/A |
| City of Cameron | 1 | F1 | 0 | 0 | $108,341 | $0 |
| City of Milano | 1 | F1 | 0 | 0 | $6,191 | $0 |
| City of Rockdale | 0 | N/A | N/A | N/A | N/A | N/A |
| City of Thorndale | 0 | N/A | N/A | N/A | N/A | N/A |
| **TOTAL LOSSES** | | **(Max Extent)** | | | **$20,779,243** | |

## Significant Events

**November 15, 1987 – Milam County**
On Sunday, November 15, 1987, a tornado hit Milam County late in the afternoon. The tornado was part of a larger storm system that destroyed scores of homes and businesses, killed 10 people, and injured approximately 160 others in central and eastern Texas. While injuries and fatalities were all located outside of the planning area, Milan County reported damages in excess of 5.3 million (2017 dollars).

**May 25, 2015 – Milam County**
A stalled cold front, combined with abundant moisture from the Gulf of Mexico combined to produce widespread rain and thunderstorms in Texas. Several rounds of strong to severe thunderstorms occurred during a four day period, producing flash flooding, and numerous reports of large hail. Tornadoes affected areas in central Texas, from near Lampasas to a deadly tornado in Milam County. A National Weather Service damage survey team found evidence of a tornado which produced EF-2 damage. The tornado first occurred near the community of Pettibone, and moved northeast across central Milam County. The tornado damaged or destroyed approximately 12 homes, mobile homes, and farm buildings. Several locations suffered tree damage as well. The tornado was strongest as it approached US 190, between Milam County roads 201 and 206. In this area, the tornado was at its widest, and affected the most buildings. One fatality and six injuries were attributed to the tornado.

# Probability of Future Events

Tornadic storms can occur at any time of year and at any time of day, but they are typically more common in the spring months during the late afternoon and evening hours. A smaller, high frequency period can emerge in the fall during the brief transition between the warm and cold seasons. According to historical records, Milam County can experience a tornado touchdown approximately once every three to four years. This frequency supports a likely probability of future events for Milam County, including all participating jurisdictions.

# Vulnerability and Impact

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities, and populations in Milam County are considered to be exposed to this hazard and could potentially be impacted. The damage caused by a tornado is typically a result of high wind velocity, wind-blown debris, lightning, and large hail.

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, three types of structures are more likely to suffer damage:

- Manufactured Homes;
- Homes on crawlspaces (more susceptible to lift); and
- Buildings with large spans, such as shopping malls, gymnasiums, and factories.

Tornadoes can cause a significant threat to people as they could be struck by flying debris, falling trees/branches, utility lines, and poles. Blocked roads could prevent first responders to respond to

calls. Tornadoes commonly cause power outages which could cause health and safety risks to residents, as well as to patients in hospitals.

The Milam County planning area features multiple mobile or manufactured home parks throughout the planning area, including all participating jurisdictions. These parks are typically more vulnerable to tornado events than typical site built structures. In addition, manufactured homes are located sporadically throughout the planning area including participating jurisdictions and unincorporated county which would also be more vulnerable. The US Census data indicates a total of 1,828 manufactured homes located in the Milam County planning area (16.1%), including participating jurisdictions and unincorporated county (Table 8-6). In addition, 53.9% (approximately 6,112 structures) of the single family residential (SFR) structures in the entire planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant tornado events.

**Table 8-6. Structures at Greater Risk by Jurisdiction**

| JURISDICTION | MANUFACTURED HOMES | SFR STRUCTURES BUILT BEFORE 1980 |
|---|---|---|
| Milam County[5] | 1,828 | 6,112 |
| Town of Buckholts | 41 | 156 |
| City of Cameron | 177 | 1,790 |
| City of Milano | 26 | 98 |
| City of Rockdale | 316 | 1,504 |
| City of Thorndale | 115 | 422 |

The following critical facilities would be vulnerable to tornado events in each participating jurisdiction:

**Table 8-7. Critical Facilities at Risk by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | Communications Tower, 8 Rural Water Supply Facilities, School |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations, School |
| City of Cameron | Airport (and 3 support facilities), 5 Government/Civic Facilities, Library, Museum, Animal Shelter, 2 Water Towers, Police Station, Fire Station, EMS (with support facility), Water Treatment Plant, Waste Water Treatment Plant, 3 Public Works Support Facilities, Sheriff's Office/County Jail, Communications Tower, 2 Funeral Homes, 2 Nursing Homes, Hospital, 2 Health Clinics, 4 Schools, Hike and Bike Trail Support Facilities |
| City of Milano | Fire Department, 3 Schools, Water Department, Civic Center, Community Center, EMS/Ambulance |

[5] County totals includes all jurisdictions and unincorporated areas within the county.

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| City of Rockdale | Government Facility, Hospital, Nursing Home, 2 Police Stations, Fire Station, Water Treatment Plant, Waste Water Treatment Plant, 4 Schools, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, Police/Fire/EMS/Government Facility, 5 Schools, Fire Station Command Facility/Evacuation Center |

The average loss estimate of property and crop is $20,779,243 (in 2017 dollars), having an approximate annual loss estimate of $305,577 (Table 8-8). Based on historic loss and damages, the impact of tornado on the Milam County planning area, including all participating jurisdictions, can be considered "Minor," with more than 10 percent of property expected to be destroyed. However, the number of injuries and fatalities indicates a "Substantial" impact.

**Table 8-8. Potential Annualized Losses by Jurisdiction, 1950-2017**

| JURISDICTION | PROPERTY & CROP LOSS | ANNUAL LOSS ESTIMATES |
|---|---|---|
| Milam County | $20,664,711 | $303,893 |
| Town of Buckholts | $0 | $0 |
| City of Cameron | $108,341 | $1,593 |
| City of Milano | $6,191 | $91 |
| City of Rockdale | $0 | $0 |
| City of Thorndale | $0 | $0 |
| **Planning Area** | **$20,779,243** | **$305,577** |

## Assessment of Impacts

Tornadoes have the potential to pose a significant risk to the population and can create dangerous situations. Often times, providing and preserving public health and safety is difficult. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Manufactured homes may suffer substantial damage as they would be more vulnerable than typical site built structures.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- Tornadoes often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.

- Extended power outages can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Tornadoes can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders must enter the damage area shortly after the tornado passes to begin rescue operations and to organize cleanup and assessments efforts, therefore they are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities, loss of communications, and damaged emergency vehicles and equipment.
- City or county departments may be damaged or destroyed, delaying response and recovery efforts for the entire community.
- Private sector entities that the City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long- term loss in revenue.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the tornado may be negatively impacted while roads and utilities are being restored, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures destroyed by a tornado may not be rebuilt for years, reducing the tax base for the community.
- Large or intense tornadoes may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Recreation activities may be unavailable and tourism can be unappealing for years following a large tornado, devastating directly related local businesses.

The economic and financial impacts of a tornado event on the community will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a tornado event.

# Section 9: Hail



## Hazard Description

Hailstorm events are a potentially damaging outgrowth of severe thunderstorms. During the developmental stages of a hailstorm, ice crystals form within a low pressure front due to the rapid rising of warm air into the upper atmosphere, and the subsequent cooling of the air mass. Frozen droplets gradually accumulate into ice crystals until they fall as precipitation that is round or irregularly shaped masses of ice typically greater than 0.75 inches in diameter. The size of hailstones is a direct result of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a by-product of heating on the Earth's surface. Higher temperature gradients above Earth's surface result in increased suspension time and hailstone size.

## Location

Hailstorms are an extension of severe thunderstorms that could potentially cause severe damage. As a result, they are not confined to any specific geographic location and can vary greatly in size, location, intensity, and duration. Therefore, the Milam County planning area, including all participating jurisdictions, are equally at risk to the hazard of hail.

## Extent

The National Weather Service (NWS) classifies a storm as "severe" if there is hail three-quarters of an inch in diameter (approximately the size of a penny) or greater, based on radar intensity or as seen by observers. The intensity category of a hailstorm depends on hail size and the potential damage it could cause, as depicted in the National Centers for Environmental Information (NCEI) Intensity Scale in Table 9-1.

**Table 9-1. Hail Intensity and Magnitude[1]**

| 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 Pong Ball | 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 |

The intensity scale in Table 9-1 ranges from H0 to H10, with increments of intensity or damage potential in relation to hail size (distribution and maximum), texture, fall speed, speed of storm translation, and strength of the accompanying wind. Based on available data regarding the previous occurrences for the area, the Milam County planning area may experience hailstorms ranging from an H0 to an H10. The County can mitigate a storm from low risk or hard hail to a super hailstorm with baseball size hail that leads to extensive structural damage and could cause fatal injuries.

## Historical Occurrences

Historical evidence shown in Figure 9-1 demonstrates that the planning area is vulnerable to hail events overall, which typically result from severe thunderstorm activity. Historical events with reported damages, injuries, or fatalities are shown in Table 9-2. A total of 69 reported historical hail events impacted the Milam County planning area between 1955 and 2017 (Summary Table 9-3). These events were reported to NCEI and NOAA databases and may not represent all hail events to have

[1] NCEI Intensity Scale, based on the TORRO Hailstorm Intensity Scale.

occurred during the past 63 years. Only those events for the Milam County planning area with latitude and longitude available were plotted (Figure 9-1).

Historical hail data for the following are provided within a City-wide basis per the NCEI database.

**Figure 9-1. Spatial Historical Hail Events, 1955-2017**

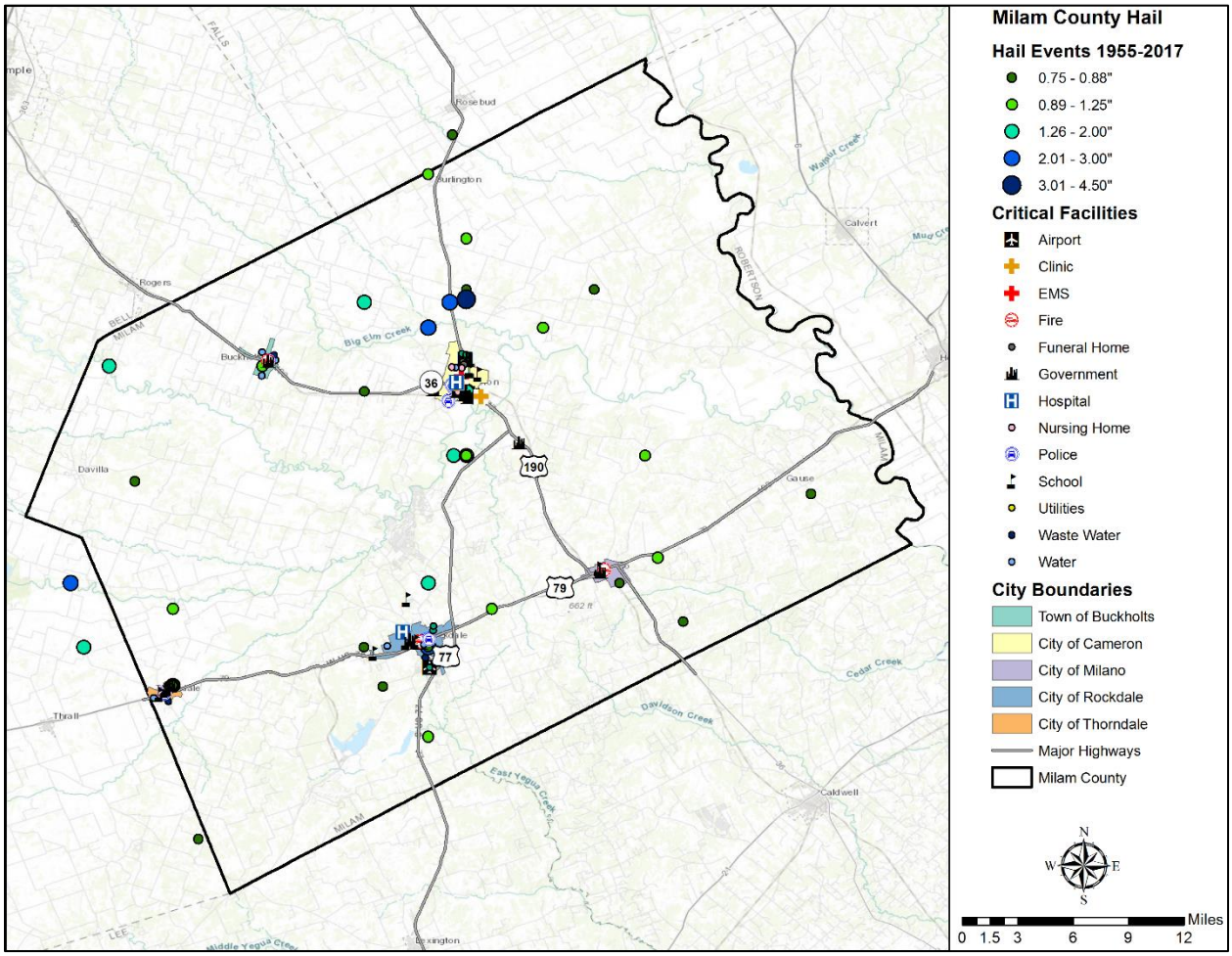


**Table 9-2. Historical Hail Events, 1955-2017[2]**

| JURISDICTION | Date | MAGNITUDE | INJURIES | FATALITIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|
| Cameron | 5/2/1994 | 1.75 inches | 0 | 0 | $81,929 | $819,295 |
| Rockdale | 5/17/1995 | 2.75 inches | 0 | 0 | $63,737 | $0 |
| Rockdale | 5/2/2007 | 1.5 inches | 0 | 0 | $5,839 | $0 |
| Rockdale | 4/25/2008 | 1.75 inches | 0 | 0 | $5,639 | $0 |
| Rockdale | 4/25/2008 | 2.75 inches | 0 | 0 | $56,395 | $0 |
| Milam County | 4/23/2010 | 2.5 inches | 0 | 0 | $4,455 | $0 |
| Cameron | 4/23/2010 | 4 inches | 0 | 0 | $4,455 | $0 |
| Cameron | 10/26/2013 | 1.5 inches | 0 | 0 | $8,339 | $0 |
| **TOTALS** | | **(Max Extent)** | | | **$1,050,083** | |

**Table 9-3. Historical Hail Events Summary, 1955-2017**

| JURISDICTION | Number of Events | MAGNITUDE | INJURIES | FATALITIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|
| Milam County | 35 | 2.75 inches | 0 | 0 | $4,455 | $0 |
| Town of Buckholts | 3 | 1.0 inches | 0 | 0 | $0 | $0 |
| City of Cameron | 17 | 4.0 inches | 0 | 0 | $94,723 | $819,295 |
| City of Milano | 2 | 0.75 inches | 0 | 0 | $0 | $0 |
| City of Rockdale | 10 | 2.75 inches | 0 | 0 | $131,610 | $0 |
| City of Thorndale | 2 | 1.75 inches | 0 | 0 | $0 | $0 |
| **TOTAL LOSSES** | | **(Max Extent)** | **0** | **0** | **$1,050,083** | |

## Significant Events

**May 2, 1994 – City of Cameron**
A thunderstorm produced large hail for over 20 minutes in Cameron. Significant damage to crops in the form of shredded leaves was reported, with most of the damage to grain and sorghum crops. Damage was reported to roofs and windows of homes and vehicles. Damage estimates exceeded 900k (2017 dollars).

[2] Only recorded events with fatalities, injuries, and/or damages are listed.

**April 25, 2008 – City of Rockdale**
A strong line of storms as well as several discrete supercells affected north Texas. Baseball-size hail fell in Rockdale breaking windows and damaging cars.

**April 23, 2010 – Milam County/City of Cameron**
A large storm system developed in Lampasas County and moved northeast through north Texas on the night of Friday, April 23rd into the early morning hours of the 24th. There were some isolated reports of hail up to the size of golf balls, however most of the damage from these storms resulted from strong straight-line winds up to 90 mph. Most of the damage associated with the winds and hail were downed trees, power poles, and power lines, but some building and residential damage was evident. Thousands of residents lost power during the event. Grapefruit size hail was reported 5 miles north of Cameron.

**March 28, 2014 – Milam County**
A strong shortwave trough and a cold front combined to produce a complex of severe thunderstorms across mainly the southern and eastern counties of the Fort Worth CWA. Hail was the main threat with these storms. Most of the hail reports were golf ball sized or smaller.

# Probability of Future Events

Based on available records of historic events, 69 events in a 63 year reporting period for Milam County provides a probability of one event every year. This frequency supports a highly likely probability of future events for the Milam County planning area including all participating jurisdictions. The numbers listed for the entire planning area are historical events that are known to have specifically impacted each jurisdiction.

# Vulnerability and Impact

Damage from hail approaches $1 billion in the U.S. each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are most commonly damaged by hail.

Utility systems on roofs at critical facilities would be vulnerable. Hail could cause a significant threat to people as they could be struck by hail and falling trees or branches. Outdoor activities and events may elevate the risk to residents when a hailstorm strikes with little warning.

The Milam County planning area features multiple mobile or manufactured home parks throughout the planning area including all participating jurisdictions. These parks are typically more vulnerable to hail events than typical site built structures. In addition, manufactured homes are located sporadically throughout the planning area in unincorporated portions of the county as well as within all participating jurisdictions.

The U.S. Census data indicates a total of 1,828 manufactured homes located in the Milam County planning area, including all participating jurisdictions (Table 9-3), totaling approximately 16.1% of the residential structures in the planning area. In addition, 53.9% (approximately 6,112 structures) of the single family residential (SFR) structures in the Milam County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant hail events.

**Table 9-4. Structures at Greater Risk by Jurisdiction**

| JURISDICTION | MANUFACTURED HOMES | STRUCTURES BUILT BEFORE 1980 |
|---|---|---|
| Milam County[3] | 1,828 | 6,112 |
| Town of Buckholts | 41 | 156 |
| City of Cameron | 177 | 1,790 |
| City of Milano | 26 | 98 |
| City of Rockdale | 316 | 1,504 |
| City of Thorndale | 115 | 422 |

The following critical facilities would be vulnerable to hail events in each participating jurisdiction:

**Table 9-5. Critical Facilities at Risk by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | Communications Tower, 8 Rural Water Supply Facilities, School |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations, School |
| City of Cameron | Airport (and 3 support facilities), 5 Government/Civic Facilities, Library, Museum, Animal Shelter, 2 Water Towers, Police Station, Fire Station, EMS (with support facility), Water Treatment Plant, Waste Water Treatment Plant, 3 Public Works Support Facilities, Sheriff's Office/County Jail, Communications Tower, 2 Funeral Homes, 2 Nursing Homes, Hospital, 2 Health Clinics, 4 Schools, Hike and Bike Trail Support Facilities |
| City of Milano | Fire Department, 3 Schools, Water Department, Civic Center, Community Center, EMS/Ambulance |
| City of Rockdale | Government Facility, Hospital, Nursing Home, 2 Police Stations, Fire Station, Water Treatment Plant, Waste Water Treatment Plant, 4 Schools, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, Police/Fire/EMS/Government Facility, 5 Schools, Fire Station Command Facility/Evacuation Center |

Hail has been known to cause injury to humans and occasionally has been fatal. Overall, the average loss estimate of property and crops (in 2017 dollars) is $1,050,083, having an approximate annual loss estimate of $16,668. Based on historic loss and damages, the impact of hail damages on the entire Milam County planning area can be considered "Limited" severity of impact meaning minor quality of life is temporarily lost, community area facilities shut down for 24 hours or less, and less than ten percent of property destroyed or with major damage.

**Table 9-6. Potential Annualized Losses for Milam County**

| JURISDICTION | PROPERTY & CROP DAMAGE | ANNUAL LOSS ESTIMATE |
|---|---|---|
| Milam County | $4,455 | $71 |

[3] County totals includes all incorporated jurisdictions and unincorporated areas.

| JURISDICTION | PROPERTY & CROP DAMAGE | ANNUAL LOSS ESTIMATE |
|---|---|---|
| Town of Buckholts | $0 | $0 |
| City of Cameron | $914,018 | $14,508 |
| City of Milano | $0 | $0 |
| City of Rockdale | $131,610 | $2,089 |
| City of Thorndale | $0 | $0 |
| **Planning Area** | **$1,050,083** | **$16,668** |

## Assessment of Impacts

Hail events have the potential to pose a significant risk to people and can create dangerous situations. Impacts to the planning area can include:

- Hail may create hazardous road conditions during and immediately following an event, delaying first responders from providing for or preserving public health and safety.
- Individuals and first responders who are exposed to the storm may be struck by hail, falling branches, or downed trees resulting in injuries or possible fatalities.
- Residential structures can be damaged by falling trees, which can result in physical harm to occupants.
- Large hail events will likely cause extensive roof damage to residential structures along with siding damage and broken windows, creating a spike in insurance claims and a rise in premiums.
- Automobile damage may be extensive depending on the size of the hail and length of the storm.
- Hail events can result in power outages over widespread areas increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning, as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, damaged structures, hazardous spills, and debris that often accompany hail events, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Downed power lines and large debris, such as downed trees, can result in the inability of emergency response vehicles to access areas of the community.
- Hazardous road conditions may prevent critical staff from reporting for duty, limiting response capabilities.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long- term loss in revenue.
- Some businesses not directly damaged by the hail event may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Hazardous road conditions will likely lead to increases in automobile accidents, further straining emergency response capabilities.

- Depending on the severity and scale of damage caused by large hail events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A significant hail event could significantly damage agricultural crops, resulting in extensive economic losses for the community and surrounding area.
- Hail events may injure or kill livestock and wildlife.
- A large hail event could impact the accessibility of recreational areas and parks due to extended power outages or debris clogged access roads.

The economic and financial impacts of hail will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning conducted by the community, local businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of any hail event.

# Section 10: Wildfire



## Hazard Description

A wildfire event can rapidly spread out of control and occurs most often in the summer when the brush is dry and flames can move unchecked through a highly vegetative area. Wildfires can start as a slow burning fire along the forest floor, killing and damaging trees. The fires often spread more rapidly as they reach the tops of trees with wind carrying the flames from tree to tree. Usually, dense smoke is the first indication of a wildfire.

A wildfire event often begins unnoticed and spreads quickly, lighting brush, trees, and homes on fire. For example, a wildfire may be started by a campfire that was not doused properly, a tossed cigarette, burning debris, or arson.

Texas has seen a significant increase in the number of wildfires in the past 30 years, which included wildland, interface, or intermix fires. Wildland Urban Interface or Intermix (WUI) fires occur in areas where structures and other human improvements meet or intermingle with undeveloped wildland or vegetative fuels. Wildland fires are fueled almost exclusively by natural vegetation while interface or intermix fires are urban/wildland fires in which vegetation and the built-environment provide the fuel.

## Location

A wildfire event can be a potentially damaging consequence of drought. Wildfires can vary greatly in terms of size, location, intensity, and duration. While wildfires are not confined to any specific geographic location, they are most likely to occur in open grasslands. The threat to people and property from a wildfire event is greater in the fringe areas where developed areas meet open grass lands, such as the WUI. (Figures 10-1 through 10-6). It is estimated that 74 percent of the total population in Milam County live within the WUI. However, the entire Milam County planning area is at risk for wildfires.

**Figure 10-1. Wildland Urban Interface Map – Milam County**

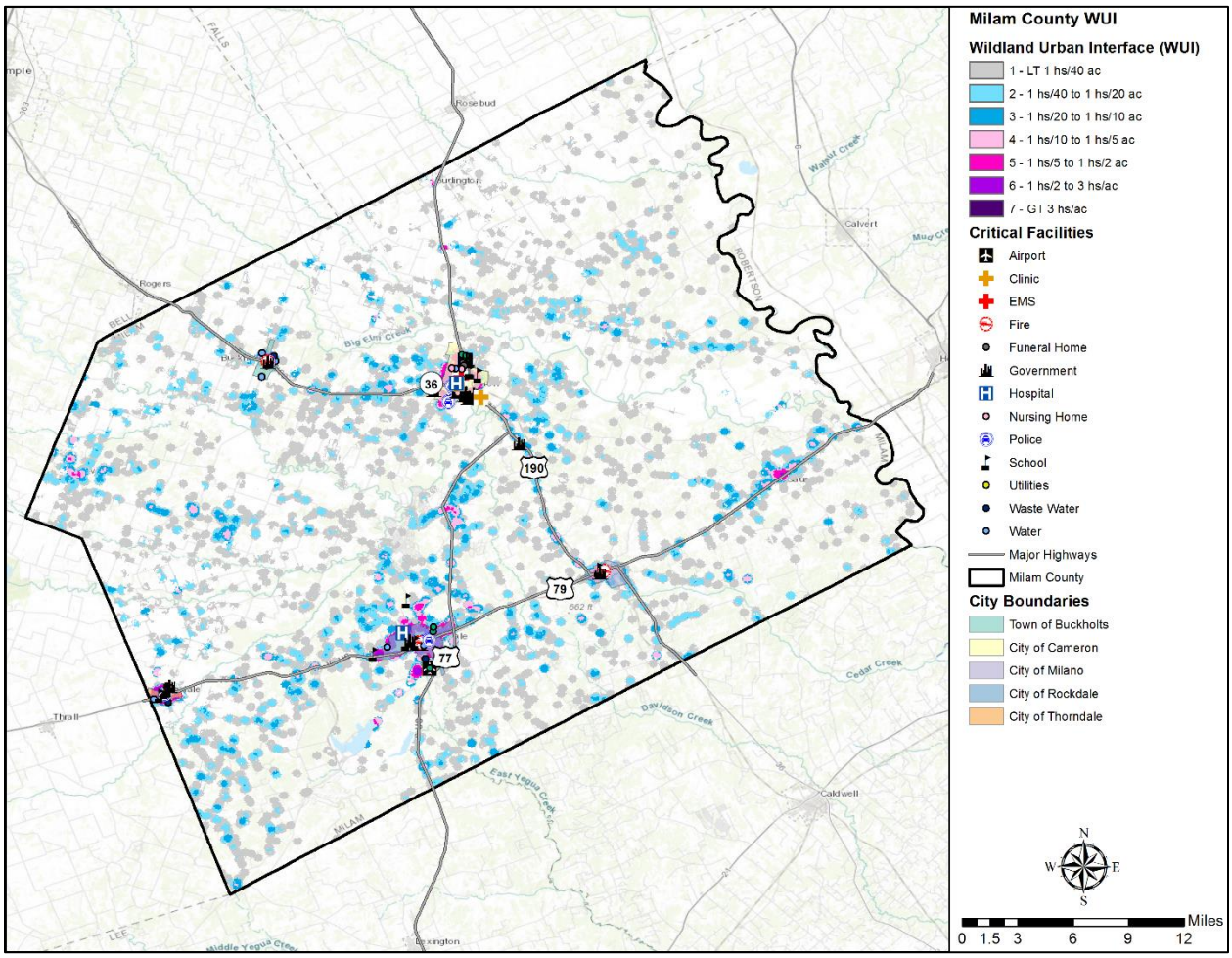
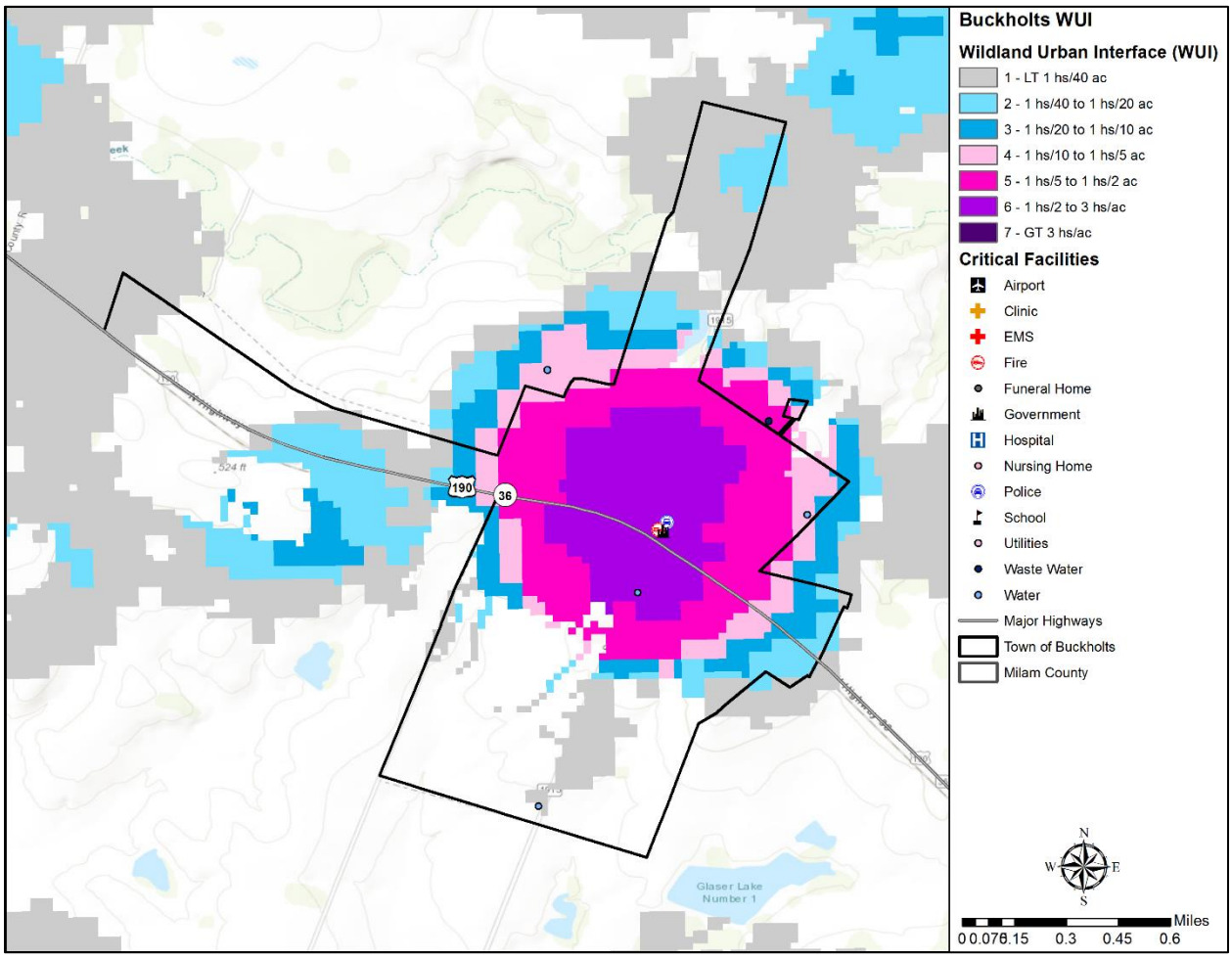
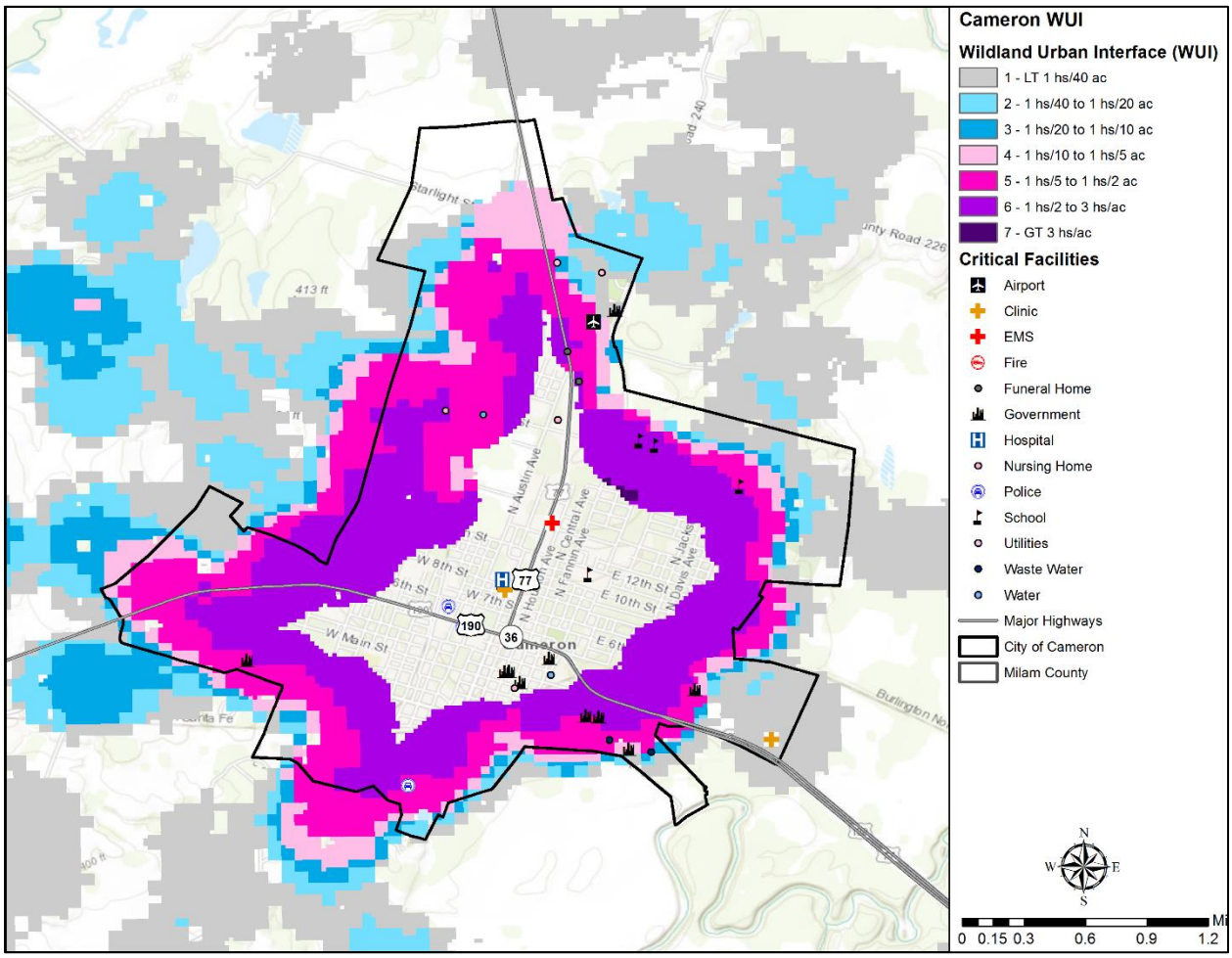


**Figure 10-2. Wildland Urban Interface Map – Town of Buckholts**



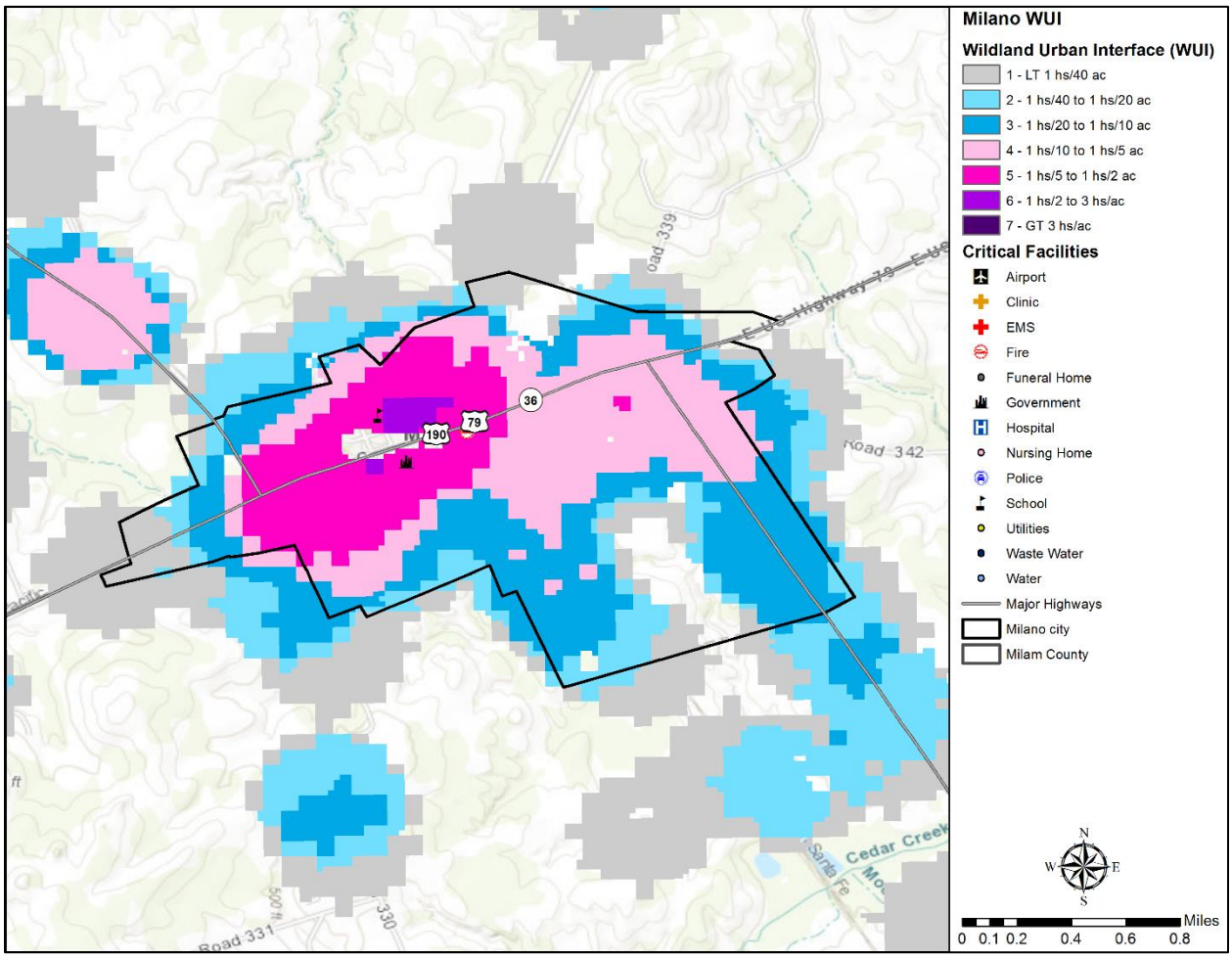

It is estimated that 99 percent of the total population in the Town of Buckholts live within the WUI. However, the entire Town of Buckholts is at risk for wildfires.

**Figure 10-3. Wildland Urban Interface Map – City of Cameron**



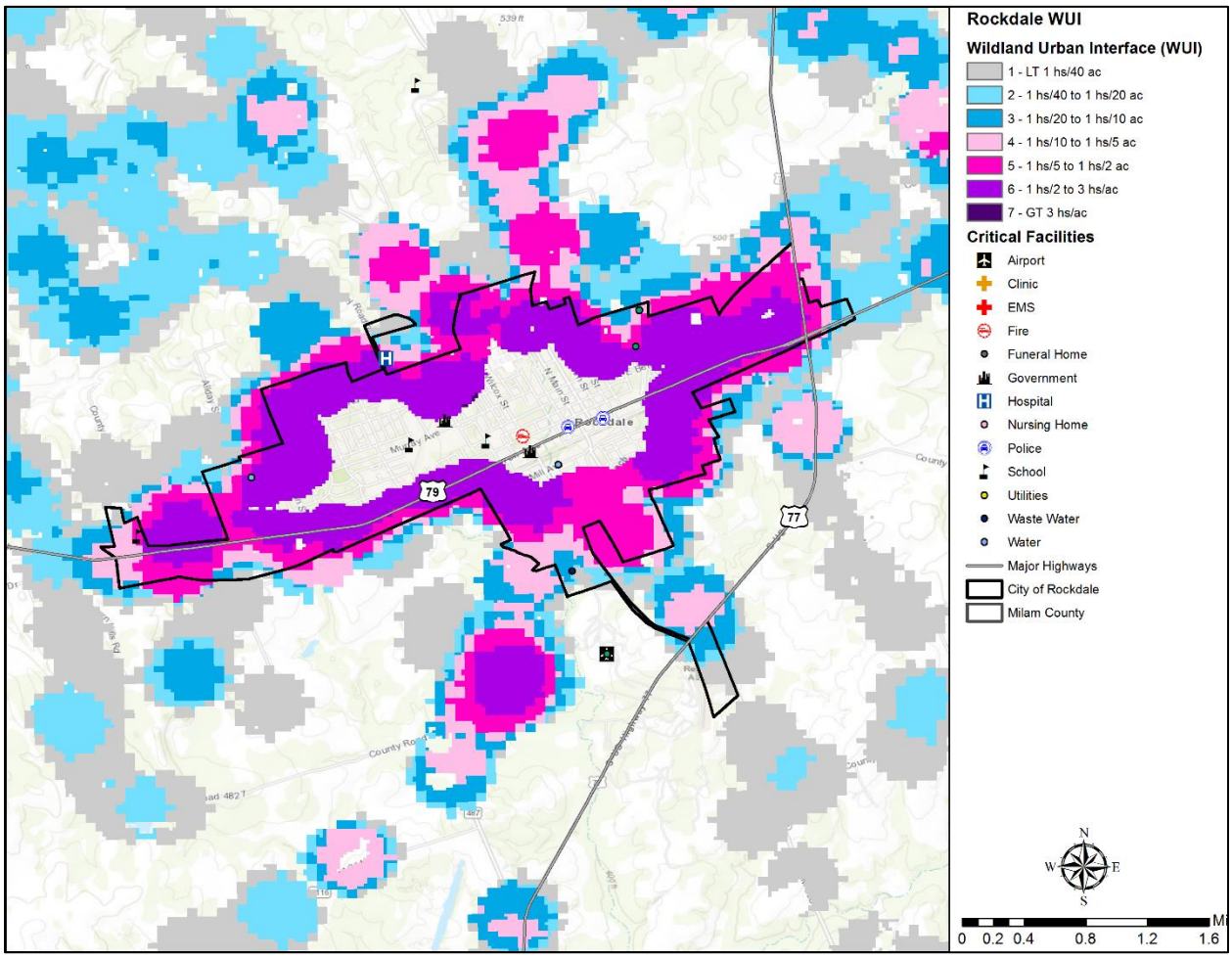

It is estimated that 44 percent of the total population in the City of Cameron live within the WUI. However, the entire City of Cameron is at risk for wildfires.

**Figure 10-4. Wildland Urban Interface Map – City of Milano**



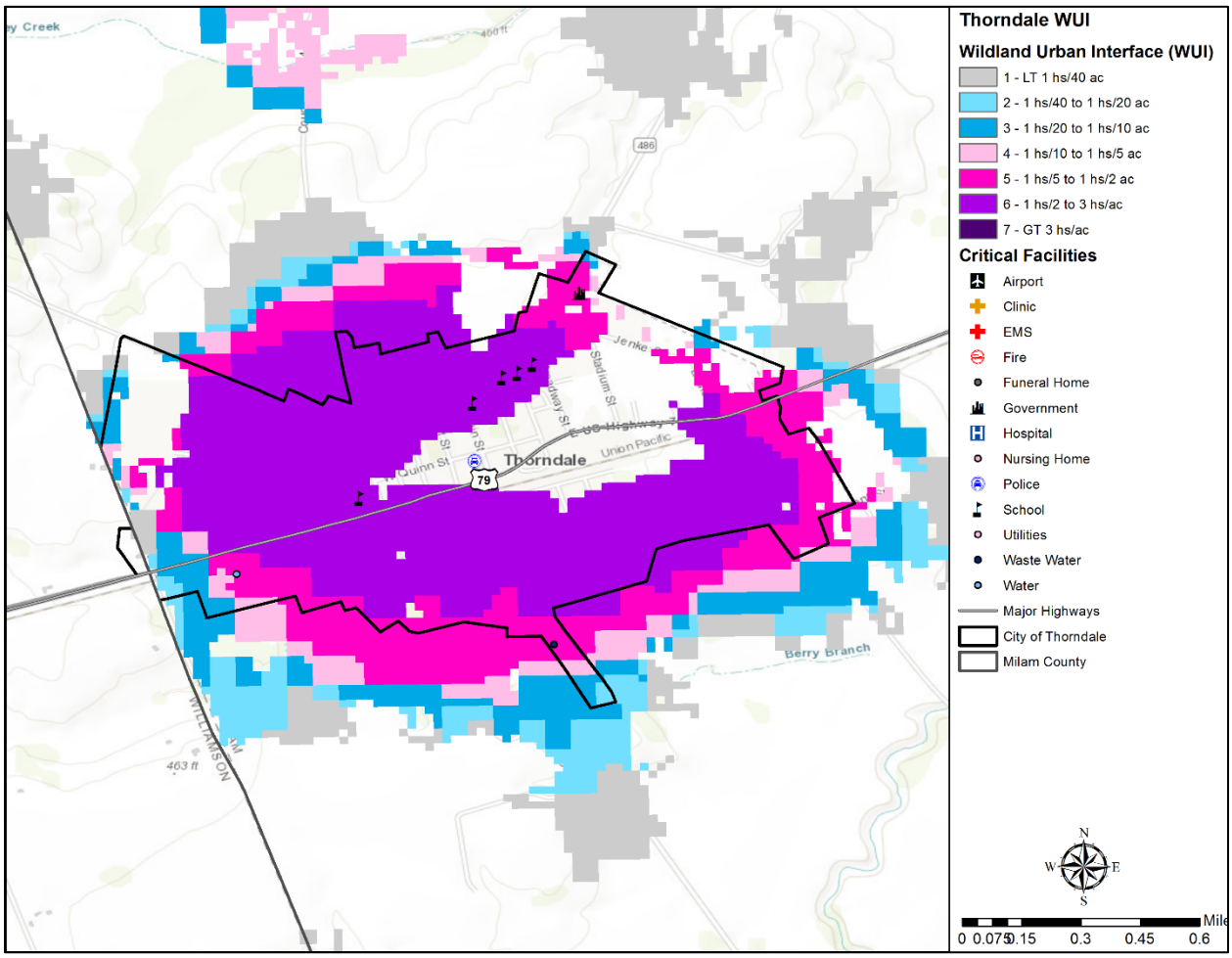

It is estimated that 91 percent of the total population in the City of Milano live within the WUI. However, the entire City of Milano is at risk for wildfires.

**Figure 10-5. Wildland Urban Interface Map – City of Rockdale**




It is estimated that 59 percent of the total population in the City of Rockdale live within the WUI. However, the entire City of Rockdale is at risk for wildfires.

**Figure 10-6. Wildland Urban Interface Map – City of Thorndale**



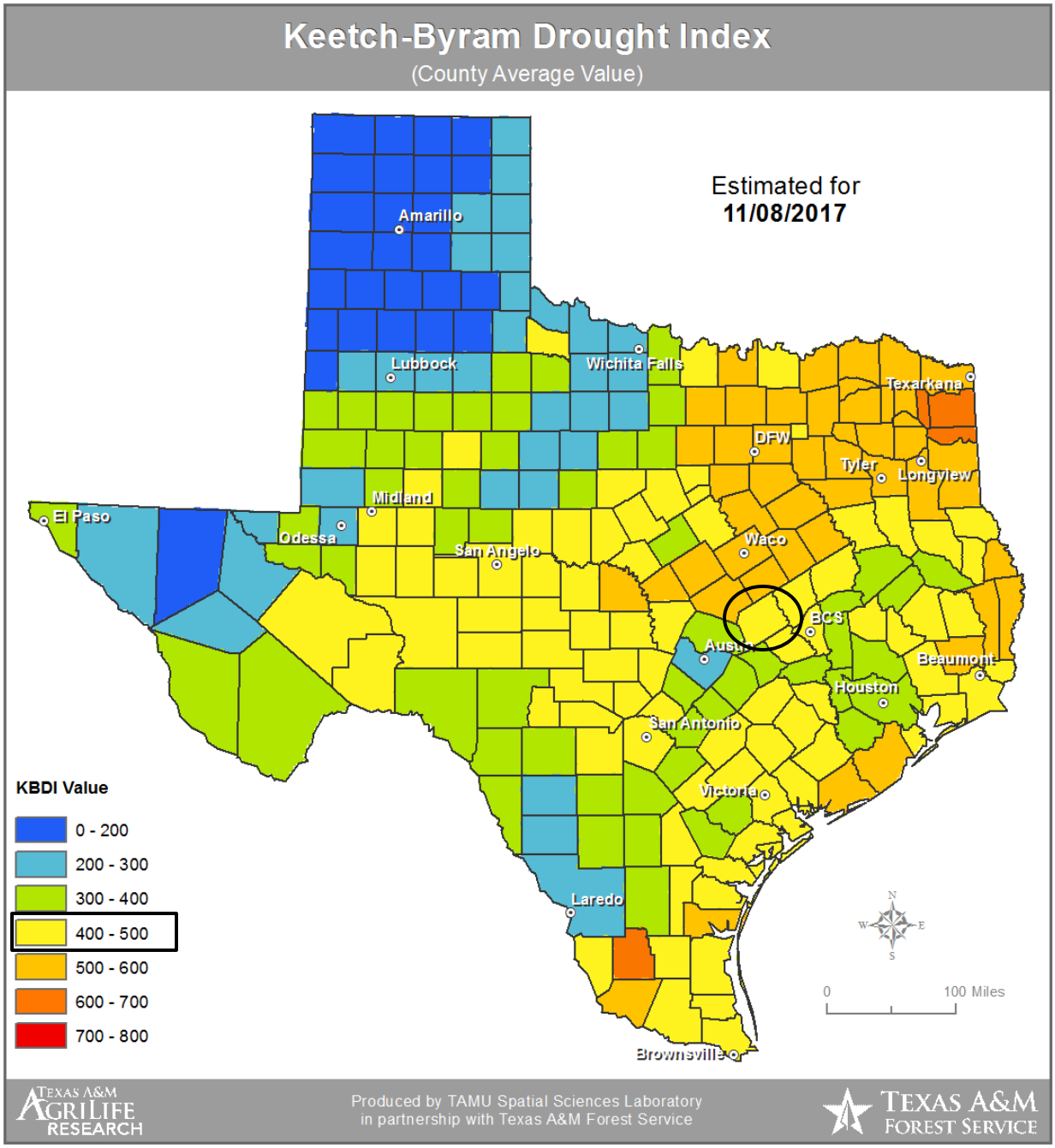

It is estimated that 86 percent of the total population in the City of Thorndale live within the WUI. However, the entire City of Thorndale is at risk for wildfires.

# Extent

Risk for a wildfire event is measured in terms of magnitude and intensity using the Keetch Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI determines forest fire potential based on a daily water balance, derived by balancing a drought factor with precipitation and soil moisture (assumed to have a maximum storage capacity of eight inches), and is expressed in hundredths of an inch of soil moisture depletion.

Each color in Figure 10-8 represents the drought index at that location. The drought index ranges from 0 to 800. A drought index of 0 represents no moisture depletion, and a drought index of 800 represents absolutely dry conditions.

**Figure 10-8. Keetch-Byram Drought Index (KBDI) for the State of Texas, 2017[1]**




Fire behavior can be categorized at four distinct levels on the KBDI:

- **0 - 200:** Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.

[1] Milam County is located within the black circle.

- **200 - 400:** Fires more readily burn and will carry across an area with no gaps. Heavier fuels will not readily ignite and burn. Expect smoldering and the resulting smoke to carry into and possibly through the night.
- **400 - 600:** Fires intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
- **600 - 800:** Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

The KBDI is a good measure of the readiness of fuels for a wildfire event. The KBDI should be referenced as the area experiences changes in precipitation and soil moisture, and caution exercised in dryer, hotter conditions.

The range of intensity for the Milam County planning area in a wildfire event is within 400-500. The average extent to be mitigated for the Milam County planning area is a KBDI of 600 to 800. At this level fires will burn to mineral soil and stumps will burn to the end of underground roots and spotting will be a major problem. Though the conditions can vary in the planning area the worst extent that can be expected for the entire planning area in the future is 800 on the KBDI.

The Texas Forest Service's Fire Intensity Scale identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on weighted average of four percentile weather categories. The Milam County planning area is currently at a predominantly low to moderate potential wildfire intensity on the scale listed in the figure below. This is the worst that can be anticipated for the future. Figures 10-9 to 10-14 identifies the wildfire intensity for the Milam County planning area.

**Figure 10-9. Fire Intensity Scale Map – Milam County**

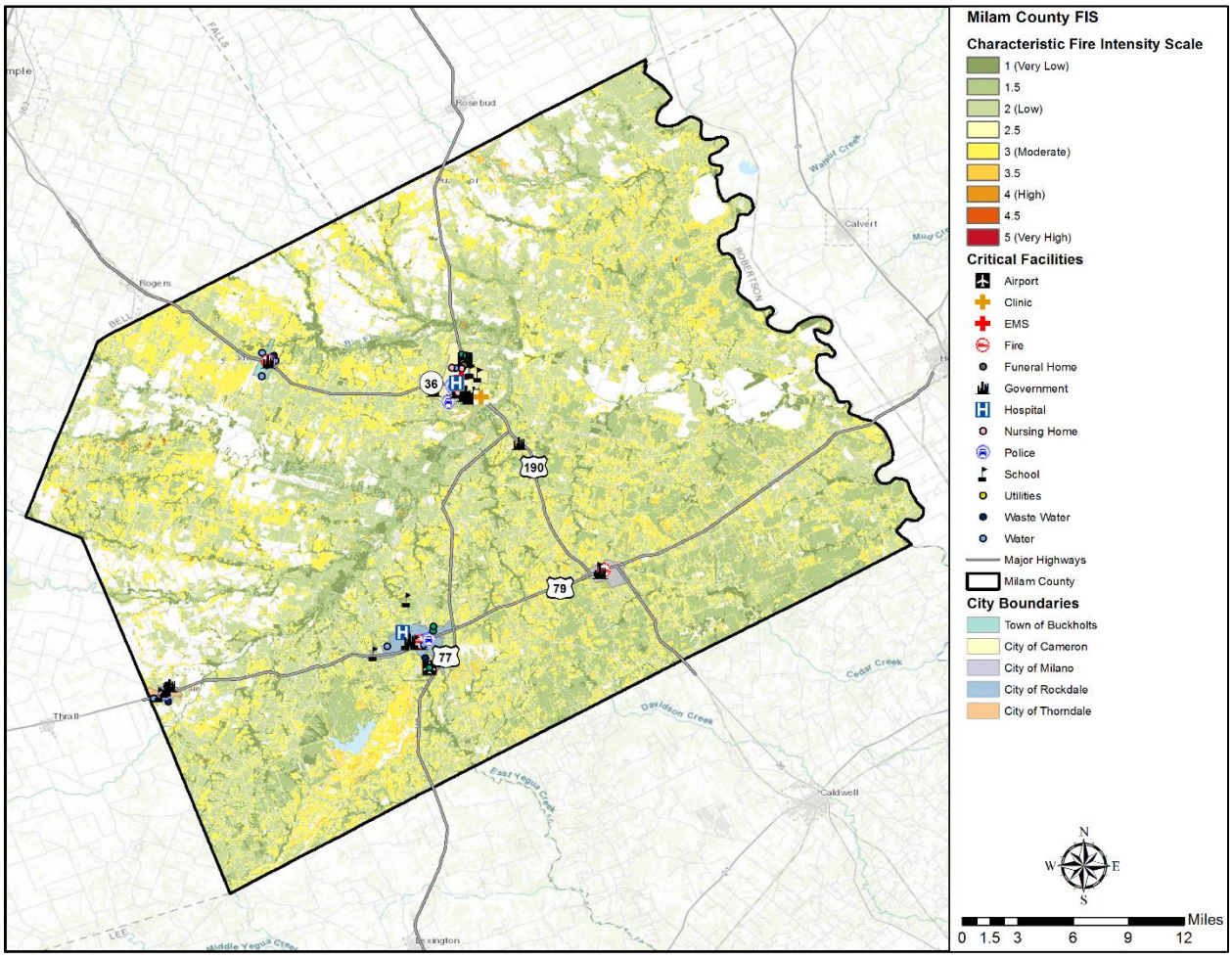


**Figure 10-10. Fire Intensity Scale Map – Town of Buckholts**

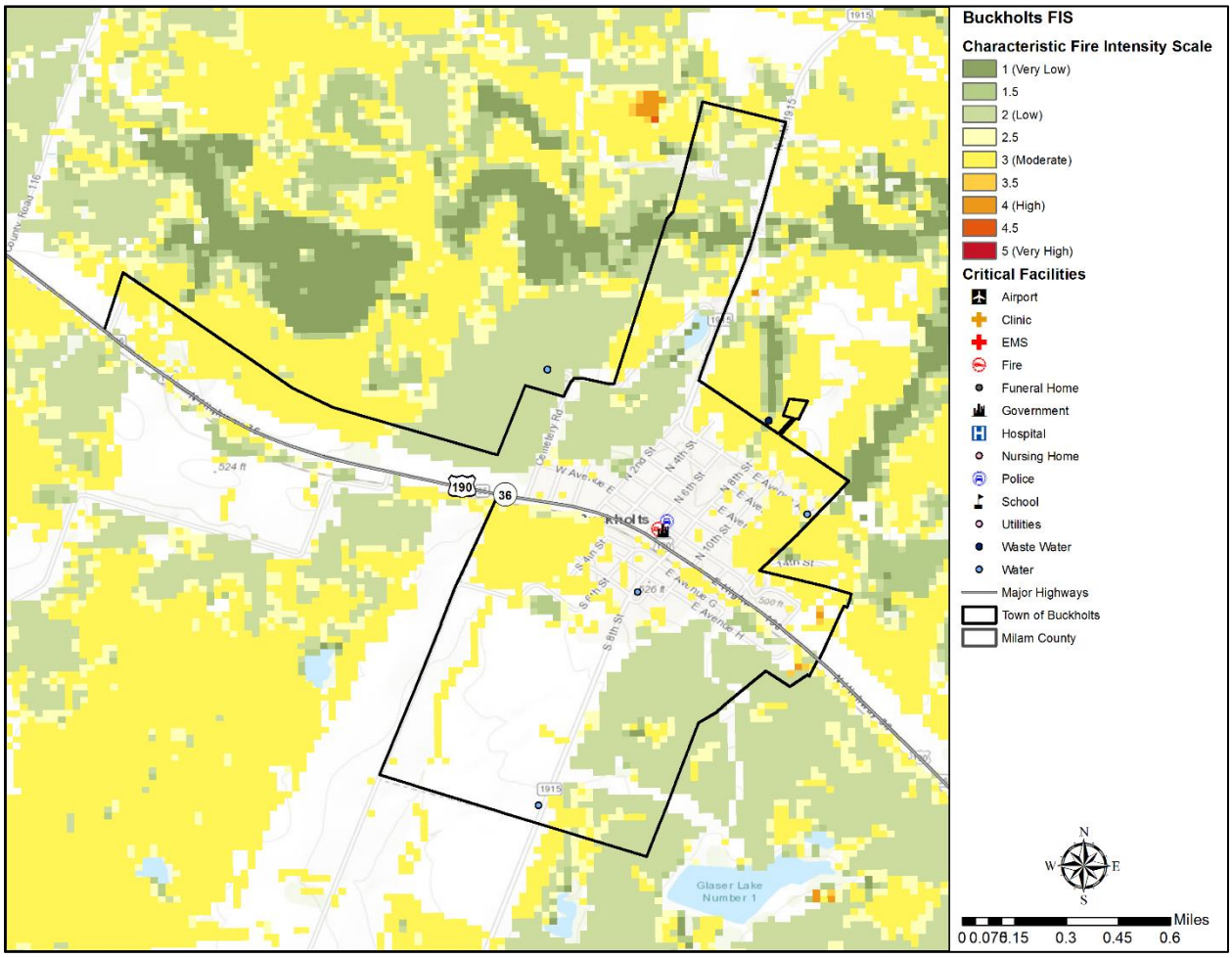


**Figure 10-11. Fire Intensity Scale Map – City of Cameron**

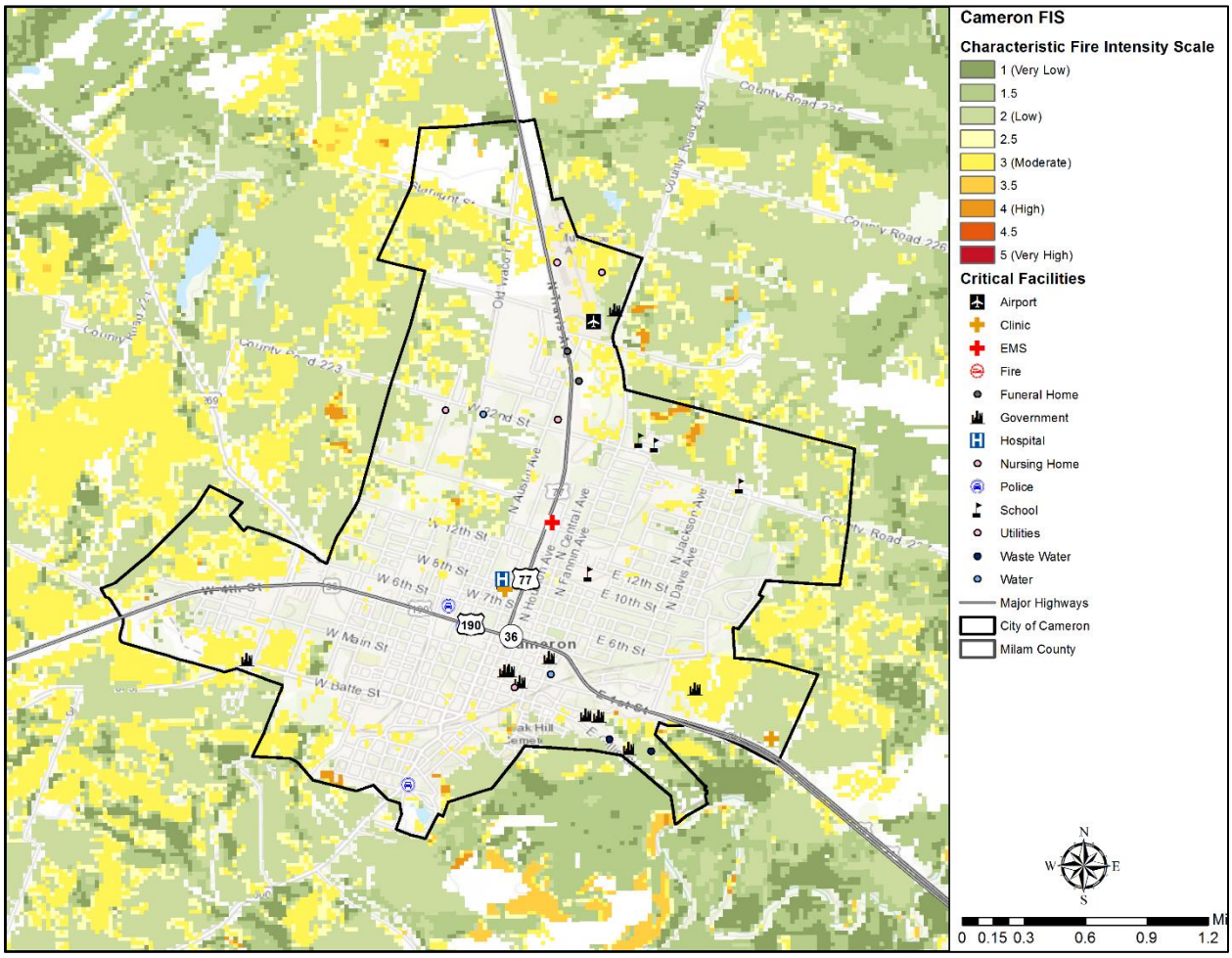


**Figure 10-12. Fire Intensity Scale Map – City of Milano**

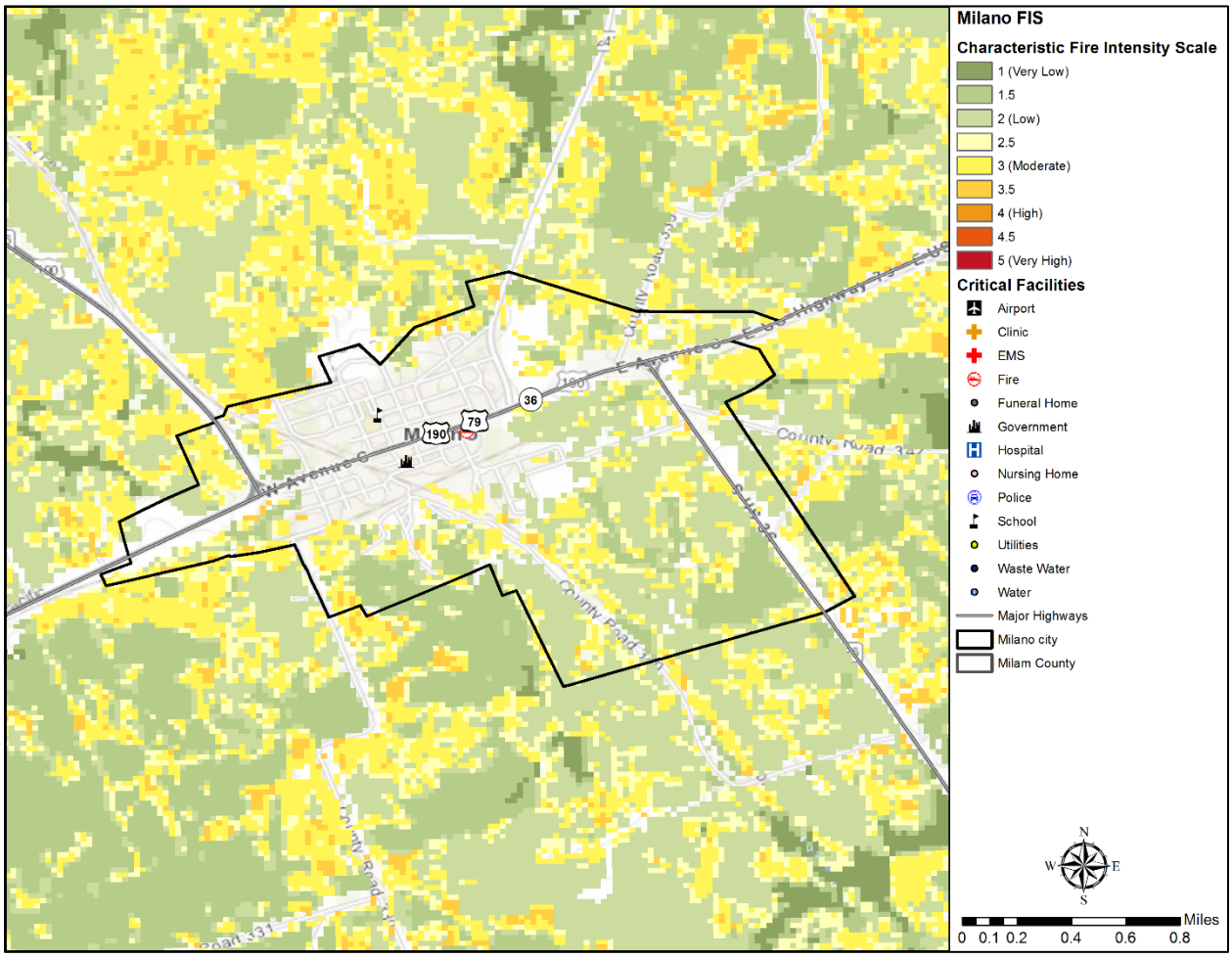


**Figure 10-13. Fire Intensity Scale Map – City of Rockdale**

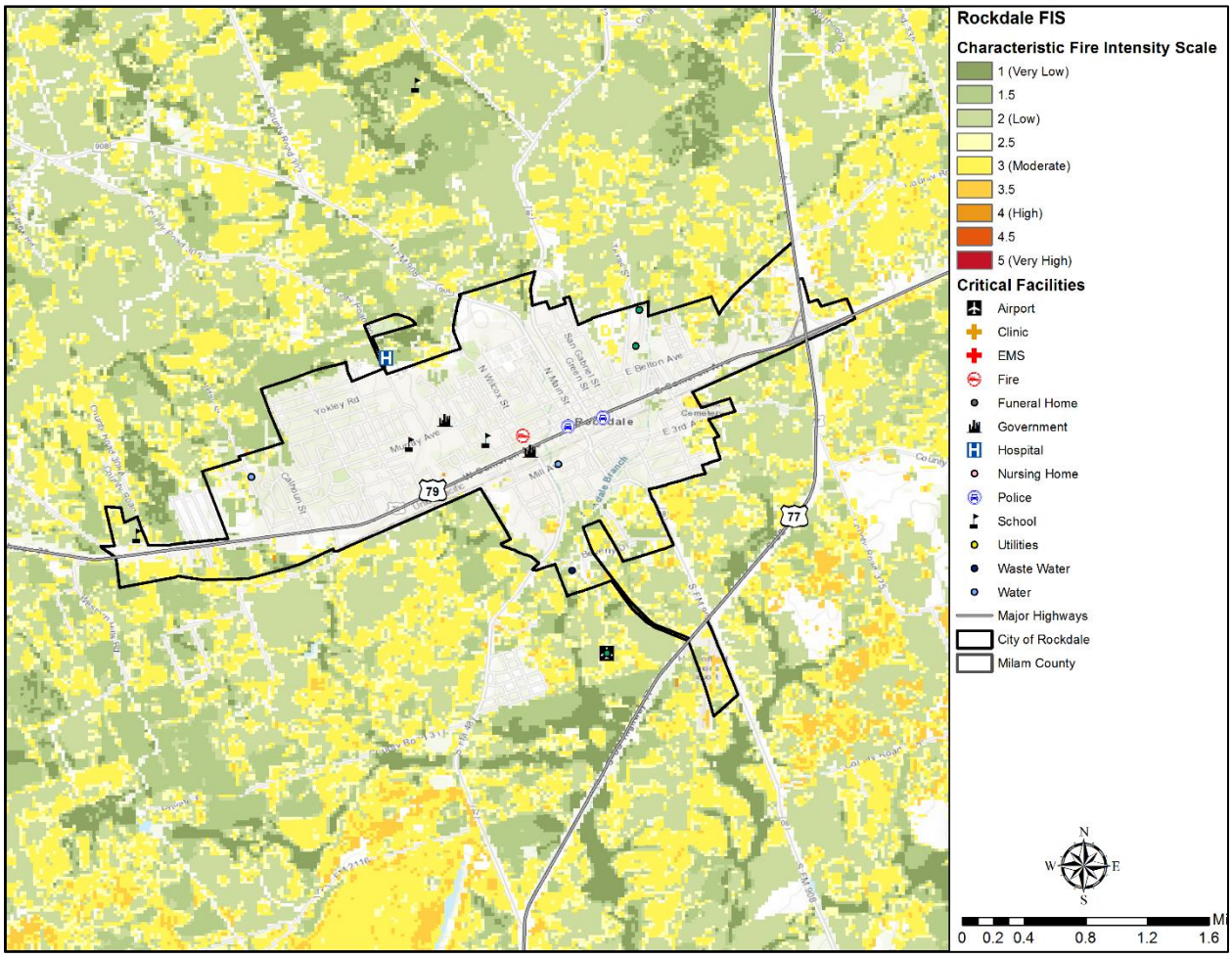
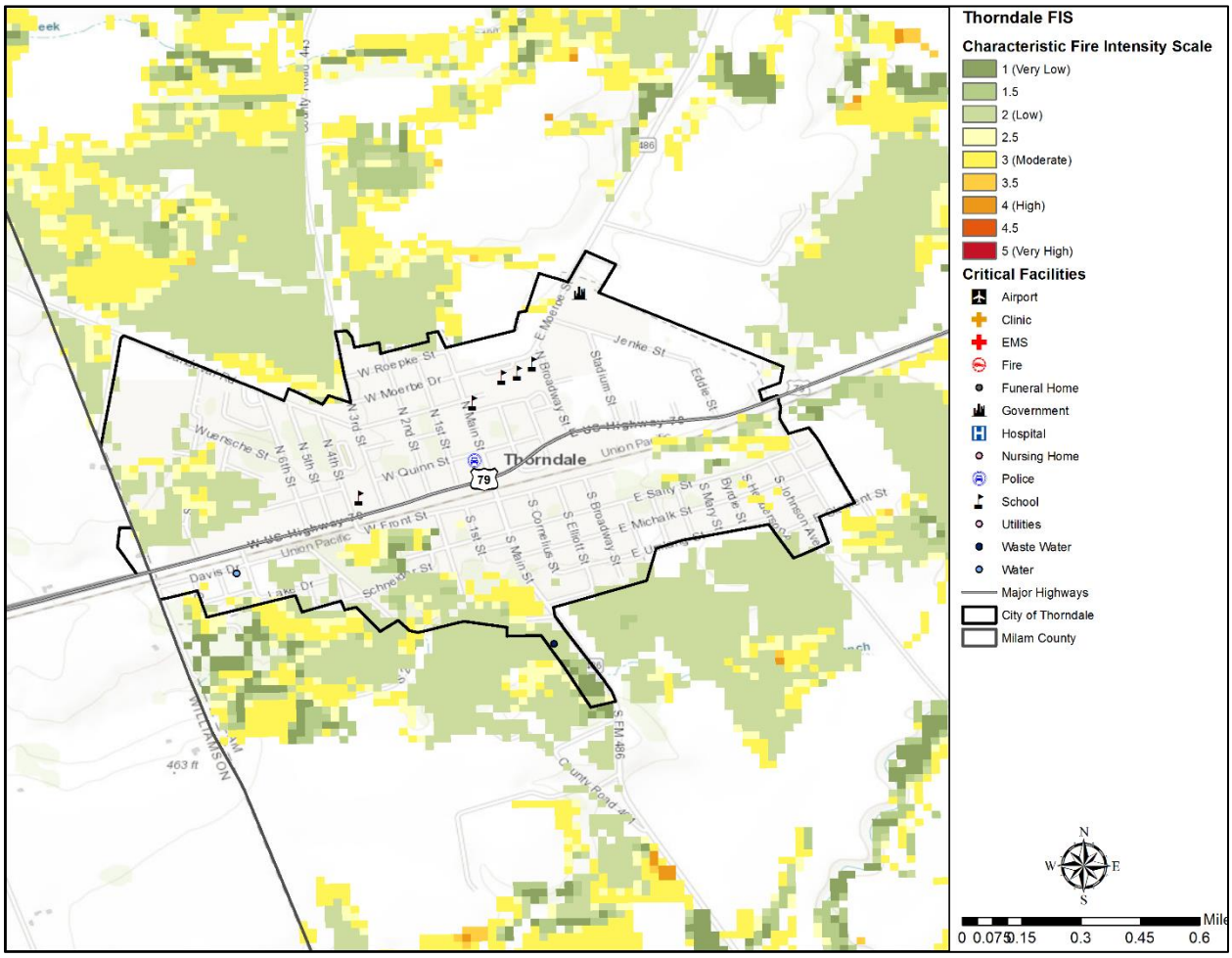


**Figure 10-14. Fire Intensity Scale Map – City of Thorndale**




# Historical Occurrences

The Texas Forest Service (TFS) reported 478 wildfire events between 2005 and 2015 for the planning area. The National Centers for Environmental Information (NCEI) includes two reported events from 1996 through 2017. Each of these events were accounted for in the TFS data. The TFS and volunteer fire departments started fully reporting events in 2005. Due to a lack of recorded data for wildfire events prior to 2005 and after 2015, frequency calculations are based on an eleven-year period, using only data from recorded years. The map below shows approximate locations of wildfires, which can be grass or brushfires of any size (Figure 10-7). Table 10-1 identifies the number of wildfires by jurisdiction and total acreage burned.

**Figure 10-7. Location and Historic Wildfire Events for Milam County Planning Area**

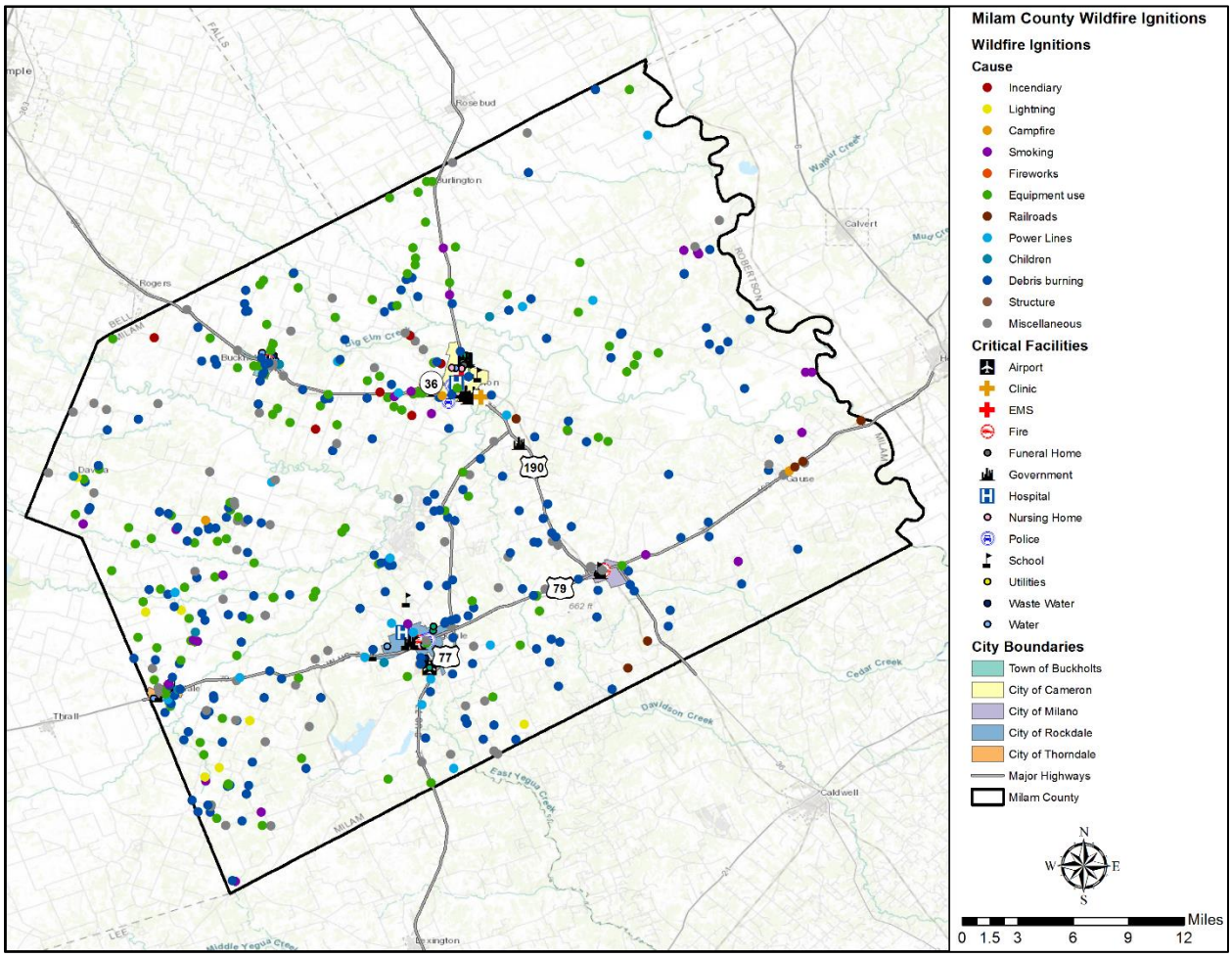



**Table 10-1. Historical Wildfire Events Summary**

| JURISDICTION | NUMBER OF EVENTS | ACRES BURNED |
|---|---|---|
| Milam County | 478 | 5,702 |
| Town of Buckholts | 18 | 39 |
| City of Cameron | 10 | 232 |
| City of Milano | 4 | 9 |
| City of Rockdale | 5 | 73 |
| City of Thorndale | 11 | 15 |

**Table 10-2. Acreage of Suppressed Wildfire by Year**

| JURISDICTION | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Milam County | 773 | 397 | 0 | 405 | 1,171 | 137 | 1,098 | 1,048 | 460 | 130 | 83 |
| Town of Buckholts | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 18 | 14 | 1 | 0 |
| City of Cameron | 0 | 1 | 0 | 0 | 2 | 0 | 30 | 135 | 64 | 0 | 0 |
| City of Milano | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 |
| City of Rockdale | 8 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 15 |
| City of Thorndale | 0 | 0 | 0 | 9 | 0 | 1 | 1 | 2 | 0 | 2 | 0 |

## Probability of Future Events

Wildfires can occur at any time of the year. As the jurisdictions within the county move into wildland, the potential area of occurrence of wildfire increases. With 478 events in a 12 year period, an event within Milam County, including all participating jurisdictions, is highly likely, meaning an event is probable within the next year.

## Vulnerability and Impact

Periods of drought, dry conditions, high temperatures, and low humidity are factors that contribute to the occurrence of a wildfire event. Areas along railroads and people whose homes are in woodland settings have an increased risk of being affected by wildfire.

The heavily populated, urban areas of Milam County are not likely to experience large, sweeping fires. Areas outside of city limits and in the unincorporated areas of Milam County are considered more vulnerable. Unoccupied buildings and open spaces that have not been maintained have the greatest vulnerability to wildfire. The overall level of concern for wildfires is located mostly along the perimeter of the study area where wildland and urban areas interface. Figures 10-1 through 10-6 illustrate the areas that are the most vulnerable to wildfire throughout the planning area.

The following critical facilities are located in the WUI and are more susceptible to wildfire in each participating jurisdiction:

**Table 10-3. Critical Facilities Located in WUI by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | None |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations |
| City of Cameron | Airport (and 2 support facilities), 2 Government/Civic Facilities, Animal Shelter, Water Tower, Water Treatment Plant, Waste Water Treatment Plant, 2 Public Works Support Facilities, Communications Tower, 2 Funeral Homes, Nursing Home, Health Clinic, 3 Schools, Hike and Bike Trail Support Facilities |

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| City of Milano | Fire Department, School, Civic Center |
| City of Rockdale | Hospital, School, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, 5 Schools, Fire Station Command Facility/Evacuation Center |

Within Milam County, a total of 478 fire events were reported from 2005 to 2015. All of these events were suspected wildfires. Historic loss and annualized estimates due to wildfires are presented in Table 10-4 below. The frequency is approximately 43 events every year.

**Table 10-4. Annual Acres Loss Estimates Due to Wildfire[2]**

| JURISDICTION | NUMBER OF EVENTS | ACRES BURNED | ANNUAL ACRE LOSSES |
|---|---|---|---|
| Milam County | 478 | 5,702 | 518 |
| Town of Buckholts | 18 | 39 | 3.55 |
| City of Cameron | 10 | 232 | 21.09 |
| City of Milano | 4 | 9 | 0.82 |
| City of Rockdale | 5 | 73 | 6.64 |
| City of Thorndale | 11 | 15 | 1.36 |

Figures 10-15 and 10-20 show Milam County and the threat of wildfire to the County and participating jurisdictions.

[2] Events divided by 11 years of data.

**Figure 10-15. Wildfire Ignition Density – Milam County**

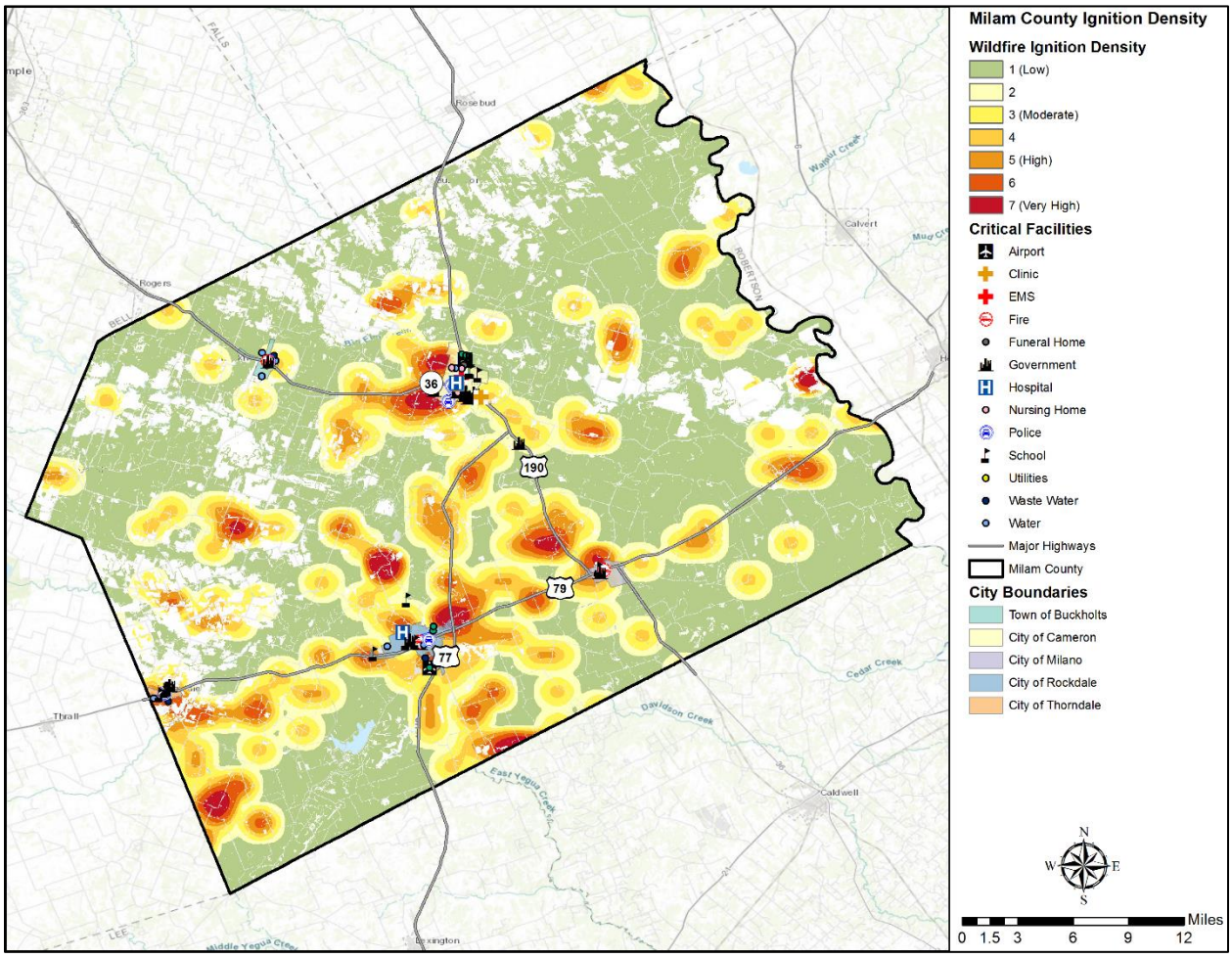


**Figure 10-16. Wildfire Ignition Density – Town of Buckholts**

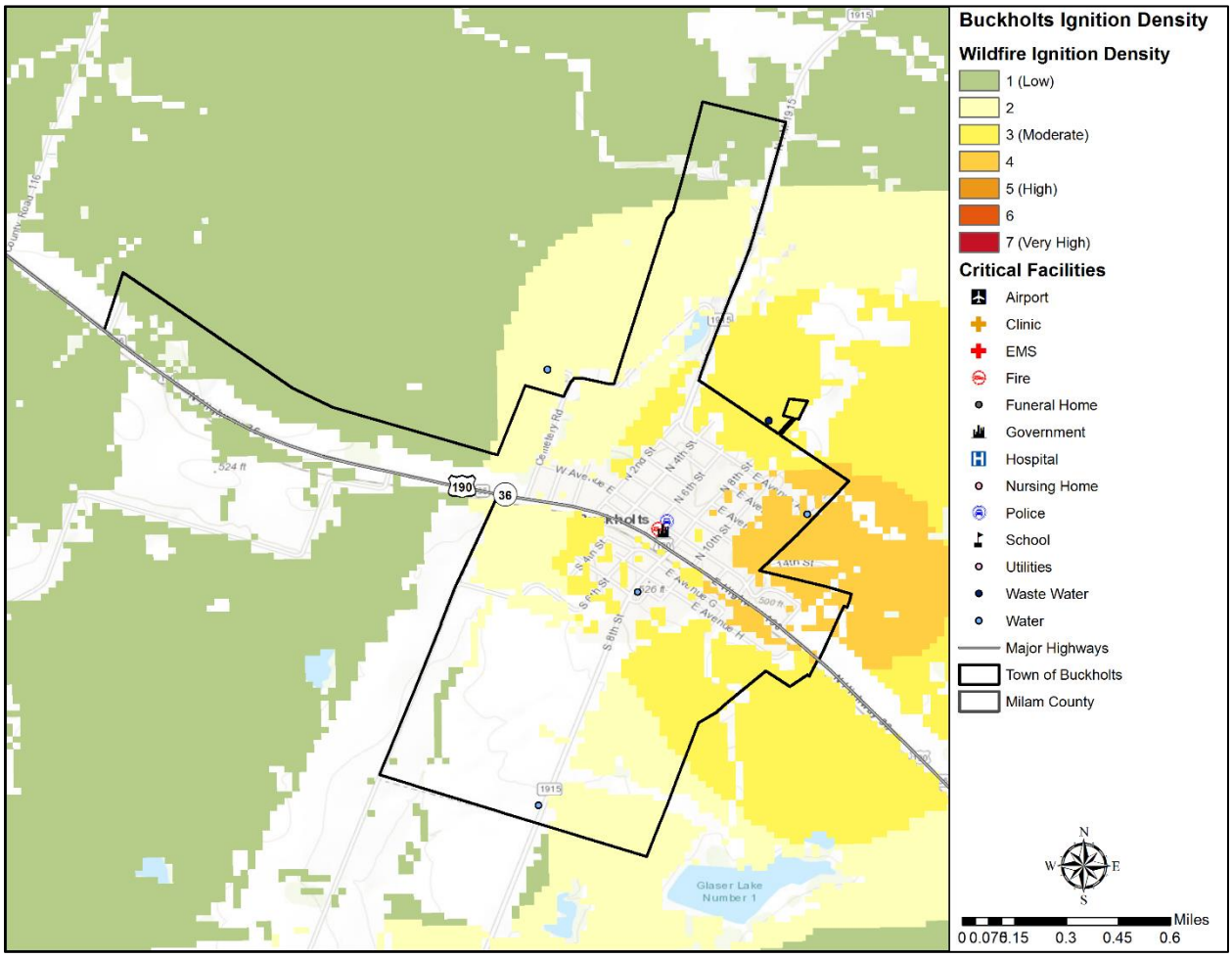


**Figure 10-17. Wildfire Ignition Density – City of Cameron**

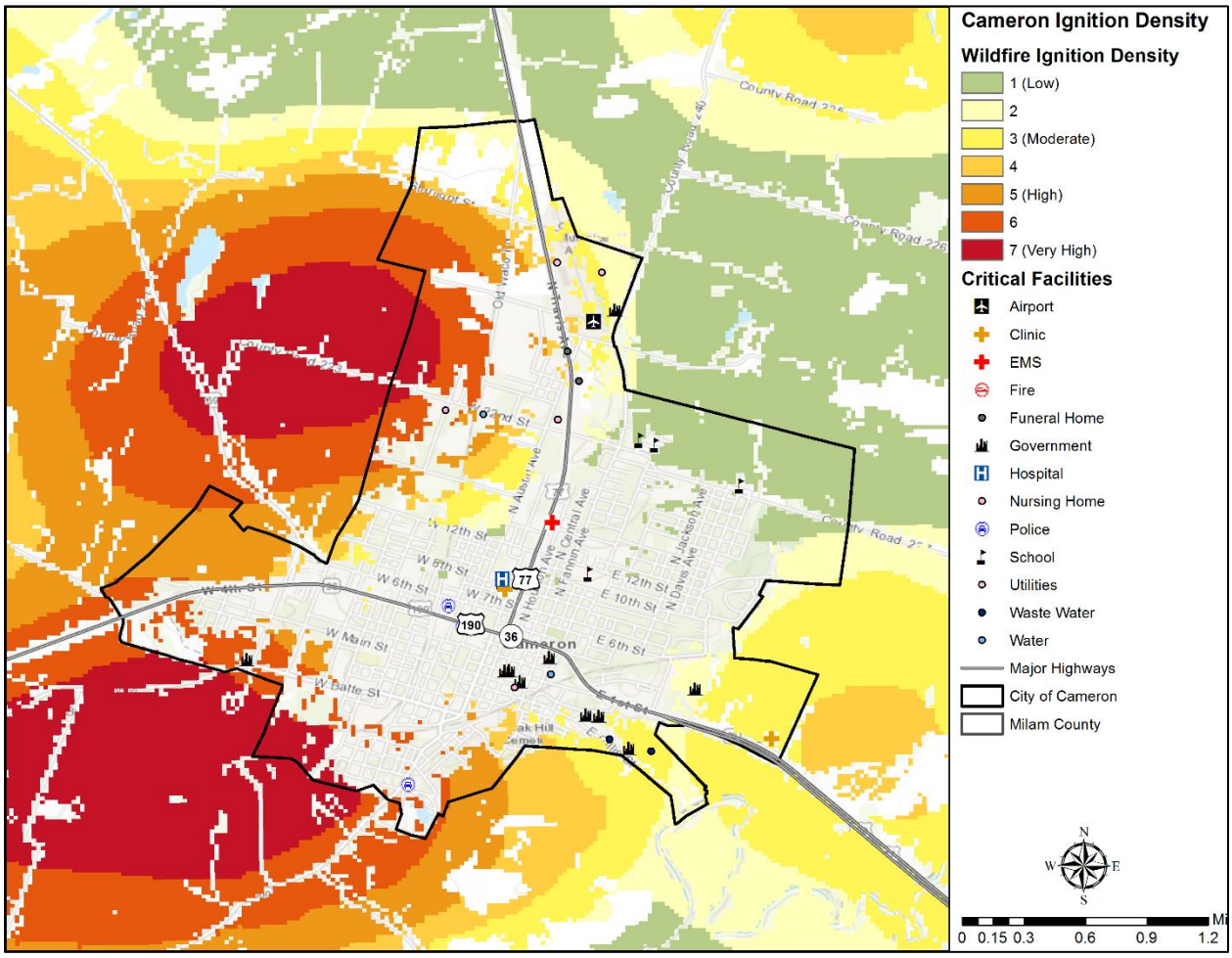


**Figure 10-18. Wildfire Ignition Density – City of Milano**

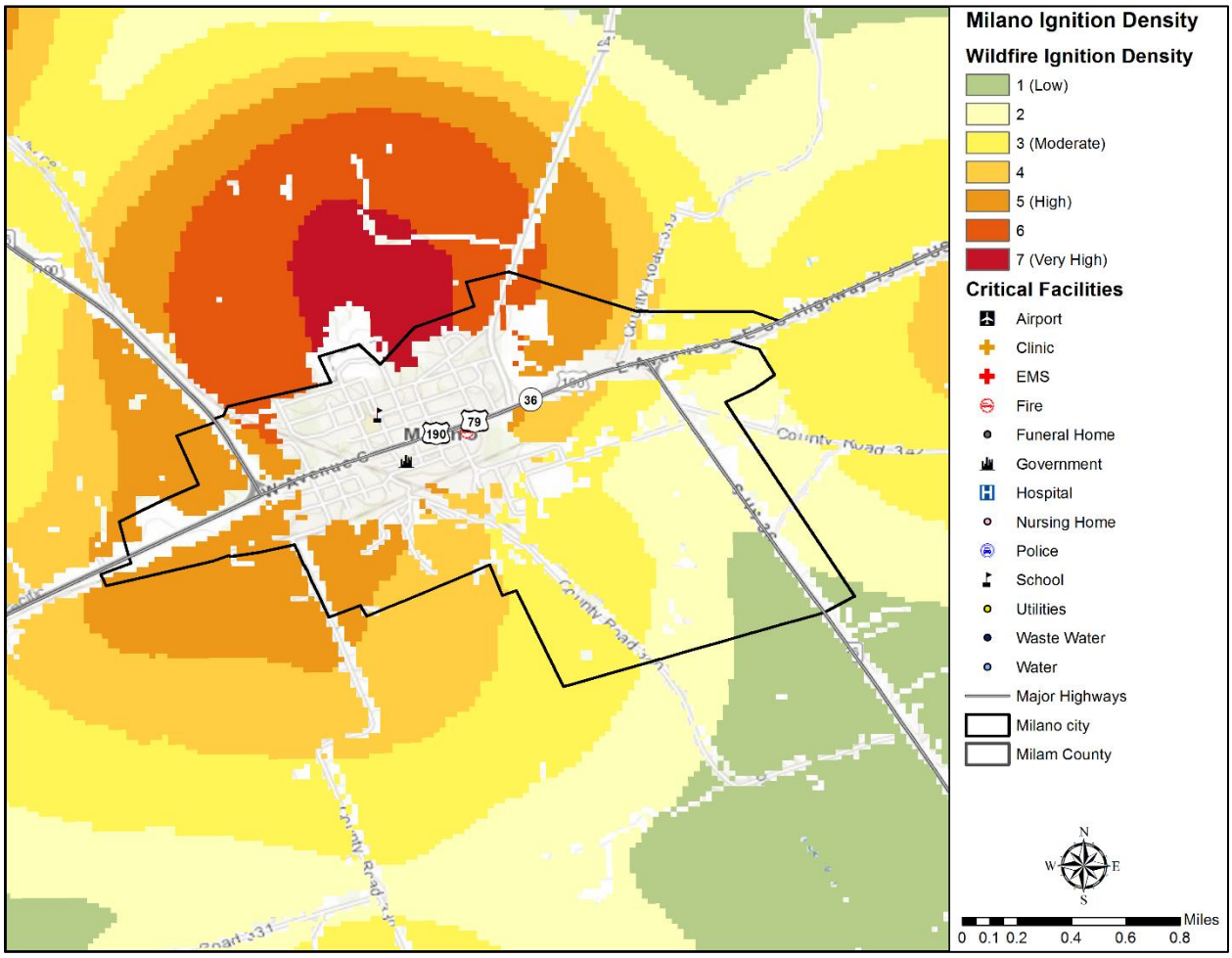


**Figure 10-19. Wildfire Ignition Density – City of Rockdale**

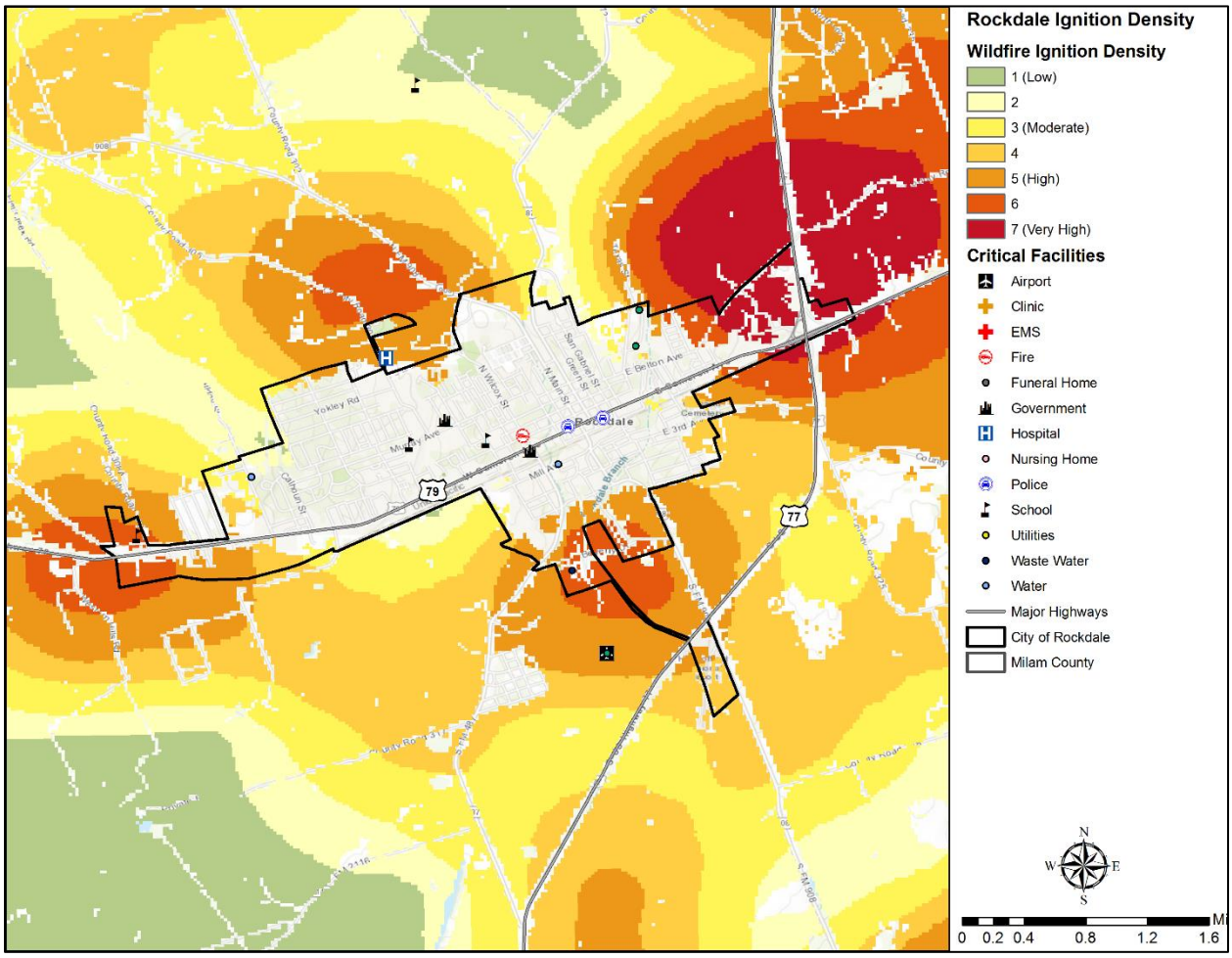
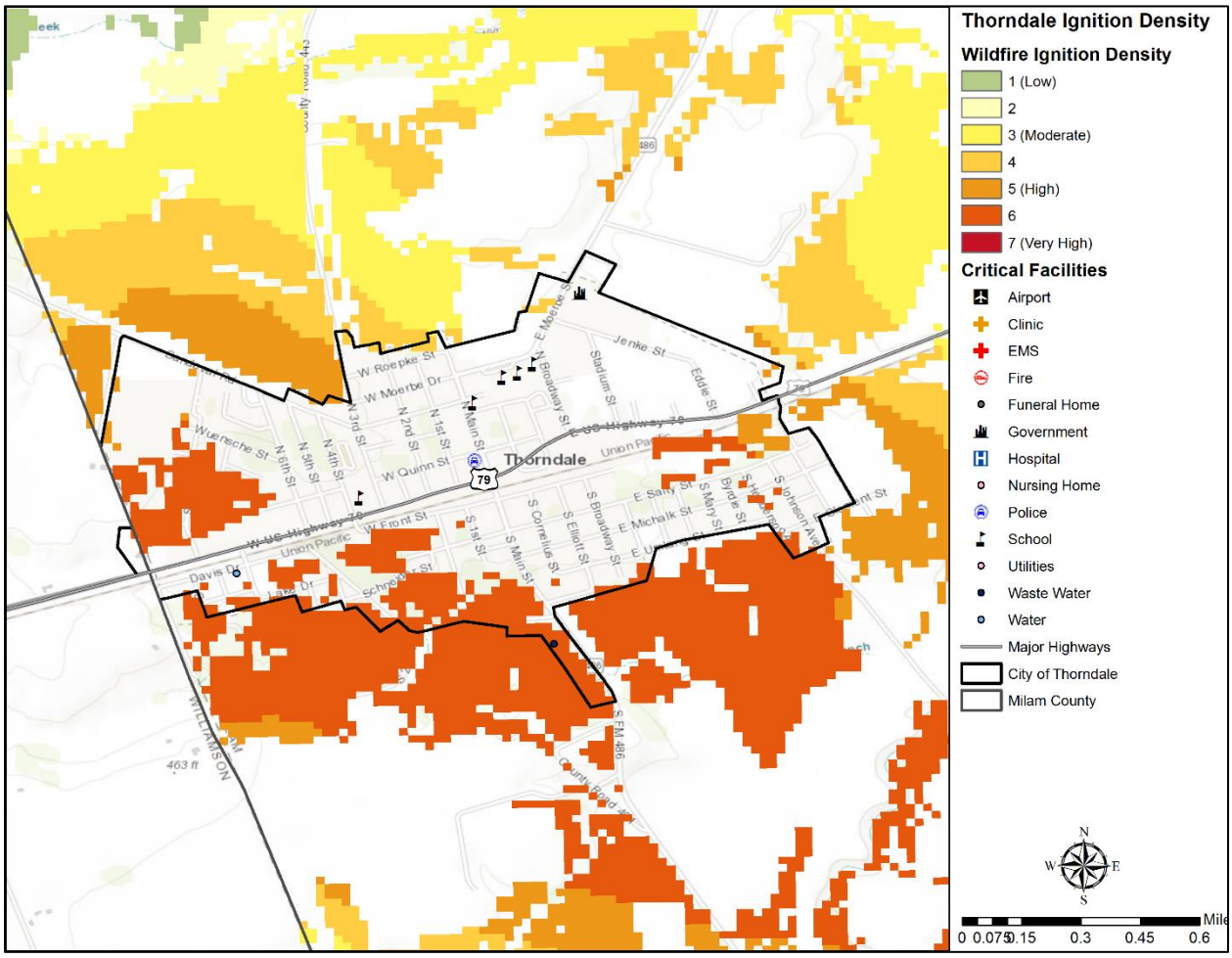


**Figure 10-20. Wildfire Ignition Density – City of Thorndale**




Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long term health effects. The elderly or those individuals with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event.

Climatic conditions such as severe freezes and drought can significantly increase the intensity of wildfires since these conditions kill vegetation, creating a prime fuel source for wildfires. The intensity and rate at which wildfires spread are directly related to wind speed, temperature, and relative humidity.

Major wildfire events can have a substantial impact. Such events can cause multiple deaths, shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. Severity of impact is gauged by acreage burned, homes and structures lost, and the number of resulting injuries and fatalities.

For the Milam County planning area, the impact from a wildfire event can be considered “Minor," meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property is destroyed or with major damage. Severity of impact is

gauged by acreage burned, homes and structures lost, injuries and fatalities. Based on this, impact for each participating jurisdiction are listed below in Table 10-5.

**Table 10-5. Impact by Jurisdiction**

| JURISDICTION | IMPACT | DESCRIPTION |
|---|---|---|
| Milam County | Minor | Milam County has an estimated 18,311 people or 74% of the total population that live within the Wildland Urban Interface (WUI). Milam County, including citizens in unincorporated areas, could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged. |
| Town of Buckholts | Minor | The Town of Buckholts has an estimated 382 people or 99% of the total population that live in the WUI, and the town has a low to moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged. |
| City of Cameron | Minor | The City of Cameron has an estimated 2,579 people or 44% of the total population that live in the WUI, and the city has a low wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged. |
| City of Milano | Minor | The City of Milano has an estimated 361 people or 91% of the total population that live in the WUI, and the city has a moderate to high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged. |
| City of Rockdale | Minor | The City of Rockdale has an estimated 3,439 people or 59% of the total population that live in the WUI, and the city has a moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged. |
| City of Thorndale | Minor | The City of Thorndale has an estimated 1,113 people or 86% of the total population that live in the WUI, and the city has a moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged. |

## Assessment of Impacts

A Wildfire event poses a potentially significant risk to public health and safety, particularly if the wildfire is initially unnoticed and spreads quickly. The impacts associated with a wildfire are not limited to the direct damages. Potential impacts for the planning area include:

- Persons in the area at the time of the fire are at risk for injury or death from burns and/or smoke inhalation.
- First responders are at greater risk of physical injury since they are in close proximity to the hazard while extinguishing flames, protecting property or evacuating residents in the area.
- First responders can experience heart disease, respiratory problems, and other long term related illnesses from prolonged exposure to smoke, chemicals, and heat.
- Emergency services may be disrupted during a wildfire if facilities are impacted, roadways are inaccessible, or personnel are unable to report for duty.
- Critical city and/or county departments may not be able to function and provide necessary services depending on the location of the fire and the structures or personnel impacted.
- Non-critical businesses may be directly damaged, suffer loss of utility services, or be otherwise inaccessible, delaying normal operations and slowing the recovery process.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Roadways in or near the WUI could be damaged or closed due to smoke and limited visibility.
- Older homes are generally exempt from modern building code requirements, which may require fire suppression equipment in the structure.
- Some high density neighborhoods feature small lots with structures close together, increasing the potential for fire to spread rapidly.
- Air pollution from smoke may exacerbate respiratory problems of vulnerable residents.
- Charred ground after a wildfire cannot easily absorb rainwater, increasing the risk of flooding and potential mudflows.
- Wildfires can cause erosion, degrading stream water quality.
- Wildlife may cause residents be displaced or homes destroyed.
- Historical or cultural resources may be damaged or destroyed.
- Tourism can be significantly disrupted, further delaying economic recovery for the area.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Fire suppression costs can be substantial, exhausting the financial resources of the community.
- Residential structures lost in a wildfire may not be rebuilt for years, reducing the tax base for the community.
- Brazos River recreation and tourism can be unappealing for years following a large wildfire, devastating directly related businesses.
- Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground delivery lines, and soil erosion or debris deposits into waterways after the fire.

The economic and financial impacts of a wildfire event on local government will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a wildfire event.

# Section 11: Drought



## Hazard Description

Drought is a period of time without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period of time, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 11-1 presents definitions for these different types of drought.

Droughts are one of the most complex of all natural hazards as it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants, and even in severe cases, trees. A secondary hazard to drought is wildfire because dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

**Table 11-1. Drought Classification Definitions[1]**

| | |
|---|---|
| **METEOROLOGICAL DROUGHT** | The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales. |
| **HYDROLOGIC DROUGHT** | The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels. |
| **AGRICULTURAL DROUGHT** | Soil moisture deficiencies relative to water demands of plant life, usually crops. |
| **SOCIOECONOMIC DROUGHT** | The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall. |

[1] Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

# Location

Droughts occur regularly throughout Texas and Milam County and are a normal condition. However, they can vary greatly in their intensity and duration. The Drought Monitor shows the planning area is currently experiencing normal conditions throughout the county (Figure 11-1). However, the planning area has experienced abnormally dry (D0) to exceptional drought conditions (D4) over the last ten years (Figure 11-2). There is no distinct geographic boundary to drought; therefore, it can occur throughout the Milam County planning area equally, including all participating jurisdictions.

**Figure 11-1. U.S. Drought Monitor, November 2017**

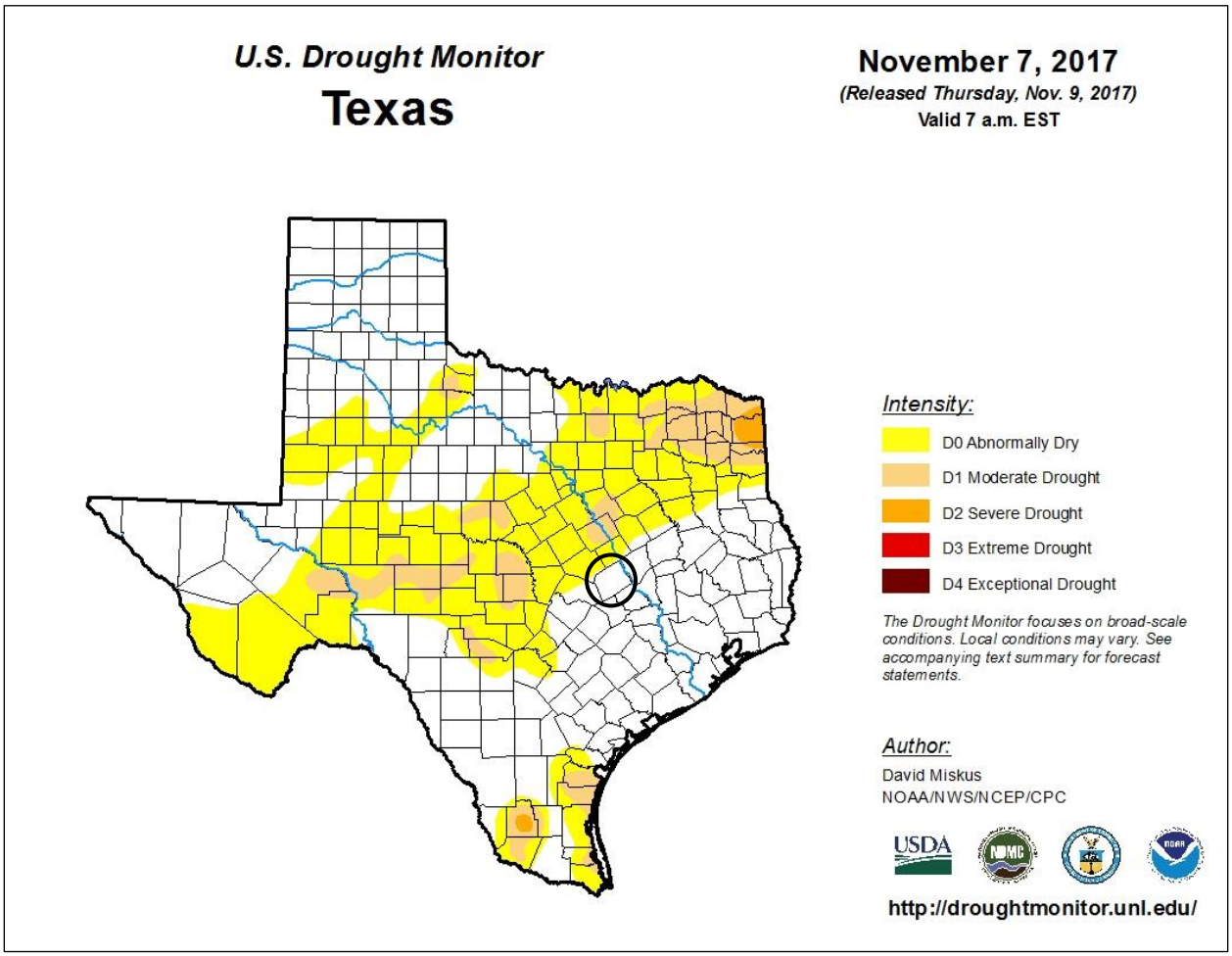
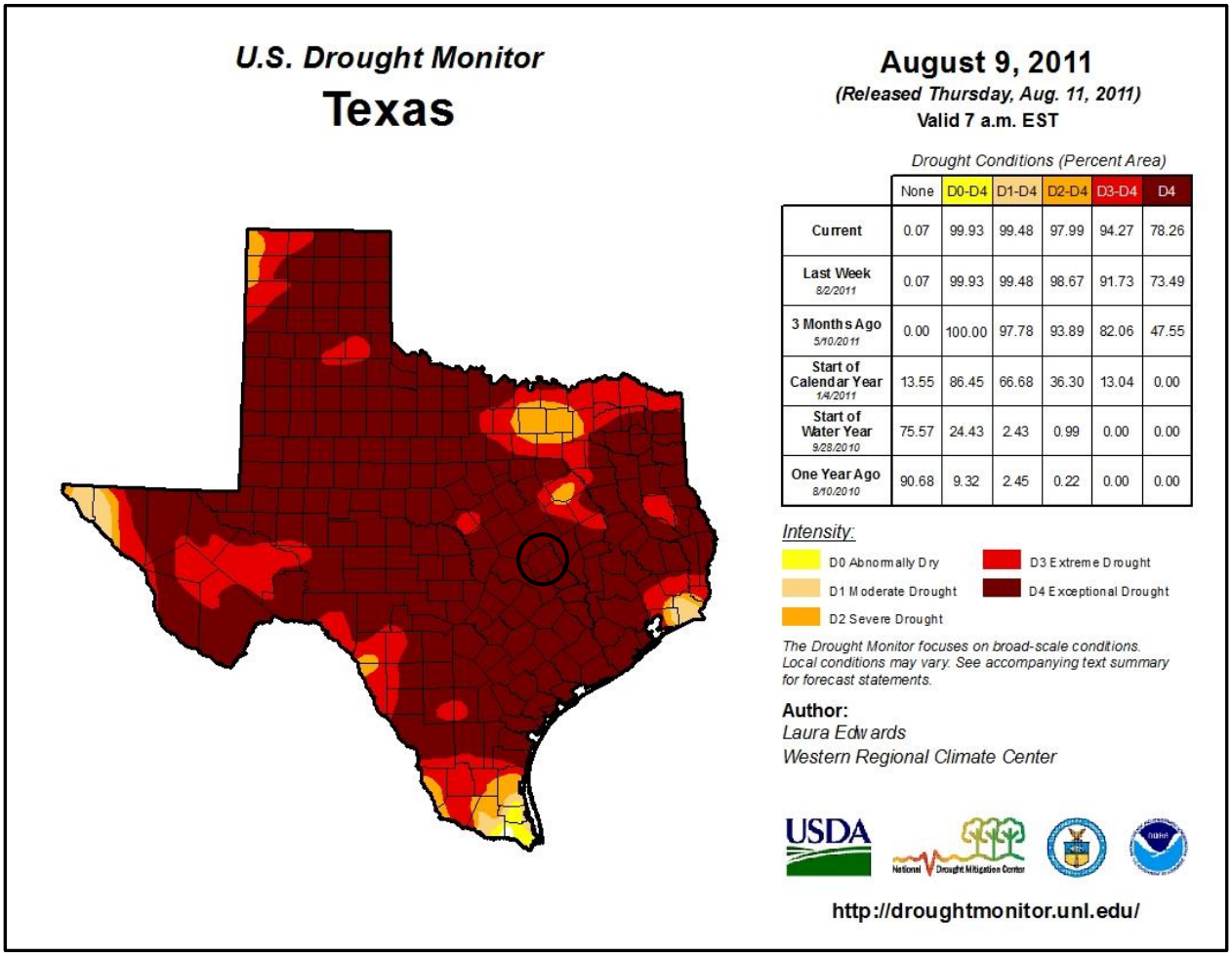


**Figure 11-2. U.S. Drought Monitor, August 2011**




# Extent

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop. Table 11-2 depicts magnitude of drought, while Table 11-3 describes the classification descriptions.

**Table 11-2. Palmer Drought Index**

| DROUGHT INDEX | DROUGHT CONDITION CLASSIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|---|
| | Extreme | Severe | Moderate | Normal | Moderately Moist | Very Moist | Extremely Moist |
| Z Index | -2.75 and below | -2.00 to -2.74 | -1.25 to -1.99 | -1.24 to +.99 | +1.00 to +2.49 | +2.50 to +3.49 | n/a |

| DROUGHT INDEX | DROUGHT CONDITION CLASSIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|---|
| | Extreme | Severe | Moderate | Normal | Moderately Moist | Very Moist | Extremely Moist |
| Meteorological | -4.00 and below | -3.00 to -3.99 | -2.00 to -2.99 | -1.99 to +1.99 | +2.00 to +2.99 | +3.00 to +3.99 | +4.00 and above |
| Hydrological | -4.00 and below | -3.00 to -3.99 | -2.00 to -2.99 | -1.99 to +1.99 | +2.00 to +2.99 | +3.00 to +3.99 | +4.00 and above |

**Table 11-3. Palmer Drought Category Descriptions[2]**

| 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 emergencies. | -5.0 or less |

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad scale drought conditions across the U.S. and correspond to the intensity of drought.

Based on the historical occurrences for drought and the location of the Milam County planning area, including all participating jurisdictions, the area can anticipate a range of drought from abnormally dry to exceptional, or D0 to D4, based on the Palmer Drought Category.

## Historical Occurrences

Milam County may typically experience a severe drought. Table 11-4 and 11-5 list historical events that have occurred in Milam County as reported in the National Centers for Environmental Information (NCEI). Historical drought information shows drought activity across a multi-county forecast area for

[2] Source: National Drought Mitigation Center

each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical drought data for all participating jurisdictions in the Milam County planning area are provided on a county-wide basis per the NCEI database.

**Table 11-4. Historical Drought Years, 1996-2017**

| DROUGHT YEAR |
|---|
| 1996 |
| 1998 |
| 2000 |
| 2005 |
| 2006 |
| 2006 |
| 2008 |
| 2009 |
| 2010 |
| 2011 |
| 2012 |
| 2013 |
| 2015 |
| **13 unique events** |

**Table 11-5. Historical Drought Events, 1996-2017[3]**

| JURISDICTION | DATE | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| Milam County | 8/1/1996 | 0 | 0 | $0 | $0 |
| Milam County | 7/1/1998 | 0 | 0 | $0 | $0 |
| Milam County | 8/1/2000 | 0 | 0 | $0 | $0 |
| Milam County | 9/1/2000 | 0 | 0 | $0 | $0 |
| Milam County | 11/1/2005 | 0 | 0 | $0 | $0 |
| Milam County | 12/1/2005 | 0 | 0 | $0 | $0 |

[3] Damages are reported in 2017 dollar values.

| JURISDICTION | DATE | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| Milam County | 1/1/2006 | 0 | 0 | $0 | $0 |
| Milam County | 2/1/2006 | 0 | 0 | $0 | $0 |
| Milam County | 3/1/2006 | 0 | 0 | $0 | $0 |
| Milam County | 6/6/2006 | 0 | 0 | $0 | $0 |
| Milam County | 7/1/2006 | 0 | 0 | $0 | $0 |
| Milam County | 8/1/2006 | 0 | 0 | $0 | $0 |
| Milam County | 9/1/2006 | 0 | 0 | $0 | $0 |
| Milam County | 11/1/2006 | 0 | 0 | $0 | $963,647 |
| Milam County | 6/24/2008 | 0 | 0 | $0 | $0 |
| Milam County | 7/1/2008 | 0 | 0 | $0 | $28,197 |
| Milam County | 8/1/2008 | 0 | 0 | $0 | $28,197 |
| Milam County | 9/1/2008 | 0 | 0 | $0 | $16,918 |
| Milam County | 10/1/2008 | 0 | 0 | $0 | $16,918 |
| Milam County | 11/1/2008 | 0 | 0 | $0 | $56,395 |
| Milam County | 12/1/2008 | 0 | 0 | $0 | $281,974 |
| Milam County | 1/1/2009 | 0 | 0 | $0 | $282,980 |
| Milam County | 2/1/2009 | 0 | 0 | $0 | $339,576 |
| Milam County | 3/1/2009 | 0 | 0 | $0 | $33,958 |
| Milam County | 4/1/2009 | 0 | 0 | $0 | $39,617 |
| Milam County | 5/1/2009 | 0 | 0 | $0 | $28,298 |
| Milam County | 6/1/2009 | 0 | 0 | $0 | $16,979 |
| Milam County | 7/1/2009 | 0 | 0 | $0 | $11,319 |
| Milam County | 8/1/2009 | 0 | 0 | $0 | $28,298 |
| Milam County | 9/1/2009 | 0 | 0 | $0 | $5,660 |
| Milam County | 12/5/2010 | 0 | 0 | $0 | $14,478 |
| Milam County | 1/1/2011 | 0 | 0 | $0 | $10,796 |
| Milam County | 2/1/2011 | 0 | 0 | $0 | $16,194 |
| Milam County | 3/1/2011 | 0 | 0 | $0 | $8,637 |

| JURISDICTION | DATE | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| Milam County | 4/1/2011 | 0 | 0 | $0 | $64,775 |
| Milam County | 5/1/2011 | 0 | 0 | $0 | $43,183 |
| Milam County | 6/1/2011 | 0 | 0 | $0 | $43,183 |
| Milam County | 7/1/2011 | 0 | 0 | $0 | $43,183 |
| Milam County | 8/1/2011 | 0 | 0 | $0 | $53,979 |
| Milam County | 9/1/2011 | 0 | 0 | $0 | $32,387 |
| Milam County | 10/1/2011 | 0 | 0 | $0 | $21,592 |
| Milam County | 11/1/2011 | 0 | 0 | $0 | $16,194 |
| Milam County | 12/1/2011 | 0 | 0 | $0 | $16,194 |
| Milam County | 1/1/2012 | 0 | 0 | $0 | $10,577 |
| Milam County | 2/1/2012 | 0 | 0 | $0 | $3,173 |
| Milam County | 3/1/2012 | 0 | 0 | $0 | $0 |
| Milam County | 6/19/2012 | 0 | 0 | $2,115 | $0 |
| Milam County | 7/1/2012 | 0 | 0 | $0 | $2,115 |
| Milam County | 8/1/2012 | 0 | 0 | $0 | $0 |
| Milam County | 12/1/2012 | 0 | 0 | $0 | $2,115 |
| Milam County | 1/1/2013 | 0 | 0 | $0 | $2,085 |
| Milam County | 2/1/2013 | 0 | 0 | $0 | $1,042 |
| Milam County | 3/1/2013 | 0 | 0 | $2,085 | $0 |
| Milam County | 4/1/2013 | 0 | 0 | $0 | $3,127 |
| Milam County | 5/1/2013 | 0 | 0 | $0 | $3,127 |
| Milam County | 6/18/2013 | 0 | 0 | $0 | $4,170 |
| Milam County | 7/1/2013 | 0 | 0 | $0 | $3,127 |
| Milam County | 8/1/2013 | 0 | 0 | $0 | $3,127 |
| Milam County | 9/1/2013 | 0 | 0 | $0 | $3,127 |
| Milam County | 8/25/2015 | 0 | 0 | $0 | $0 |
| Milam County | 9/1/2015 | 0 | 0 | $0 | $1,025 |
| Milam County | 10/1/2015 | 0 | 0 | $3,074 | $0 |

| JURISDICTION | DATE | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| TOTALS | | 0 | 0 | $7,274 | $2,605,643 |

## Significant Events

**June 2006 – November 2006**
Persistent drought conditions continued across portions of north and central Texas. Hydrologic deficits remained extremely high, with almost every lake well below conservation levels. Stage 1 water restrictions remained in effect in most impacted counties. Agricultural losses due to the drought continued to increase as the summer wore on. Ranchers, facing a lack of grass to feed their cattle, had to use hay to supplement feedings. As a result, hay prices increased dramatically, which forced producers to sell off cattle underweight rather than pay the high hay prices. The Drought Impact Reporter indicated hay prices in Texas were approximately twice what they were before the drought began. Crops continued to suffer, with the cotton production this year about half the size of last year. Milam County reported just under one million (2017 dollars) in crop losses as a direct result of the drought.

**June 2008 – September 2009**
Milam County was considered to be in an extreme drought (D3) in June 2008 according to the U.S. Drought Monitor. The western portion of Milam County reported oat and wheat crops were stressed from the lack of rain by September 2008. By the end of the westernmost third of the county was experiencing extreme drought (D3) with the remainder of the county experiencing severe drought (D2). Vegetation and livestock continued to suffer consequences of the lack of rain. One half of the winter wheat crop was in poor or very poor condition, while 75% of the winter oat crop was rated poor or very poor. Grazing land was also considered to be in poor condition, which affected the cattle industry.

Drought conditions continued to worsen across Milam County during the month of June according to the U.S. Drought Monitor. Extreme Drought was observed across the county for most of the month, but Exceptional Drought was declared across the southern third of the county by the end of the month. Rainfall totals continued to be below normal with less than an inch of rain in June.

By the end of August 2009, conditions worsened and most of the entire county was experiencing exceptional drought. Heavy rainfall in the middle of September 2009 substantially eased drought conditions, and the county was classified as abnormally dry (D0) by the end of the month. Milam County reported losses in excess of 1.2 million (2017) dollars through the duration of the drought.

# Probability of Future Events

Based on available records of historic events, there have been twelve extended time periods of drought (ranging in length from approximately 30 days to over 480 days) within a 22 year reporting period, which provides a probability of one event every year. This frequency supports a highly likely probability of future events. All participating jurisdictions events are included under the County.

# Vulnerability and Impact

Loss estimates were based on 22 years of statistical data from the NCEI. A drought event frequency-impact was then developed to determine an impact profile on agriculture products and estimate

potential losses due to drought in the area. Table 11-6 shows annualized exposure for Milam County, including all participating jurisdictions.

**Table 11-6. Drought Event Damage Totals, 1996-2017**

| JURISDICTION | PROPERTY & CROP LOSS | ANNUALIZED LOSS ESTIMATES |
|---|---|---|
| Milam County | $2,612,917 | $118,769 |

Drought impacts large areas and crosses jurisdictional boundaries. All existing and future buildings, facilities, and populations are exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings.

In terms of vulnerability, population, agriculture, property, and environment are all vulnerable to drought in the Milam County planning area, including all participating jurisdictions. The average person will survive only a few days without water, and this timeframe can be drastically shortened for those people with more fragile health – typically children under 5, the elderly, and the ill. Population over 65 in the Milam County planning area is estimated at 20% of the total population, and children under the age of 5 are estimated at 6.5% or an estimated total of 6,591[4] potentially vulnerable residents in the planning area based on age (Table 11-7).

**Table 11-7. Populations at Greater Risk by Jurisdiction**

| JURISDICTION | POPULATION 65 AND OLDER | POPULATION UNDER 5 |
|---|---|---|
| Milam County[5] | 4,974 | 1,617 |
| Town of Buckholts | 105 | 34 |
| City of Cameron | 1,114 | 362 |
| City of Milano | 85 | 28 |
| City of Rockdale | 1,124 | 365 |
| City of Thorndale | 269 | 87 |

The population is also vulnerable to food shortages when drought conditions exist, and potable water is in short supply. Potable water is used for drinking, sanitation, patient care, sterilization, equipment, heating and cooling systems, and many other essential functions in medical facilities. All residents in the Milam County planning area could be adversely affected by drought conditions, which could limit water supplies and present health threats. During summer drought, or hot and dry conditions, elderly persons, small children, infants and the chronically ill who do not have adequate cooling units in their homes may become more vulnerable to injury and/or death.

The economic impact of droughts can be significant as they produce a complex web of impacts that spans many sectors of the economy and reach well beyond the area experiencing physical drought.

[4] US Census Bureau 2016 data for Milam County

[5] County totals includes all incorporated jurisdictions and unincorporated areas.

This complexity exists because water is integral to our ability to produce goods and provide services. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

Habitat damage is a vulnerability of the environment during periods of drought for both aquatic and terrestrial species. Fish and wildlife in and near Belton Lake and the Miller Springs Nature Center may be negatively impacted by prolonged drought. The environment also becomes vulnerable during periods of extreme or prolonged drought due to severe erosion and land degradation.

Impact of droughts experienced in the Milam County planning area has resulted in no injuries or fatalities supporting a limited severity of impact meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property is destroyed or with major damage. Annualized loss over the 22-year reporting period in the Milam County planning area, including all participating jurisdictions is $118,769 annually.

## Assessment of Impacts

The Drought Impact Reporter was developed in 2005 by the University of Nebraska-Lincoln to provide a national database of drought impacts. Droughts can have an impact on: the agriculture; business and industry; energy; fire; plants and wildlife; relief, response, and restrictions; society and public health; tourism and recreation; and water supply and quality. Table 11-8 lists the drought impacts to the Milam County planning area from 2005 to 2017 based on reports received by the Drought Impact Reporter.

**Table 11-8. Drought Impacts, 2005-2017**

| DROUGHT IMPACTS 2005-2015 | |
|---|---|
| Agriculture | 36 |
| Business & Industry | 2 |
| Energy | 1 |
| Fire | 13 |
| Plants & Wildlife | 15 |
| Relief, Response & Restrictions | 16 |
| Society & Public Health | 3 |
| Tourism & Recreation | 0 |
| Water Supply & Quality | 12 |

Drought has the potential to impact people in the Milam County planning area. While it is rare that drought, in and of itself, leads to a direct risk to the health and safety of people in the U.S., severe water shortages could result in inadequate supply for human needs. Drought also is frequently associated with a variety of impacts, including:

- Recreational activities that rely on water may be curtailed, such as hunting and fishing, resulting in fewer tourists and lower revenue.

- The number of health-related low-flow issues (e.g., diminished sewage flows, increased pollution concentrations, reduced firefighting capacity, cross-connection contamination) will increase as the drought intensifies.
- Public safety from forest/range/wildfires will increase as water availability and/or pressure decreases.
- Respiratory ailments may increase as the air quality decreases.
- There may be an increase in disease due to wildlife concentrations (e.g., rabies, Rocky Mountain spotted fever, Lyme disease).
- Jurisdictions and residents may disagree over water use/water rights, creating conflict.
- Political conflicts may increase between municipalities, counties, states, and regions.
- Water management conflicts may arise between competing interests.
- Increased law enforcement activities may be required to enforce water restrictions.
- Severe water shortages could result in inadequate supply for human needs as well as lower quality of water for consumption.
- Firefighters may have limited water resources to aid in firefighting and suppression activities, increasing risk to lives and property.
- During drought there is an increased risk for wildfires and dust storms.
- The community may need increased operational costs to enforce water restriction or rationing.
- Prolonged drought can lead to increases in illness and disease related to drought.
- Utility providers can see decreases in revenue as water supplies diminish.
- Utilities providers may cut back energy generation and service to their customers to prioritize critical service needs.
- Fish and wildlife food and habitat will be reduced or degraded over time during a drought and disease will increase, especially for aquatic life.
- Wildlife will move to more sustainable locations creating higher concentrations of wildlife in smaller areas, increasing vulnerability and further depleting limited natural resources.
- Severe and prolonged drought can result in the reduction of a species, or cause the extinction of a species altogether.
- Plant life will suffer from long-term drought. Wind and erosion will also pose a threat to plant life as soil quality will decline.
- Dry and dead vegetation will increase the risk of wildfire.
- Drought poses a significant risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Drought related declines in production may lead to an increase in unemployment.
- Drought may limit livestock grazing resulting in decreased livestock weight, potential increased livestock mortality, and increased cost for feed.
- Negatively impacted water suppliers may face increased costs resulting from the transport water or develop supplemental water resources.
- Long term drought may negatively impact future economic development.

The overall extent of damages caused by periods of drought is dependent on its extent and duration. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a drought event.

# Section 12: Lightning



## Hazard Description

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall.

According to FEMA, an average of 300 people are injured and 80 people are killed in the United States each year by lightning. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities, and infrastructure. Lightning is also responsible for igniting wildfires that can result in widespread damages to property before firefighters have the ability to contain and suppress the resultant fire.

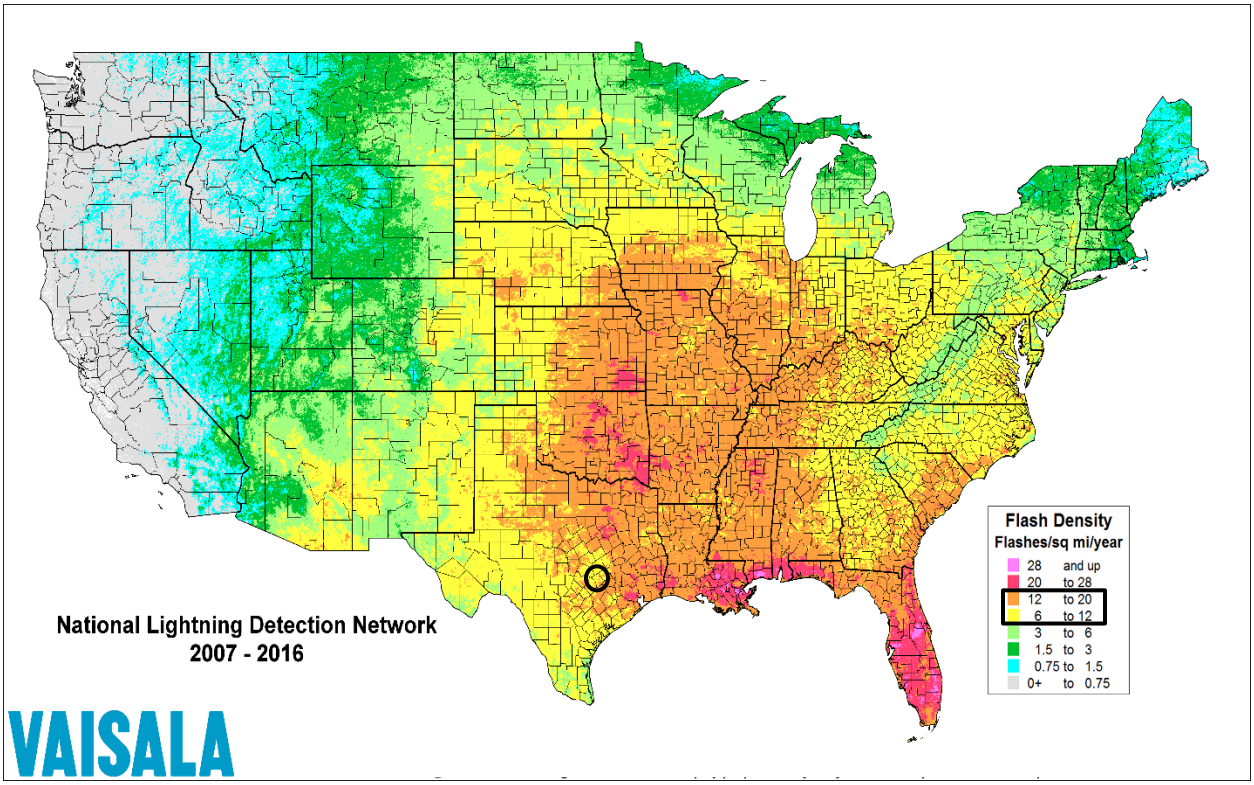
## Location

Lightning can strike in any geographic location and is considered a common occurrence in Texas. The Milam County planning area, including all participating jurisdictions, is located in a region of the country that is moderately susceptible to a lightning strike. Therefore, lightning could occur at any location within the entire planning area. It is assumed that the entire Milam County planning area is uniformly exposed to the threat of lightning.

## Extent

According to the NOAA, the average number of cloud-to-ground flashes for the State of Texas between 2007 and 2016 was 11.3 flashes per square mile. Vaisala's U.S. National Lightning Detection Network lightning flash density map (Figure 12-1) shows a range of six to twenty cloud-to-ground lightning flashes per square mile per year for the entire Milam County planning area. This rate equates to approximately 6,132 to 20,440 flashes per year for the entire planning area.

**Figure 12-1. Lightning Flash Density, 2007-2016**




The extent for lightning can be expressed in terms of the number of strikes in an interval. NOAA utilizes lightning activity levels (LALs) on a scale from 1-6. LAL rankings reflect the frequency of cloud-to-ground lightning either forecast or observed (Table 12-1).

**Table 12-1. NOAA Lightning Activity Levels (LAL)**

| LAL | CLOUD & STORM DEVELOPMENT | LIGHTNING STRIKES/ 15 MIN |
|---|---|---|
| 1 | No thunderstorms. | - |
| 2 | Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent. | 1-8 |
| 3 | Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent. | 9-15 |
| 4 | Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common and lightning is frequent. | 16-25 |
| 5 | Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense. | >25 |

| LAL | CLOUD & STORM DEVELOPMENT | LIGHTNING STRIKES/ 15 MIN |
|---|---|---|
| 6 | Similar to LAL 3 except thunderstorms are dry. | |

The NCEI does not include the LAL for historical lightning events, therefore in order to determine the extent of lightning strikes, the yearly average range of estimated number of lightning strikes within the planning area (6,132 to 20,440 flashes) and a cloud-to-ground flash density of six to twenty per square mile were divided by the number[1] of thunderstorm events that occur annually in the planning area. Milam County, including all participating jurisdictions, should expect an average range of 11 to 35 lightning strikes within 15 minutes at any given time during a lightning or combined lightning and thunderstorm event, indicating lightning strikes have an average LAL range of 4 to 5. With the LAL of 5 being the worst that can be anticipated in the future for all participating jurisdictions.

# Historical Occurrences

Table 12-2 depicts historical occurrences of lightning for the Milam County planning area, including all participating jurisdictions, with associated damages according to the National Centers for Environmental Information (NCEI) data. Since January 1996, only three recorded lightning events are known to have impacted Milam County, based upon NCEI records. It is highly likely additional lightning occurrences have gone unreported before and during the recording period.

The NCEI is a national data source organized under the National Oceanic and Atmospheric Administration. The NCEI is the largest archive available for climate data; however, it is important to note that the only incidents factored into this risk assessment are those that are reported to the NCEI for the Milam County planning area. Damage estimates provided in a table for losses have been modified to reflect the damage in 2017 dollars.

**Table 12-2. Historical Lightning Events, with Reported Damages, 1996-2017**[2]

| JURISDICTION | DATE | TIME | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|---|
| Cameron | 9/17/2006 | 10:00 PM | 0 | 0 | $120,456 | $0 |
| Thorndale | 3/13/2007 | 2:00 AM | 0 | 0 | $5,856 | $0 |
| Cameron | 5/1/2007 | 4:50 PM | 1 | 1 | $0 | $0 |
| **TOTALS** | | | **1** | **1** | **$126,312** | **$0** |

## Significant Events

**May 1, 2007 – Cameron**

A split in the upper levels of the atmosphere steered several southern stream impulses into north Texas, producing flash flooding, strong winds, lightning, and a few tornadoes. Two people were struck

[1] Analysis includes the highest number of events recorded in a given year during the reporting period in order to account for typical under reporting of thunderstorm and lightning events.
[2] Damage values are in 2017 dollars.

by lightning in Milam County while fishing at the edge of a pond. One was killed and the other was injured.

## Probability of Future Events

Based on historical records and input from the planning team the probability of occurrence for future lightning events in the Milam County planning area is considered highly likely, or an event probable in the next year. The planning team stated that lightning occurs regularly in the planning area. According to NOAA, Milam County is located in an area of the country that experiences six to twenty lightning flashes per square mile per year (approximately 6,132 to 20,440 flashes per year). Given this estimated probability of events, it can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the planning area, including all participating jurisdictions.

## Vulnerability and Impact

Vulnerability is difficult to evaluate since lightning events can occur at different strength levels, in random locations, and can create a broad range of damages depending on the strike location. Due to the randomness of these events, all existing and future structures and facilities in the Milam County planning area could potentially be impacted and remain vulnerable to possible injury and property loss from lightning strikes. The Milam County planning area has had only three reported lightning events, however the entire planning area, including all participating jurisdictions, are vulnerable and could be impacted by lightning.

The direct and indirect losses associated with these events include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources. The entire population of Milam County is considered exposed to the lightning hazard. The peak lightning season in the State of Texas is from June to August; however, the most fatalities occur in July. Fatalities occur most often when people are outdoors and/or participating in some form of recreation. Population located outdoors is considered at risk and more vulnerable to a lightning strike compared to being inside a structure. Moving to a lower risk location will decrease a person's vulnerability.

The entire general building stock and all infrastructure of Milam County are considered exposed to the lightning hazard. Lightning can be responsible for damages to buildings, cause electrical, forest and/or wildfires, and damage infrastructure such as power transmission lines and communication towers. Agricultural losses can be extensive due to lightning and resulting fires.

The following critical facilities would be vulnerable to lightning events in each participating jurisdiction:

**Table 12-3. Critical Facilities at Risk by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | Communications Tower, 8 Rural Water Supply Facilities, School |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations, School |
| City of Cameron | Airport (and 3 support facilities), 5 Government/Civic Facilities, Library, Museum, Animal Shelter, 2 Water Towers, Police Station, Fire Station, EMS (with support facility), Water Treatment Plant, Waste Water Treatment |

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| | Plant, 3 Public Works Support Facilities, Sheriff's Office/County Jail, Communications Tower, 2 Funeral Homes, 2 Nursing Homes, Hospital, 2 Health Clinics, 4 Schools, Hike and Bike Trail Support Facilities |
| City of Milano | Fire Department, 3 Schools, Water Department, Civic Center, Community Center, EMS/Ambulance |
| City of Rockdale | Government Facility, Hospital, Nursing Home, 2 Police Stations, Fire Station, Water Treatment Plant, Waste Water Treatment Plant, 4 Schools, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, Police/Fire/EMS/Government Facility, 5 Schools, Fire Station Command Facility/Evacuation Center |

Impact of lightning experienced in the Milam County planning area has resulted in one injury and one fatality. The structural impact of lightning events experienced in the Milam County planning area, including all participating jurisdictions, would be limited with less than ten percent of structures destroyed or damaged and facilities shut down for 24 hours or less. However, based on the past fatality and injury, the impact of lightning events is considered "Substantial". Overall, the average loss estimate for Milam County, including all participating jurisdictions, (in 2017 dollars) is $126,312, having an approximate annual loss estimate of $5,741 (Table 12-4).

**Table 12-4. Potential Annualized Losses for Milam County**[3]

| JURISDICTION | PROPERTY & CROP LOSS | ANNUAL LOSS ESTIMATE |
|---|---|---|
| Milam County | $0 | $0 |
| Town of Buckholts | $0 | $0 |
| City of Cameron | $120,456 | $5,475 |
| City of Milano | $0 | $0 |
| City of Rockdale | $0 | $0 |
| City of Thorndale | $5,856 | $266 |
| **Planning Area** | **$126,312** | **$5,741** |

## Assessment of Impacts

Lightning events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be directly struck, posing significant health risks and potential death.
- Structures can be damaged or crushed by falling trees damaged by lightning, which can result in physical harm to the occupants.

[3] Damage values are in 2017 dollars.

- Lightning strikes can result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Lightning strikes can be associated with structure fires and wildfires, creating additional risk to residents and first responders.
- Emergency operations and services may be significantly impacted due to power outages and/or loss of communications.
- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Economic disruption due to power outages and fires negatively impacts the programs and services provided by the community due to short and long- term loss in revenue.
- Some businesses not directly damaged by lightning events may be negatively impacted while utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of lightning on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, communities, local businesses, and citizens will also contribute to the overall economic and financial conditions in the aftermath of any lightning event.

# Section 13: Winter Storm



## Hazard Description

A severe winter storm event is identified as a storm with snow, ice, or freezing rain. This type of storm can cause significant problems for area residents. Winter storms are associated with freezing or frozen precipitation such as freezing rain, sleet, snow, and the combined effects of winter precipitation and strong winds. Wind chill is a function of temperature and wind. Low wind chill is a product of high winds and freezing temperatures.

Winter storms that threaten Milam County usually begin as powerful cold fronts that push south from central Canada. Although the county is at risk to ice hazards, extremely cold temperatures, and snow, the effects and frequencies of winter storm events are generally mild and short-lived. As indicated in Figure 13-1, on average, the Milam County planning area, including all participating jurisdictions, typically does not experience extreme cold days every year. Extreme Cold days are described as when the weather drops below $32^0$F for an extended period of time. However, winter storms are possible in the planning area. During times of ice and snow accumulation, response times will increase until public works road crews are able to make major roads passable. Table 13-1 describes the types of winter storms possible to occur in the Milam County planning area, including all participating jurisdictions.

**Figure 13-1. Extreme Cold Days, 1960-2003[1]**

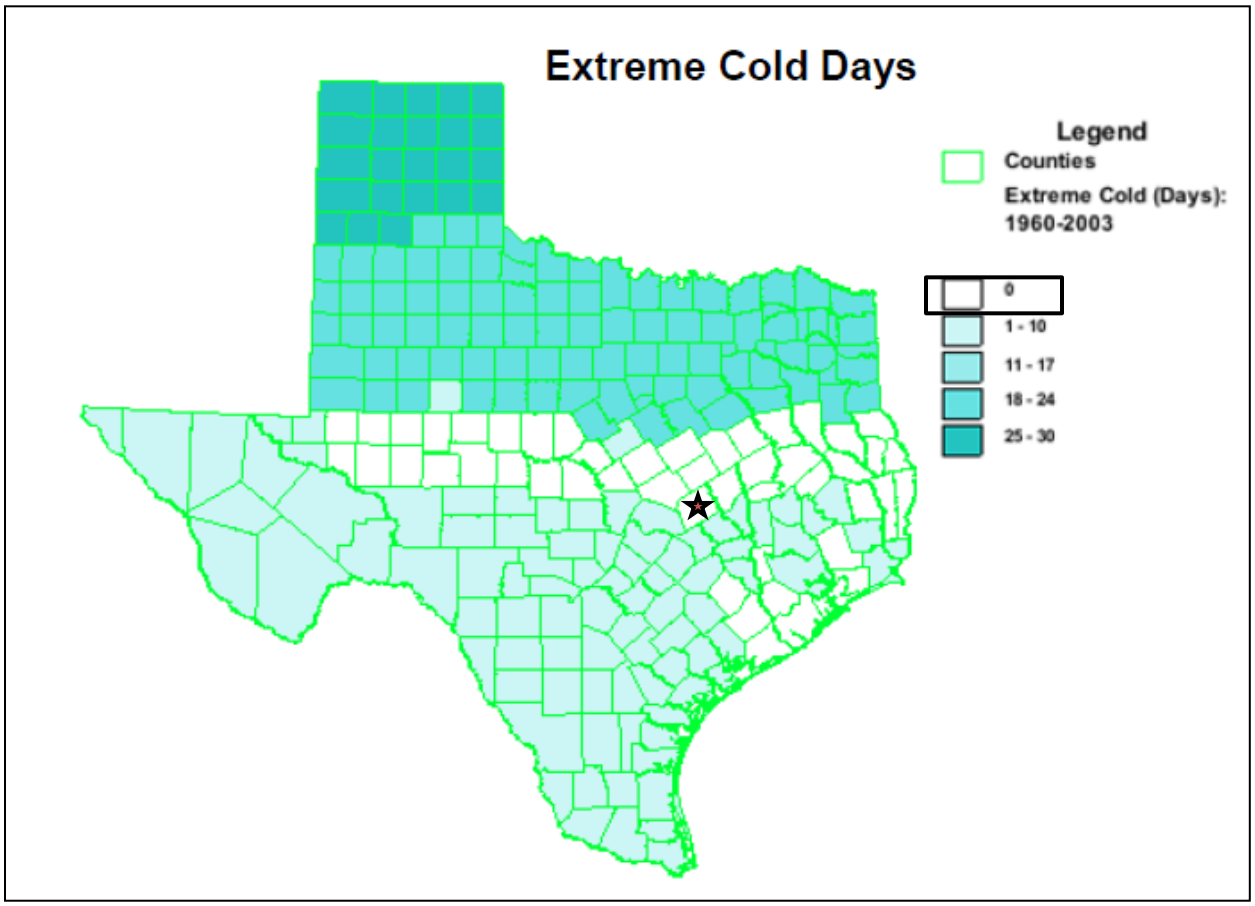



**Table 13-1. Types of Winter Storms**

| TYPE OF WINTER STORM | DESCRIPTION |
|---|---|
| **Winter Weather Advisory** | This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events. |
| **Winter Storm Watch** | Severe winter weather conditions may affect your area (freezing rain, sleet, or heavy snow may occur separately or in combination). |
| **Winter Storm Warning** | Severe winter weather conditions are imminent. |
| **Freezing Rain or Freezing Drizzle** | Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects. |
| **Sleet** | Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous. |

[1] Source: National Weather Service. Milam County indicated by star.

| TYPE OF WINTER STORM | DESCRIPTION |
|---|---|
| **Blizzard Warning** | Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted. |
| **Frost/Freeze Warning** | Below freezing temperatures are expected and may cause significant damage to plants, crops, and fruit trees. |
| **Wind Chill** | A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor. |

# Location

Winter storm events are not confined to specific geographic boundaries. Therefore, all existing and future buildings, facilities, and populations in the Milam County planning area, including all participating jurisdictions, are considered to be exposed to a winter storm hazard and could potentially be impacted.

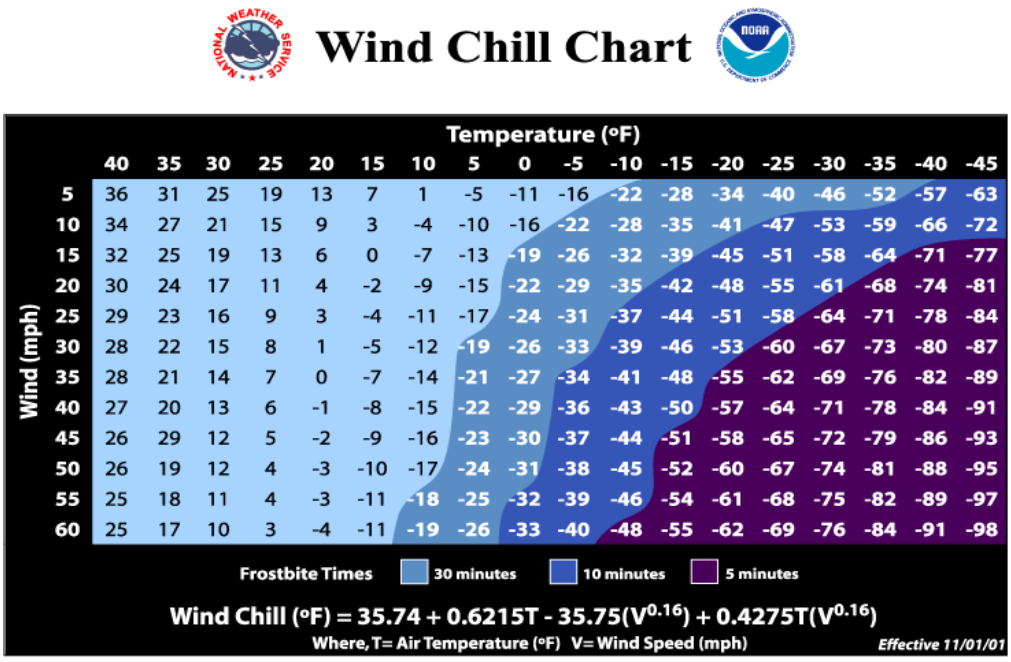
# Extent

The extent or magnitude of a severe winter storm is measured in intensity based on the temperature and level of accumulations as shown in Table 13-2. Table 13-2 should be read in conjunction with the wind-chill factor described in Figure 13-2 to determine the intensity of a winter storm. The chart is not applicable when temperatures are over 50°F or winds are calm. This is an index developed by the National Weather Service.

**Table 13-2. Magnitude of Severe Winter Storms**

| INTENSITY | TEMPERATURE RANGE (Fahrenheit) | EXTENT DESCRIPTION |
|---|---|---|
| **Mild** | 40° – 50° | Winds less than 10 mph and freezing rain or light snow falling for short durations with little or no accumulations |
| **Moderate** | 30° – 40° | Winds 10 – 15 mph and sleet and/or snow up to 4 inches |
| **Significant** | 25° – 30° | Intense snow showers accompanied with strong gusty winds between 15 and 20 mph with significant accumulation |
| **Extreme** | 20° – 25° | Wind driven snow that reduces visibility, heavy winds (between 20 to 30 mph), and sleet or ice up to 5 millimeters in diameter |
| **Severe** | Below 20° | Winds of 35 mph or more and snow and sleet greater than 4 inches |

**Figure 13-2. Wind Chill Chart**




| Wind (mph) | 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 | 29 | 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 |

Wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30°F day would feel just as cold as a calm day with 0°F temperatures. The Milam County planning area, including all participating jurisdictions, has never experienced a blizzard, but based on 14 previous occurrences recorded from 1996 through 2017, it has been subject to winter storm watches, warnings, freezing rain, sleet, snow, and wind chill.

The average number of cold days is similar for the entire planning area, including all participating jurisdictions. Therefore, the intensity or extent of a winter storm event to be mitigated for the area ranges from mild to significant according to the definitions at Table 13-2. Milam County planning area, including all participating jurisdiction, can expect anywhere between 0.1 to 4.0 inches of ice and snow during a winter storm event and temperatures between 25 and 50 degrees with winds ranging from 0 to 20 mph in the future.

## Historical Occurrences

Table 13-3 shows historical occurrences for Milam County from 1996 through 2017 provided by the NCEI database. There have been 14 recorded winter storm events in Milam County. Historical winter storm information, as provided by the NCEI, identifies winter storm activity across a multi-county forecast area for each event. The appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical winter storm data for the county and all participating jurisdictions are provided on a County-wide basis per the NCEI database. Table 13-3 shows historical incident information for the planning area.

**Table 13-3. Historical Winter Storm Events, 1996-2017[2]**

| JURISDICTION | DATE | DEATHS | INJURIES | PROPERTY DAMAGE | CROP DAMAGE |
|---|---|---|---|---|---|
| Milam County | 11/24/1996 | 0 | 0 | $0 | $0 |
| Milam County | 1/12/1997 | 0 | 0 | $0 | $0 |
| Milam County | 12/22/1998 | 0 | 0 | $0 | $0 |
| Milam County | 1/25/2000 | 0 | 0 | $0 | $0 |
| Milam County | 12/12/2000 | 0 | 0 | $0 | $0 |
| Milam County | 12/25/2000 | 0 | 0 | $0 | $0 |
| Milam County | 12/31/2000 | 0 | 0 | $0 | $0 |
| Milam County | 1/1/2001 | 0 | 0 | $0 | $0 |
| Milam County | 2/24/2003 | 0 | 0 | $0 | $0 |
| Milam County | 12/22/2004 | 0 | 0 | $0 | $0 |
| Milam County | 12/7/2005 | 0 | 0 | $0 | $0 |
| Milam County | 1/15/2007 | 0 | 0 | $35,136 | $0 |
| Milam County | 1/16/2007 | 0 | 0 | $23,424 | $0 |
| Milam County | 2/23/2010 | 0 | 0 | $27,841 | $0 |
| **TOTALS** | | | | **$86,401** | |

## Significant Events

**January 15, 2007 – Milam County**
Cold air in place in combination with ample moisture and an upper level disturbance caused a mix of freezing rain and rain to fall across North Texas. Dozens of winter weather and flash flood incidents were reported with this event. Between 1/8 and 1/4-inch of ice fell over the northern half of the county, with the southern half receiving between 1/4 and 1/2-inch. The ice covered roads, bridges, and overpasses, causing dozens of wrecks. Just outside of Cameron, several tractor-trailers got stuck along the south side of Little River Bridge when they could not gain traction on the ice. Highways 36, 77, and 190 were especially icy and were the sites of several accidents.

# Probability of Future Events

According to historical records, the planning area experiences approximately one winter storm event per year. Hence, the probability of a future winter storm event affecting the Milam County planning area, including all participating jurisdictions, is highly likely.

[2] Values are in 2017 dollars.

# Vulnerability and Impact

During periods of extreme cold and freezing temperatures, water pipes can freeze and crack, and ice can build up on power lines, causing them to break under the weight or causing tree limbs to fall on the lines. These events can disrupt electric service for long periods.

An economic impact may occur due to increased consumption of heating fuel, which can lead to energy shortages and higher prices. 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.

All populations, buildings, critical facilities, and infrastructure in the entire Milam County planning area are vulnerable to severe winter events.

The following critical facilities would be vulnerable to Winter Storm events in each participating jurisdiction:

**Table 13-4. Critical Facilities at Risk by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | Communications Tower, 8 Rural Water Supply Facilities, School |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations, School |
| City of Cameron | Airport (and 3 support facilities), 5 Government/Civic Facilities, Library, Museum, Animal Shelter, 2 Water Towers, Police Station, Fire Station, EMS (with support facility), Water Treatment Plant, Waste Water Treatment Plant, 3 Public Works Support Facilities, Sheriff's Office/County Jail, Communications Tower, 2 Funeral Homes, 2 Nursing Homes, Hospital, 2 Health Clinics, 4 Schools, Hike and Bike Trail Support Facilities |
| City of Milano | Fire Department, 3 Schools, Water Department, Civic Center, Community Center, EMS/Ambulance |
| City of Rockdale | Government Facility, Hospital, Nursing Home, 2 Police Stations, Fire Station, Water Treatment Plant, Waste Water Treatment Plant, 4 Schools, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, Police/Fire/EMS/Government Facility, 5 Schools, Fire Station Command Facility/Evacuation Center |

People and animals are subject to health risks from extended exposure to cold air. Elderly people are at greater risk of death from hypothermia during these events, especially in the rural areas of the county where populations are sparse, icy roads may impede travel, and there are fewer neighbors to check in on the elderly. 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.

Population over 65 in the Milam County planning area is estimated at 20% of the total population or an estimated total of 4,974[3] potentially vulnerable residents in the planning area based on age (Table 13-5).

[3] US Census Bureau 2016 data for Milam County

**Table 13-5. Population at Greater Risk by Jurisdiction**

| JURISDICTION | POPULATION 65 AND OLDER |
|---|---|
| Milam County[4] | 4,974 |
| Town of Buckholts | 105 |
| City of Cameron | 1,114 |
| City of Milano | 85 |
| City of Rockdale | 1,124 |
| City of Thorndale | 269 |

Historic loss, in 2017 dollars, is estimated at $86,401 in damages over the 21-year recording period giving an approximate loss of $3,927 in damages annually (Table 13-6). The potential severity of impact for the Milam County planning area, including all participating jurisdictions, are limited meaning injuries are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property destroyed or with major damage.

**Table 13-6. Winter Storm Event Damage Totals, 1996-2017**

| JURISDICTION | PROPERTY & CROP LOSS | ANNUALIZED LOSS ESTIMATES |
|---|---|---|
| Milam County | $86,401 | $3,927 |

## Assessment of Impacts

The greatest risk from a winter storm hazard is to public health and safety. Potential impacts for the planning area may include:

- Vulnerable populations, particularly the elderly and children under 5, can face serious or life-threatening health problems from exposure to extreme cold including hypothermia and frostbite.
- Loss of electric power or other heat source can result in increased potential for fire injuries or hazardous gas inhalation because residents burn candles for light or use fires or generators to stay warm.
- Response personnel, including utility workers, public works personnel, debris removal staff, tow truck operators, and other first responders, are subject to injury or illness resulting from exposure to extreme cold temperatures.
- Response personnel would be required to travel in potentially hazardous conditions, elevating the life safety risk due to accidents and potential contact with downed power lines.
- Operations or service delivery may experience impacts from electricity blackouts due to winter storms.
- Power outages are possible throughout the planning area due to downed trees and power lines and/or rolling blackouts.

[4] County totals includes all incorporated jurisdictions and unincorporated areas.

- Critical facilities without emergency backup power may not be operational during power outages.
- Emergency response and service operations may be impacted by limitations on access and mobility if roadways are closed, unsafe, or obstructed.
- Hazardous road conditions will likely lead to increases in automobile accidents, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by ice and snow events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A winter storm event could lead to tree, shrub, and plant damage or death.
- Severe cold and ice could significantly damage agricultural crops.
- Schools may be forced to shut early or completely close due to treacherous driving conditions.
- Exposed water pipes may be damaged by severe or late season winter storms at both residential and commercial structures, causing significant damages.

The economic and financial impacts of winter weather on the community will depend on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of a winter storm event.

# Section 14: Hurricane



## Hazard Description

According to the National Oceanic and Atmospheric Administration (NOAA), a hurricane is an intense tropical weather system of strong thunderstorms with well-defined surface circulation and maximum sustained winds of 74 miles per hour (mph) or higher. In the Northern Hemisphere, circulation of winds near the Earth's surface is counterclockwise.

As a hurricane develops, the barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. Tropical depressions intensify into tropical storms when maximum sustained winds increase to between 35-46 knots (39-73 mph). At these wind speeds, the storm becomes more organized and circular in shape and begins to resemble a hurricane. Tropical storms can be equally problematic without ever becoming a hurricane, resulting in heavy rainfall, high winds and tidal surge in coastal communities. When maximum sustained winds reach or exceed 39 mph, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 mph, the storm is deemed a hurricane.

The intensity of a land falling hurricane is expressed in categories relating wind speeds and potential damage. Tropical storm-force winds are strong enough to be dangerous to those caught in them. For this reason, emergency managers plan to have evacuations completed and personnel sheltered before winds of tropical storm-force arrive, which precedes the arrival of hurricane-force winds.

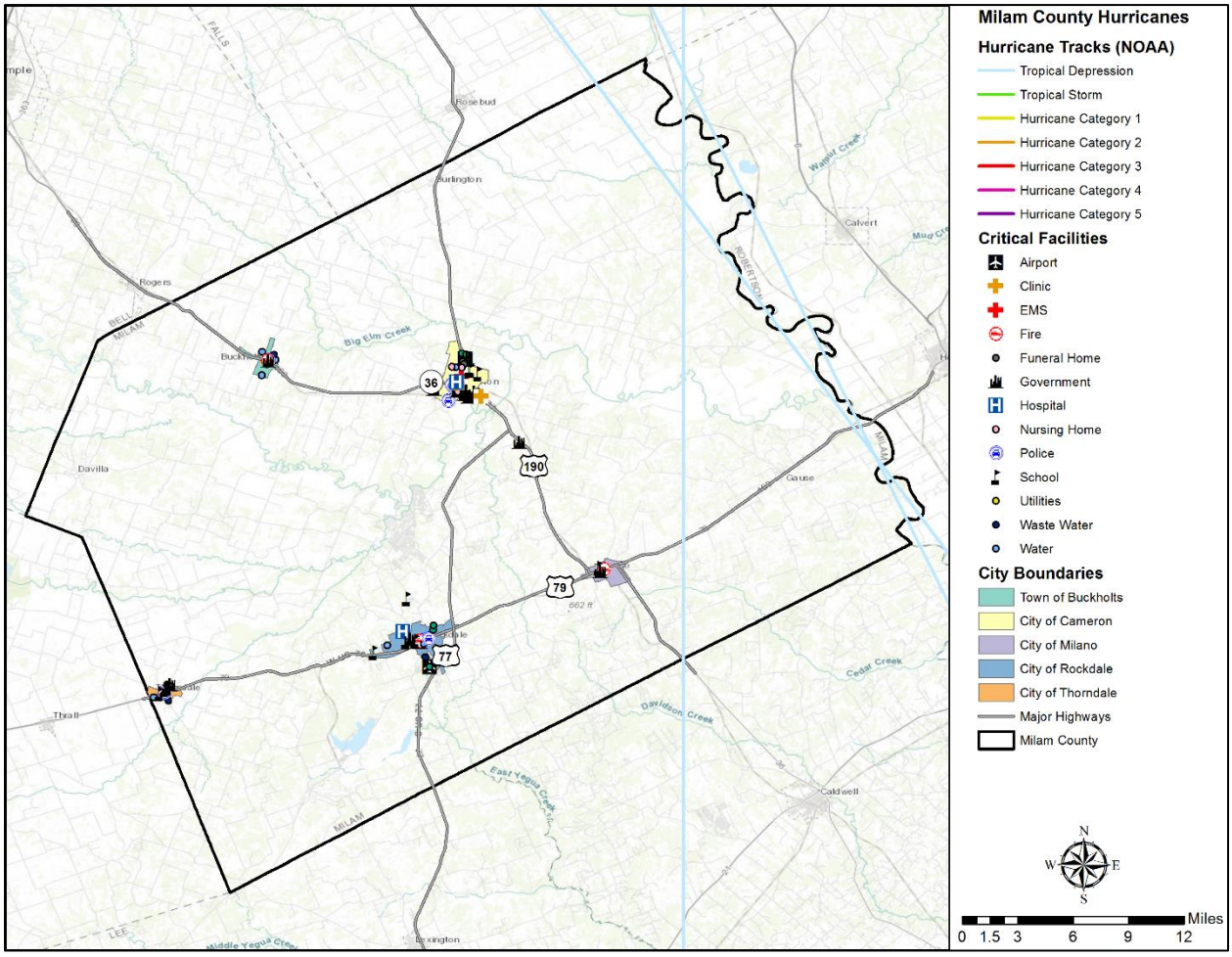
According to the National Hurricane Center, the greatest potential for loss of life related to a hurricane is from storm surge. This happens when low pressure and high circular winds "pile" the water into a dome shape that can be 50-100 miles wide. The surge travels with the storm and is most severe on the right side of the storm, relative to the direction the storm travels. The surge can be 15 feet deep, topped by waves, and make landfall ahead of the center, or "eye", of the hurricane. Wind-driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with normal high tides.

## Location

The Milam County planning area is located inland from the coast and is outside of the hurricane wind speed hazard areas. However, the entire planning area is susceptible to the indirect threats of a

hurricane, including high winds and flooding. Thus, the Milam County planning area, including all participating jurisdictions, is in a low risk area for hurricane wind speeds of 90 miles per hour (mph) or less as shown in Figure 14-1. Hurricanes and/or tropical storms can impact the planning area from June 1 through November 30, the official Atlantic U.S. hurricane season.

**Figure 14-1. Locations of Hurricane Tracks**




# Extent

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale (See Table 14-1). A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. This scale only ranks wind speed, but lower category storms can inflict greater damage than higher category storms depending on where they strike, other weather they interact with, and how slow they move.

**Table 14-1. Extent Scale for Hurricanes**

| CATEGORY | MAXIMUM SUSTAINED WIND SPEED (Mph) | MINIMUM SURFACE PRESSURE (Millibars) | STORM SURGE (Feet) |
|---|---|---|---|
| **1** | 74 – 95 | Greater than 980 | 3 – 5 |
| **2** | 96 – 110 | 979 – 965 | 6 – 8 |
| **3** | 111 – 130 | 964 – 945 | 9 – 12 |
| **4** | 131 – 155 | 944 – 920 | 13 – 18 |
| **5** | 155 + | Less than 920 | 19 + |

Based on the historical storm tracks for hurricanes and the location of the Milam County planning area, which is outside of the hurricane wind hazard area, the average extent to be mitigated in the future is for a Category 1 storm for the entire planning area. This data is based on the design wind speeds for a 100-year event.

## Historical Occurrences

Previous occurrences include storms that had a direct path through Milam County and the tracks near the county. Table 14-2 below lists the storms that have impacted the Milam County planning area, including all participating jurisdictions, during the years of 1960-2017.

**Table 14-2. Historical Hurricane Events for Milam County Planning Area, 1960-2017**

| JURISDICTION | DATE | MAGNITUDE | FATALITIES | INJURIES | PROPERTY DAMAGE (2017 Value) | CROP DAMAGE (2017 Value) |
|---|---|---|---|---|---|---|
| Countywide | 6/23/1960 | Tropical Depression (Unnamed) | 0 | 0 | $0 | $0 |
| Countywide | 9/12/1970 | Tropical Depression Felice | 0 | 0 | $0 | $0 |
| Countywide | 7/28/1995 | Tropical Depression Dean | 0 | 0 | $0 | $0 |
| Countywide | 9/8/1998 | Tropical Depression Frances | 0 | 0 | $0 | $0 |
| Countywide | 9/13/2008 | Tropical Storm Ike | 0 | 0 | $11,495 | $0 |
| Countywide | 6/16/2015 | Tropical Depression Bill | 0 | 0 | $2,056 | $0 |
| **Total** | | | **0** | **0** | **$13,551** | |

## Significant Events

**Tropical Storm Ike on September 13, 2008**
After slamming into the Gulf coast, Hurricane Ike weakened slowly as it moved north. Several counties in east Texas received damaging winds from the storm. Sustained winds of 25-35 MPH with gusts up to 50 MPH were reported for several hours as T.S. Ike moved east of the area. Power lines, trees, and large limbs were blown down, causing damage to vehicles and structures. Power was knocked out in Milam County in the unincorporated town of Gause as T.S. Ike blew past. Large limbs damaged power lines causing power outages.

**Tropical Depression Bill on June 16, 2015**
Tropical Depression Bill brought flooding to parts of Texas. Heavy rainfall fell in many counties along the storm's path including Milam County. The ground in many areas was still saturated from heavy rainfall in April and May, and the heavy rainfall from TD Bill quickly overflowed creeks, streams, lakes, and roads. In some areas it took over 24 hours for the water to drain. Strong winds up to 35 mph from Tropical Depression Bill knocked down a few trees in Rockdale. A few of the damaged trees fell on power lines causing additional damage.

# Probability of Future Events

Based on historical occurrences of significant hurricane/tropical storm wind events, the probability of future events is unlikely, with a probability of one event every ten years for the entire Milam County planning area.

# Vulnerability and Impact

Hurricane-force winds can cause major damage to large areas; hence all existing buildings, facilities, and populations are equally exposed and vulnerable to this hazard and could potentially be impacted. Warning time for hurricanes has lengthened due to modern and early warning technology. Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes, as well as debris such as signs, roofing materials, and small items left outside become extremely hazardous in hurricanes and tropical storms. Extensive damage to trees, towers, and underground utility lines (from uprooted trees) and fallen poles cause considerable civic disruption.

The Milam County planning area features multiple mobile or manufactured home parks throughout the planning area including all participating jurisdictions. These parks are typically more vulnerable to thunderstorm wind events than typical site built structures. In addition, manufactured homes are located sporadically throughout the planning area in unincorporated portions of the county as well as within all participating jurisdictions.

The U.S. Census data indicates a total of 1,828 manufactured homes located in the Milam County planning area, including all participating jurisdictions (Table 14-3), totaling approximately 16.1% of the residential structures in the planning area. In addition, 53.9% (approximately 6,112 structures) of the single family residential (SFR) structures in the Milam County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant Hurricane or Tropical Storm events.

**Table 14-3. Structures at Greater Risk by Jurisdiction**

| JURISDICTION | MANUFACTURED HOMES | STRUCTURES BUILT BEFORE 1980 |
|---|---|---|
| Milam County[1] | 1,828 | 6,112 |
| Town of Buckholts | 41 | 156 |
| City of Cameron | 177 | 1,790 |
| City of Milano | 26 | 98 |
| City of Rockdale | 316 | 1,504 |
| City of Thorndale | 115 | 422 |

The following critical facilities would be vulnerable to hurricane events in the Milam County planning area, by jurisdiction:

**Table 14-4. Critical Facilities by Jurisdiction**

| JURISDICTION | CRITICAL FACILITIES |
|---|---|
| Milam County | Communications Tower, 8 Rural Water Supply Facilities, School |
| Town of Buckholts | Police Station, Fire Station, Town Hall, Water Tower, Waste Water Treatment Facility, 3 Lift Stations, School |
| City of Cameron | Airport (and 3 support facilities), 5 Government/Civic Facilities, Library, Museum, Animal Shelter, 2 Water Towers, Police Station, Fire Station, EMS (with support facility), Water Treatment Plant, Waste Water Treatment Plant, 3 Public Works Support Facilities, Sheriff's Office/County Jail, Communications Tower, 2 Funeral Homes, 2 Nursing Homes, Hospital, 2 Health Clinics, 4 Schools, Hike and Bike Trail Support Facilities |
| City of Milano | Fire Department, 3 Schools, Water Department, Civic Center, Community Center, EMS/Ambulance |
| City of Rockdale | Government Facility, Hospital, Nursing Home, 2 Police Stations, Fire Station, Water Treatment Plant, Waste Water Treatment Plant, 4 Schools, 4 Utility Facilities |
| City of Thorndale | Water Treatment Plant, Waste Water Treatment Plant, Police/Fire/EMS/Government Facility, 5 Schools, Fire Station Command Facility/Evacuation Center |

Storm track data was available for the past 58 years; however, property and crop loss data is only available from 1960 to the present. Table 14-2 shows impact or loss estimation for storms impacting the county. Table 14-3 shows the number of significantly vulnerable structures within the planning area, including all participating jurisdictions. Damages in Table 14-2 are reported on a countywide basis and are not independently available for each participating jurisdiction. The annual loss estimates for the entire planning area were considered negligible based on the 58 year reporting period for damages (Table 14-5).

[1] County totals includes all incorporated jurisdictions and unincorporated areas.

**Table 14-5. Potential Annualized Losses, 1960-2017**

| JURISDICTION | NUMBER OF EVENTS | PROPERTY & CROP LOSS (2017 DOLLARS) | ANNUAL LOSS ESTIMATES (2017 DOLLARS) |
|---|---|---|---|
| Milam County | 6 | $13,551 | $234 |

The potential severity of impact from a hurricane for the Milam County planning area is considered minor meaning, complete shutdown of critical facilities and services for 24 hours of less, and less than 10 percent of property would be destroyed or have major damage.

## Assessment of Impacts

Hurricane events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Residential structures may suffer substantial damage, requiring immediate shelter and long-term displacement assistance for residents.
- Driving conditions in the planning area may be dangerous during a hurricane event, especially over elevated bridges, elevating the risk of injury and accidents during evacuations if not timed properly.
- Additional resources may be required for emergency preparedness and response during the summer months due to increases in populations.
- Emergency evacuations may be necessary prior to a hurricane landfall, requiring emergency responders, evacuation routing, and temporary shelters.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- Hurricane events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Extreme hurricane events may rupture gas lines and down trees and power lines, increasing the risk of structure fires during and after a storm event.
- Extreme hurricane events may lead to prolonged evacuations during search and rescue, and immediate recovery efforts requiring additional emergency personnel and resources to prevent entry, and protect citizens and property.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.

- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the County and City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long- term loss in revenue.
- Some businesses not directly damaged by the hurricane may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to hurricane damage.
- Large scale hurricanes can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of a hurricane on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, community, local businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of any hurricane event.

# Section 15: Dam Failure

Portions of the CTCOG/Milam County Hazard Mitigation Plan are considered confidential and not for release to the public. The information in this section is covered under Privacy Act of 1974 (5 U.S.C. Section 552a).

# Section 16: Mitigation Strategy



## Mitigation Goals

Based on the results of the risk and capability assessments, the Planning Team developed and prioritized the mitigation strategy. At the Mitigation Workshop in September 2017, Planning Team members refined the Plan's mitigation strategy. The following goals and objectives were identified.

### Goal 1

Protect public health and safety.

#### Objective 1.1

Advise the public about health and safety precautions to guard against injury and loss of life from hazards.

#### Objective 1.2

Maximize utilization of the latest technology to provide adequate warning, communication, and mitigation of hazard events.

#### Objective 1.3

Reduce the danger to, and enhance protection of, high risk areas during hazard events.

#### Objective 1.4

Protect critical facilities and services.

### Goal 2

Build and support local capacity and commitment to continuously become less vulnerable to hazards.

#### Objective 2.1

Build and support local partnerships to continuously become less vulnerable to hazards.

#### Objective 2.2

Build a cadre of committed volunteers to safeguard the community before, during, and after a disaster.

#### Objective 2.3

Build hazard mitigation concerns into county planning and budgeting processes.

## Goal 3

Increase public understanding, support, and demand for hazard mitigation.

### Objective 3.1

Heighten public awareness regarding the full range of natural and man-made hazards the public may face.

### Objective 3.2

Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards and increase individual efforts to respond to potential hazards.

### Objective 3.3

Publicize and encourage the adoption of appropriate hazard mitigation measures.

## Goal 4

Protect new and existing properties.

### Objective 4.1

Reduce repetitive losses to the National Flood Insurance Program (NFIP).

### Objective 4.2

Use the most cost-effective approach to protect existing buildings and public infrastructure from hazards.

### Objective 4.3

Enact and enforce regulatory measures to ensure that future development will not put people in harm's way or increase threats to existing properties.

## Goal 5

Maximize the resources for investment in hazard mitigation.

### Objective 5.1

Maximize the use of outside sources of funding.

### Objective 5.2

Maximize participation of property owners in protecting their properties.

### Objective 5.3

Maximize insurance coverage to provide financial protection against hazard events.

### Objective 5.4

Prioritize mitigation projects, based on cost-effectiveness and sites facing the greatest threat to life, health, and property.

## Goal 6

Promote growth in a sustainable manner.

### Objective 6.1

Incorporate hazard mitigation activities into long-range planning and development activities.

### Objective 6.2

Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

### Objective 6.3

Utilize regulatory approaches to prevent creation of future hazards to life and property.

# Section 17: Mitigation Actions



## Summary

As discussed in Section 2, at the mitigation workshop the planning team and stakeholders met to develop mitigation actions for each of the natural hazards included in the Plan. Each of the actions in this section were prioritized based on FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) criteria necessary for the implementation of each action. As a result of this exercise, an overall priority was assigned to each mitigation action.

As part of the economic evaluation of the STAPLEE analysis, jurisdictions analyzed each action in terms of the overall costs, measuring whether the potential benefit to be gained from the action outweighed costs associated with it. As a result of this exercise, priority was assigned to each mitigation action by marking them as High (H), Moderate (M), or Low (L). An action that is ranked as "High" indicates that the action will be implemented as soon as funding is received. A "Moderate" action is one that may not be implemented right away depending on the cost and number of citizens served by the action. Actions ranked as "Low" indicate that they will not be implemented without first seeking grant funding and after "High" and "Moderate" actions have been completed.

All mitigation actions created by Planning Team members are presented in this section in the form of Mitigation Action Worksheets. More than one hazard is sometimes listed for an action, if appropriate. Actions presented in this section represent a comprehensive range of mitigation actions per current State and FEMA Guidelines, including two actions, per hazard, and of two different types.

**Table 17-1. Milam County and Participating Jurisdictions Mitigation Action Matrix**

| TYPE OF ACTION: | |
|---|---|
| Action #1 – Plans/Regulations (Blue) | Action #4 - Structural (Orange) |
| Action #2 - Education/Awareness (Red) | Action #5 – Preparedness/Response (Black) |
| Action #3 - Natural Resource (Green) | |

| Jurisdiction | Thunderstorm Wind | Flood | Extreme Heat | Tornado | Hail | Wildfire | Drought | Lightning | Winter Storm | Hurricane | Dam Failure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Milam County | XXX | XXXXX | XXXX | XXX | XXX | XXX XXX | XXX | XXX | XXXXX | XXX | XXX |
| Buckholts | XXX XXXX | XXXX XXXXX | XXXX XXXX | XXX XXXX | XXXX XXXX | XXXX XXXXX | XXX XXX XXX | XXXXX | XXXXX XXXX | XXXXX | |
| Cameron | XXXXX XXXXX | XXXXXX XXXXXX | XXXXX XXXXX | XXXXX XXXXX | XXXXX XXXXX | XXXXX XXXXX XXX | XXXX XXXX XX | XXXX XXX XXX | XXXXX XXXX XXXX | XXXXX XXXXX XXX | |
| Milano | XXXXX XXXXX | XXXXXX XXXXXX | XXXXX XXXXXX | XXXXX XXXXX | XXXX XXXXX | XXXXX XXXXX XXXX | XXXX XXXX XXX | XXX XXX XXX | XXXX XXXX XXXXX | XXXX XXXXX | |
| Rockdale | XXXXX XXXXX | XXXX XXXXX | XXXXX XXXXX | XXXX XXXXX | XXXXX XXXXX | XXXX XXXX XXX | XXXX XXXX | XXX XXX XXX | XXXX XXXX XXX | XXXX XXXXX | |
| Thorndale | XXXX XXXX | XXXX XXXXX | XXXXX XXXXX | XXXX XXXX | XXXX XXXX | XXXX XXXXX | XXX XXXX | XXX XXX XXX | XXXX XXXX XXXX | XXXX XXX | |

# Milam County

| | Milam County – Action #1 |
|---|---|
| **Proposed Action:** | **Work with Lower Brushy Creek Water Control & Improvement District; Participate in the Belton Dam TTX and Stillhouse Dam Drills with US Army Corps of Engineers – Resource the inundation maps showing areas that will flood if Belton Dam breaches. Serve on the L.E.P.C.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | Milam County |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of property damages or loss of life. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Dam Failure |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $20,000 |
| **Potential Funding Sources:** | County EM Budget, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milam County Commissioners, EMC |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Response Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Milam County – Action #2 |
|---|---|---|
| | **Proposed Action:** | **Multiple County roads are prone to flooding, need to replace culverts to larger sizes, purchase and install box culverts, low water crossings and several aging wooden structure bridges need to be replaced and upgraded to current load limits and regulations. Several hundred miles of roads need to be chipped seal and seal coated. Multiple areas need H&H Analysis.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Areas of Milam County to include:<br>**Pct. 1** CR 418 Davilla area; **Pct. 2** CR 133, 134, 255 Loop, 255 East and CR 273; **Pct. 3** CR 237, 264, 320, 325, 328, 342 and CR 352; **Pct. 4** CR 304, 437, 442, 445, 446, 455, 462 and CR 464 |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce flood losses to structures and infrastructure through drainage improvements and increased flow capacity. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to existing and future structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,000,000 |
| **Potential Funding Sources:** | Milam County R&B, EM Budget, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milam County |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Drainage Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milam County – Action #3 |
|---|---|---|
| | **Proposed Action:** | **Participate in the NWS Skywarn-Stormspotters Training.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to life and property through continued education and training. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | Milam County Emergency Management Budget |
| **Lead Agency/Department Responsible:** | Emergency Management Coordinator |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Milam County – Action #4 |
|---|---|---|
| | **Proposed Action:** | **Work with the Public Health Preparedness Coordinator to assist vulnerable population; Collect and distribute fans and electric heaters to vulnerable populations.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce illness or fatalities of vulnerable populations during extreme temperatures. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milam County Commissioners, county and Local EMCs |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Milam County – Action #5 |
|---|---|---|
| | **Proposed Action:** | **Educate/practice heat awareness safety with road crews and provide water for hydration during extreme heat events.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of injuries or illness to employees and contractors through education. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Local EMCs |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Standard Operating Procedures Planning |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Milam County – Action #6 |
|---|---|---|
| | **Proposed Action:** | **Implement improved asphalt materials for roads during repaving.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce damages to roadways during severe winter storms. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing and future infrastructure |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $250,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants, Milam County R&B, EM Budget |
| **Lead Agency/Department Responsible:** | County and Local Public Works |
| **Implementation Schedule:** | Within 48 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milam County – Action #7 |
|---|---|---|
| | **Proposed Action:** | **Adopt and implement Burn Ban; Implement fuels reduction program utilizing Control Burn Policies; maintain MOUs/Mutual Aid with VFDs of Milam County and Region; Provide Burn Ban signage throughout the county.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of wildfire and wildfire spread through regulations, fuels reduction and education. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations<br>Natural Systems Protection<br>Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire |
| **Effect on New/Existing Buildings:** | Reduce risk to existing and future infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Precinct Commissioners |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milam County – Action #8 |
|---|---|---|
| | **Proposed Action:** | **Utilize social media and/or distribute pamphlets with information on pre-disaster mitigation ideas, health and safety tips, and local risk for all profiled natural hazards.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents during natural hazard events. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Dam Failure (only to Milam Co Unincorporated), Drought, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $2,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milam County Commissioners, County and Local EMCs |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | N/A |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Milam County – Action #9 |
|---|---|---|
| | **Proposed Action:** | **Harden critical facilities; Install backup generators with permanent hard wiring for all critical facilities.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents during natural hazard events; Ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Dam Failure (Milam Co Unincorporated only), Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $100,000 - $500,000 per jurisdiction |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | County and Local EMCs |
| **Implementation Schedule:** | Within 48 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milam County – Action #10 |
|---|---|---|
| | **Proposed Action:** | **Install drought tolerant landscaping at all public buildings.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Milam County (including all participating jurisdictions) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce water usage at public facilities during times of drought; Increase water conservation. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Natural Systems Protection |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $2,000 - $5,000 per jurisdiction |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | County and Local Public Works |
| **Implementation Schedule:** | Within 48 months of plan adoption |
| **Incorporation into Existing Plans:** | N/A |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Milam County – Action #11 |
|---|---|---|
| | **Proposed Action:** | **Develop H&H study for flood zones and storm drainage/waste water system; Submit H&H data to FEMA for flood mapping; Adopt identified flood hazard areas, as determined in the H&H study as best available data for floodplain development.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | County-wide – Covering all areas with no SFHA data or limited SFHA data including Milam County unincorporated, Buckholts, Milano, Rockdale, and Thorndale. |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of flooding through improved floodplain management data and regulated development; Enhance risk assessment. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to future structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $3,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milam County Floodplain Manager |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Drainage Plan, Flood Damage Prevention Ordinance |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

# Buckholts

| | Buckholts – Action #1 |
|---|---|
| **Proposed Action:** | **Harden and retrofit the gymnasium to be FEMA 361 safe room and include a generator with permanent hard wiring for HVAC system; Utilize gymnasium as heating/ cooling center for community during extreme temperatures.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | Buckholts ISD Gymnasium |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Prevent loss of life due to severe weather events. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Tornado, Hail, Hurricane, Thunderstorm Wind, Winter Storm, Extreme Heat |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $750,000 |
| **Potential Funding Sources:** | General Funds, Bonds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts Emergency Management & ISD |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan; ISD Operations Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Buckholts – Action #2 |
|---|---|---|
| | **Proposed Action:** | **Develop and implement plan to utilize media, town hall postings and social media on a regular schedule to educate citizens with information about mitigation activities to reduce risk to property and life from all hazards that pose a risk to the area.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to citizens and property through education and awareness. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Extreme Heat, Flood, hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Buckholts Administration, EMC |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | **Buckholts – Action #3** |
|---|---|---|
| | **Proposed Action:** | **Serve on the Milam County Emergency Response Board (L.E.P.C.); Develop plans and action plans to reduce risk and education citizens.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to citizens and property through education and awareness and preparedness. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $500 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Buckholts Emergency Management Coordinator |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Buckholts – Action #4 |
|---|---|---|
| | **Proposed Action:** | **Adopt and enforce requirements for mandatory water conservation measures during periods of drought; Develop and implement drought contingency plan.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce water usage during periods of drought through water conservation measures. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Buckholts Administration |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Buckholts – Action #5 |
|---|---|---|
| | **Proposed Action:** | **Improve water supply monitoring.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of contamination. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $10,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts Administration |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Buckholts – Action #6 |
|---|---|---|
| | **Proposed Action:** | **Provide assistance to vulnerable populations during extreme events.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce loss of life or injury. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts Administration, EMC |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Preparedness plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Buckholts – Action #7 |
|---|---|---|
| | **Proposed Action:** | **Adopt higher National Flood Insurance Program standards to reduce future flood losses.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce future flood losses through higher building standards. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to future structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Buckholts City Engineer |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Floodplain Ordinance |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Buckholts – Action #8 |
|---|---|---|
| | **Proposed Action:** | **Improve storm water management plan; Upgrade drainage system to accommodate a higher flow capacity.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce future flood losses through improved planning and drainage. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to existing and future structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $250,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts City Engineers |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Storm Water Management Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Buckholts – Action #9 |
|---|---|---|
| | **Proposed Action:** | **Participate in annual Sky-warn Training.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Buckholts emergency personnel, first responders |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Increase high risk awareness to prevent loss of life and property. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds |
| **Lead Agency/Department Responsible:** | Buckholts Administration |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Buckholts – Action #10 |
|---|---|---|
| | **Proposed Action:** | **Harden critical facilities and equipment; Install generators with permanent hard wired quick connections; Install redundant communications system and internal fiber network.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Buckholts Critical Facilities |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce damages to critical facilities through improved construction techniques; Ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce damages to existing structures |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts Administration, EMC |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| Buckholts – Action #11 | |
|---|---|
| **Proposed Action:** | **Adopt and implement routine fire hydrant maintenance, burn ban ordinance, and fire prevention regulations.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | Community-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of fires through local burn restrictions and regular maintenance. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire |
| **Effect on New/Existing Buildings:** | Reduce damages to existing and future structures |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $10,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts Administration |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan, Community Wildfire Protection Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Buckholts – Action #12 |
|---|---|---|
| | **Proposed Action:** | **Reduce impact to roadways using improved asphalt material (inter-governmental agreement with Commissioner Precinct 1).** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Community-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of loss of life and property through improved road conditions. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce damage to existing and future infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Buckholts Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

# Cameron

| Cameron – Action #1 | |
|---|---|
| **Proposed Action:** | **Develop evacuation plan.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to life and property. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations - Preparedness |

| MITIGATION ACTION DETAILS | |
|---|---|
| **Hazard(s) Addressed:** | Flood, Hurricane, Wildfire |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $10,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Fire Department |
| **Implementation Schedule:** | Within 24-36 months of plan adoption |
| **Incorporation into Existing Plans:** | Evacuation Plan |

| COMMENTS |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Cameron – Action #2 |
|---|---|---|
| | **Proposed Action:** | **Replace dated fire hydrants and extend city water mains and hydrants into outlying areas.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of wildfire with additional access to hydrants. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $200,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Fire Department, Public Works |
| **Implementation Schedule:** | Within 24-36 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | Cameron – Action #3 |
|---|---|
| **Proposed Action:** | **Modernize and upgrade Communication systems; Implement reverse 911 system; Install emergency alert system such as sirens.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to life and property through early warning; Increased/reliable communications system for emergency personnel can reduce risk and increase response time. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $50,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Fire Department, EMC |
| **Implementation Schedule:** | Within 36-48 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Response Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | Cameron – Action #4 |
|---|---|
| **Proposed Action:** | **Implement fuels reduction program in high risk areas; Design and Implement tree trimming program near power lines and roadways.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce power outages resulting from downed trees and limbs; Reduce risk of wildfire through reduction in fuels in high risk areas such as the WUI. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $250,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Fire Department, Public Works |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Cameron – Action #5 |
|---|---|---|
| | **Proposed Action:** | **Identify and retrofit locations as community safe room or build stand-alone community safe room; Utilize safe room as cooling and heating centers for vulnerable populations.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City site to be determined |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Protect lives of citizens and first responders during extreme weather events. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $800,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Emergency Management |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Cameron – Action #6 |
|---|---|---|
| | **Proposed Action:** | **Reduce impact to roadway through resurfacing roadway with materials resistant to ice hazards; Adopt requirements for ice resistant roadway materials in future development.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide roadways (as they are repaved or developed) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce damages to roadways through improved construction practices. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project<br>Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to new and existing infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Public Works |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Cameron – Action #7 |
|---|---|---|
| | **Proposed Action:** | **Utilize social media and/or distribute pamphlets with information on pre-disaster mitigation ideas, health and safety tips, and local risk for all natural hazards.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents during natural hazard events through education and awareness program. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Drought, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Emergency Management |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Cameron – Action #8 |
|---|---|---|
| | **Proposed Action:** | **Improve existing Emergency Operation Centers and facilities with generators (with hardwired quick connections), harden building, install emergency and redundant communications, and create city internal fiber networks.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Cameron Emergency Operation Center |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents; Ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $500,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Emergency Management |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
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| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Cameron – Action #9 |
|---|---|---|
| | **Proposed Action:** | **Develop H&H study for flood zones and storm drainage/waste water system; Implement improvements based on study including upgrading box culverts lift stations, storm water drains and developing retention ponds; Increase size of existing storm drainage system.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of flooding through improved drainage capacity; Enhance risk assessment. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to new and existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Public Works |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Drainage Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Cameron – Action #10 |
|---|---|---|
| | **Proposed Action:** | **Rebuild and relocate dam and city water intake station; Secure and build strong holds on the banks of the Ox Bow; Build an alternate intake station and water source; Create interconnection of water lines with other water district.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide; Intake Station – Little River Ox Bow and Dam |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of flash flooding and loss of life; Flash flood destroy Little River Ox Bow and Dam where Cameron City water intake station is. This is the City's only water source. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood, Drought |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $5,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Public Works, Emergency Management |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan |

| **COMMENTS** |
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| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| Cameron – Action #11 | |
|---|---|
| **Proposed Action:** | **Build covered parking for emergency vehicles that will reduce damage to emergency vehicles.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | Cameron Police and EMS Stations, City Hall |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk damage to vehicles by providing protection; Ensure continuity of emergency services. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing assets |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Emergency Management |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Cameron – Action #12 |
|---|---|---|
| | **Proposed Action:** | **Adopt and implement Drought Contingency Plan; Adopt measures to regularly monitor river and water supply; Adopt water restriction regulations during extreme drought periods.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of water shortages through water restrictions and contingency planning. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $3,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Water Department |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| Cameron – Action #13 | |
|---|---|
| **Proposed Action:** | **Drill alternative water wells.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of water shortages through water use of alternate or redundant sources. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| MITIGATION ACTION DETAILS | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Cameron Water Department |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan |

| COMMENTS |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

# Milano

| | | Milano – Action #1 |
|---|---|---|
| | **Proposed Action:** | **Utilize social media and/or distribute pamphlets with information on pre-disaster mitigation ideas, health and safety tips, and local risk for all natural hazards; Serve on LEPC Committee.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents through education and awareness programs. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Drought, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $2,500 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Emergency Management |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | N/A |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Milano – Action #2 |
|---|---|---|
| | **Proposed Action:** | **Adopt and implement drought tolerant construction practices and landscaping techniques for all public infrastructure and buildings.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide public facilities |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce water usage through improved permeable construction techniques and drought tolerant landscaping. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations<br>Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $15,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Milano – Action #3 |
|---|---|---|
| | **Proposed Action:** | **Develop H&H study for flood zones and drainage; Implement feasible drainage improvements to reduce flood levels in high risk areas of Milano; Re-work road base and seal coat roads to enhance roadways; Develop storm water projects to include upgraded culverts and street projects that reduce future flood losses; Submit H&H data to FEMA for flood mapping.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide with emphasis on 4th, 5th, 6th Streets and Avenue A, B, C, D, E, and F |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk through improved drainage system and capacity. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $75,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan; Drainage Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milano – Action #4 |
|---|---|---|
| | **Proposed Action:** | **Participate in the National Flood Insurance Program.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk through improved development regulations. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to future structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Milano Administration |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 4 |

| | Milano – Action #5 |
|---|---|
| **Proposed Action:** | **Increase awareness by participation in annual NWS Sky-warn Training-Storm Spotter Class.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk through improved training and education. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,500 |
| **Potential Funding Sources:** | General Funds (staff time), State Grants |
| **Lead Agency/Department Responsible:** | Milano Administration |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Response Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Milano – Action #6 |
|---|---|---|
| | **Proposed Action:** | **Identify and retrofit location as community safe room or build stand-alone community safe room; Utilize safe room as cooling and heating centers for vulnerable populations.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City site to be determined |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Protect lives of citizens and first responders during extreme weather events. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $800,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Emergency Management |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milano – Action #7 |
|---|---|---|
| | **Proposed Action:** | **Improve existing critical facilities with generators (with hardwired quick connections), harden buildings, install emergency and redundant communications, and create city internal fiber networks.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide Critical Facilities |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents; Ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Emergency Management |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milano – Action #8 |
|---|---|---|
| | **Proposed Action:** | **Modernize and upgrade Communication systems; Implement reverse 911 system; Install emergency alert system such as sirens.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to life and property through early warning; Increased/reliable communications system for emergency personnel can reduce risk and increase response time. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $200,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Emergency Management |
| **Implementation Schedule:** | Within 36 months of plan adoption |
| **Incorporation into Existing Plans:** | N/A |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Milano – Action #9 |
|---|---|---|
| | **Proposed Action:** | **Develop, adopt and implement outdoor burn ban ordinance.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to life and property through burn regulations. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $2,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Emergency Management |
| **Implementation Schedule:** | Within 36 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection Plan |

| **COMMENTS** |
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| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| Milano – Action #10 | |
|---|---|
| **Proposed Action:** | **Implement a hazardous fuels reduction program for local critical facilities, roadways and railways at risk for wildfire.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of wildfires as well as the spread of wildfires through fuels reduction near critical facilities; Ensure continuity of services. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Natural Systems Protection |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $15,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Fire Department |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Milano – Action #11 |
|---|---|---|
| | **Proposed Action:** | **Reduce impact to roadway through resurfacing roadway with materials resistant to ice hazards; Adopt requirements for ice resistant roadway materials in future development.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide roadways (as they are repaved or developed) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce damages to roadways through improved construction practices. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project<br>Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to new and existing infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $25,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Milano Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

# Rockdale

| | Rockdale – Action #1 |
|---|---|
| **Proposed Action:** | **Serve on a Milam County Emergency Response Board – Local Emergency Planning Committee.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Provide City input to County Emergency Response Plan; Coordinate with other cities. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire, Winter Storm, Hail, Drought, Flood, Extreme Heat, Hurricane, Thunderstorm Wind |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $5,000 |
| **Potential Funding Sources:** | General Funds |
| **Lead Agency/Department Responsible:** | Rockdale City Administration |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Rockdale – Action #2 |
|---|---|---|
| | **Proposed Action:** | **Utilize social media and/or distribute pamphlets with information on pre-disaster mitigation ideas, health and safety tips and local risk for all natural hazards.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents during natural hazard events through education and awareness program. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Drought, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $10,000 |
| **Potential Funding Sources:** | General Fund, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Rockdale Emergency Management |
| **Implementation Schedule:** | Within 36 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| Rockdale – Action #3 | |
|---|---|
| **Proposed Action:** | **Implement fuels reduction program in high risk areas; Implement tree trimming program near power lines and roadways.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce power outages resulting from downed trees and limbs; Reduce risk of wildfire through reduction in fuels in high risk areas such as the WUI. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $250,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Rockdale Fire Department, Public Works |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Rockdale – Action #4 |
|---|---|---|
| | **Proposed Action:** | **Improve existing Emergency Operations Centers and facilities with generators (with hardwired quick connections), harden building, install emergency and redundant communications, and create city internal fiber networks.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Rockdale Emergency Operation Center |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to property and residents; Ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, , Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $3,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Rockdale Emergency Management |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Rockdale – Action #5 |
|---|---|---|
| | **Proposed Action:** | **Modernize and upgrade Communication systems; Implement reverse 911 system; Install emergency alert system such as sirens.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk to life and property through early warning; Increased/reliable communications system for emergency personnel can reduce risk and increase response time. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | Low |
| **Estimated Cost:** | $50,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Rockdale Fire Department, EMC |
| **Implementation Schedule:** | Within 36-48 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Response Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Rockdale – Action #6 |
|---|---|---|
| | **Proposed Action:** | **Develop H&H study for flood zones and storm drainage/waste water system; Implement improvements based on study including upgrading box culverts, lift stations, storm water drains and developing retention ponds; Increase size of existing storm drainage system; Submit H&H data to FEMA for flood mapping.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of flooding through improved drainage capacity; Enhance risk assessment. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to new and existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $3,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Rockdale Public Works |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Drainage Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | Rockdale – Action #7 |
|---|---|
| **Proposed Action:** | **Build covered parking for emergency vehicles that will reduce damage to emergency vehicles.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | Rockdale Police and EMS Stations, City Hall |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of damage to vehicles by providing protection; Ensure continuity of emergency services. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing assets |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $800,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Rockdale Emergency Management |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Capital Improvement Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

# Thorndale

| | Thorndale – Action #1 |
|---|---|
| **Proposed Action:** | **Implement an education program to inform residents of local risks, mitigation measures to reduce the risk of property damages, and health and safety tips to protect citizens from risk of injury, illness or potential fatalities.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of property damages and risk of injury/fatalities through education of risk and mitigation measures. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12 months of plan adoption |
| **Incorporation into Existing Plans:** | N/A |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Thorndale – Action #2 |
|---|---|---|
| | **Proposed Action:** | **Educate City Council on Dam Failure Issues; Work with Dam failure of Site 20 of Lower Brushy Creek watershed WCID in Williamson County to establish evacuation procedures; Identify, adopt and enforce development regulations in high risk dam failure inundation areas.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | Site 20 farm area adjacent to the city boundary line – dam inundation area |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of property damages and risk of injury/ fatalities through regulations on new development. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | Reduce risk to future structures |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $3,000 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Action Plan (EAP) |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Thorndale – Action #3 |
|---|---|---|
| | **Proposed Action:** | **Implement program to clean and clear vegetation, dead trees and debris, overhanging tree limbs from right-of-way and drainage systems; Adopt requirement for private property owners to clean, clear and trim or allow city and/or county workers to access property for debris removal, vegetation management, and tree trimming.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of power outages and flooding resulting from debris and owned trees; reduce risk of flooding resulting from decreased or failed drainage capacity. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations<br>Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to new and existing structures and infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $30,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Standard Operating Procedures Planning |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| Thorndale – Action #4 | |
|---|---|
| **Proposed Action:** | **Adopt and implement enhanced drought contingency plan; education citizens on water conservation mitigation measures.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce water usage during drought periods through regulations and requirements. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| MITIGATION ACTION DETAILS | |
|---|---|
| **Hazard(s) Addressed:** | Drought |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,500 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| COMMENTS |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Thorndale – Action #5 |
|---|---|---|
| | **Proposed Action:** | **Harden critical facilities; Install back-up generators with permanent hard wiring for all critical facilities.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide critical facilities |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of damages to critical facilities; ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Hail, Extreme Heat, Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Thorndale – Action #6 |
|---|---|---|
| | **Proposed Action:** | **Use TVFD Haul for shelter; Work with council on MOU.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Protect lives and property. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations - Preparedness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $1,000 |
| **Potential Funding Sources:** | General Funds (staff time) |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5 |

| | | Thorndale – Action #7 |
|---|---|---|
| | **Proposed Action:** | **Utilize available centers as heating/cooling centers for vulnerable populations in the community during extreme temperatures; Collect and distribute fans and electric heaters to vulnerable populations during extreme temperature events.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Protect vulnerable populations during extreme temperature events. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Education and Awareness |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Extreme Heat, Winter Storm |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,500 |
| **Potential Funding Sources:** | General Funds (staff time), State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Operations Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5 |

| | | Thorndale – Action #8 |
|---|---|---|
| | **Proposed Action:** | **Develop local drainage plan with engineer studies and H&H Analysis; Upgrade drainage infrastructure on N. Third Street, North Broadway and East Moerbe, East Sally Street, and along East US Highway 79.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide (as indicated above) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of flood damages through increased drainage capacity. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Flood |
| **Effect on New/Existing Buildings:** | N/A |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,000,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration and Public Works |
| **Implementation Schedule:** | Within 12-24months of plan adoption |
| **Incorporation into Existing Plans:** | Drainage Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Thorndale – Action #9 |
|---|---|---|
| | **Proposed Action:** | **Install surge protectors and lightning detection and alarm at City Park; Participate in the NWS Skywarn-Stormspotter Training.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide (as indicated above) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of lightning damage and ensure continuity of emergency services. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Lightning |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures |
| **Priority (High, Moderate, Low):** | Moderate |
| **Estimated Cost:** | $5,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration and Public Works |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Emergency Management Plan |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5 |

| Thorndale – Action #10 | |
|---|---|
| **Proposed Action:** | **Adopt and Implement burning ban ordinance to reduce wildfire risk.** |
| **BACKGROUND INFORMATION** | |
| **Jurisdiction/Location:** | City-wide |
| **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce risk of wildfire or spread of wildfire through restrictions on outdoor burning. |
| **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Local Plans and Regulations |

| MITIGATION ACTION DETAILS | |
|---|---|
| **Hazard(s) Addressed:** | Wildfire |
| **Effect on New/Existing Buildings:** | Reduce risk to existing structures and Infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $2,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Community Wildfire Protection Plan |

| COMMENTS |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

| | | Thorndale – Action #11 |
|---|---|---|
| | **Proposed Action:** | **Reduce impact to roadway through resurfacing roadway with materials resistant to ice hazards; Adopt requirements for ice resistant roadway materials in future development.** |
| | **BACKGROUND INFORMATION** | |
| | **Jurisdiction/Location:** | City-wide roadways (as they are repaved or developed) |
| | **Risk Reduction Benefit** *(Current Cost/Losses Avoided)***:** | Reduce damages to roadways through improved construction practices. |
| | **Type of Action** *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)* | Structure and Infrastructure Project<br>Local Plans and Regulations |

| **MITIGATION ACTION DETAILS** | |
|---|---|
| **Hazard(s) Addressed:** | Winter Storm |
| **Effect on New/Existing Buildings:** | Reduce risk to new and existing infrastructure |
| **Priority (High, Moderate, Low):** | High |
| **Estimated Cost:** | $100,000 |
| **Potential Funding Sources:** | General Funds, State and Federal Grants |
| **Lead Agency/Department Responsible:** | Thorndale Administration |
| **Implementation Schedule:** | Within 12-24 months of plan adoption |
| **Incorporation into Existing Plans:** | Local Ordinances |

| **COMMENTS** |
|---|
| |
| **Additional Considerations:**<br>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) |
| Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4 |

# Section 18: Plan Maintenance



## Plan Maintenance Procedures

The following is an explanation of how Milam County, participating jurisdictions, and the general public will be involved in implementing, evaluating, and enhancing the Plan over time. The sustained hazard mitigation planning process consists of four main parts:

- Incorporation
- Monitoring and Evaluation
- Updating
- Continued Public Involvement

## Incorporation

Milam County and participating jurisdictions will be responsible for further development and implementation of mitigation actions. Each action has been assigned to a specific department within the County and participating jurisdictions. The following describes the process by which Milam County will incorporate elements of the mitigation plan into other planning mechanisms.

### Process of Incorporation

Once the Plan is adopted, Milam County and participating jurisdictions will implement actions based on priority and the availability of funding. The County currently implements policies and programs to reduce loss to life and property from hazards. The mitigation actions developed for this Plan enhance this ongoing effort and will be implemented through other program mechanisms where possible.

The potential funding sources listed for each identified action may be used when the jurisdiction seeks funds to implement actions. An implementation time period or a specific implementation date has been assigned to each action as an incentive for completing each task and gauging whether actions are implemented in a timely manner.

Milam County and participating jurisdictions will integrate implementation of their mitigation actions with other plans and policies such as construction standards and emergency management plans, and

ensure that these actions, or proposed projects, are reflected in other planning efforts. Coordinating and integrating components of other plans and policies into goals and objectives of the Plan will further maximize funding and provide possible cost-sharing of key projects, thereby reducing loss of lives and property and mitigating hazards affecting the area.

Upon formal adoption of the Plan, planning team members from each participating jurisdiction will work to integrate the hazard mitigation strategies into other plans and codes as they are developed. Participating team members will conduct periodic reviews of plans and policies, once per year at a minimum, and analyze the need for amendments in light of the approved Plan. The planning team will review all comprehensive land use plans, capital improvement plans, annual budget reviews, emergency operations or management plans, transportation plans, and any building codes to guide and control development. Participating jurisdictions will ensure that capital improvement planning in the future will also contribute to the goals of this hazard mitigation Plan to reduce the long-term risk to life and property from all hazards. Within one year of formal adoption of the hazard mitigation Plan, existing planning mechanisms will be reviewed by each jurisdiction.

Milam County is committed to supporting the cities, communities, and participating jurisdictions as they implement their mitigation actions. Milam County and participating planning team members will review and revise, as necessary, the long-range goals and objectives in strategic plan and budgets to ensure that they are consistent with this mitigation action plan. Additionally, the County will work to advance the goals of this hazard mitigation plan through its routine, ongoing, long-range planning, budgeting, and work processes.

Table 18-1 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts. The team members, listed in Table 18-2 below, will be responsible for the review of these planning mechanisms and their incorporation of the plan, with the exception of the Floodplain Management Plans; the jurisdictions who have a Floodplain Administrator on staff will be responsible for incorporating the plan when floodplain management plans are updated or new plans are developed.

**Table 18-1. Methods of Incorporation of the Plan**

| PLANNING MECHANISM | DEPARTMENT / TITLE RESPONSIBLE | INCORPORATION OF PLAN |
|---|---|---|
| Annual Budget Review | Milam County: EMC<br>Buckholts: City Secretary<br>Cameron: City Manager<br>Milano: Mayor<br>Rockdale: City Manager<br>Thorndale: City Administrator | Various departments and key personnel that participated in the planning process for Milam County and participating jurisdictions will review the Plan and mitigation actions therein when conducting their annual budget review. The planning team will recommend funding in the annual budget to be allocated as potential matching funds in accordance with grant applications sought and HMAP mitigation actions that will be undertaken per the implementation schedule of the specific action. |

| PLANNING MECHANISM | DEPARTMENT / TITLE RESPONSIBLE | INCORPORATION OF PLAN |
|---|---|---|
| Capital Improvement Plans | Milam County: EMC<br>Buckholts: City Secretary<br>Cameron: City Manager<br>Milano: Mayor<br>Rockdale: City Manager<br>Thorndale: City Administrator | Milam County and participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County and City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments. The planning team will include information from the risk assessment in the updated plan and enhance identified projects to include mitigation elements where natural hazards pose a risk. The team will implement goals in the updated plan to site new projects outside of known hazard areas as identified in the HMAP when possible. |
| Comprehensive Plans | Milam County: EMC<br>Buckholts: City Secretary<br>Cameron: City Manager<br>Milano: Mayor<br>Rockdale: City Manager<br>Thorndale: City Administrator | Milam County has a Long-term Comprehensive Development Plan in place. Since comprehensive plans involve developing a unified vision for a community, the mitigation vision and goals of the Plan will be included in the development or revision of a Comprehensive Plan. |
| Floodplain Management Plans | Milam County: Floodplain Manager<br>Buckholts: Floodplain Manager<br>Cameron: Floodplain Manager<br>Milano: Mayor<br>Rockdale: Floodplain Manager<br>Thorndale: City Administrator | Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 6 of this Plan discussing the people and property at risk to flood, will be reviewed and included when Milam County updates their management plans or develops new plans. The goals and objectives of the new or updated plan will be developed to be consistent with the goals and objectives of the HMAP with regard to floodplain management. |

| PLANNING MECHANISM | DEPARTMENT / TITLE RESPONSIBLE | INCORPORATION OF PLAN |
|---|---|---|
| Grant Applications | Milam County: EMC<br>Buckholts: City Secretary<br>Cameron: City Manager<br>Milano: Mayor<br>Rockdale: City Manager<br>Thorndale: City Administrator | The Plan Update will be evaluated by Milam County and participating jurisdictions when grant funding is sought for mitigation projects. If a project is not in the Plan, an amendment may be necessary to include the action in the Plan. |
| Regulatory Plans | Milam County: EMC<br>Buckholts: City Secretary<br>Cameron: City Manager<br>Milano: Mayor<br>Rockdale: City Manager<br>Thorndale: City Administrator | Currently, Milam County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, Economic Development, and Evacuation Plans. The Plan will be consulted when County and City departments review or revise their current regulatory planning mechanisms, or in the development of regulatory plans that are not currently in place. The planning team will include information on natural hazards in the updated plan and enhance identified projects to include mitigation elements where natural hazards pose a risk. The planning team will work with local officials when building code or ordinance updates are in progress to ensure that development of regulations include mitigation measures. |

# Monitoring and Evaluation

Periodic revisions of the Plan are required to ensure that goals, objectives, and mitigation actions are kept current. When the plan is discussed in these sections it includes the risk assessment and mitigation actions as a part of the monitoring, evaluating, updating and review process. Revisions may be required to ensure the Plan is in compliance with federal and state statutes and regulations. This section outlines the procedures for completing Plan revisions, updates, and review. Table 18-2 indicates the department and title of the party responsible for Plan monitoring, updating, and review of the Plan.

**Table 18-2. Team Members Responsible for Plan Monitoring, Evaluating, Updating, and Review of the Plan**

| JURISDICTION | TITLE |
|---|---|
| Milam County | Homeland Security / EMC (Lead) |
| Buckholts | City Secretary |
| Cameron | City Manager |
| Milano | Mayor |
| Rockdale | City Manager |
| Thorndale | City Administrator |

## Monitoring

Designated Planning Team members are responsible for monitoring, evaluating, updating, and reviewing the Plan, as shown in Table 18-2. Individuals holding the title listed in Table 18-2 will be responsible for monitoring the Plan on an annual basis. Plan monitoring includes reviewing and incorporating into the Plan other existing planning mechanisms that relate or support goals and objectives of the Plan; monitoring the incorporation of the Plan into future updates of other existing planning mechanisms as appropriate; reviewing mitigation actions submitted and coordinating with various County and City departments to determine if mitigation actions need to be re-evaluated and updated; evaluating and updating the Plan as necessary; and monitoring plan maintenance to ensure that the process described is being followed, on an annual basis, throughout the planning process. The Planning Team will develop a brief report that identifies policies and actions in the plan that have been successfully implemented and any changes in the implementation process needed for continued success. A summary of meeting notes will report the particulars involved in developing an action into a project. In addition to the annual monitoring, the Plan will be similarly reviewed immediately after extreme weather events include but not limited to state and federally declared disasters.

## Evaluation

As part of the evaluation process, the Planning Team will assess changes in risk; determine whether the implementation of mitigation actions is on schedule; determine whether there are any implementation problems, such as technical, political, legal, or coordination issues; and identify changes in land development or programs that affect mitigation priorities for each respective department or organization.

The Planning Team will meet on an annual basis to evaluate the Plan and identify any needed changes, and assess the effectiveness of the plan achieving its stated purpose and goals. The team will evaluate the number of mitigation actions implemented along with the loss-reduction associated with each action. Actions that have not been implemented will be evaluated to determine if any social, political or financial barriers are impeding implementation and if any changes are necessary to improve the viability of an action. The team will evaluate changes in land development and/or programs that affect mitigation priorities in their respective jurisdictions. The annual evaluation process will help to

determine if any changes are necessary. In addition, the Plan will be similarly evaluated immediately after extreme weather events including but not limited to state and federally declared disasters.

# Updating

## Plan Amendments

At any time, minor technical changes may be made to update the Milam County Hazard Mitigation Plan. Material changes to mitigation actions or major changes in the overall direction of the Plan or the policies contained within it, must be subject to formal adoption by the County and participating jurisdictions.

The County will review proposed amendments and vote to accept, reject, or amend the proposed change. Upon ratification, the amendment will be transmitted to TDEM.

In determining whether to recommend approval or denial of a Plan amendment request, the County will consider the following factors:

- Errors or omissions made in the identification of issues or needs during the preparation of the Plan;
- New issues or needs that were not adequately addressed in the Plan; and
- Changes in information, data, or assumptions from those on which the Plan was based.

## Five (5) Year Review

The Plan will be thoroughly reviewed by the Planning Team at the end of three years from the approval date, to determine whether there have been significant changes in the planning area that necessitate changes in the types of mitigation actions proposed. Factors that may affect the content of the Plan include new development in identified hazard areas, increased exposure to hazards, disaster declarations, increase or decrease in capability to address hazards, and changes to federal or state legislation.

The Plan review process provides the County and participating jurisdictions an opportunity to evaluate mitigation actions that have been successful, identify losses avoided due to the implementation of specific mitigation measures, and address mitigation actions that may not have been successfully implemented as assigned.

It is recommended that the full Executive and Advisory Planning Team (Section 2, Tables 2-1 and 2-2) meet to review the Plan at the end of three years because grant funds may be necessary for the development of a five-year update. Reviewing planning grant options in advance of the five-year Plan update deadline is recommended considering the timelines for grant and planning cycles can be in excess of a year.

Following the Plan review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and Plan amendment process outlined herein. Upon completion of the review, update, and amendment process the revised Plan will be submitted to TDEM for final review and approval in coordination with FEMA.

# Continued Public Involvement

Public input was an integral part of the preparation of this Plan and will continue to be essential for Plan updates. The Public will be directly involved in the annual evaluation, monitoring and cyclical

updates. Changes or suggestions to improve or update the Plan will provide opportunities for additional public input.

The public can review the Plan on Milam County's website or at the Homeland Security/EM Office, where officials and the public are invited to provide ongoing feedback, via email to MilamHMAP@milamcounty.net.

The Planning Team may also designate voluntary citizens from the County or willing stakeholder members from the private sector businesses that were involved in the Plan's development to provide feedback on an annual basis. It is important that stakeholders and the immediate community maintain a vested interest in preserving the functionality of the planning area as it pertains to the overall goals of the mitigation plan. The Planning team is responsible for notifying stakeholders and community members on an annual basis and maintaining the Plan.

Media, including local newspaper and radio stations, will be used to notify the public of any maintenance or periodic review activities during the implementation, monitoring, and evaluation phases. Additionally, local news media will be contacted to cover information regarding Plan updates, status of grant applications, and project implementation. Local and social media outlets, such as Facebook and Twitter, will keep the public and stakeholders apprised of potential opportunities to fund and implement mitigation projects identified in the Plan.

# Appendix A: Planning Team



## Planning Team Members

The Milam County Plan (Plan), was organized using a direct representative model. An Executive Planning Team from Milam County and participating jurisdictions, shown in Table A-1, was formed to coordinate planning efforts and request input and participation in the planning process. Table A-2 reflects the Advisory Planning Team, consisting of area organizations and departments that participated throughout the planning process. Table A-3 is comprised of stakeholders who were invited to provide Plan input. Public outreach efforts and meeting documentation is provided in Appendix E.

**Table A-1. Executive Planning Team**

| ORGANIZATION / DEPARTMENT | TITLE |
|---|---|
| Milam County | Homeland Security / EMC |
| Town of Buckholts | City Secretary |
| City of Cameron | City Manager |
| City of Milano | Mayor |
| City of Rockdale | City Manager |
| City of Thorndale | City Administrator |

**Table A-2. Advisory Planning Team**

| ORGANIZATION / DEPARTMENT | TITLE |
|---|---|
| Milam County | Commissioner Pct. #4 |
| Milam County | County Judge |
| Town of Buckholts | Mayor |
| City of Thorndale | City Secretary |
| CTCOG | Director of Planning & Regional Services |
| CTCOG | Homeland Security/Criminal Justice Coordinator |
| CTCOG | Senior Planner |
| CTCOG | Grant Coordinator |

| ORGANIZATION / DEPARTMENT | TITLE |
|---|---|
| CTCOG | Emergency Services Director |

# Stakeholders

The following groups listed in Table A-3 represent a list of organizations invited to stakeholder meetings, public meetings, and workshops throughout the planning process and include: non-profit organizations, private businesses, universities, and legislators. The public were also invited to participate via e-mail throughout the planning process. Many of the invited organizations and stakeholders participated and were integral to providing comments and data for the Plan. For a list of attendees at meetings, please see Appendix E[1].

**Table A-3. Stakeholders**

| AGENCY | TITLE |
|---|---|
| American Red Cross | Executive Director |
| Bartlett ISD | President |
| Bell County | Emergency Management Coordinator |
| Buckholts ISD | Superintendent |
| Cameron ISD | Superintendent |
| Gause ISD | Superintendent |
| Grant Central Texas | Economic Development Corporation |
| Hamilton County | County Judge |
| Hamilton ISD | Superintendent |
| Holland ISD | Superintendent |
| Killeen ISD | Deputy Superintendent |
| Milano ISD | President |
| Rockdale ISD | Superintendent |
| Rogers ISD | Superintendent |
| Salado ISD | Superintendent |
| Temple ISD | Superintendent |
| Texas A&M Agrilife – Milam County Office | District Extension Administrator |

[1] Information contained in Appendix E is exempt from public release under the Freedom of Information Act (FOIA).

# Appendix A: Planning Team

| AGENCY | TITLE |
|---|---|
| Texas Forest Service | Regional Fire Coordinator I |
| Thorndale ISD | Superintendent |
| Troy ISD | Superintendent |
| TX House Representative Hugh Shine | District Director |

# Appendix B: Public Survey Results



## Overview

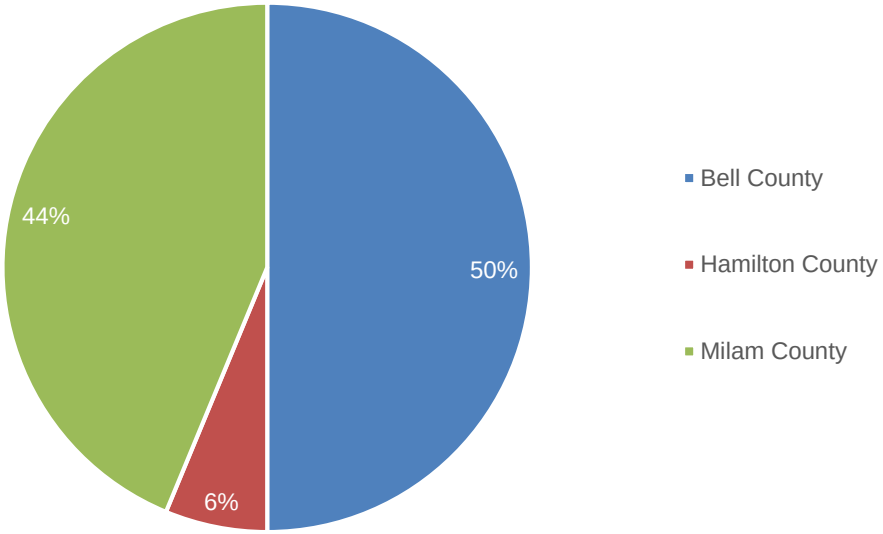
The CTCOG prepared a public survey that requested public opinion on a wide range of questions relating to natural hazards. The survey was made available to the three counties, Bell, Hamilton and Milam, on websites, including Milam County's website. This survey link was also distributed at public meetings and stakeholder events throughout the planning process.

A total of 16 surveys were collected, the results of which are analyzed in Appendix B. The purpose of the survey was twofold: 1) to solicit public input during the planning process, and 2) to help the jurisdictions identify any potential actions or problem areas.

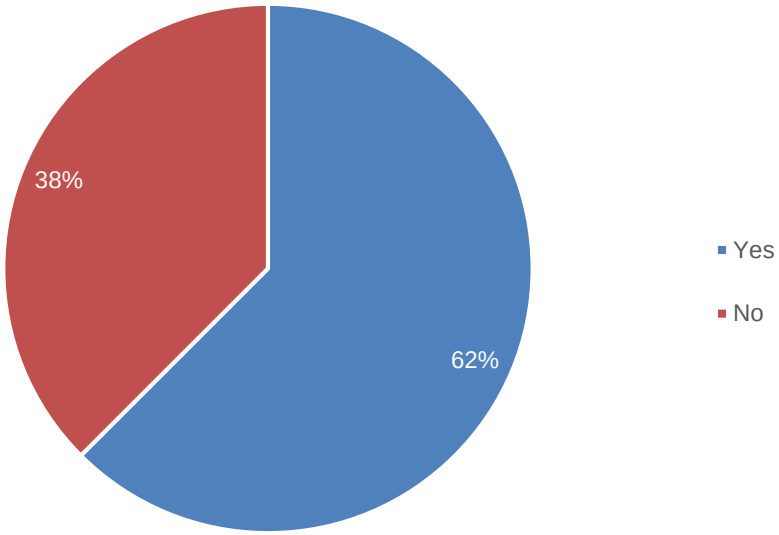
The following survey results depict the percentage of responses for each answer. Similar responses have been summarized for questions that did not provide a multiple-choice answer or that required an explanation.

# Public Survey Results

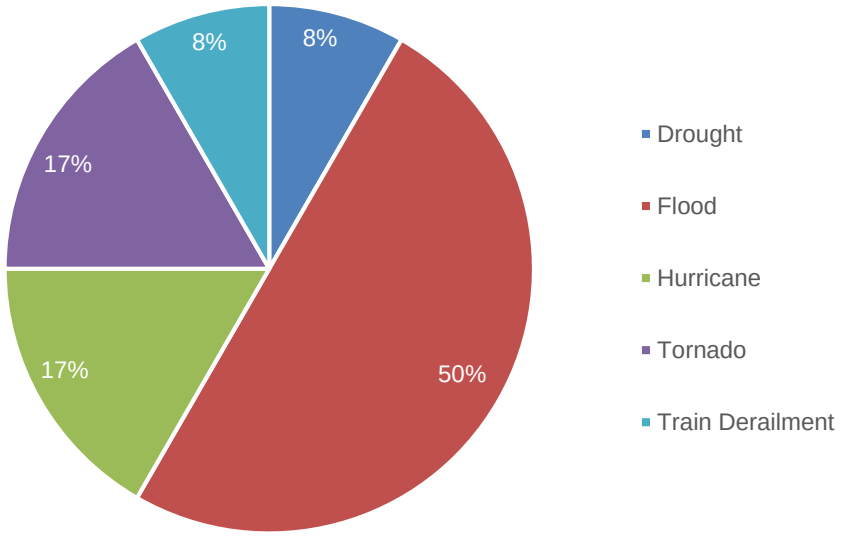
1. Please state the jurisdiction (city and community) where you reside.



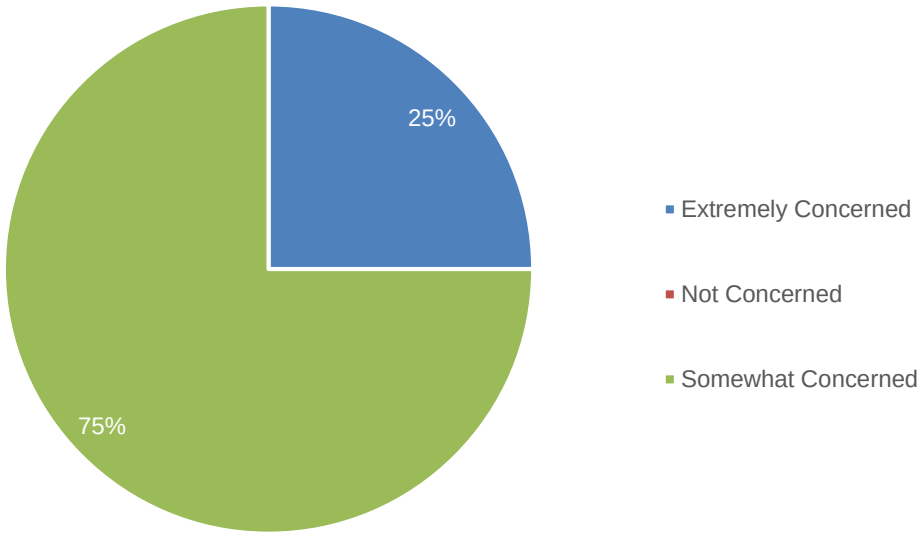

2. A. Have you ever experienced or been impacted by a disaster?



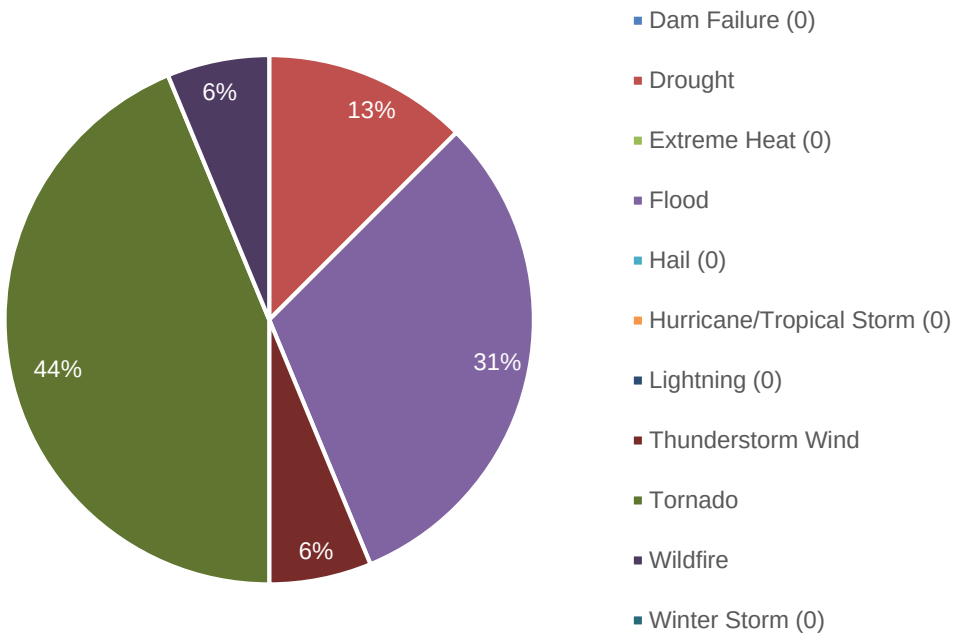
2. B. If “Yes”, please explain:



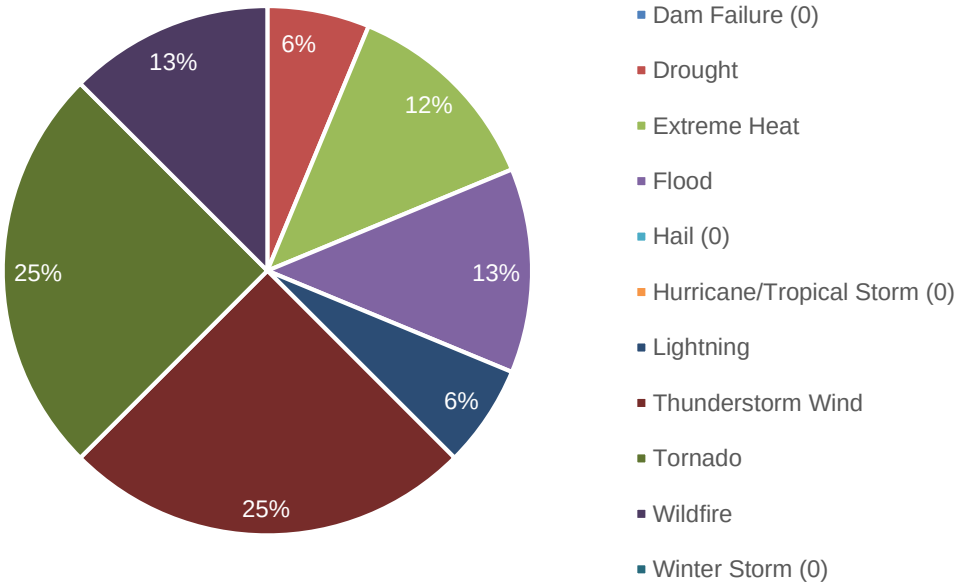

3. How concerned are you about the possibility of your community being impacted by a disaster?



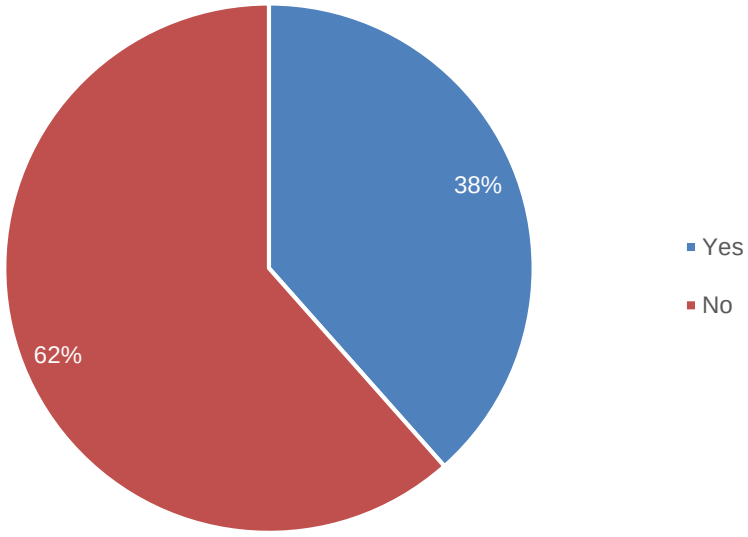
4. Please select the one hazard you think is the highest threat to your neighborhood:



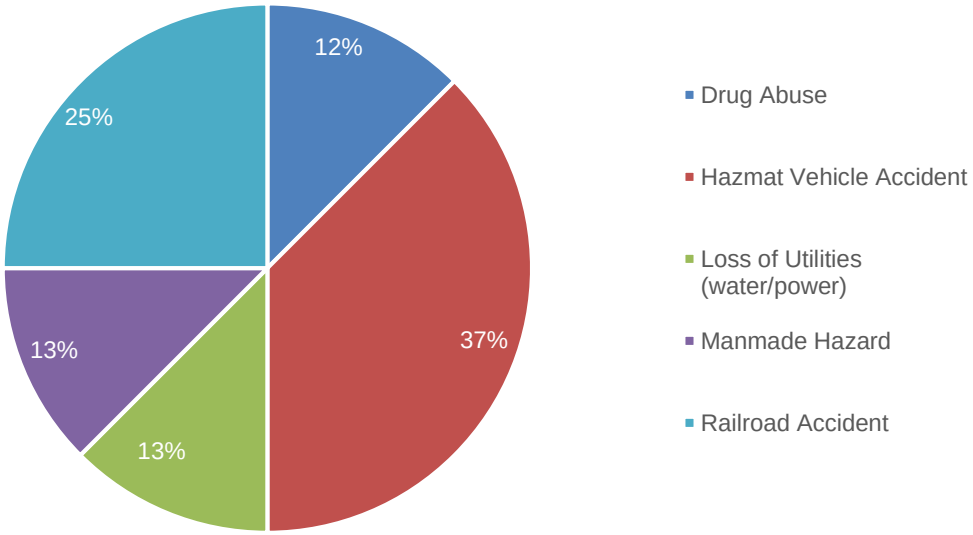

5. Please select the one hazard you think is the second highest threat to your neighborhood:



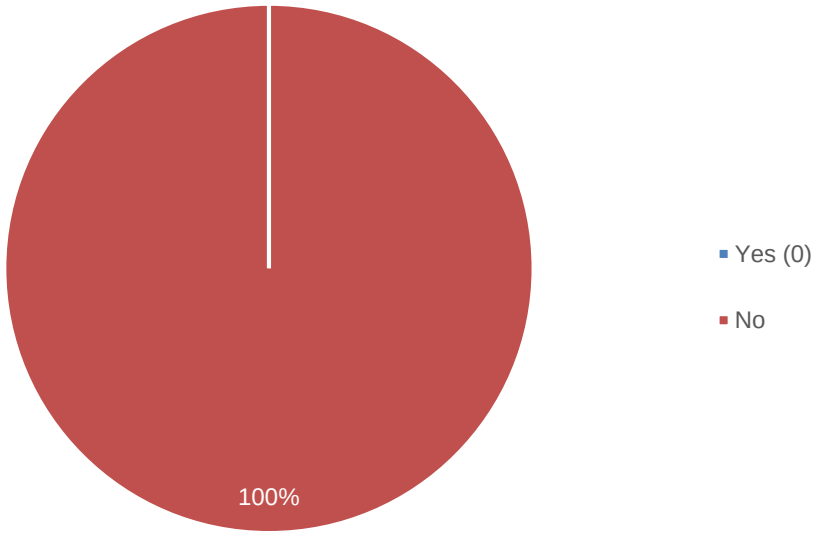
6. A. Are there hazards not listed above that you think is a wide-scale threat to your neighborhood?



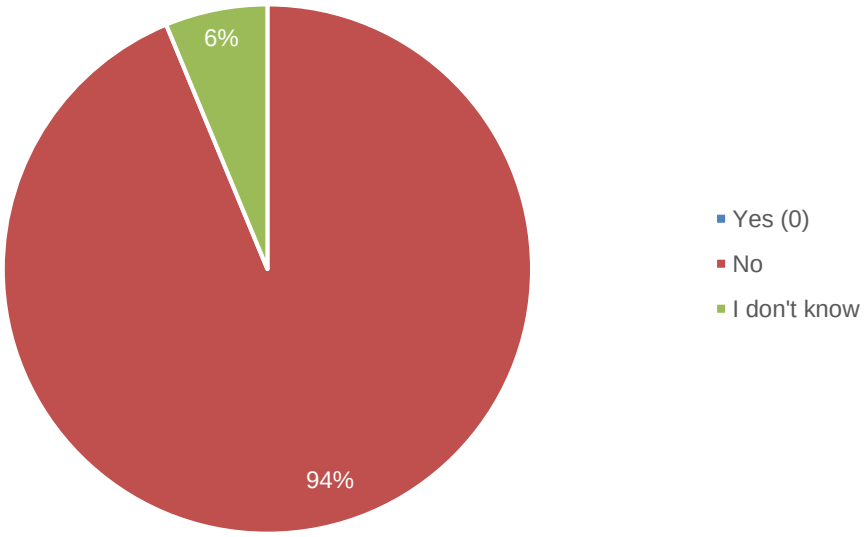

6. B. If “Yes”, please explain:



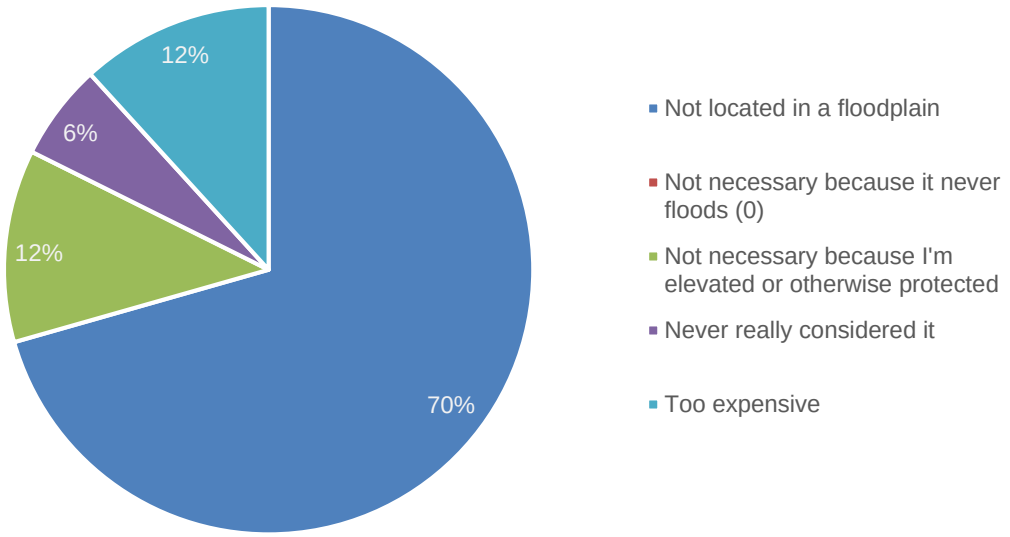
7. Is your home located in a floodplain?



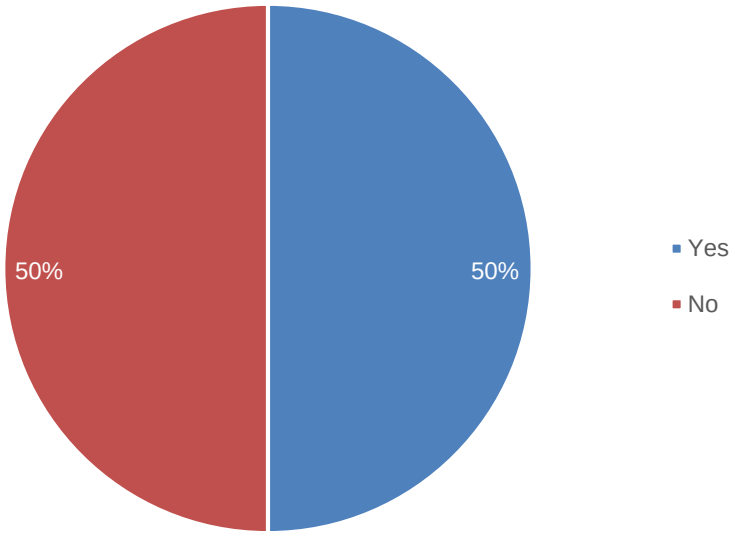

8. Do you have flood insurance?



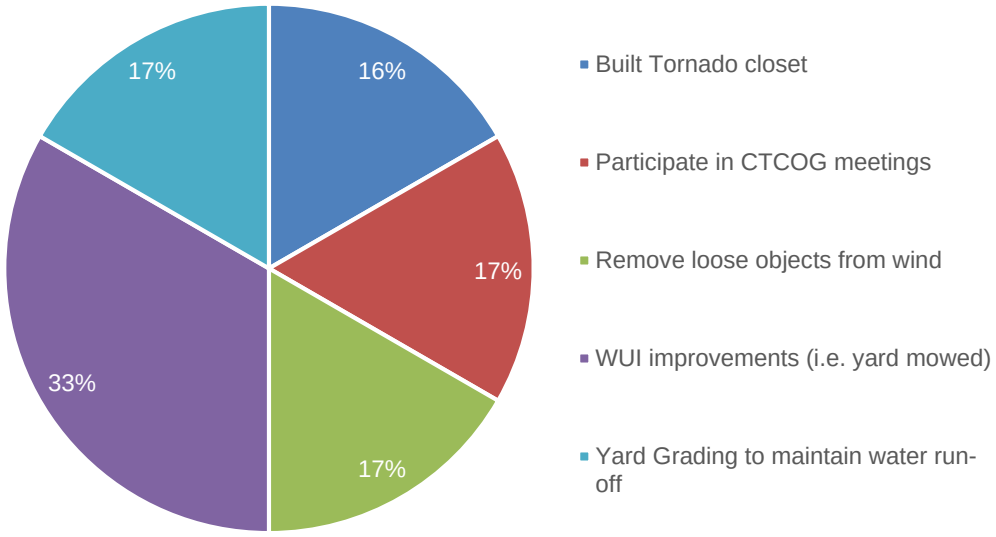
9. If you do not have flood insurance, why not?



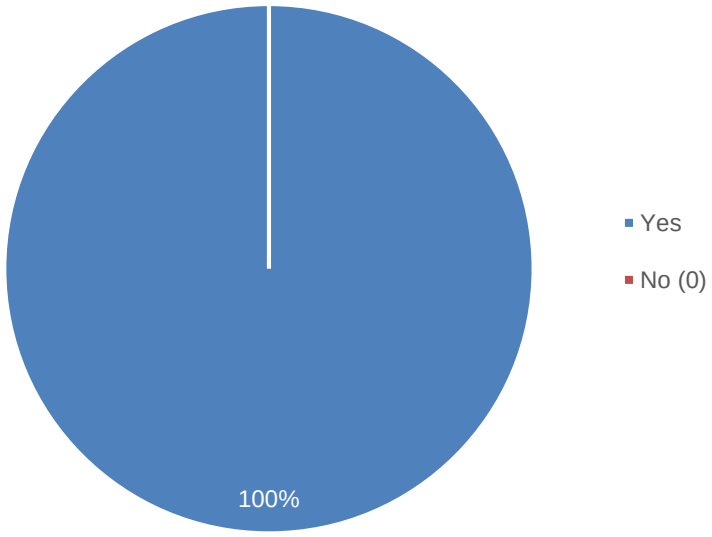

10. A. Have you taken any actions to make sure your home or neighborhood is more resistant to hazards?



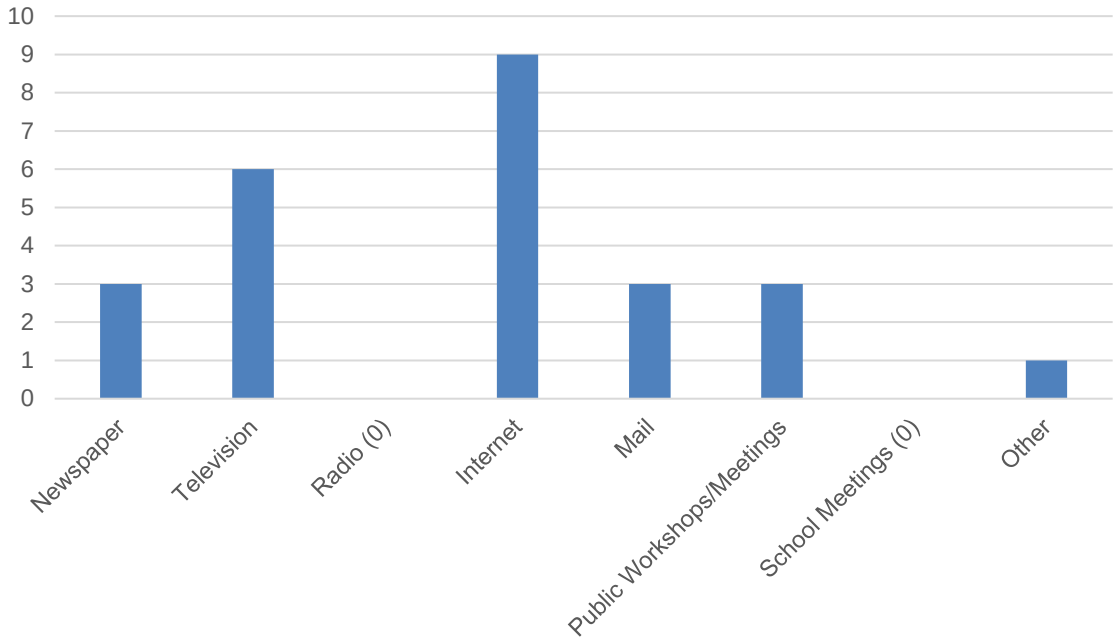
10. B. What have you done?



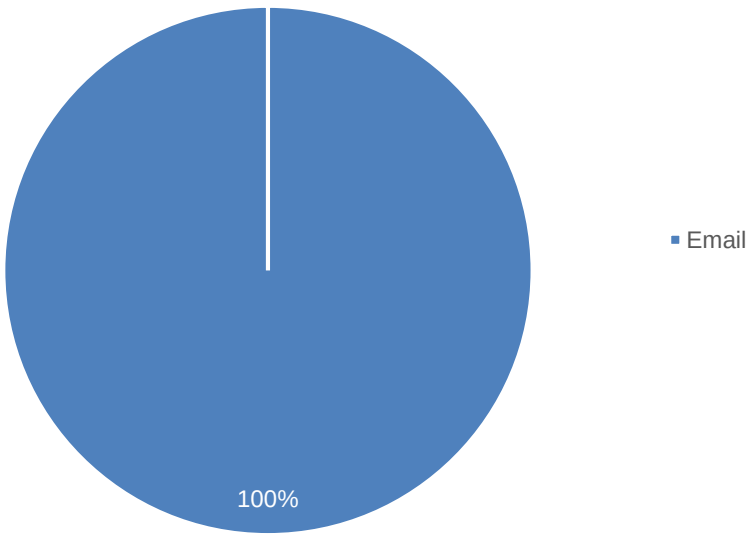

11. Are you interested in making your home or neighborhood more resistant to hazards?



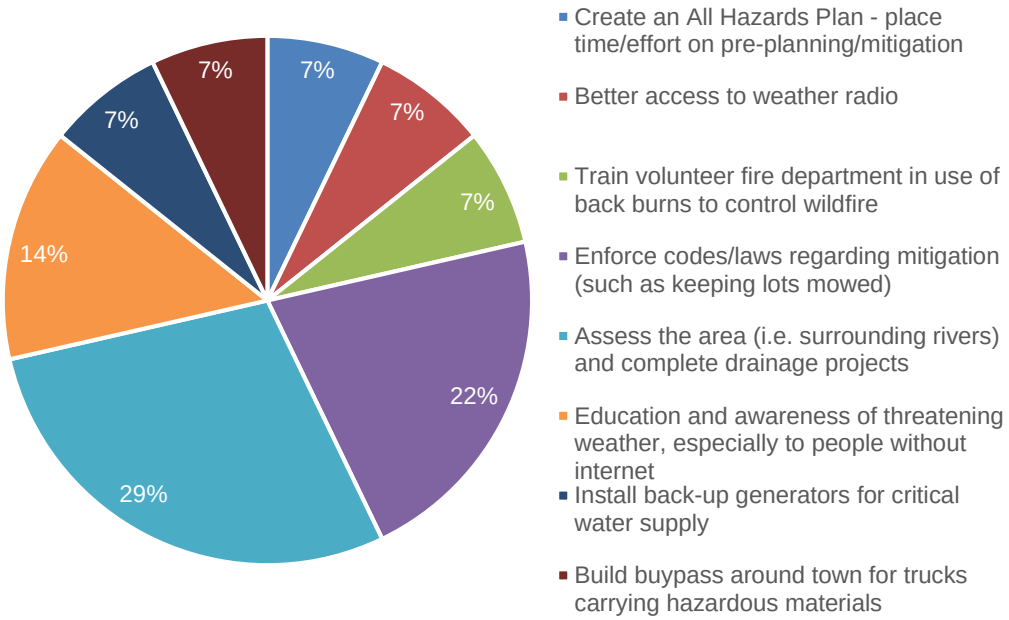
12. A. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?



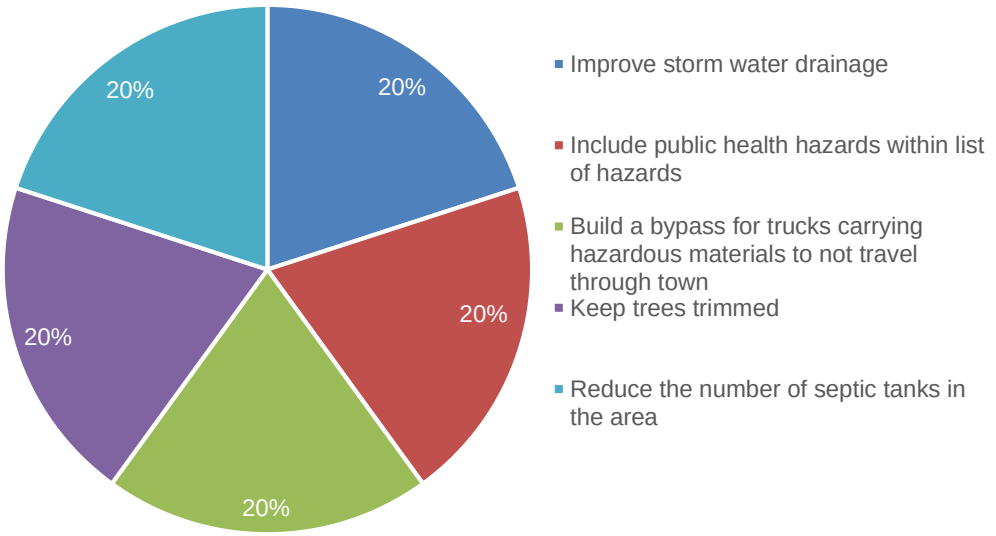

12. B. If “Other”, please specify.



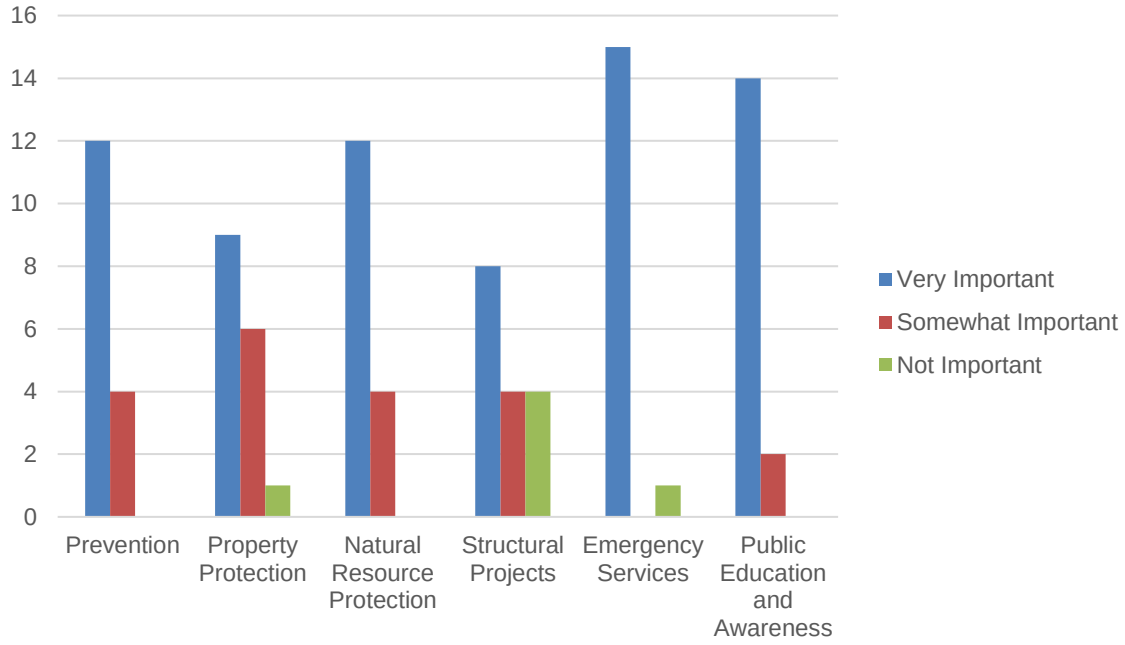
13. If your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?




14. Are there any other issues regarding the reduction of risk and loss associated with hazards or disasters in the community that you think are important?



15. A number of community-wide activities can reduce the risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.




Prevention / Local Plans & Regulations - Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.

Property Protection - Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.

Natural Resource Protection - Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.

Structural Projects - Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, seawalls detention / retention basins, channel modification, retaining walls, and storm sewers.

Emergency Services - Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical facilities or systems.

Public Education and Awareness - Actions to inform citizens about hazards and techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials, and demonstration events.

# Appendix C: Critical Facilities

This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under Freedom of Information Act (FOIA).

# Appendix D: Dam Locations

Appendix D is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

# Appendix E: Meeting Documentation

Appendix E is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

# Appendix F: Capability Assessment

Appendix F is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).