Lavaca County

Hazard Mitigation Plan Update 2018

Maintaining a Safe, Secure, and Sustainable Community

June 20, 2018 - June 19, 2023

H2O PARTNERS
PLAN YOUR RECOVERY

THE STATE OF TEXAS
LAVACA COUNTY

TEXAS DEPARTMENT OF PUBLIC SAFETY

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July 30, 2018

The Honorable Tramer J. Woytek
Lavaca County Judge
109 N. La Grange
Hallettsville, TX 77964
danajohnson@co.lavaca.tx.us

RE: Approval of Multi-Jurisdictional Hazard Mitigation Plan for Lavaca County, Texas

Dear Judge Woytek:

This letter is to inform you of the FEMA approval for the Local Hazard Mitigation Plan for Lavaca County and participating jurisdictions. All participating jurisdictions who adopt the plan are eligible for Unified Hazard Mitigation Grant funding which includes: the Hazard Mitigation Grant Program (HMGP); Pre-Disaster Mitigation (PDM); Severe Repetitive Loss (SRL); and Flood Mitigation Assistance (FMA) programs. Your efforts demonstrate a commitment to reducing the risk to the citizens and property of Lavaca County.

See the attachment for the list of jurisdictions that have submitted adoption resolutions to date. Any remaining participants should submit resolutions within 90 days of the original plan approval date. This plan was approved on June 20, 2018 and will expire in five years on June 19, 2023. A current plan is required to remain eligible for Unified Hazard Mitigation Grant funding.

If you have any questions or concerns, please contact Mr. Raymond Mejia, Mitigation Planner, via email at raymond.mejia@dps.texas.gov or by phone at 512-438-6519.

Respectfully,

David Jackson, CEM
State Hazard Mitigation Officer
Mitigation Section Administrator
Texas Division of Emergency Management
Texas Department of Public Safety

cc: H2O Partners, info@h2opartnersusa.com
Jay Hall, TDEM State Coordinator jay.hall@dps.texas.gov
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Terrell Kincaid, Mitigation Coordinator, terrell.kincaid@dps.texas.gov

Below is the list of approved participating governments included in the June 20, 2018 review of the referenced Lavaca County, Texas Multi-Jurisdictional Hazard Mitigation Plan.
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1. City of Hallettsville
2. Lavaca County
3. City of Moulton
4. City of Shiner
5. City of Yoakum

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Section 1: Introduction

Background

Lavaca County, located in southeast Central Texas, was created in 1846 and was named for the Lavaca River which curves it way southeast through Moulton to Hallettsville. Hallettsville is the county seat of Lavaca County.

Lavaca County is bounded by Fayette County to the north, Colorado County to the northeast, Jackson County to the southeast, Victoria County to the south, De Witt County to the southwest, and Gonzales County to the northwest. Lavaca County is on U.S. Highways 77 and Alternate 90 east of San Antonio.

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

The Federal Emergency Management Agency (FEMA) defines mitigation as, "*sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.*[2] One way communities participate in hazard mitigation is by developing hazard mitigation plans. The Texas Division of Emergency Management (TDEM) and FEMA have the authority to review and approve hazard mitigation plans through the Disaster Mitigation Act of 2000.

In 1997, Lavaca County and the participating jurisdictions (Cities of Hallettsville, Shiner, and Moulton) adopted their initial Hazard Mitigation Plan. Then in 2004, information about the planning area and hazard events were updated and incorporated into their HMAP. This plan was developed by the Lavaca County Hazard Mitigation Team with assistance from Phoenix Disaster Services LLC.

The Disaster Mitigation Act requires that hazard mitigation plans be reviewed and revised every five years to maintain eligibility for Hazard Mitigation Assistance (HMA) grant funding. Since FEMA originally approved the Lavaca County HMAP in 1997, and then approved an update in 2006, the County began the process of developing a HMAP Update in order to become eligible for grant funding. Lavaca County has selected H2O Partners, Inc. to write and develop the 2018 HMAP Update, hereinafter titled: "Lavaca County Hazard Mitigation Plan Update 2018: Maintaining a Safe, Secure, and Sustainable Community" (Plan or Plan Update). The City of Yoakum has joined the 2018 Plan Update.

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. A comprehensive update to a hazard mitigation plan addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore, it is essential

[1] Source: http://floodsafety.com/texas/regional_info/regional_info/houston_zone.htm

[2] Source: http://www.fema.gov/hazard-mitigation-planning-resources

that a plan identify projected patterns of how future development will increase or decrease a community's overall hazard vulnerability.

Scope and Participation

Lavaca County's 2018 Hazard Mitigation Plan Update is a multi-jurisdictional plan. The participating jurisdictions in the 2018 Plan Update include Lavaca County, and the Cities of Hallettsville, Moulton, Shiner, and Yoakum. These jurisdictions provided valuable input into the planning process. Throughout the plan "Lavaca County planning area" refers to the entire planning area including the unincorporated area of Lavaca County, the political borders of the Cities of Hallettsville, Moulton, Shiner, and Yoakum. Similarly, the term "countywide" refers to the entire planning area including the unincorporated area of Lavaca County, the political borders of the Cities of Hallettsville, Moulton, Shiner and Yoakum.

The focus of the Plan is to classify the severity of hazards within the planning area through a detailed hazard risk assessment and identify activities to mitigate those hazards classified to be "high" or "moderate" risk. 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 noted geographic scope.

Purpose

The Plan Update was prepared by Lavaca 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 within the planning area. 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 within the planning area. The planning process is an opportunity for Lavaca 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 Lavaca County planning area.

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

Lavaca County, participating jurisdictions, and planning participants identified ten natural hazards to be addressed by the plan. The specific goals of the Plan Update are to:

- Minimize disruption to Lavaca 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 Lavaca County and participating jurisdictions to take advantage of rapidly developing mitigation grant opportunities as they arise; and
- Ensure that Lavaca County and participating jurisdictions maintain eligibility for the full range of future federal disaster relief.

Authority

The Plan is tailored specifically for Lavaca 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 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 14 present a hazard overview and in depth information on individual natural hazards in the planning area. The hazards generally appear in order of priority based on potential losses of 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 15 presents hazard mitigation goals and objectives. Mitigation actions for Lavaca County and the participating jurisdictions are presented in Section 16, while Section 17 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 contains information regarding workshops and meeting documentation. Capability Assessment results for Lavaca County and participating jurisdictions are located in Appendix E.[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 the key steps of Plan development and a detailed description of how stakeholders and the public were involved.

Overview of the Plan

Lavaca County hired H2O Partners, Inc. (Consultant Team), to provide technical support and oversee the development of the Plan. The Consultant Team used the FEMA "Local Mitigation Plan Review Guide" (October 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

Lavaca County, participating jurisdictions, and the Consultant Team met in December 2016 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 Lavaca 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 Lavaca County departments that participated throughout the planning process.

Table 2-1. Executive Planning Team

JURISDICTION/DEPARTMENT	TITLE
Lavaca County	County Sheriff
Lavaca County	Deputy Emergency Management Coordinator
Lavaca County	Executive Assistant
City of Hallettsville	City Secretary/Administrator
City of Moulton	City Secretary
City of Shiner	Emergency Management Coordinator
City of Shiner	Police Chief

JURISDICTION/DEPARTMENT	TITLE
City of Yoakum	Fire Chief
City of Yoakum	City Manager

Table 2-2. Advisory Planning Team

JURISDICTION/DEPARTMENT	TITLE
Lavaca County	County Auditor
Lavaca County	County Judge
Lavaca County	County Treasurer

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, Lavaca County and participating jurisdictions described methods for achieving future hazard mitigation measures by expanding existing capabilities. For example, while all of the jurisdictions have an emergency manager on staff, not all of them have an 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 TDEM by monitoring classes and availability through preparetexas.org.
- Reviewing current floodplain ordinances for opportunities to increase resiliency (above current standards) such as modifying permitting or building codes.
- Developing ordinances that will require all new developments to conform to the highest mitigation standards, exceeding current requirements.

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 upgrading or improving bridges and culverts, providing back-up generators to all critical facilities, purchasing and distributing box fans to vulnerable residents, and protecting power lines and infrastructure

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 Lavaca 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 17. Participation of Planning Team members, stakeholders, and the public at each of the workshops is documented in Appendix D.

At each of 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 Lavaca County, participating jurisdictions, agencies, and partners will participate in implementing the Plan.

Kickoff Workshop

The Kickoff Workshop was held at the Lavaca County Courthouse on December 15, 2016. This 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 independent school districts within the participating jurisdictions and neighboring counties. 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 from high to low in terms of perceived level of risk, frequency of occurrence, and potential impact.

Hazard Identification

The Planning Team in coordination with the Consultant Team reviewed and considered a full range of natural hazards affecting Lavaca County. Preliminary hazard identification was conducted at the Kickoff Workshop, and through e-mail and phone correspondence. 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 study results from other reputable sources such as federal and state agencies. Based on this initial analysis, the teams identified a total of ten natural hazards which pose a significant threat to the planning area.

Risk Assessment

An initial risk assessment for Lavaca 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 20, 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.

Potential dollar losses from each hazard were estimated gathering data from the National Centers for Environmental Information (NCEI). The assessments examined the impact of various hazards on the built environment, including facilities. 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 14.

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 Lavaca County Courthouse on July 12, 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 wildfire projects. Additionally, the County and participating jurisdictions were proactive in identifying mitigation actions to reduce 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 Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLE+E). 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 16.

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 Lavaca County's website with a hard copy available to view at the Lavaca County Courthouse.

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 5-14) 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 NCEI. Results of past hazard events were found through searching the NCEI storm events database. The USACE studies were reviewed for their assessment of risk and potential projects in the region. The Texas State Data Center documents were used to obtain population projections. The Texas 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 development requirements.

Incorporation of Existing Plans into the HMAP Process

A Capability Assessment was completed by key Lavaca 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 comprehensive Capability Assessment, Appendix E.

Existing projects, studies and plans were utilized as a starting point for discussing hazard mitigation actions among Planning and Consultant Team members. For example, the City of Yoakum is looking to periodically update their Drought Contingency Plan and Water Conservation Plan. The County as a whole has included an action for all participating jurisdictions to adopt ordinance to require drought resistant landscaping at public facilities. Other plans were reviewed, such as Emergency Operation Plans, to identify any additional mitigation actions. Additionally, policies and ordinances were reviewed by several of the participating jurisdictions. The City of Hallettsville has included an action to adopt and implement design-failure mode for power line design to limit the size of outages and allow for faster restoration. 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 Lavaca County Plan.

Incorporation of the HMAP into Other Planning Mechanisms

Planning Team members will integrate implementation of the Plan with other planning mechanisms for Lavaca County, such as the Emergency Operations Plan. Existing plans for Lavaca County will be reviewed and incorporated into the Plan, as appropriate. This section discusses how the Plan will be implemented by Lavaca 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.

Lavaca County and the participating jurisdictions will be responsible for implementing the entire Hazard Mitigation Plan including the risk assessment, goals, objectives, and mitigation actions into other planning mechanisms. Team members from each jurisdiction will be responsible for integrating the Plan when developing or updating other planning mechanisms. While all team members play a role in integrating the Plan into other plans as they relate to their field of expertise, key team members identified in Section 17 (Table 17-2) will be responsible for identifying incorporation opportunities as other plans come up for renewal or updates. Other plan update schedules can range from annually to every 20 years or more depending on the type of plan and resources of the community. The key members of each participating jurisdiction will monitor schedules within the community in order to identify opportunities for incorporating the Plan.

The mitigation actions identified in the plan have each 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.

Lavaca County and the participating jurisdictions will integrate the Plan with existing planning mechanisms such as building codes, zoning ordinances and land use restrictions, site plan review requirements, and other local and area planning efforts. Lavaca County will work closely with area organizations to coordinate implementation of the Plan in order to benefit the planning area in terms of financial and economic impact.

Upon formal adoption of the Plan, Planning Team members from Lavaca County and the participating jurisdictions will review existing plans along with building codes to guide development and ensure that hazard mitigation goals, objectives and actions are integrated and/or implemented. Each of the jurisdictions will be responsible for coordinating periodic review of the plan with members of the Executive 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. Lavaca 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, Lavaca 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
Grant Applications	The hazard mitigation plan will be evaluated by Lavaca 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.
Annual Budget Review	Various departments and key personnel that participated in the planning process for Lavaca 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.
Regulatory Plans	Currently, Lavaca County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, and Post-disaster Recovery 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.

Planning Mechanism	Incorporation of 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 5 of this plan discussing the people and property at risk to flood, will be reviewed and revised when Lavaca County updates their management plans or develops new plans.

Appendix E provides an overview of Planning Team members' existing planning and regulatory capabilities to support implementation of mitigation strategy objectives. Appendix E 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.

It should be noted for the purposes of the Plan Update that the HMAP has been used as a reference when reviewing and updating all plans and ordinances for the entire planning area, including all participating jurisdictions. All participating jurisdictions maintain a current Emergency Management Plan which is updated every five years. Lavaca County updated their Emergency Management Plan in 2017 utilizing the mitigation strategy, risk assessment and prioritized actions from the previous plan. Each emergency manager in the planning area utilizes the four phases of emergency management in the plan update including: Mitigation, Preparedness, Response, and Recovery. The previous Hazard Mitigation Plan informs a complex part of the Emergency Management Plan update process and is utilized in each jurisdictions five year update. Additionally, the City of Moulton and the City of Hallettsville utilize the mitigation plan to inform and influence their drought contingency plan, and subdivision regulations as they are updated per their code of ordinances. The City of Yoakum has similarly implemented strategies of the plan into their comprehensive plan.

Plan Review and Plan Update

As with the development of the plan, Lavaca County will oversee the review and update process for the plan and to make and necessary 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 Lavaca 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 Lavaca County's comprehensive planning process, budgetary constraints, and community needs. Lavaca 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 Lavaca 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 Lavaca County's website.

The draft plan was made available to the general public for review and comment on the Lavaca 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 Lavaca County's website upon approval from FEMA.

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 Lavaca County's outreach efforts for development of the plan. Documentation of stakeholder meetings is found in Appendix D. A list of organizations invited to attend via e-mail is found in Table 2-4.

Table 2-4. Stakeholder Working Group

AGENCY	TITLE
Sweet Home Independent School District	Superintendent
Moulton Independent School District	Superintendent
Shiner Independent School District	Superintendent
Vysehrad Independent School District	Superintendent
Yoakum Independent School District	Superintendent
DeWitt County	Judge
Gonzales County	Judge
Fayette County	Judge

AGENCY	TITLE
Colorado County	Judge
Wharton County	Judge
Texas House of Representatives	State Representative for the Area
Texas Senate	State Senator for the Area

Development agencies invited to participate as stakeholders included Lavaca County Economic Development Agency, Hallettsville 4A Manufacturing Corporation, and Yoakum Economic Development Corporation. Stakeholders and participants from neighboring communities that attended the Planning Team and public meetings played a key role in the planning process. For example, flood was one of the major concerns to the stakeholders, so the County included an action to implement upgrades to undersized culverts and replace undersized bridges in order to reduce flood losses. Additionally, many jurisdictions added an action to educate their citizens of flood mitigation projects to minimize flood damages at residential properties.

Public Meetings

A series of public meetings were held throughout the planning area to collect public and stakeholder input. 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, Lavaca 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 D.

Public meetings were held on the following dates and locations:

- December 16, 2016, Lavaca County Courthouse
- April 20, 2017, Lavaca County Courthouse
- July 12, 2017, Lavaca 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 Lavaca County's website. A total of 7 surveys were completed online. The survey results are analyzed in Appendix B. Lavaca 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 runoff/flood mitigation as potential steps the jurisdictions could take to reduce or eliminate the risk of future hazard damages. In response to public input several hazard mitigation actions were added to the Plan to implement drainage improvements and flood control measures throughout the County and participating jurisdictions, including detention ponds, flood diversion improvements, and conveyance improvements. Programs for routinely cleaning debris from support bracing under bridges and drainage waterways to reduce debris in waterways were also added to the Plan.

Section 3: County Profile

Overview

In 1842, the Republic of Texas Congress established a judicial county from portions of Fayette, Colorado, Jackson, Victoria, and Gonzales counties and named it L Baca County. In 1846, the area was renamed Lavaca County and it became a regularly constituted county with 140 taxpayers. Petersburg and Hallettsville vied to be county seat, and after two hotly contested elections Hallettsville won the contest in 1852.

The County consists of several cities and towns and a few unincorporated communities. The following cities are participating within this plan and are considered part of the planning area: the City of Hallettsville, the City of Moulton, the City of Shiner, and the City of Yoakum.

The County consists of 970 square miles of flat to undulating terrain, with elevations ranging from 150 to 350 feet. The eastern part is drained by the Navidad River, and the central and western parts are drained by the Lavaca River. The vegetation in the northwest is typical of the Blackland Prairies region, with tall grasses, mesquite, and oak predominating, with pecan and elm trees found along streams. The southeast is in the Post Oak Savannah vegetation area, characterized by tall grasses and post and blackjack oaks. Between 21 and 30 percent of the land is considered prime farmland. Natural resources include oil and natural gas.[1]

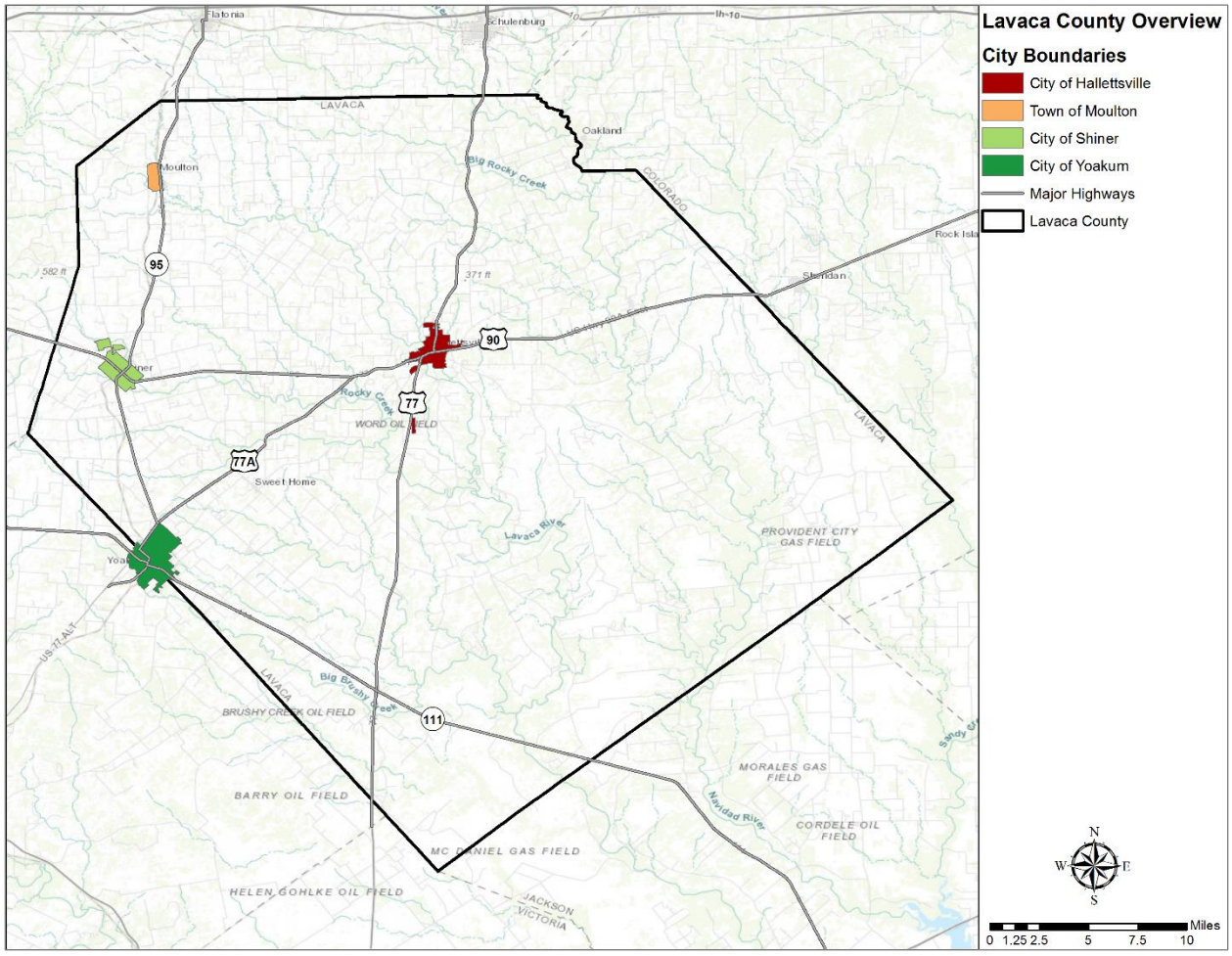
Figure 3-1 shows the general location of Lavaca County, along with the cities that are located within the county.

[1] Source: https://tshaonline.org/handbook/online/articles/hcl05

Figure 3-1. Location of Lavaca County Planning Area

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

Figure 3-2. Lavaca County Study Area



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

Table 3-1. Participating Jurisdictions

PARTICIPATING JURISDICTIONS
Lavaca County
Hallettsville
Moulton
Shiner
Yoakum

Population and Demographics

In the official U.S. Census population count, as of April 1, 2010, Lavaca County had a population of 19,263 residents. By July 2015, the number had grown to 19,821, and by July 2016, the population was 19,809. Table 3-2 provides the

distribution of population between the participating jurisdictions within Lavaca County noting the estimated vulnerable or sensitive populations per jurisdiction.[2]

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 OF LAVACA COUNTY TOTAL	ESTIMATED VULNERABLE OR SENSITIVE POPULATIONS	
			Older Adults (Over 65)	Below Poverty Level
Hallettsville	2,550	13.2%	598	436
Moulton	886	4.6%	228	139
Shiner	2,069	10.7%	508	183
Yoakum	5,815	30.2%	936	691
Unincorporated Lavaca County	7,943	41.3%	1,819	316
LAVACA COUNTY TOTAL	**19,263**	**100%**	**4,089**	**1,765**

Population Growth

The official 2010 Lavaca County population is 19,263. Overall, Lavaca County experienced a slight increase in population between 1980 and 2010 by 1.36 percent, or an increase by 259 people. While each of the participating cities saw a decrease in population during this time period, the unincorporated area of the County experienced a population growth. Between 2000 and 2010, Hallettsville and Yoakum experienced a population growth while Moulton and the unincorporated area of the County experienced a decrease in population. The City of Shiner remained very similar with only a decrease of 1 person. Overall, Lavaca County saw a slight increase in population during this time period. Table 3-3 provides historic growth rates in Lavaca County.

Table 3-3. Population for Lavaca County, 1980-2010

JURISDICTIONS	1980	1990	2000	2010	POP CHANGE 1980-2010	PERCENT CHANGE	POP CHANGE 2000-2010	PERCENT CHANGE
Hallettsville	2,865	2,718	2,345	2,550	-315	-10.99%	205	8.74%
Moulton	1,009	923	944	886	-123	-12.19%	-58	-6.14%
Shiner	2,213	2,074	2,070	2,069	-144	-6.51%	-1	-0.05%
Yoakum	6,148	5,611	5,731	5,815	-333	-5.42%	84	1.47%
Unincorporated Lavaca County	6,769	7,364	8,120	7,943	1,174	17.34%	-177	-2.18%
COUNTY TOTAL	**19,004**	**18,690**	**19,210**	**19,263**	**259**	**1.36%**	**53**	**0.28%**

[2] Source: https://www.census.gov/quickfacts/fact/table/lavacacountytexas,US/PST045215

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, the number of permits that have been issued throughout the county, 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. Lavaca 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)
Lavaca	970	19,263	19.86	19,304	19.90	19,519	20.12	19,313	19.91

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 Lavaca 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

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 Lavaca County that have been granted between 1996 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 to demonstrate growth rates.

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

Lavaca County			
Year	Buildings	Units	Construction Cost
2000	10	10	$973,550
2005	17	20	$1,884,490
2010	9	9	$580,000
2011	18	18	$1,322,750
2012	17	17	$799,000
2013	4	4	$645,000
2014	11	11	$858,244
2015	19	19	$1,916,558
2016	27	27	$3,341,000

[3] Source: https://www2.census.gov/econ/bps/County/

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 14, which include detailed hazard descriptions and vulnerability assessments.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, Lavaca County and the participating jurisdictions, identified ten natural hazards that are addressed in the Hazard Mitigation Plan Update. All of the hazards identified were natural hazards, and were categorized 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 associated with weather generated phenomenon. Atmospheric hazards that have been identified as significant for the Lavaca County planning area include extreme heat, hail, hurricane, lightning, thunderstorm wind, tornado, and winter storm (Table 4-1).

Hydrologic hazards are events associated with the distribution of surface and ground water, 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 (Table 4-1).

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/Tropical Storm	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.

HAZARD	DESCRIPTION
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. Thunderstorms create extreme wind events which include straight line winds. Wind is the horizontal motion of the air past a given point originating from differences in air pressure. 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.
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.

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. Hazard Identification Process

HAZARD CONSIDERED	REASON FOR DETERMINATION
Coastal Erosion	The planning area is not located on the coast, therefore coastal erosion does not pose a risk.
Dam Failure	There are two dams located in the unincorporated area of Lavaca County. However, there are no historical occurrences of these dams failing and there is none expected in the future. If the dams were to fail, Lavaca County would not experience any impact to life, property, or services provided by the community.
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.
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 change in the earth's climate which can increase or decrease the risk of other weather hazards. Global climate change is a long- term hazard expected to exacerbate the risks of natural hazards through rising sea levels, warming ocean temperatures, and increased humidity. This will lead to the possibility of stronger storms and increased wind and flood damage due to storm surge. 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. Climate change also directly endangers property due to sea level rise and biological organisms due to habitat destruction.

Texas is considered one of the more vulnerable states in the U.S. to both abrupt climate changes and 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 the National Centers for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA) were reported for the Lavaca County planning area. 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 Lavaca County planning area, and evaluate community assets and their vulnerability to the hazards.

The 4 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 Lavaca 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. Hazard vulnerability for Lavaca County was reviewed based on recent development changes that occurred throughout the County. The Lavaca County planning area has grown slightly between 2000 and 2016 according to the U.S. Census Bureau, therefore there has been no significant factors or development trends with a consequential effect or increase in vulnerability to the population, infrastructure, and buildings for hazards.

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 considers 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
Flood	Highly Likely	Limited[1]	High
Hail	Highly Likely	Limited	High
Hurricane/Tropical Storm	Occasional	Limited	High
Lightning	Highly Likely	Major[2]	High
Thunderstorm Wind	Highly Likely	Limited	High
Extreme Heat	Highly Likely	Limited	High
Drought	Highly Likely	Limited	High
Wildfire	Highly Likely	Minor	Moderate
Tornado	Highly Likely	Major	Low
Winter Storm	Likely	Limited	Low

[1] All of the participating jurisdictions have a Potential Severity of "Limited", while Lavaca County has a Potential Severity of "Substantial".

[2] According to structural damages, the Potential Severity would be considered "Limited", however with a fatality reported as a result of Lightning, the Potential Severity is considered "Major".

Section 5: 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. 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 Digital Flood Insurance Rate Map (DFIRM) data provided by FEMA for Lavaca 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 flood depths, are shown within these zones.

The location of the flood zones in Lavaca County based on the DFIRM from FEMA are illustrated in Figures 5-1 to 5-5.

Figure 5-1. Estimated Flood Zones in Lavaca County

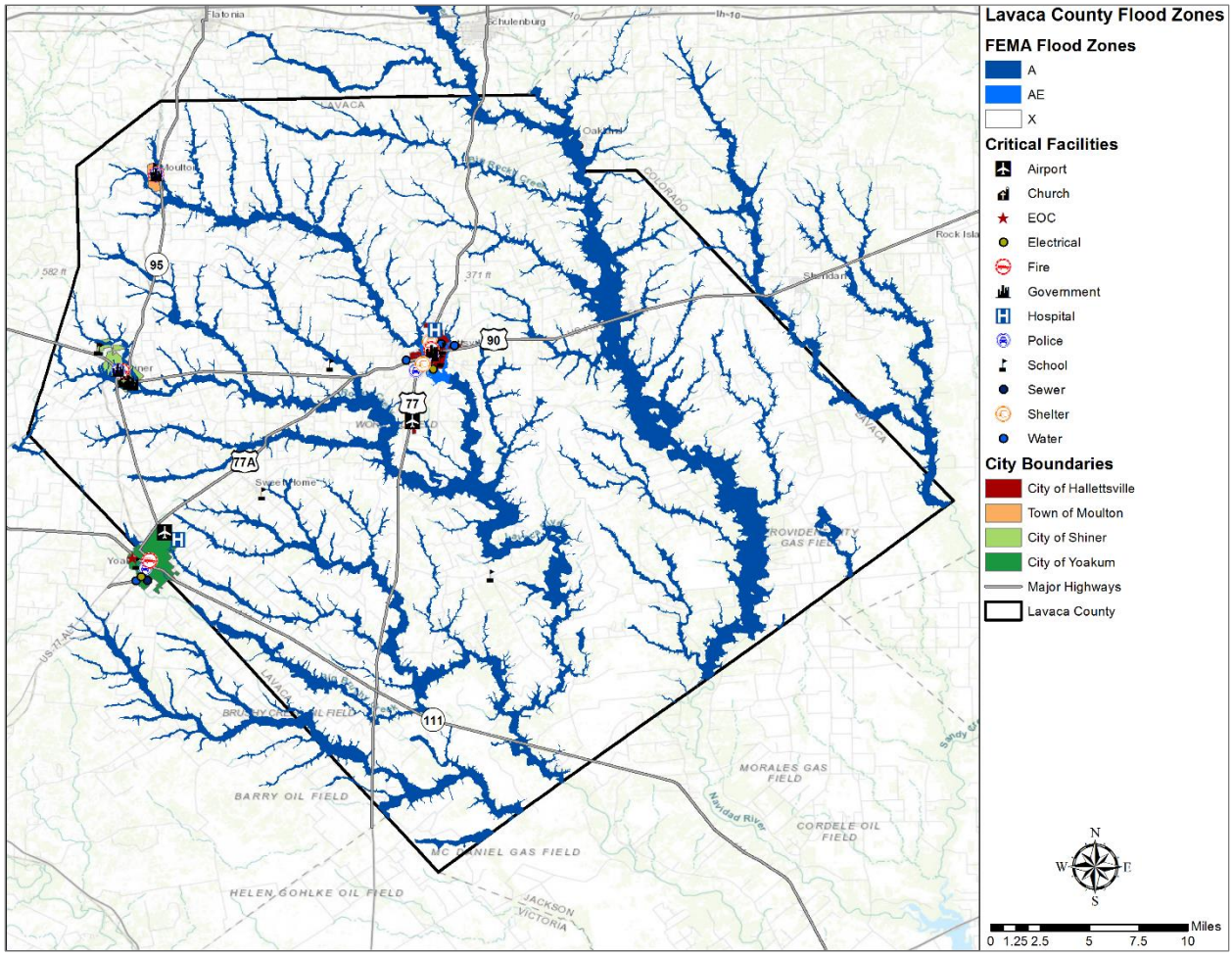


Figure 5-2. Estimated Flood Zones in the City of Hallettsville

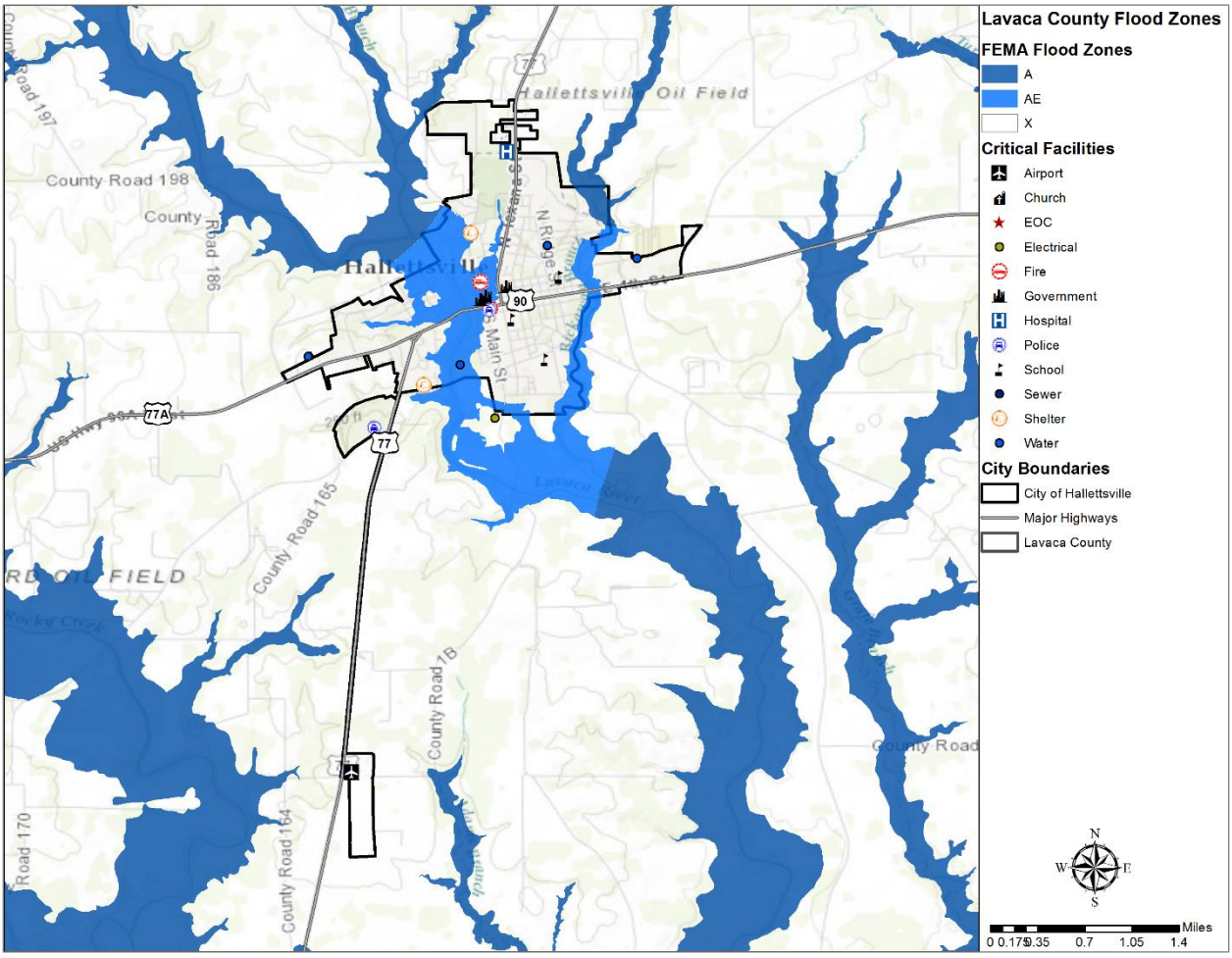


Figure 5-3. Estimated Flood Zones in the City of Moulton

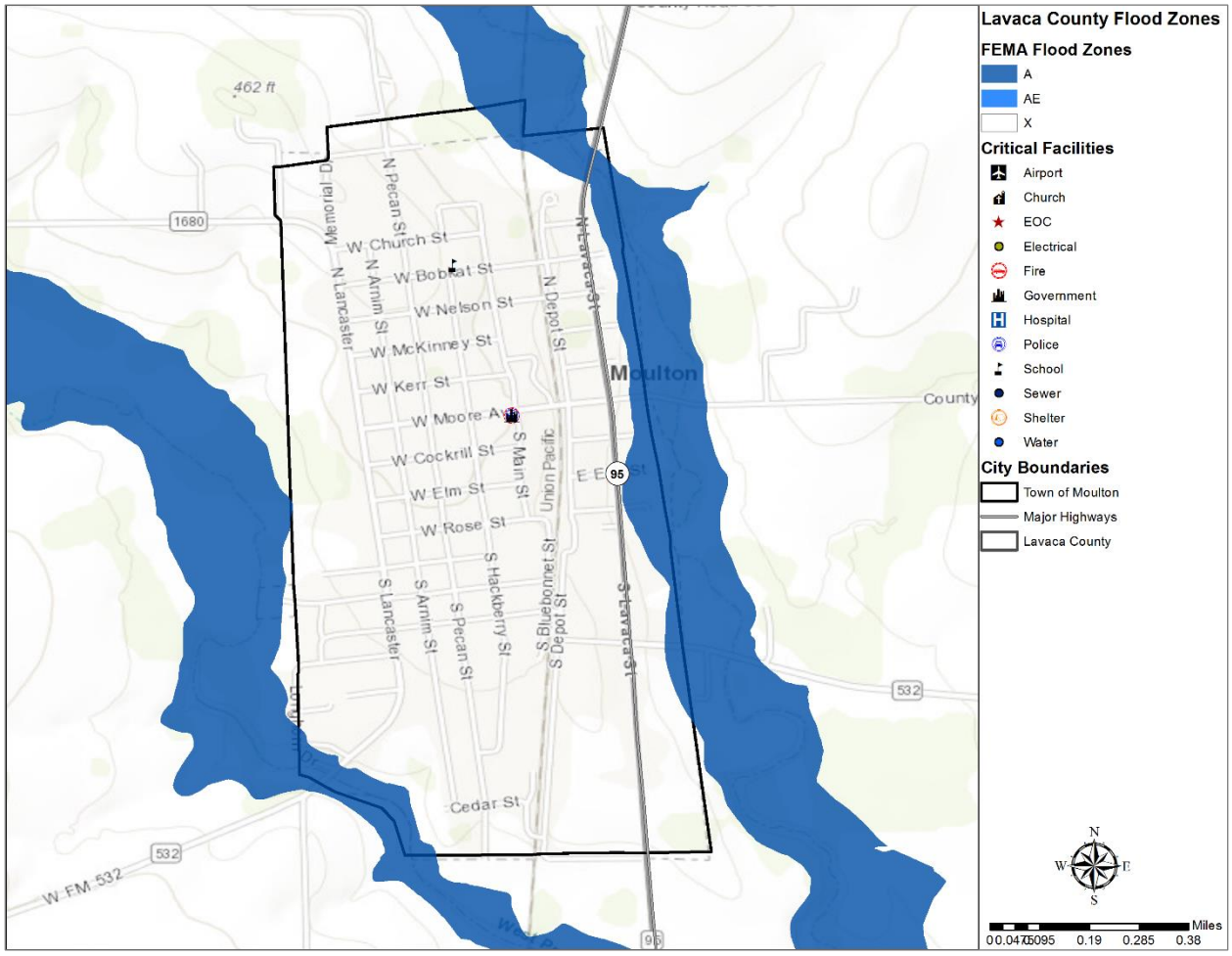


Figure 5-4. Estimated Flood Zones in the City of Shiner

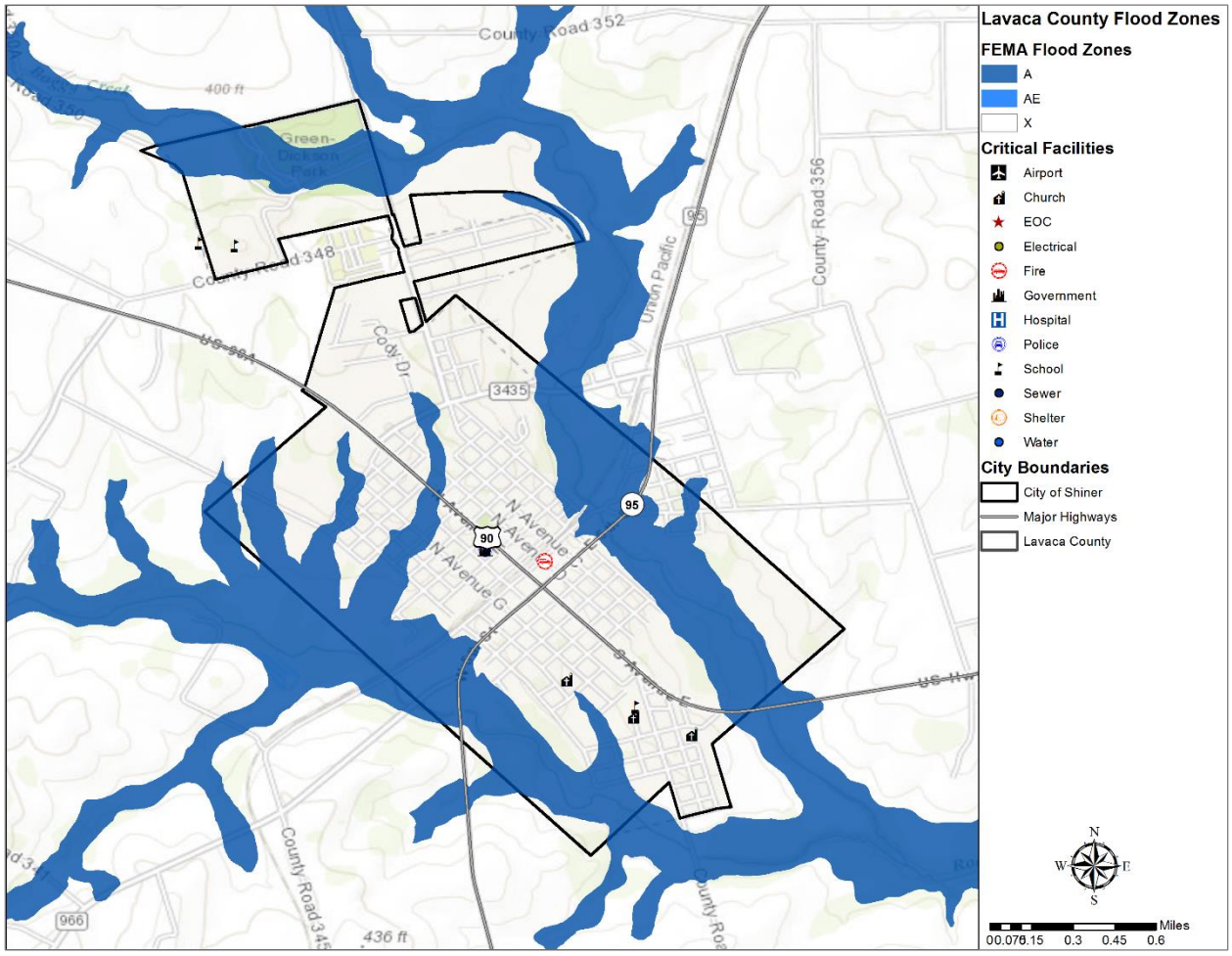
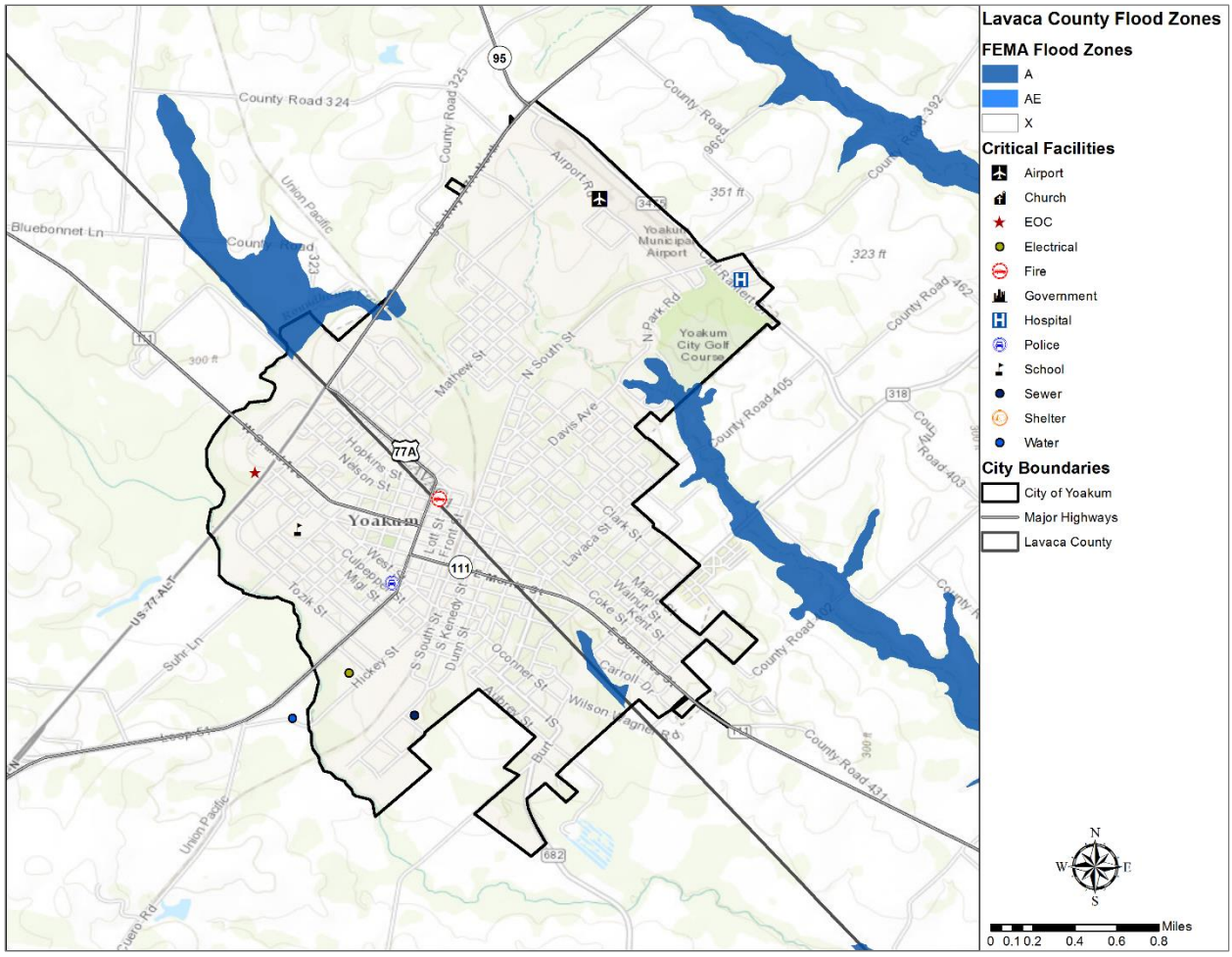


Figure 5-5. Estimated Flood Zones in the City of Yoakum



Extent

The severity of a flood event is established 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, location of the flood hazard area, and depth of flood water. Extent of flood damage can be expected to be more destructive in the areas that will convey a base flood. FEMA categorizes areas on 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 5-1 provides a description of FEMA flood zones and the flood impact in terms of severity or potential harm. Flood Zones A, AE, AO, and X are the hazard areas mapped in the planning area. Figures 5-1 through 5-5 should be read in conjunction with the extent for flooding in Tables 5-1, 5-2, and 5-3 to determine the intensity of a potential flood event.

Table 5-1. 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.
	ZONE V	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
	ZONE VE	Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

INTENSITY	ZONE	DESCRIPTION
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, or 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 destructive 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 5-2 below describes the category of risk and potential magnitude of an event in correlation to water depth. The water depths depicted in Table 5-2 are an approximation based on elevation data. Table 5-3 describes the extent associated with stream gauge data provided by the United States Geological Survey (USGS).

Table 5-2. 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 5-3. Extent for Lavaca County[1]

JURISDICTION[2]	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
Lavaca County	Action Stage, 16 to 23 feet	Moderate Flood Stage: Navidad River reached an overflow elevation of 30.24 feet in October 1998 near Speaks, Texas.
Lavaca County	Flood Stage, 24 to 28 feet	Major Flood Stage: Navidad River reached an overflow elevation of 40 feet in June 1940 near Hallettsville, Texas.
Hallettsville	Action Stage, 16 to 23 feet	Major Flood Stage: Lavaca River reached an overflow elevation of 41.1 feet in August 1981 in Hallettsville, Texas.

The data described in Tables 5-1 through 5-3, together with Figures 5-1 through 5-5, and historical occurrences for the area, provides an estimated potential magnitude and severity for flooding in the County. For example, the City of Hallettsville, as shown in Figure 5-2, has areas designated as Zones A and AE. Reading this figure in conjunction with Table 5-1 means the area is an area of high risk for flood.

The extent of flood intensity that the County can experience is high, or Zone A. Based on reporting from the USGS, a flood event can place the County at the extent of "Action Flood Stage" as shown in Tables 5-2 and 5-3. Based on historical occurrences, the planning area could expect to experience from 6-15 inches of water within a 24-hour period due to flooding.

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 reported flood events 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 5-4 identifies historical flood events that resulted in damages, injuries, or fatalities within the Lavaca County planning area. Table 5-5 provides the historical flood event summary by jurisdiction. Historical Data is provided by the Storm Prediction Center (NOAA), NCEI database for Lavaca County.

Table 5-4. Historical Flood Events, 1996 – 2017[3]

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	6/26/1996	11:00 AM	0	0	$77,630	$15,526
Lavaca County	9/9/1996	10:00 AM	0	0	$15,526	$0
Lavaca County	2/20/1997	12:30 PM	0	0	$15,178	$0

[1] 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.

[2] Severity is provided for jurisdictions where peak data was provided.

[3] Only recorded events with fatalities, injuries, and/or damages are listed. Values are in 2017 dollars. Analysis period from January 1996 through August 2017.

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	4/4/1997	6:00 AM	0	0	$4,553	$0
Lavaca County	4/10/1997	10:30 PM	1	0	$1,517,776	$75,889
Lavaca County	5/21/1997	5:00 PM	0	0	$15,178	$0
Lavaca County	5/24/1997	3:30 PM	0	0	$7,589	$0
Lavaca County	6/21/1997	12:30 PM	0	0	$7,589	$0
Lavaca County	7/8/1997	2:30 PM	0	0	$30,356	$0
Lavaca County	10/7/1997	8:00 PM	0	0	$30,356	$0
Lavaca County	10/10/1997	5:00 PM	0	0	$45,533	$0
Lavaca County	10/11/1997	3:00 PM	0	0	$45,533	$0
Lavaca County	10/13/1997	1:00 AM	0	0	$30,356	$0
Lavaca County	2/16/1998	9:00 AM	0	0	$0	$4,483
Lavaca County	2/21/1998	7:00 PM	0	0	$7,472	$0
Lavaca County	2/26/1998	2:45 AM	0	0	$4,483	$0
Lavaca County	8/22/1998	5:00 AM	0	0	$44,835	$74,725
Lavaca County	8/23/1998	2:30 AM	0	0	$14,945	$14,945
Lavaca County	9/10/1998	10:50 PM	0	0	$22,417	$29,890
Lavaca County	9/15/1998	3:00 PM	0	0	$4,483	$0
Lavaca County	9/16/1998	3:00 PM	0	0	$4,483	$0
Lavaca County	10/17/1998	7:00 PM	0	50	$2,988,994	$149,450
Lavaca County	10/17/1998	10:00 PM	0	5	$298,899	$149,450
Lavaca County	10/18/1998	11:30 PM	0	300	$4,483,491	$747,248
Lavaca County	11/12/1998	10:00 PM	0	0	$14,945	$74,725
Lavaca County	11/12/1998	11:30 PM	0	0	$74,725	$0
Lavaca County	11/13/1998	9:30 PM	0	0	$29,890	$0
Lavaca County	1/1/1999	10:00 PM	0	0	$4,387	$0
Lavaca County	6/25/1999	3:00 PM	0	0	$21,933	$43,866

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	11/3/2000	6:30 PM	0	0	$7,073	$0
Lavaca County	11/23/2000	11:30 PM	0	0	$14,147	$0
Lavaca County	5/5/2001	3:30 PM	0	0	$110,041	$0
Lavaca County	8/29/2001	11:30 PM	0	0	$20,633	$41,265
Lavaca County	8/31/2001	1:30 AM	0	0	$68,776	$137,551
Lavaca County	9/3/2001	11:15 PM	0	0	$13,755	$0
Lavaca County	9/5/2001	10:00 AM	0	0	$13,755	$0
Lavaca County	11/15/2001	6:00 PM	0	0	$4,127	$0
Lavaca County	11/4/2002	7:30 PM	0	0	$13,541	$0
Lavaca County	2/20/2003	6:00 PM	0	0	$3,972	$0
Lavaca County	9/2/2003	8:00 AM	0	0	$6,620	$0
Lavaca County	9/3/2003	12:30 PM	0	0	$13,239	$0
Lavaca County	11/17/2003	8:30 AM	0	0	$6,620	$0
Lavaca County	11/17/2003	8:00 PM	0	0	$3,972	$0
Lavaca County	3/14/2004	12:15 PM	0	0	$3,869	$0
Lavaca County	3/14/2004	6:30 PM	0	0	$6,448	$0

Table 5-5. Summary of all Recorded Historical Flood Events, 1996 – 2017[4]

JURISDICTION	Number of Events	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	91	1	355	$10,174,123	$1,559,013
Hallettsville	5	0	0	$0	$0
Moulton	4	0	0	$0	$0
Shiner	3	0	0	$0	$0
Yoakum	4	0	0	$0	$0
TOTAL LOSSES	**107**	**1**	**355**	**$11,733,136**	

[4] Values are in 2017 dollars. Analysis period from January 1996 through August 2017.

Based on the list of historical flood events for the Lavaca County planning area (listed above), including all participating jurisdictions, 48 of the events have occurred since the 2006 Plan.

Significant Events

Flash Flood on April 10-11, 1997 – Lavaca County

A flash flooding event, resulting in six inches of rain and isolated totals nearing 14 inches, was reported in Lavaca County beginning on April 10, 1997. This event resulted in widespread road closures throughout the county, including Hwy 95 from Yoakum to Shiner, with widespread closures across the county. During the event, several homes in Yoakum and Sweet Home (Unincorporated Lavaca County) were flooded and up to 500 head of cattle were reported lost. Damages were estimated at approximately $1,590,000 in 2017 dollars.

One man died during the flash flooding event, drowning in his truck after it was swept off the road as he was trying to get to Hallettsville for his job. Two other couples were trapped in their van as they were returning from Sweet Home to Yoakum, but luckily they were able to break a rear window and escape; grabbing ahold of a fence line and eventually clinging to a tree for hours until they were rescued.

Flash Flood October 16-19, 1998 – Lavaca County

A major flash flooding event hit South Central Texas shortly before noon on Saturday, October 17, 1998. Lavaca, Guadalupe, Caldwell, Bastrop, and Lee Counties were all hit with heavy rain continuing throughout the afternoon spreading throughout Comal, Hays, and Gonzales Counties. All rivers, creeks, and streams along and east of a San Antonio to Austin line remained at or above flood stage from Saturday, October 17th through Sunday, October 18th, with a majority continuing to flood through Monday, October 19th.

This event broke rainfall records across South Central Texas, producing 18 floods of record in the region's streams. Rivers across the area reached or exceeded record stage heights, resulting in widespread flooding in stream, creek, and river flood plains. Damages for the Lavaca County planning area were reported in excess $5.5 million (2017 dollars).

Probability of Future Events

Based on recorded historical occurrences and extent within the Lavaca County planning area, 107 recorded flooding events in the 21-year reporting period provides a probability of occurrence of at least 5 events per year. This frequency supports a highly likely probability of future events meaning that an event is probable in 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.

All participating jurisdictions encourage future development to be outside of the floodplain, although there are some critical facilities, homes, and businesses already located in the floodplain. Table 5-6 includes critical facilities in the planning area that are located in the floodplain and are vulnerable to flooding.

Table 5-6. Critical Facilities in the Floodplain by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	Government Facility
Hallettsville	Fire Station, Wastewater Treatment Facility, Airport, Emergency Shelter, Government Facility
Moulton	No critical facilities location in the floodplain

JURISDICTION	CRITICAL FACILITIES
Shiner	No critical facilities location in the floodplain
Yoakum	No critical facilities location in the floodplain

Historic loss estimates due to flooding are presented in Table 5-7 below. Considering 107 flood events over a 21-year period, frequency is approximately five to six events every year.

Table 5-7. Potential Annualized Losses by Jurisdiction, 1996-2017[5]

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Lavaca County	$11,733,136	$552,148
Hallettsville	$0	$0
Moulton	$0	$0
Shiner	$0	$0
Yoakum	$0	$0
Planning Area	**$11,733,136**	**$552,148**

The severity of a flooding event varies depending on the relative risk to citizens and structures located within each city. Table 5-8 depicts the level of impact for Lavaca County and each participating city.

[5] Values are in 2017 dollars. Analysis period from January 1996 through August 2017.

Table 5-8. Impact by Jurisdiction

JURISDICTION	IMPACT	DESCRIPTION
Lavaca County	Substantial	While damage in Lavaca County may result in a minor loss in quality of life, less than 10 percent of property would be destroyed or damaged and critical facilities would be shut down for 24 hours or less, the high number of injuries and reported fatality result in a substantial impact for the county.
Hallettsville	Limited	Any injuries or illnesses would be treatable with first aid, with a potential for minor loss in quality of life. If critical facilities are shut down, it would be for 24 hours or less and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Moulton	Limited	Any injuries or illnesses would be treatable with first aid, with a potential for minor loss in quality of life. If critical facilities are shut down, it would be for 24 hours or less and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Shiner	Limited	Any injuries or illnesses would be treatable with first aid, with a potential for minor loss in quality of life. If critical facilities are shut down, it would be for 24 hours or less and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Yoakum	Limited	Any injuries or illnesses would be treatable with first aid, with a potential for minor loss in quality of life. If critical facilities are shut down, it would be for 24 hours or less and it is expected that less than 10 percent of property would be destroyed or damaged in the city.

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. All of the jurisdictions located in Lavaca County participate in the NFIP.

As an additional indicator of floodplain management responsibility, communities may choose to participate in FEMA's Community Rating System (CRS). This is an incentive-based program that allows communities to undertake flood mitigation activities that go beyond NFIP requirements. Currently, none of the communities in Lavaca County participate in CRS.

The City of Yoakum has adopted higher standards above the NFIP minimum, such as requiring 1 foot of freeboard for new construction and substantial improvements of structures. But Lavaca County, Hallettsville, Moulton, and Shiner currently have only adopted the minimum NFIP standards. These jurisdictions are considering adopting additional higher regulatory NFIP standards to limit floodplain development.

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

These flood losses are created by the cumulative effect of obstructions in floodplains. Occupancy of flood hazard areas is especially hazardous when development is inadequately elevated, flood-proofed, or otherwise protected from flood damage. Moreover, development in this region can increase flood heights and velocities making flooding more intense and widespread then predicted. Mitigation actions are included to address flood maintenance issues

as well (Section 16), including routinely clearing debris from roadside ditches and bridges and expanding drainage culverts and storm water structures to more adequately convey flood waters.

It is the purpose of Lavaca County and NFIP jurisdictions participating in the Hazard Mitigation plan to continue to promote the public health, safety, and general welfare by minimizing public and private losses due to flood conditions in specific areas. Each 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 each 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, and 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.

To accomplish these tasks, Lavaca County and participating NFIP 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 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, Lavaca County and participating jurisdictions have developed mitigation actions that relate to either NFIP maintenance or compliance. Compliance and maintenance actions can be found in Section 18.

Flooding was identified by the City of Hallettsville as a high-risk hazard during hazard ranking activities at the Risk Assessment Workshop. The City of Yoakum and unincorporated Lavaca County identified flood as a moderate risk. Moulton and Shiner both identified flood as a low risk. 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. County-wide, communities recognize the need and are working towards adopting higher NFIP regulatory standards to further minimize flood risk in their community. Smaller, no-growth communities that typically do not have personnel or funds to implement more stringent NFIP compliance measures 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.

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 FMA 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 5-9 shows repetitive loss and severe repetitive loss properties for Lavaca County and all participating jurisdictions.

Table 5-9. Repetitive Loss and Severe Repetitive Loss Properties

JURISDICTION	BUILDING TYPE	NUMBER OF STRUCTURES	NUMBER OF LOSSES
Lavaca County	Single Family	1	2
Hallettsville	Single Family	2	13
Moulton	N/A	0	N/A
Shiner	N/A	0	N/A
Yoakum	N/A	0	N/A

[6] Source: Texas Water Development Board

Section 6: Hail

Hazard Description

Hail is a form of frozen participation and is a potentially damaging outgrowth of severe thunderstorms. During the developmental stages of a hailstorm, ice crystals form within a low-pressure front when warm air rapidly rises into the upper atmosphere and the air mass is subsequent cooled. Frozen droplets within the cooled air mass gradually accumulate to form ice crystals, then they fall as precipitation that is round or irregularly shaped masses of ice. The size of hailstones is a direct result of the size and severity of the storm as the longer the ice crystals remain in the upper atmosphere before they fall, the larger the mass of ice falling as hail. 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. Larger temperature gradients above Earth's surface result in increased suspension time and therefore increased hailstone size.

Location

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

Extent

The intensity category of a hailstorm depends on hail size and the potential damage it could cause, as depicted in the NCEI Intensity Scale (Table 6-1). The intensity scale 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. The National Weather Service (NWS) classifies a storm as "severe" if there is hail one inch in diameter (approximately the size of a quarter) or greater, based on radar intensity or as seen by observers.

Table 6-1. 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 – 1.2	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

Based on available data regarding the previous occurrences for the area discussed further below, the Lavaca County planning area may experience hailstorms ranging from an H0 to an H10. The planning area can plan to mitigate storms ranging from hard hail (low risk) to super hailstorms (high risk), the latter potentially leading to widespread destruction of glass, roofs, and potential risk of injuries.

Historical Occurrences

Historical evidence for Lavaca County demonstrates that the entire planning area is vulnerable to hail events. Figure 6-1 plots this historical evidence by locating past hail events in the Lavaca County planning area where latitude and longitude were available. Historical events with reported damage, injuries or fatalities are shown in Table 6-2. A total of 76 reported historical hail events impacted Lavaca County, including all participating jurisdictions, during the 62-year period from 1955 through August 2017 (Summary Table 6-3). These were the events reported to NCEI and NOAA databases, and may not represent all hail events to have occurred during this time.

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

Figure 6-1. Spatial Historical Hail Events, 1955-2017

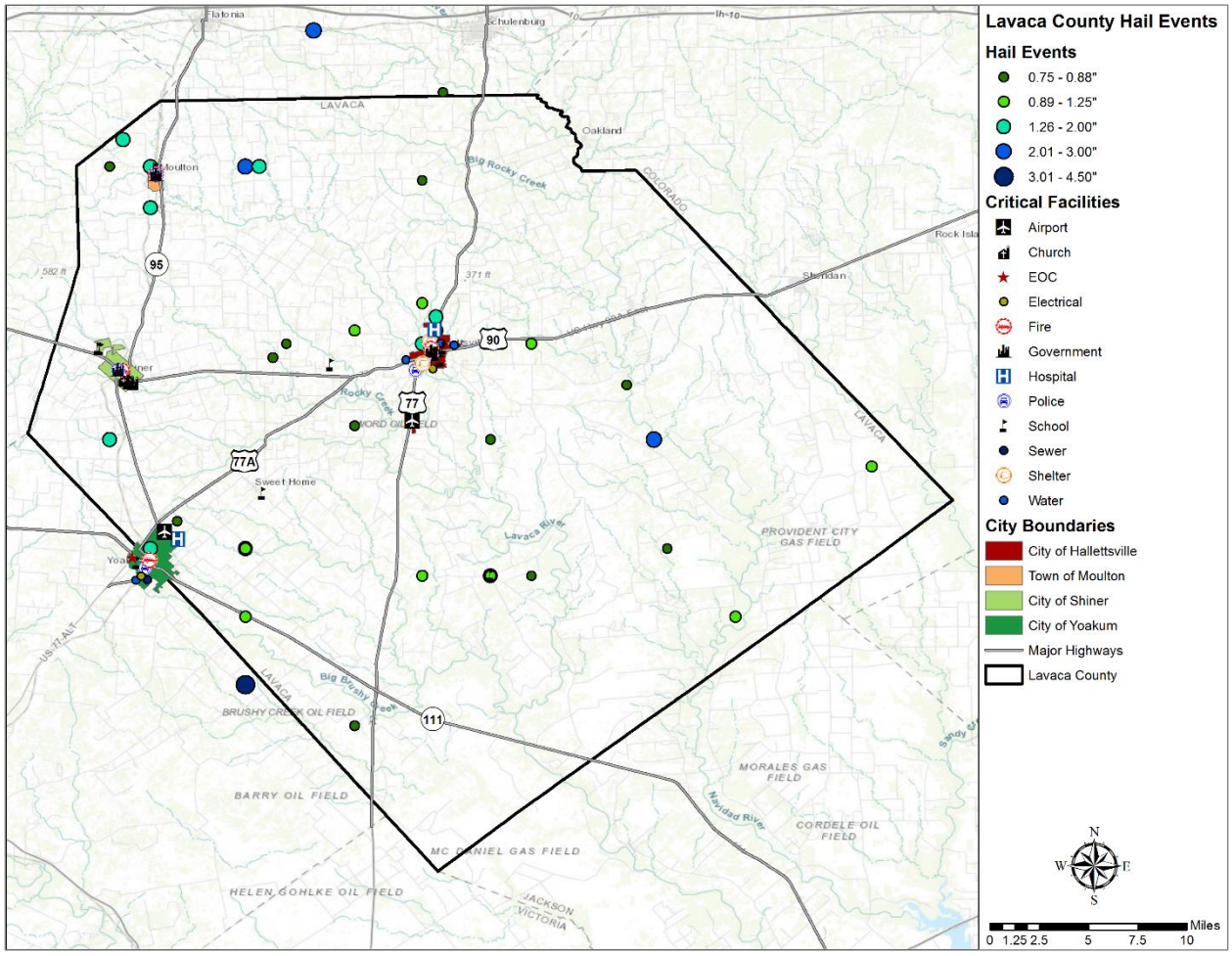


Table 6-2. Historical Hail Events, 1955-2017[2]

JURISDICTION	DATE	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
Hallettsville	4/5/1994	1.25 inches	0	0	$82,187	$82,187
Hallettsville	4/11/1994	1.00 inches	0	0	$8,219	$8,219
Lavaca County	4/15/1994	1.00 inches	0	0	$8,219	$8,219
Hallettsville	4/15/1994	1.00 inches	0	0	$8,219	$8,219
Lavaca County	4/15/1994	1.75 inches	0	0	$82,187	$82,187
Lavaca County	4/15/1994	1.75 inches	0	0	$82,187	$82,187
Moulton	4/10/2004	2.75 inches	0	0	$128,959	$0
Lavaca County	5/26/2011	1.00 inches	0	0	$1,083	$0

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

JURISDICTION	DATE	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
TOTALS		(Max Extent)	0	0	$401,260	$271,218

Table 6-3. Historical Hail Events Summary, 1955-2017[3]

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	36	4.00 inches	0	0	$173,676	$172,593
Hallettsville	18	1.75 inches	0	0	$98,625	$98,625
Moulton	13	2.75 inches	0	0	$128,959	$0
Shiner	5	1.75 inches	0	0	$0	$0
Yoakum	4	1.00 inches	0	0	$0	$0
TOTAL LOSSES	76	(Max Extent)	0	0	$672,478	

Based on the list of historical hail events for the Lavaca County planning area (listed above), including all participating jurisdictions, 15 of the events have occurred since the 2006 Plan.

Significant Events

April 15, 1994 – Lavaca County

A series of hail events occurred throughout the northwest portion of Lavaca County on April 15, 1994; bringing destructive nickel to half dollar size hail to the County. Damages were estimated at more than $100,000 for each property and crop damage in 2017 dollars.

April 10, 2004 – Moulton, Lavaca County

On April 10, 2004, a storm brought a flurry of large hail larger than baseballs, damaging cars and homes on the east side of Moulton. Reported damage for this event was approximately $128,959 in 2017 dollars.

Probability of Future Events

Based on available records of historic events, 76 events in a 62-year reporting period for Lavaca County provides a probability of at least 1 event every year. This frequency supports a highly likely probability of future events meaning that an event is probable in the next year.

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 school districts and critical facilities would be vulnerable and could be damaged. Hail could cause a significant threat to people as they could be struck by hail and falling trees and branches. Outdoor activities

[3] Values are in 2017 dollars.

and events may elevate the risk to residents when a hailstorm strikes with little warning. Older structures not built to current codes may be more vulnerable to damages than newer structures.

The Lavaca County planning area, including all participating jurisdictions, features multiple manufactured home parks, which are more vulnerable to hail damage than site built structures. In addition, manufactured homes are located sporadically throughout rural portions of the county which would also be more vulnerable. The US Census data indicates a total of 1,707 manufactured homes are located in the Lavaca County planning area, including all participating jurisdictions. In addition, 59.2% (approximately 6,142 structures in the entire planning area) of the residential structures in the Lavaca County planning area were built before 1980.[4] These structures would typically be built to lower or less stringent construction standards than newer construction and may be more suseptible to damages during significant hail events.

Table 6-4. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Lavaca County[5]	1,707	6,142
Hallettsville	158	1,048
Moulton	18	364
Shiner	84	739
Yoakum	284	1,863

Table 6-5 includes critical facilities that would be vulnerable to hail events in the Lavaca County planning area.

Table 6-5. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACLITIES
Lavaca County	2 Schools, Government Facility
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Public Works Plant, Evacuation Center, 2 Government Facilities, Hospital, Sheriff's Office, 6 Schools
Moulton	Police Station, Fire Station, Community Center, 2 Schools, 6 Water/Waste Water Facilities, Nursing Home, Government Facility
Shiner	Police Station, Fire Station, 5 School Facilities, 3 Churches, Government Facility
Yoakum	Police Station, Fire Station, School, Hospital, Airport, 2 Water/Waste Water Facilities, Electrical Sub-station, EOC/Government Facility

First responders may not be able to respond to calls due to blocked roads. Also, hail could cause power outages which could cause health and safety risks to more vulnerable populations in the planning area.

[4] Source: US Census Bureau data estimates for 2015.

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

Section 6: Hail

Hail has been known to cause injury to humans, and occasionally has been fatal. Overall, the average loss estimate of property and crop (in 2017 dollars) is $672,478, having an approximate annual loss estimate of $10,846. Frequency of return of a hail event can be assumed to be 1 hail event every year (Table 6-6).

Table 6-6. Potential Annualized Losses and Hail Intensity by Jurisdiction, 1955-2017

JURISDICTION	PROPERTY & CROP LOSSES	ANNUAL LOSS ESTIMATES	MAX HAIL INTENSITY
Lavaca County	$346,269	$5,585	Super Hailstorm
Hallettsville	$197,250	$3,181	Destructive
Moulton	$128,959	$2,080	Very Destructive
Shiner	$0	$0	Destructive
Yoakum	$0	$0	Severe

Based on historic loss and damages, the impact of hail damages on the Lavaca County planning area, including all participating jurisdictions, can be considered "Limited" severity of impact meaning injuries and/or illness can be treatable with first aid, County area facilities shut down for less than 24 hours, and less than ten percent of property destroyed or with major damage.

Section 7: Hurricane/Tropical Storm

Hazard Description

According to NOAA, a hurricane is an intense tropical weather system consisting of strong thunderstorms with well-defined surface circulation and maximum sustained winds of 74 mph or higher.[1] These types of tropical weather systems often begin as tropical depressions, which possess similar qualities to hurricanes but with lower wind speeds, that intensify into tropical storms when maximum sustained winds increase to between 39 – 73 mph. At these wind speeds the storm becomes more organized and circular in shape and begins to resemble a hurricane. In the Northern Hemisphere, circulation of winds near the Earth's surface during this type of storm is counterclockwise.

The intensity of a hurricane storm system 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. Moreover, the distinction between tropical storm and hurricane can be misleading because tropical storms resulting in heavy rainfall can be equally dangerous and damaging to people and property. 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.

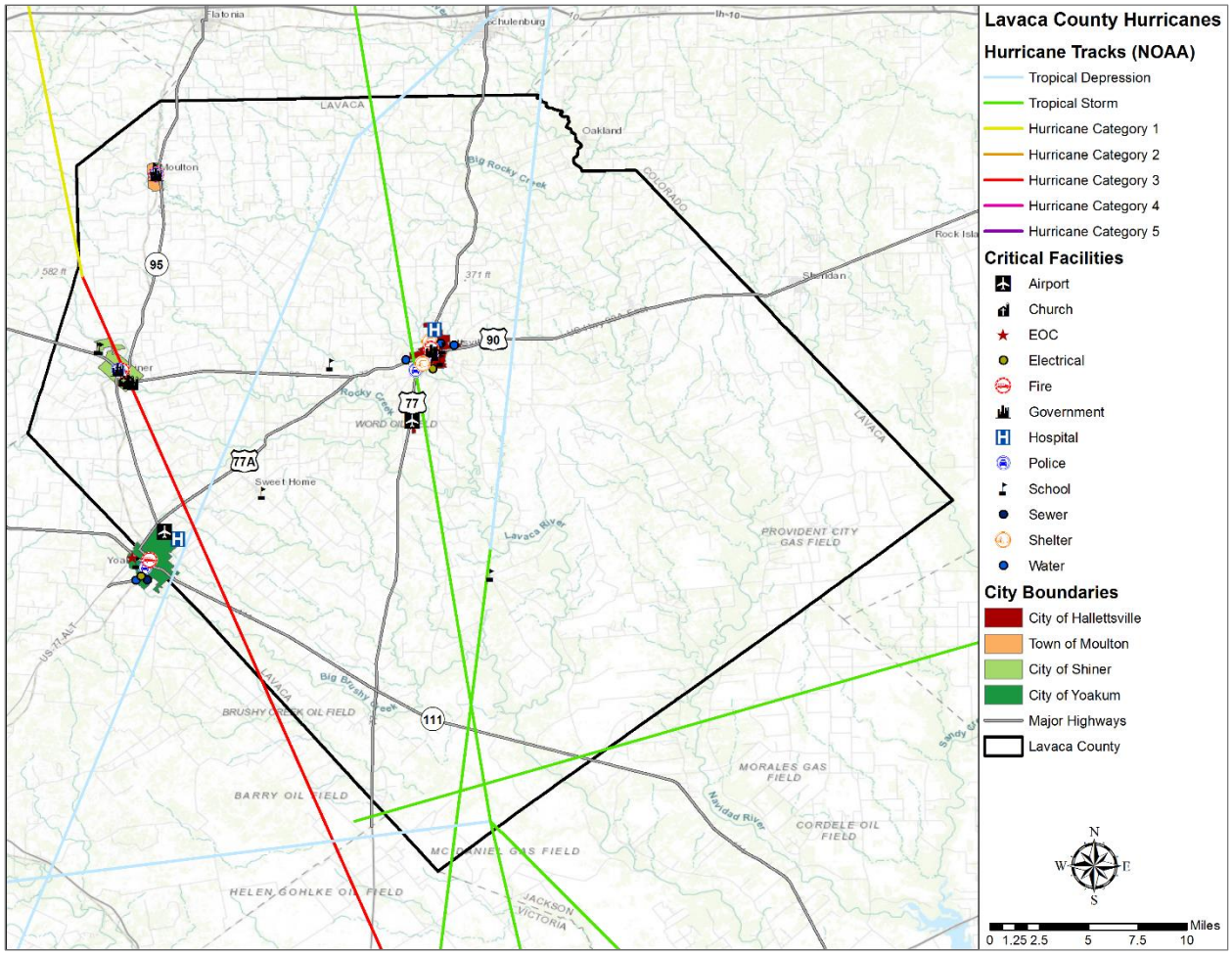
Lavaca County is vulnerable to multiple threats related to hurricane and tropical storm events including high-force winds and heavy rainfall. However, this section only considers the hazard related to high-force winds; the hazard related to heavy rainfall due to hurricane events is addressed in Section 5 on flooding hazard.

Location

A tropical storm or hurricane event can impact any location within Lavaca County's planning area, as these storms are not confined to any geographic area within the County. However, the planning area is located inland from the coast, which makes them less vulnerable to high winds from a hurricane event than communities located along the coast. Therefore, it is assumed that the Lavaca County planning area, including all participating jurisdictions, is uniformly exposed to the threat of tropical storm or hurricane wind speeds of 110 miles per hour (mph) or less as shown in Figure 7-1.

[1] https://oceanservice.noaa.gov/facts/hurricane.html

Figure 7-1. Location of Historical Hurricane/Tropical Storm Tracks



Extent

The extent of hurricanes and tropical storms are determined by wind speed. As a hurricane develops, the barometric pressure (measured in millibars or inches of mercury) at its center of the storm falls and wind speeds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. 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 designated a hurricane.

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale (Table 7-1). This scale uses the maximum sustained wind speed, which is an average of the wind speed measured 33 feet above the surface for the duration of a minute within the area of maximum strength of the storm known as the radius of maximum wind. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest wind speeds. This scale only ranks hurricanes based on 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 7-1. 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 – 129	964 – 945	9 – 12
4	130 – 156	944 – 920	13 – 18
5	157 +	Less than 920	19 +

Based on the historical storm tracks for hurricanes and tropical storms, as well as the location of Lavaca County, the extent to be mitigated for is a tropical storm, falling just below a Category 1 storm. Lavaca County is located in the 90-110 mph wind zone in terms of average wind speeds that should be mitigated in the event of a hurricane/tropical storm. This data is based on the design wind speeds for a 100-year event.

Historical Occurrences

Previous occurrences of tropical storms and hurricanes in Lavaca County include storms that had a direct path through the Lavaca County planning area, and the tracks near the county. Table 7-2 below lists the storms that have impacted the Lavaca County planning area during the years of 1955 through August 2017.

Table 7-2. Historical Tropical Storm/Hurricane Events for Lavaca County Planning Area, 1955-2017

JURISDICTION	DATE	MAGNITUDE	FATALITIES	INJURIES	PROPERTY DAMAGE (2017 VALUE)	CROP DAMAGE (2017 VALUE)
Countywide	9/14/1958	Tropical Depression	0	0	N/A	N/A
Countywide	9/3/1961	Hurricane Category 3	0	0	N/A	N/A
Countywide	9/4/1980	Tropical Storm	0	0	N/A	N/A
Countywide	9/8/1998	Tropical Depression	0	0	N/A	N/A
Countywide	9/7/2002	Tropical Storm	0	0	N/A	N/A
Countywide	7/15/2003	Tropical Storm	0	0	$132,393	$397,178
Countywide	6/16/2015	Tropical Storm	0	0	N/A	N/A
Countywide	8/26/2017	Tropical Storm	0	0	$100,000	$0
Total			**0**	**0**	**$629,571**	

Based on the list of historical tropical storm/hurricane events for the Lavaca County planning area (listed above), including all participating jurisdictions, 2 of the events have occurred since the 2006 Plan.

Significant Events

Hurricane/Tropical Storm Claudette on July 15, 2003

Hurricane Claudette made landfall on July 15 and struck southern Lavaca County as a tropical storm in the afternoon. Winds were unofficially estimated at 60 to 70 mph, with gusts up to 90 mph. Wind from the storm knocked over dozens of trees and off hundreds of tree limbs. It caused minor roof damage to homes and buildings in southern Lavaca County.

Tropical Storm Bill on June 17, 2015

Tropical Storm Bill made landfall the morning of June 16th and the center of the storm moved over Lavaca County June 17th. Winds from the storm downed power lines in Lavaca County and blew the roof off an auction barn onto a power line. Flash flooding from heavy rain was more widespread in South Central Texas and rainfall in Lavaca County totaled about 11.50 inches.

Tropical Storm Harvey on August 26, 2017

Hurricane Harvey made landfall during the late evening of August 25th as a Category 4. As Harvey moved inland it continued to weaken to a tropical storm. The Lavaca County area sustained tropical storm winds with many gusts well over 50 mph. Several trees were down across the county including some structural damage in Yoakum and Shiner. The Navidad River reached record heights at both Sublime and Speaks. The high water mainly affected the floodplain and no structures were directly impacted. Some roads were closed due to high water in the river as well as from the high rain totals across the county. The highest rain total was 20 inches of rain near Shiner. Other areas to the south received 15 to 20 inches based on radar estimates. With Harvey recently hitting Lavaca County these are currently the numbers reported to NCEI and are subject to change.

Probability of Future Events

Based on historical occurrences and the frequency of significant hurricane events, there have been eight tropical storm events in the 62-year reporting period which provides a probability of one event every five years. This frequency supports an occasional probability for the Lavaca County planning area, including all participating jurisdictions, meaning it is probable that the area will be impacted by a hurricane or tropical storm event in the next five years.

Vulnerability and Impact

Tropical storm and hurricane hazards can cause major damage across large areas. Therefore, 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 allowing the community time to reduce the impact of tropical storm and hurricane events.

Tropical storm and hurricane events can cause extensive damage to property and infrastructure. Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes. The Lavaca County planning area features 21 manufactured home parks (including all participating jurisdictions), which are more vulnerable to hurricane winds than site built structures. In addition, manufactured homes are located sporadically throughout rural portions of the county which are also vulnerable to the tropical storm and hurricane hazard. The US Census data indicates a total of 1,707 (16.5%) manufactured homes located in the Lavaca County planning area including all participating jurisdictions. In addition, 59.2% (approximately 6,142 structures) of the residential structures in the Lavaca County

planning area were built before 1980.[2] These structures would typically be built to lower or less stringent construction standards than newer construction and may be more suseptible to damages during significant events.

Table 7-3. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Hallettsville	158	1,048
Moulton	18	364
Shiner	84	739
Yoakum	284	1,863
Lavaca County[3]	**1,707**	**6,142**

Moreover, debris such as signs, roofing materials, and small items left outside become extremely hazardous during hurricanes and tropical storms. Extensive damage to trees, towers, and underground utility lines (from uprooted trees) and fallen poles cause considerable civic disruption.

The following critical facilities would be vulnerable to hurricane events in each participating jurisdiction, respectively.

Table 7-4. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	2 Schools, Government Facility
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Public Works Plant, Evacuation Center, 2 Government Facilities, Hospital, Sheriff's Office, 6 Schools
Moulton	Police Station, Fire Station, Community Center, 2 Schools, 6 Water/Waste Water Facilities, Nursing Home, Government Facility
Shiner	Police Station, Fire Station, 5 School Facilities, 3 Churches, Government Facility
Yoakum	Police Station, Fire Station, School, Hospital, Airport, 2 Water/Waste Water Facilities, Electrical Sub-station, EOC/Government Facility

Table 7-5 shows impact or loss estimation for storms impacting the county. Storm track data was available for the past 150 years; however, property and crop loss data is only available from 1955 to the present. Damages are reported on a countywide basis and are not available for participating local jurisdictions. Annual loss estimates were based on the 62 year reporting period for such damages (Table 7-5). The average annual loss estimate for Lavaca County is approximately $10,154.

[2] Source: US Census Bureau data estimates for 2015.

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

Table 7-5. Potential Annualized Losses Lavaca County, 1955-2017

JURISDICTION	NUMBER OF EVENTS	PROPERTY & CROP LOSS (2017 DOLLARS)	ANNUAL LOSS ESTIMATES (2017 DOLLARS)
Lavaca County	8	$629,572	$10,154

The potential severity of impact from a hurricane or tropical storm for the Lavaca County planning area, including all participating jurisdictions, is classified as "Limited," meaning minor quality of life lost, shutdown of critical facilities and services for 24 hours or less, and less than 10% of property destroyed or with major damage.

Section 8: Lightning

Hazard Description

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within separate parts of a thunderstorm cloud.[1] A "bolt," or visible spark, is created when the difference of charges during a storm becomes strong enough and a discharge of electricity occurs. This flash of light most commonly occurs within the thunderstorm clouds but often occurs between the clouds and the ground.[2] A bolt of lightning can cause air temperatures surrounding the bolt to approach 50,000°F.[3] This causes rapid air expansion leading to thunder which often accompanies lightning strikes.[4] While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and can occur as far as 10 miles away from any rainfall.[5]

According to FEMA, an average of 300 people are injured and 47 people are killed in the United States each year by lightning.[6] Additionally, direct lightning strikes have the ability to cause significant damage to buildings, critical facilities and infrastructure. Lightning can also be 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

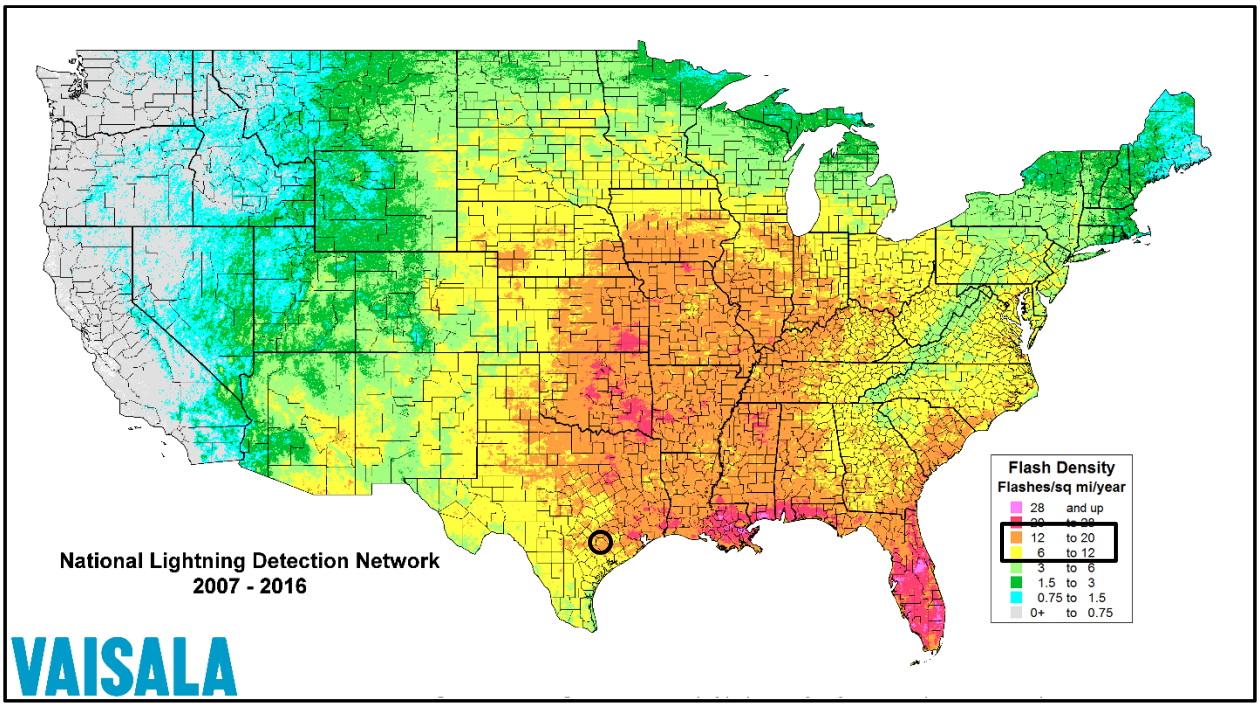
Lightning can strike in any geographic location and the Lavaca County planning area, including all participating jurisdictions, is located in a region of the country that is moderately susceptible to lightning strike. Therefore lightning can occur at any location within the entire planning area. It is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

Extent

The planning area considers a flash density of less than two to be a minor severity and a flash density of three and greater to be a major severity. Any lightning strike that causes death or property damage is considered a major severity. The Vaisala's U.S. National Lightning Detection Network lightning flash density map (Figure 8-1) shows a range of 6 to 20 lightning flashes per square mile per year for the Lavaca County planning area.

[1] http://www.lightningsafety.noaa.gov/science/science-overview.shtml
[2] http://www.nssl.noaa.gov/education/svrwx101/lightning/types/
[3] http://www.lightningsafety.noaa.gov/temperature.shtml
[4] http://www.lightningsafety.noaa.gov/science/science-overview.shtml
[5] http://www.lightningsafety.noaa.gov/science/science-overview.shtml
[6] https://www.nws.noaa.gov/os/lightning.shtml

Figure 8-1. Lightning Flash Density, 2007-2016



The extent for lightning hazard events can also be expressed in terms of the number of strikes in an interval of time for specific lightning events. NOAA utilizes lightning activity levels (LALs) on a scale from 1-6 to express the extent of lightning events. LAL rankings reflect the frequency of cloud-to-ground lightning either forecast or observed (Table 8-1).

Table 8-1. 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
6	Similar to LAL 3 except thunderstorms are dry.	

The NCEI Storm Events Database does not include the LAL for historical lightning events, therefore to estimate the extent of lightning strikes in the planning area, a range for the estimated average number of lightning strikes per year was calculated and then divided by the average number of thunderstorm events that occur annually in the planning area. To calculate the range for the estimated average number of lightning strikes per year, the cloud-to-ground flash density range of 6 to 20 flashes per square mile per year was multiplied by the square mileage of the county (970 square miles) resulting in a range of 5,820 to 19,400 flashes per year. For the average number of thunderstorm events that occur annually, the highest number of events recorded in a given year during the reporting period was used to account for typical under reporting of thunderstorm and lightning events, rather than an average, resulting in this number being 485 thunderstorm events. Therefore, the Lavaca County, including all participating jurisdictions, should expect an average range of 12 to 40 lightning strikes per 15 minutes during a lightning or combined lightning and thunderstorm event, indicating these events in the planning area have an average LAL range of 3 to 5.

Historical Occurrences

Lightning occurrences and damages are not well documented. Only one event was reported for the entire planning area since 1996 (Table 8-2) according to the National Centers for Environmental Information (NCEI) data. However, team members indicate that lightning events are a regular occurrence for the planning area based on local knowledge and experience. Structural damages resulting from lighting events are considered negligible. However, the reported incident includes a lightning related fatality. Risk of injury or death represents the greatest risk for the hazard of lightning. With limited reported incidents in the planning area, the team utilized the most current lightning flash density estimate for the risk assessment.

Table 8-2. Historical Lightning Events, 1996-2017

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hallettsville	7/31/1997	3:00 PM	1	0	$0	$0
TOTALS			**1**	**0**	**$0**	**$0**

Based on the list of historical lightning events for the Lavaca County planning area (listed above), including all participating jurisdictions, no events have occurred since the 2006 Plan.

Significant Events

July 31, 1997 – Lavaca County near Hallettsville

A woman was working with her husband and three daughters in a field on her farm near Wied, just west of Hallettsville, as thunderstorms moved into the area. All five headed indoors quickly, but the mother was struck by lightning and killed before getting inside. The rest of the family was uninjured by the event.

Probability of Future Events

Based on the most current lightning flash density estimate, in Lavaca County there is a probability of occurrence of approximately 6-20 lightning flashes per square mile per year or approximately 5,820 to 19,400 flashes per year. This frequency supports a highly likely probability of occurrence for future lightning events in the Lavaca County planning area, including all participating jurisdictions, meaning that an event probable in the next year. Given this estimated frequency of occurrence, it can be expected that future lightning events will continue to threaten life and cause minor property damage throughout the planning area.

Vulnerability and Impact

Due to the randomness of lightning, all existing and future structures, facilities, and community members in the Lavaca County planning area, including all participating jurisdictions, could potentially be impacted and remain vulnerable to the impact lightning strikes. The direct and indirect impacts associated with lightning events include damage to structures and infrastructure, utility failure (power outages), stress on community resources injury and loss of life, and agricultural losses,.

The entire building stock and all infrastructure of the planning area are considered exposed to the lightning hazard. Lightning can be responsible for: damage to buildings; electrical, forest and/or wildfires; and damage to infrastructure such as power transmission lines and communication towers.

The following critical facilities would be vulnerable to lightning events in the Lavaca County planning area:

Table 8-3. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	2 Schools, Government Facility
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Public Works Plant, Evacuation Center, 2 Government Facilities, Hospital, Sheriff's Office, 6 Schools
Moulton	Police Station, Fire Station, Community Center, 2 Schools, 6 Water/Waste Water Facilities, Nursing Home, Government Facility
Shiner	Police Station, Fire Station, 5 School Facilities, 3 Churches, Government Facility
Yoakum	Police Station, Fire Station, School, Hospital, Airport, 2 Water/Waste Water Facilities, Electrical Sub-station, EOC/Government Facility

Risk of injury or death represents the greatest risk for the hazard of lightning. The peak lightning season in the State of Texas is from June to August; however, the most fatalities occur in July as fatalities occur most often when people are outdoors, working or participating in some form of recreation. Moving inside will decrease a person's vulnerability to injury or death due to lightning strike. Agricultural losses can also be extensive due to lightning and resulting fires.

Overall, the average loss estimate for Lavaca County (in 2017 dollars) is $0, having an approximate annual loss estimate of $0.

Table 8-4. Potential Annualized Losses for Lavaca County

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Lavaca County	$0	$0
Hallettsville	$0	$0
Moulton	$0	$0
Shiner	$0	$0
Yoakum	$0	$0

Section 8: Lightning

Impact of lighting events experienced in the Lavaca County planning area resulting in structural damages would be considered “Limited,” with quality of life lost would be minor and facilities shut down for 24 hours or less. However, given the fatality reported in the planning area as a result of lightning, the impact is considered “Major”.

Section 9: 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.

Straight line winds can have gusts of 87 knots (100 mph) or more, and are often accompanied by hail or rain. Unlike tornados, windstorms have a broader path that is several miles wide and can cover several counties. Straight line winds may down trees and power lines, overturn mobile homes, and cause damage to well-built structures.

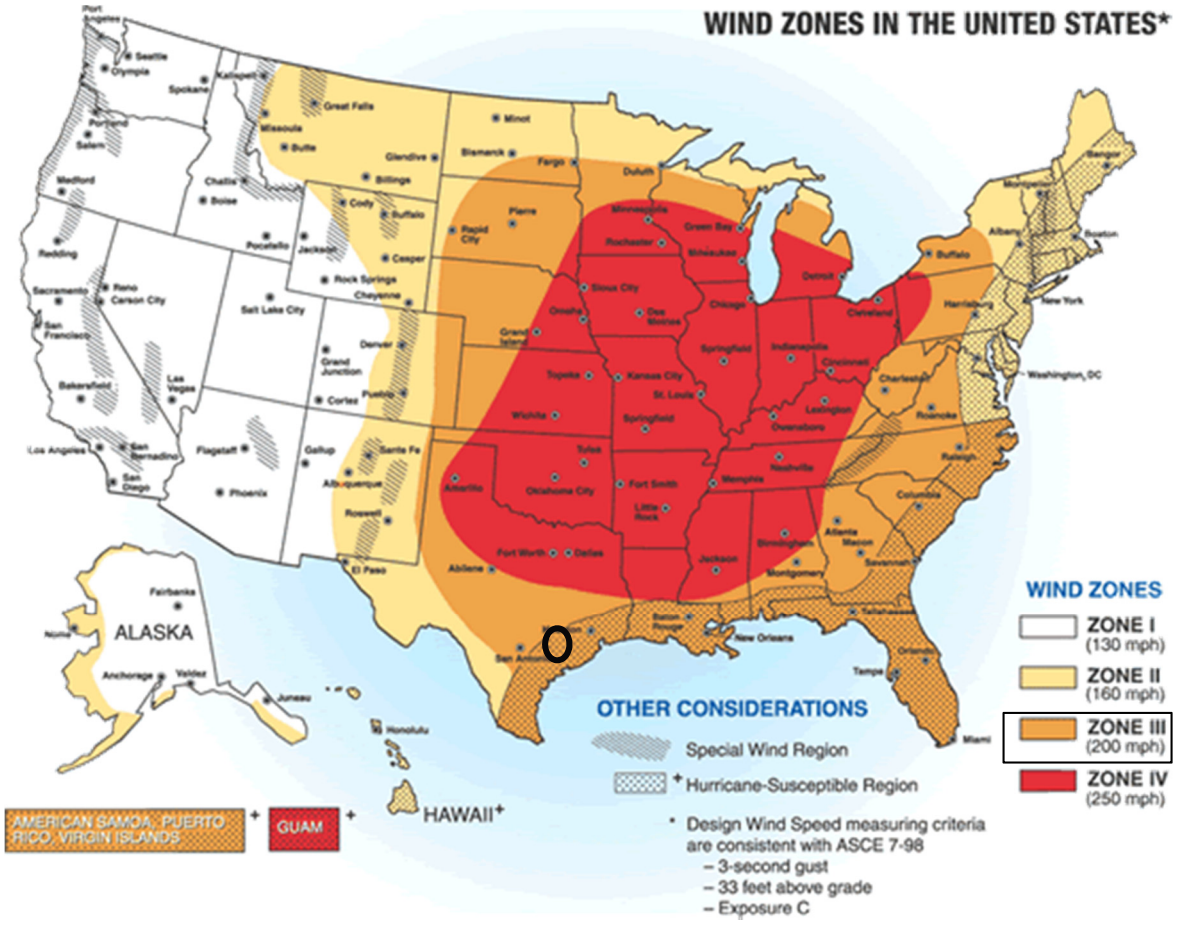
Location

A thunderstorm wind event could occur at any location within Lavaca County's planning area, as these storms develop randomly and are not confined to any geographic area within the County. It is assumed that the Lavaca County planning area, including all participating jurisdictions, is uniformly exposed to the threat of thunderstorm winds.

Extent

The extent or magnitude of a thunderstorm wind event can be determined using the Wind Zone Map. Figure 9-1 displays the wind zones as derived from NOAA.

Figure 9-1. Wind Zones in the United States[1]



Lavaca County is located within Zone III and in the hurricane-susceptible region, meaning that they can experience winds up to 200 mph.

The extent or magnitude of a specific thunderstorm wind event is measured by the Beaufort Wind Scale. Table 9-1 describes the Beaufort Wind Scale, with different intensities of wind events in terms of speed and effect, from calm to violent and destructive.

Table 9-1. Beaufort Wind Scale[2]

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

[1] Lavaca County is indicated by the circle.

[2] Source: World Meteorological Organization

FORCE	WIND (KNOTS)	WMO CLASSIFICATION	APPEARANCE OF WIND EFFECTS
3	9-12	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

On average, the planning area experiences approximately one thunderstorm wind event every year. Lavaca County has experienced a wind event with speeds above 73 knots, or “Force 12,” the maximum category on the Beaufort Wind Scale. Force 12 is the worst to be anticipated for the entire planning area. On average, the planning area can anticipate between a Force 5 and Force 8 category storm.

Historical Occurrences

Tables 9-2, 9-3 and 9-4 depict historical occurrences of thunderstorm wind events for the Lavaca County planning area according to the NCEI data. Since January 1955, 58 thunderstorm wind events are known to have impacted Lavaca County, based upon NCEI records. Table 9-3 presents information on known historical events impacting the Lavaca County planning area, with resulting damages. It is important to note that only high wind events associated with thunderstorm wind are considered in this section; wind damage 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 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 9-2. Historical Maximum Wind Speed, Thunderstorm Wind Events 1955-2017[3]

MAXIMUM WIND SPEED RECORDED (KNOTS)	NUMBER OF REPORTED EVENTS
0-30	22
31-40	0
41-50	6
51-60	12
61-70	4
71-80	1
81-90	0
91-105	0
Unknown	13

Table 9-3. Historical Thunderstorm Wind Events with Reported Damages, 1955-2017[4]

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Moulton	5/9/1993	8:20 PM	Unknown	0	0	$8,429	$843
Yoakum	5/30/1994	12:15 AM	Unknown	0	0	$8,219	$8,219
Lavaca County	5/30/1994	12:45 AM	Unknown	0	0	$82,187	$8,219
Hallettsville	5/30/1994	12:50 AM	Unknown	0	0	$82,187	$8,219
Yoakum	6/20/1994	6:00 PM	Unknown	0	0	$821,872	$822
Lavaca County	6/11/1995	2:36 AM	Unknown	0	0	$15,984	$15,984
Yoakum	4/28/1996	11:58 PM	70 knots	0	0	$7,763	$7,763
Moulton	4/11/1997	12:25 AM	Unknown	0	0	$75,889	$15,178
Lavaca County	12/23/1997	3:00 PM	Unknown	0	0	$75,889	$0
Yoakum	2/10/1998	10:40 AM	Unknown	0	0	$89,670	$7,472
Hallettsville	2/10/1998	11:00 AM	Unknown	0	0	$149,450	$14,945
Shiner	6/15/1998	4:40 PM	Unknown	0	0	$298,899	$0
Hallettsville	6/15/1998	4:50 PM	Unknown	0	0	$59,780	$0

[3] Events reported through August 2017.

[4] Only recorded events with fatalities, injuries or damages are listed. Magnitude is listed when available. Damage values are in 2017 dollars. Events reported through August 2017.

Section 9: Thunderstorm Wind

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Moulton	8/20/1998	7:45 PM	Unknown	0	0	$29,890	$0
Hallettsville	2/27/1999	5:25 PM	Unknown	0	0	$73,110	$0
Lavaca County	5/30/1999	8:20 PM	Unknown	0	0	$7,311	$0
Shiner	7/27/2000	5:10 PM	Unknown	0	0	$70,733	$0
Hallettsville	11/15/2001	10:00 PM	Unknown	0	0	$68,776	$0
Shiner	12/23/2002	8:40 AM	Unknown	0	0	$108,328	$0
Hallettsville	12/30/2002	6:50 PM	Unknown	0	0	$108,328	$0
Lavaca County	7/24/2003	4:50 PM	60 knots	0	0	$66,196	$0
Moulton	8/8/2003	4:50 PM	60 knots	0	0	$198,589	$0
Shiner	8/11/2003	3:25 PM	80 knots	0	0	$26,479	$0
Hallettsville	4/11/2004	12:45 PM	60 knots	0	0	$25,792	$0
Hallettsville	5/11/2004	12:45 PM	60 knots	0	0	$25,792	$0
Moulton	6/25/2004	4:30 PM	60 knots	0	0	$38,688	$0
Hallettsville	7/22/2006	5:30 PM	70 knots	0	0	$120,835	$0
Lavaca County	6/10/2008	3:20 PM	50 knots	0	0	$1,131	$0
Hallettsville	8/21/2009	7:40 PM	45 knots	0	0	$5,677	$0
Lavaca County	8/26/2009	4:09 PM	50 knots	0	0	$11,355	$0
Shiner	8/26/2009	5:00 PM	50 knots	0	0	$22,710	$0
Hallettsville	9/29/2011	4:10 PM	50 knots	0	0	$54,149	$0
Shiner	9/29/2012	4:45 PM	50 knots	0	0	$53,051	$0
TOTAL				**0**	**0**	**$2,980,802**	

Table 9-4. Summary of Historical Thunderstorm Wind Events, 1955-2017[5]

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	25	60 knots	0	0	$260,053	$0
Hallettsville	12	70 knots	0	0	$773,876	$87,664
Moulton	8	60 knots	0	0	$351,485	$0
Shiner	9	80 knots	0	0	$580,200	$0
Yoakum	4	70 knots	0	0	$927,524	$0
TOTAL LOSSES	**58**	**(Max Extent)**	**0**	**0**	**$2,980,802**	

Based on the list of historical thunderstorm events for the Lavaca County planning area (listed above), including all participating jurisdictions, 17 of the events have occurred since the 2006 Plan.

Significant Events

June 20, 1994 – Yoakum/Lavaca County

Severe storm winds were reported in Yoakum on June 20, 1994, resulting in downed trees, residential roof damage and other structural damage.

February 10, 1998, – Halletsville/Yoakum

A severe storm was reported in Hallettsville and Yoakum produced severe downbursts with a maximum strength of 73 knots at the airport in Yoakum. This wind event resulted in damaged roofs, awnings and carports of homes, blew over trees and destroyed two mobile homes near Hallettsville.

Probability of Future Events

Most severe thunderstorm wind events occur during the spring, during the months of March, April, and May, and in the fall, during the month of September. Based on available records of historic events, 58 events in a 62-year reporting period provides a probability of approximately one event every year. Therefore, the probability of future events is highly likely, meaning that an event is probable within the next year for the Lavaca County planning area.

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 Lavaca County could potentially be impacted and remain vulnerable to possible injury and property loss from strong winds.

Many non-reinforced physical assets in the Lavaca County plannning area are vulnerable to the the impacts of severe thunderstorm winds. Infrastructure and residential features, such as power lines and poles, street signs, radio towers, gabage recepticles, concrete block walls, brick facades, windows, patio furniture, storage barns, vehicles, and trees, unless reinforced, are vulnerable to thunderstorm wind events. Beyond immediate damage to the

[5] NCEI events reported through August 2017.

physical assets, severe damage also comes from when these items become windborne debris. Debris from damaged structures has caused damage to other buildings not directly impacted by the event.

Additionally, Lavaca County features multiple mobile or manufactured home parks and individual manufactured homes throughout the planning area and all participating jurisdictions. These structures are typically more vulnerable to thunderstorm wind events than typical site built structures. The US Census data indicates a total of 1,707 (16.5%) manufactured homes located in the Lavaca County planning area, including all participating jurisdictions (Table 9-5). Similarly, Lavaca County features many houses that were built before 1980[6]. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more suseptible to damages during significant wind events. 59.2% (approximately 6,142 structures) of the residential structures in the Lavaca County planning area, including all participating jurisdictions, were built before 1980.

Table 9-5. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Hallettsville	158	1,048
Moulton	18	364
Shiner	84	739
Yoakum	284	1,863
Lavaca County[7]	**1,707**	**6,142**

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

Table 9-6. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	2 Schools, Government Facility
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Public Works Plant, Evacuation Center, 2 Government Facilities, Hospital, Sheriff's Office, 6 Schools
Moulton	Police Station, Fire Station, Community Center, 2 Schools, 6 Water/Waste Water Facilities, Nursing Home, Government Facility
Shiner	Police Station, Fire Station, 5 School Facilities, 3 Churches, Government Facility
Yoakum	Police Station, Fire Station, School, Hospital, Airport, 2 Water/Waste Water Facilities, Electrical Sub-station, EOC/Government Facility

A thunderstorm wind event can also result in impacts on human health and well-being including traffic disruptions, injuries, and in rare cases, fatalities. While these vulnerabilities still exist, impact of extreme winds experienced in the Lavaca County planning area has resulted in no injuries or fatalities during the reporting period.

[6] Source: U.S. Census Bureau data estimates for 2015.
[7] County totals includes all participating jurisdictions and unincorporated areas.

Overall, the average loss estimate (in 2017 dollars) is $2,980,802, having an approximate annual loss estimate of $48,077 (Table 9-7).

Table 9-7. Potential Annualized Losses for Lavaca County[8]

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Lavaca County	$260,053	$4,194
Hallettsville	$861,540	$13,896
Moulton	$351,485	$5,669
Shiner	$580,200	$9,358
Yoakum	$927,524	$14,960

Impact of thunderstorm winds experienced in the Lavaca County planning area, including all participating jurisdictions, has resulted in no injuries and no fatalities. Impact of thunderstorm wind events experienced in the Lavaca County planning area, including all participating jurisdictions, would be "Limited," the quality of life lost would be minor, and facilities would be shut down for 24 hours or less. Less than 10% of property would be destroyed or have major damage.

[8] Values are in 2017 dollars.

Section 10: Extreme Heat

Hazard Description

Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period. Extreme heat during the summer months is a common occurrence throughout the State of Texas, and Lavaca County is no exception. Severe, excessive summer heat is characterized by a combination of exceptionally high temperatures and humidity. When these conditions persist over a period of time, it is defined as a heat wave. Lavaca County and all participating jurisdictions typically experience extended heat waves.

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, 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.

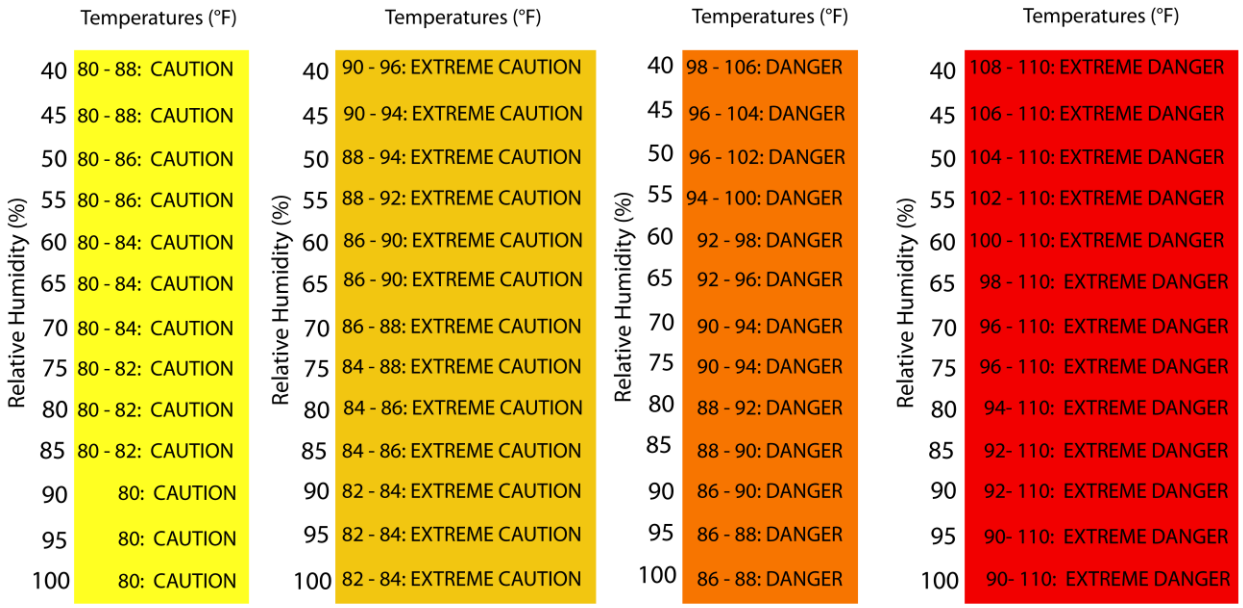
Location

Though no deaths from extreme heat have been recorded in Lavaca County, there have been heat related deaths reported in neighboring counties including Jefferson and Liberty County. There is no specific geographic scope to the extreme heat hazard. Extreme heat could occur anywhere within the planning area.

Extent

The magnitude or intensity of an extreme heat event is measured according to temperature and relative humidity. This relationship, defined by the National Oceanic Atmospheric Administration (NOAA), is referred to as the "Heat Index," and is depicted in Figure 10-1. This index combines the effect of high temperatures with high humidity to determine how hot it feels outside.

Figure 10-1. Extent Scale for Extreme Summer Heat[1]



The Extent Scale in Figure 10-1 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 10-1.

Table 10-1. Heat Index and Warnings

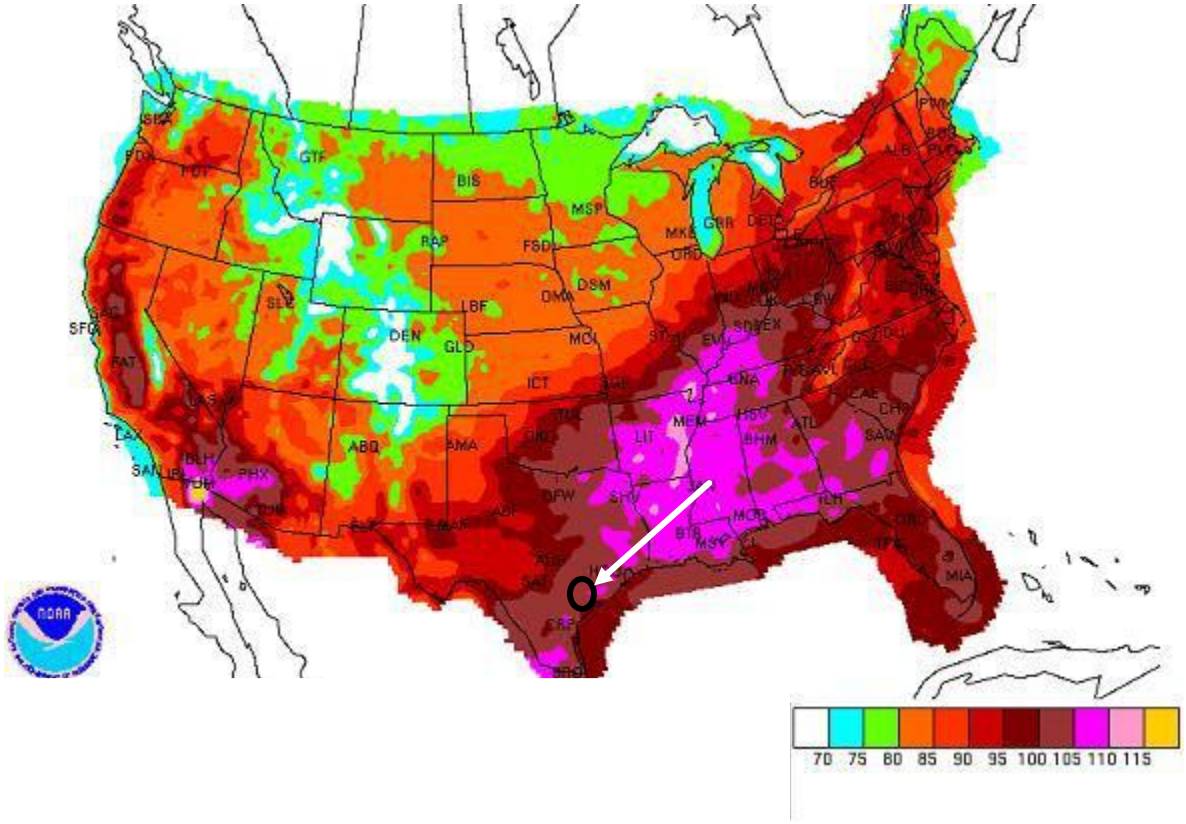
CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Extreme Danger	125°F and higher	Heat stroke or sun stroke likely.	A heat advisory will be issued to warn that the Heat Index may exceed 105°F.
Danger	103 – 124°F	Sunstroke, muscle cramps, and/or heat exhaustion are likely. Heatstroke possible with 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 hours during the day or above 80°F at night.
Caution	80 – 90°F	Fatigue is possible with prolonged exposure and/or physical activity.	

[1] Source: NOAA

Lavaca County's terrain is relatively level terrain with limited elevation variations located in Southeast Texas. Due to its geography, and warm, sunny, humid subtropical climate, the Lavaca County planning area 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 10-2 displays the daily maximum heat index across the Contiguous United States as derived from NOAA based on data compiled from 1838 to 2015. The black circle shows the Lavaca County area. The Lavaca County Planning area is represented with primarily brown but also has a small amount of bright pink, which indicates an average daily maximum heat index of 100-110°F.

Figure 10-2. Average Daily Maximum Heat Index Days[2]



The Lavaca County planning area can experience heat from 90°F to 110°F. Therefore, Lavaca County should mitigate extreme heat events to the extent of "Danger," which can include sunstroke, muscle cramps, heat exhaustion, and potential heatstroke with prolonged exposure.

Historical Occurrences

Every summer extreme heat is a significant hazard throughout the United States creating associated public health issues across the countries. Table 10-2 depicts historical occurrences of mortality from heat from 1994 to 2004 from the Texas Department of State Health Services and 2005 through August 2017 from the NCEI database.

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[2] Source: NRDC and the black circle indicates the Lavaca County planning area.

Table 10-2. Extreme Heat Related Deaths in Texas

YEAR	DEATHS
1994	1
1995	12
1996	10
1997	2
1998	66
1999	22
2000	71
2001	20
2002	1
2003	0
2004	3
2005	49
2006	2
2007	2
2008	7
2009	6
2010	4
2011	20
2012	2
2013	1
2014	0
2015	5
2016	6
2017	0

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 Lavaca

County, no heat waves[3] have been reported for the County. Historical extreme heat data for the Cities of Hallettsville, Moulton, Shiner, and Yoakum are provided on a County-wide bases per the NCEI database. Extreme temperatures are a normal occurrence for the planning area and are typically not reported as adverse events to the NCEI. The planning team defined extreme heat occurrences on an annual basis. Team input on occurrences has been factored into the risk assessment due to a lack of data available from the NCEI.

Probability of Future Events

According to historical maximum daily heat index records and planning team input, the Lavaca County planning area has experienced one event every year in a twenty-one year reporting period. This provides a probability of one event probable every year. This frequency supports a highly likely probability of future events and that an event is likely to occur in the next year.

Vulnerability and Impact

There is no defined geographic boundary for extreme heat events. While all of Lavaca County 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 heat exhaustion or a lack of adequate air-conditioning. 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. The very young are also vulnerable as they may not display early warning signs of heat exhaustion or dehydration.

In the Lavaca County planning area, the population over the age of 65 is approximately 29.6% of the total population, and children under the age of 5 is approximately 6.2% or an estimated total of 5,466[4] potentially vulnerable residents based on age (Table 10-3).

Table 10-3. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Hallettsville	581	106
Moulton	287	34
Shiner	467	187
Yoakum	891	475
Lavaca County[5]	**4,250**	**1,216**

[3] Even though the County experiences heat waves each summer, NCEI data only records events reported. Based on reports, only one event is on record.

[4] US Census Bureau 2015 data for Lavaca County.

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

Another segment of the population at risk are those whose jobs consist of strenuous labor outdoors. The Lavaca County planning area features approximately 30 percent prime farmland.[6] Livestock and crops (beef cattle, poultry, hog, hay, milo, and corn) can become stressed, decreasing in quality or in production, during times of extreme heat. 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 "Limited" as injuries and/or illnesses would be minor and treatable with first aid.

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.

The potential impact of extreme heat for the Lavaca County planning area, including all participating jurisdictions, can be considered "Limited," resulting in few injuries and minimal disruption to the quality of life. Based on historical records over a 21-year period, annualized losses for the entire Lavaca County planning area are negligible.

[6] Texas State Historical Association; https://tshaonline.org/handbook/online/articles/hcl05

Section 11: Drought

Hazard Description

Drought is a period of substantially lower rainfall than the average in a region, causing a serious hydrologic imbalance. Drought is the consequence of anticipated natural precipitation not being met over an extended period, usually a season or more in length. Droughts can become very prolonged and persist from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 11-1 presents definitions for these different types of drought.

Table 11-1. Drought Classification Definitions[1]

METEOROLOGICAL DROUGHT	The degree of dryness, measured as 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 demand for water exceeds the supply as a result of a weather-related supply shortfall.

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.

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

Location

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

Figure 11-1. U.S. Drought Monitor, June 2017

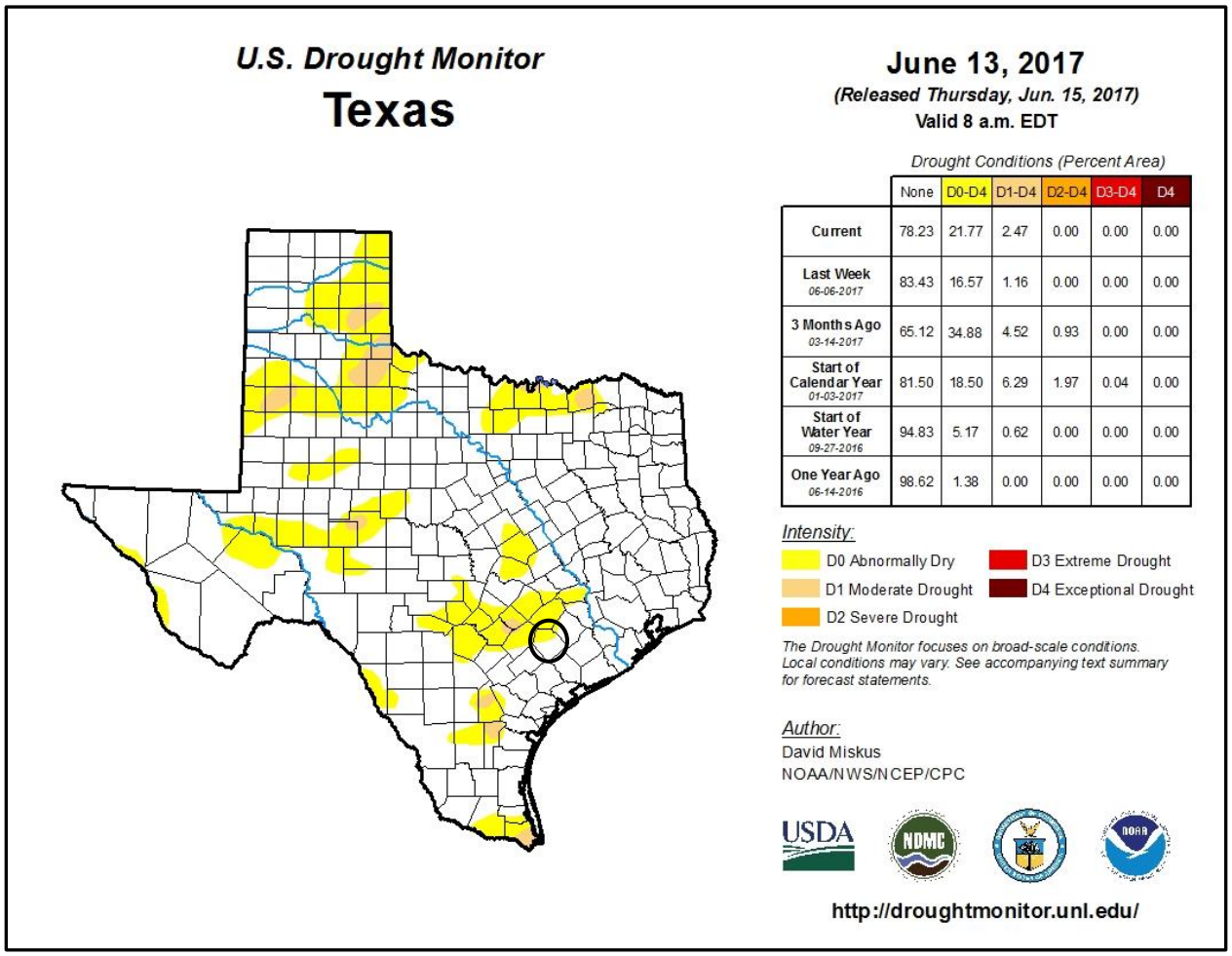
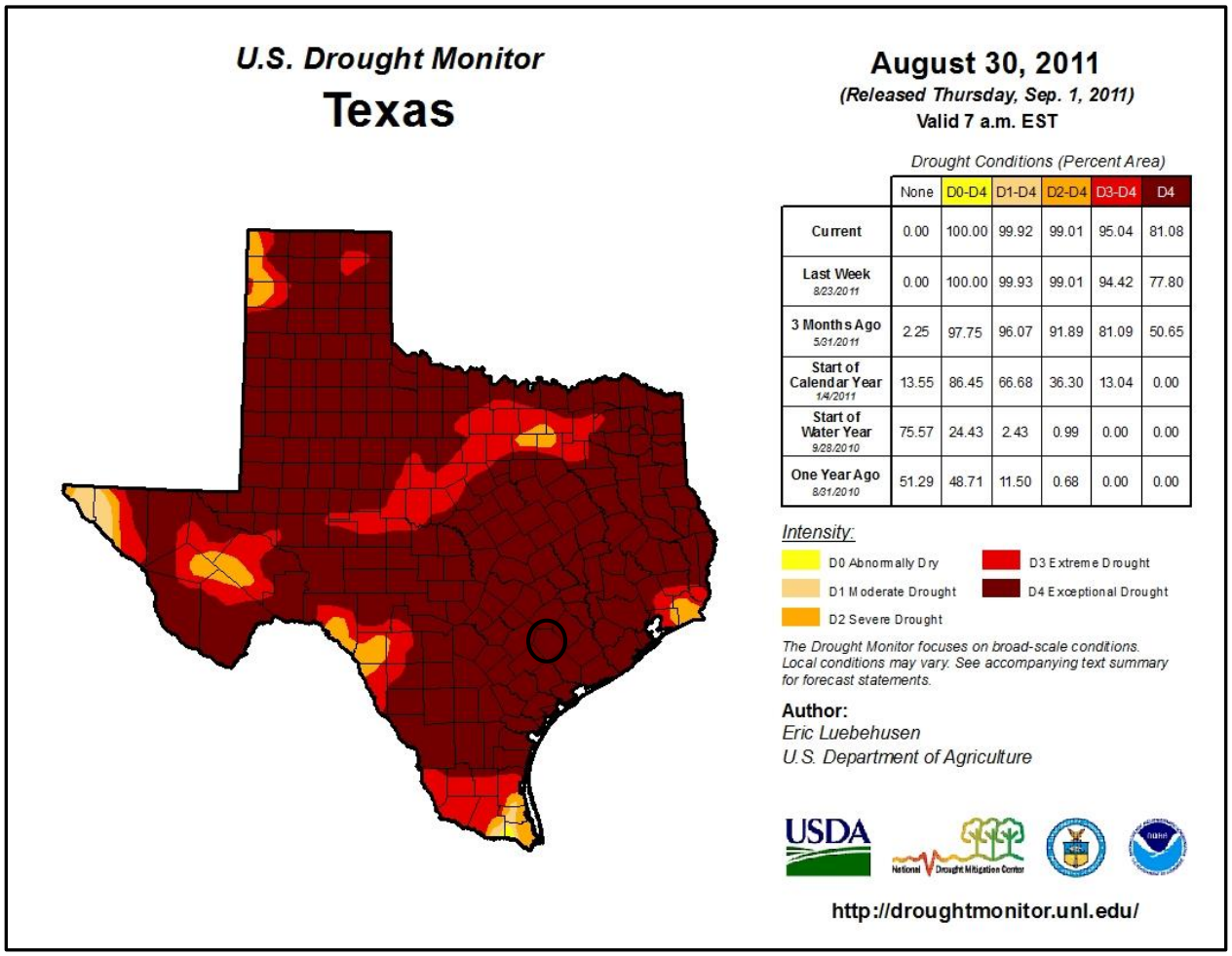


Figure 11-2. U.S. Drought Monitor, August 2011



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
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

DROUGHT INDEX	DROUGHT CONDITION CLASSIFICATIONS						
	Extreme	Severe	Moderate	Normal	Moderately Moist	Very Moist	Extremely Moist
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 United States. Indicators correspond to the intensity of drought.

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

Historical Occurrence

Lavaca County has experienced severe drought. Table 11-4 and 11-5 list historical events that have occurred in Lavaca County as reported in the NCEI. Historical drought information, as provided by the NCEI, shows drought 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 drought data for the participating jurisdictions in the Lavaca County planning area, including all participating jurisdictions, is provided at the county level per the NCEI database.

[2] Source: National Drought Mitigation Center

Table 11-4. Historical Drought Years, 1996-2017[3]

DROUGHT YEAR
1996
2000
2011
2012
2012
2013
2013
2014
8 unique events

Table 11-5. Historical Drought Events, 1996-2017[4]

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	4/1/1996	0	0	$0	$0
Lavaca County	5/1/1996	0	0	$0	$0
Lavaca County	6/1/1996	0	0	$0	$0
Lavaca County	7/1/1996	0	0	$0	$0
Lavaca County	8/1/1996	0	0	$0	$0
Lavaca County	8/1/2000	0	0	$0	$0
Lavaca County	9/1/2000	0	0	$0	$0
Lavaca County	10/1/2000	0	0	$0	$0
Lavaca County	5/1/2011	0	0	$0	$0
Lavaca County	6/1/2011	0	0	$0	$0
Lavaca County	7/1/2011	0	0	$0	$0
Lavaca County	8/1/2011	0	0	$0	$0
Lavaca County	9/1/2011	0	0	$0	$0

[3] Historical events are reported through August 2017.
[4] Values are in 2017 dollars. Historical events are reported through August 2017.

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	10/1/2011	0	0	$0	$0
Lavaca County	11/1/2011	0	0	$0	$0
Lavaca County	12/1/2011	0	0	$0	$0
Lavaca County	1/1/2012	0	0	$0	$0
Lavaca County	2/1/2012	0	0	$0	$0
Lavaca County	3/1/2012	0	0	$0	$0
Lavaca County	6/1/2012	0	0	$0	$0
Lavaca County	12/1/2012	0	0	$0	$0
Lavaca County	3/1/2013	0	0	$0	$0
Lavaca County	4/1/2013	0	0	$0	$0
Lavaca County	7/1/2013	0	0	$0	$0
Lavaca County	10/1/2014	0	0	$0	$0
Lavaca County	11/1/2014	0	0	$0	$0
TOTALS		**0**	**0**	**$0**	

Based on the list of historical drought events for the Lavaca County planning area (listed above), including all participating jurisdictions, 6 extended time periods of drought have occurred since the 2006 Plan.

Significant Events

May 2011 – March 2012 – Lavaca County

The drought of 2011 in South Central Texas was the most severe one-year drought ever for Texas. Drought conditions began in May and persisted throughout the year. Drought condition was exacerbated by a weak La Niña event and below normal rainfall. In July, two months into the drought, rainfall at four climate sites was 0.05 inches. By winter 2012, conditions began to improve as the La Niña event weakened and by March most of South Central Texas saw above normal rainfall, including some very significant rainfall events with two to six inches.

Probability of Future Events

Based on available records of historic events, there have been eight extended time periods of drought within a 21-year reporting period, which provides a probability of occurrence of one event every one to two years. This frequency supports a highly likely probability of future events, including all participating jurisdictions, meaning that an event is probable in the next year.

Vulnerability and Impact

Drought impacts large areas and crosses jurisdictional boundaries, creating vulnerability for the property, population, agriculture, and environment of the entire planning area. Most often, farming and wildlife is deeply affected - killing crops, grazing land, edible plants, and in severe cases, trees. Droughts can also intensify other

natural hazards such as extreme heat and wildfires. Drought can worsen the impacts, particularly human impacts, of extreme heat hazards. Wildfire can be an indirect effect of wildfire as dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation. All existing and future structures exposed to the drought hazard could potentially be impacted, but drought impacts are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings and critical facilities.

The population of the Lavaca County planning area is vulnerable to drought hazard due to the shortage of potable water. All residents in the Lavaca County planning area could be adversely affected by drought conditions, which could limit water supply and present health threats. Potable water is used for drinking, sanitation, heating and cooling systems, and patient care including sterilization, equipment, and many other essential functions in medical facilities. 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, older adults, and people with illnesses. Additionally during summer drought, these populations who do not have adequate cooling units in their homes may become more susceptible to injury and/or death. In the Lavaca County planning area, the population over the age of 65 is 4,250 or approximately 29.6% of the total population and children under the age of 5 is 1,216 or approximately 6.2% of the total population. This creates an estimated total of 5,466[5] potentially vulnerable residents based on age (Table 11-6).

Table 11-6. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Hallettsville	581	106
Moulton	287	34
Shiner	467	187
Yoakum	891	475
Lavaca County[6]	**4,250**	**1,216**

Beyond vulnerability of populations, the environment of the planning area is vulnerable to damage during drought. Both aquatic and terrestrial habitats are vulnerable to potential damage from drought, and can result in reduction in species. Extreme or prolonged drought can result in severe erosion and land degradation.

The economic impact of droughts can be significant, as water is integral to our ability to produce goods and provide services. Droughts therefore produce a complex web of effects that span many sectors of the economy and reach well beyond the area physically experiencing drought. Generally, the longer that droughts last, the larger the economic impact is.

Loss estimates were based on 21 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 11-7 shows annualized exposure.

[5] US Census Bureau 2015 data for Lavaca County.
[6] County totals includes all participating jurisdictions and unincorporated areas.

Table 11-7. Drought Event Damage Totals, 1996-2017[7]

JURISDICTION	PROPERTY & CROP LOSS	ANNUALIZED LOSS ESTIMATES
Lavaca County	$0	$0

The impact of droughts experienced in the Lavaca County planning area, including all participating jurisdictions, has resulted in no known damages and 0 injuries and fatalities. This supports 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 sustains major damage. Annualized loss over the 21-year reporting period in Lavaca County is negligible.

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. There are nine possible impact categories in the Drought Impact Reporter including: 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 for Lavaca County from 2005 to 2017, based on reports received by the Drought Impact Reporter.

Table 11-8. Drought Impacts, 2005-2017[8]

DROUGHT IMPACTS	
Agriculture	45
Business & Industry	4
Energy	2
Fire	5
Plants & Wildlife	16
Relief, Response, & Restrictions	11
Society & Public Health	2
Tourism & Recreation	0
Water Supply & Quality	10

Drought has the potential to impact people in the Lavaca 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. 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.

[7] Historical events are reported through August, 2017

[8] Historical events are reported through May 2017

Section 12: Wildfire

Hazard Description

A wildfire is an unplanned, unwanted, and uncontrolled fire burning in a natural area of vegetative fuels such as grasslands, brush, or woodlands.[1] Wildfires can be classified as natural, ignited by lightning strike and a part of the natural management of forest ecosystems, but are primarily either accidentally or deliberately caused by humans, for example ignited by a campfire that was not doused properly, a tossed cigarette, or burning debris.[2]

Usually, dense smoke is the first indication of a wildfire. Wildfires can start as a slow burning fire along the forest floor, killing and damaging trees. As they reach the tops of trees, fire often spreads more rapidly with wind carrying the flames from tree to tree. A wildfire event may often initially go unnoticed, but can rapidly spread out of control. While wildfires can occur any time of year, they are especially likely over the summer, when fuel is often dry so flames can move unchecked through a highly vegetative area. Furthermore, long-term area hydrologic conditions, such as drought, can contribute to wildfire ignition and spread.

Wildland urban interface or intermix (WUI) fires occur in areas where the built environment, structures and other improvements, meets undeveloped wildland or vegetative fuels. Wildland fires are fueled almost exclusively by natural vegetation, while WUI fires are urban/wildland fires in which vegetation and the built-environment provide the fuel, increasing vulnerability of communities to the impact of wildfire events. Texas has seen a significant increase in the number of wildfires in the past 30 years, including both wildland and WUI fires.

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 12-1 through 12-5). It is estimated that 85 percent of the total population in Lavaca County live within the WUI. However, the entire Lavaca County planning area is at risk for wildfires.

[1] https://www.fema.gov/media-library-data/1409003859391-0e8ad1ed42c129f11fbc23d008d1ee85/how_to_prepare_wildfire_033014_508.pdf

[2] https://www.fema.gov/media-library-data/1409003859391-0e8ad1ed42c129f11fbc23d008d1ee85/how_to_prepare_wildfire_033014_508.pdf

Figure 12-1. Wildland Urban Interface Map – Lavaca County

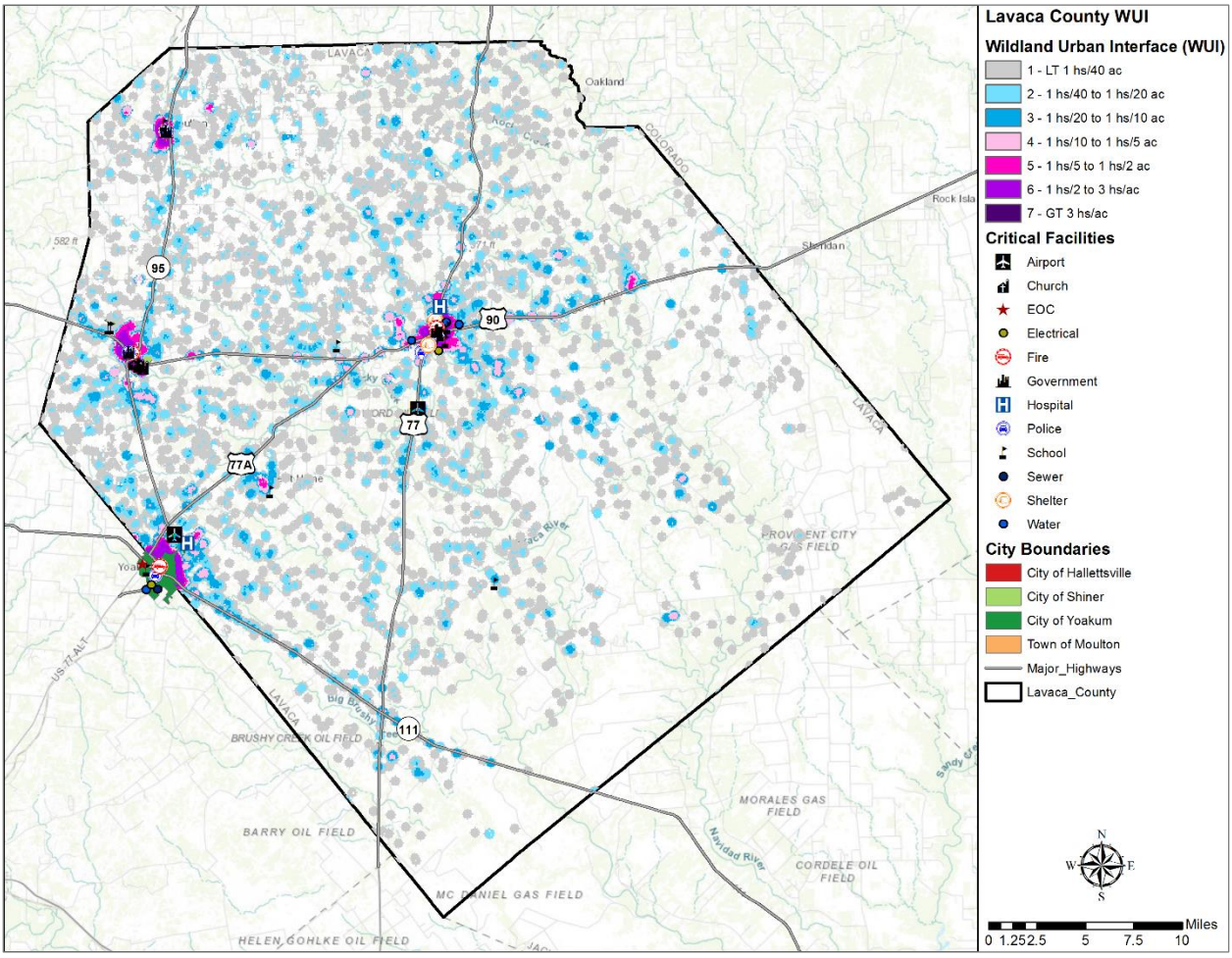
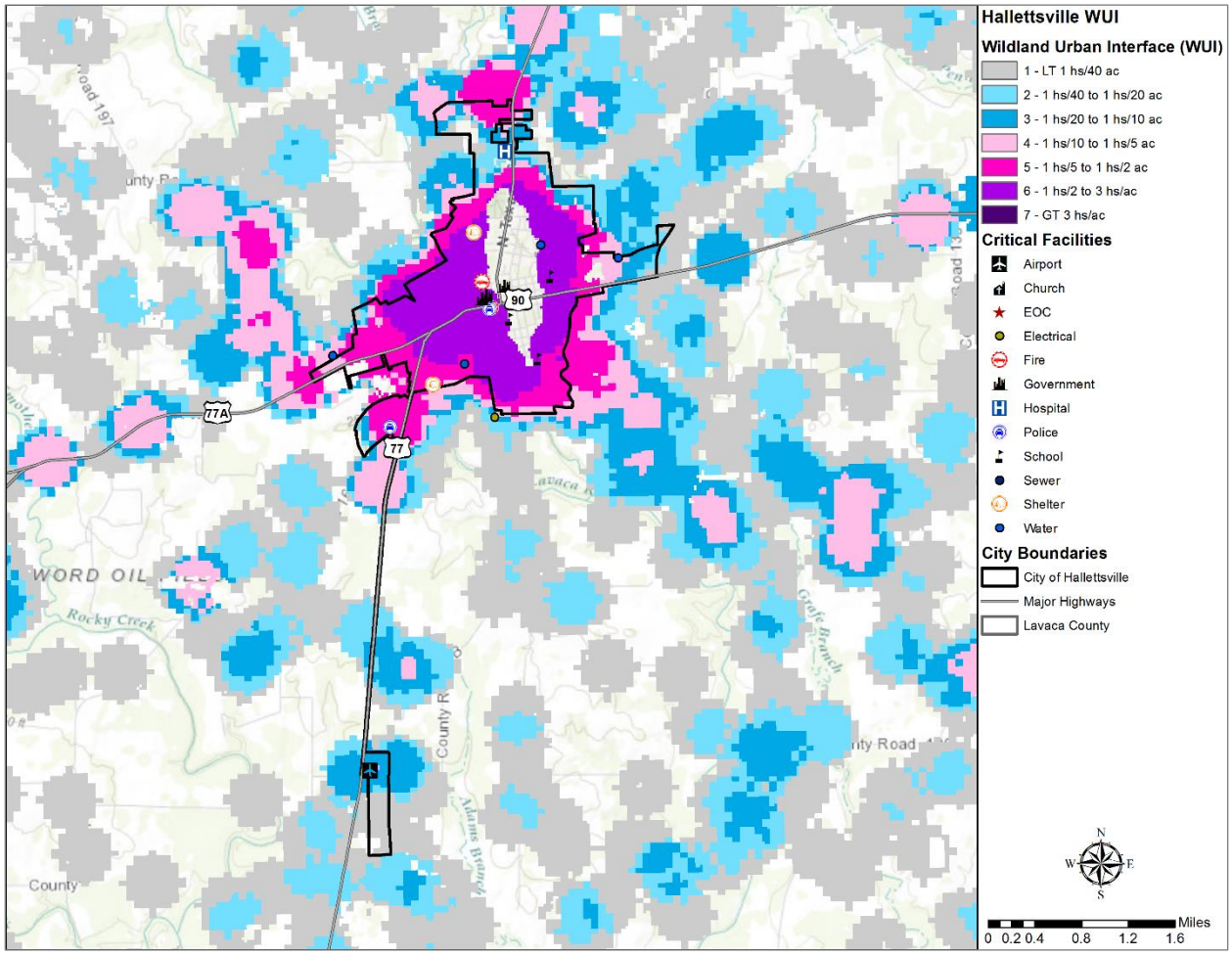
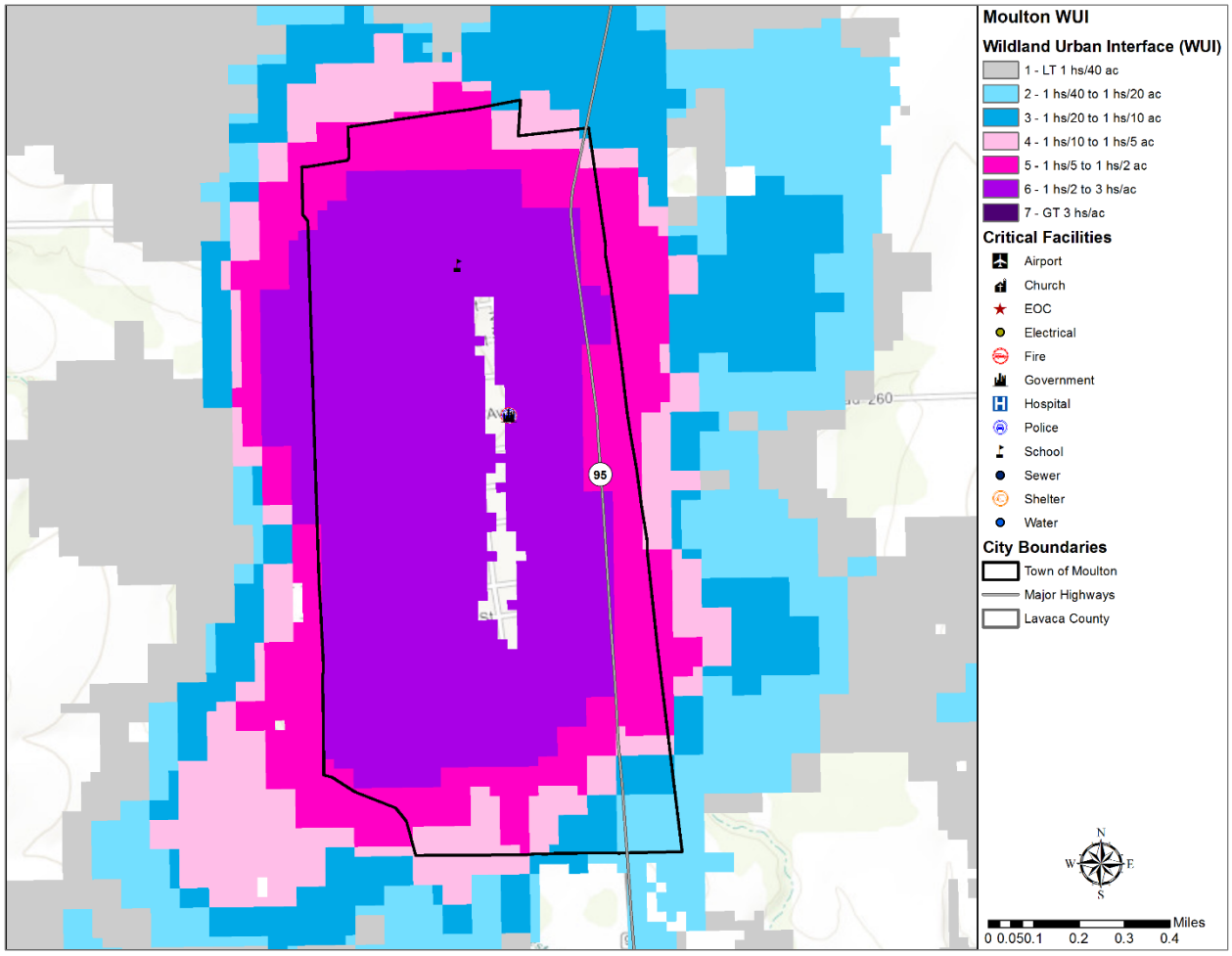


Figure 12-2. Wildland Urban Interface Map – Hallettsville



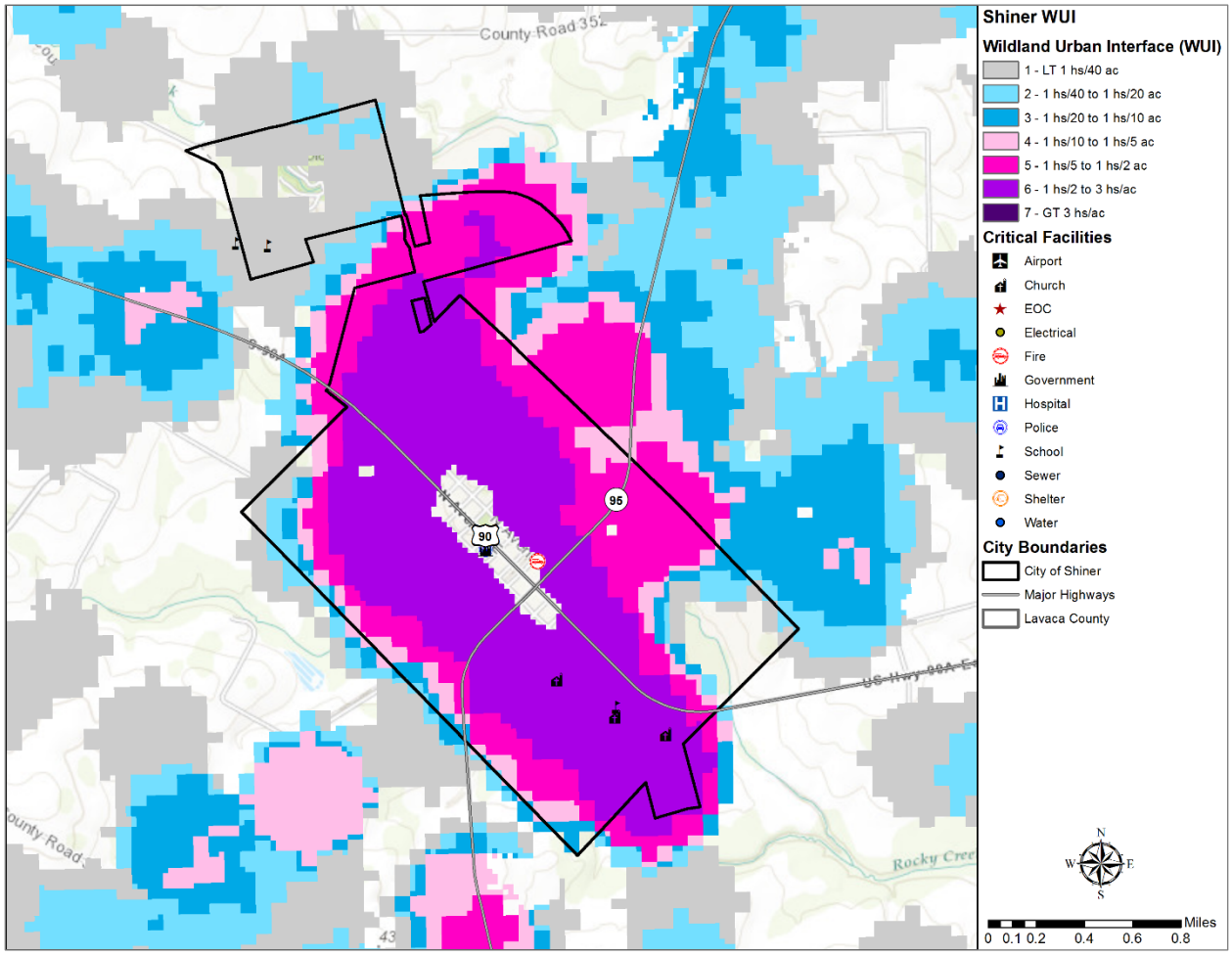
It is estimated that 72 percent of the total population in Hallettsville live within the WUI. However, the entire City of Hallettsville is at risk for wildfires.

Figure 12-3. Wildland Urban Interface Map – Moulton



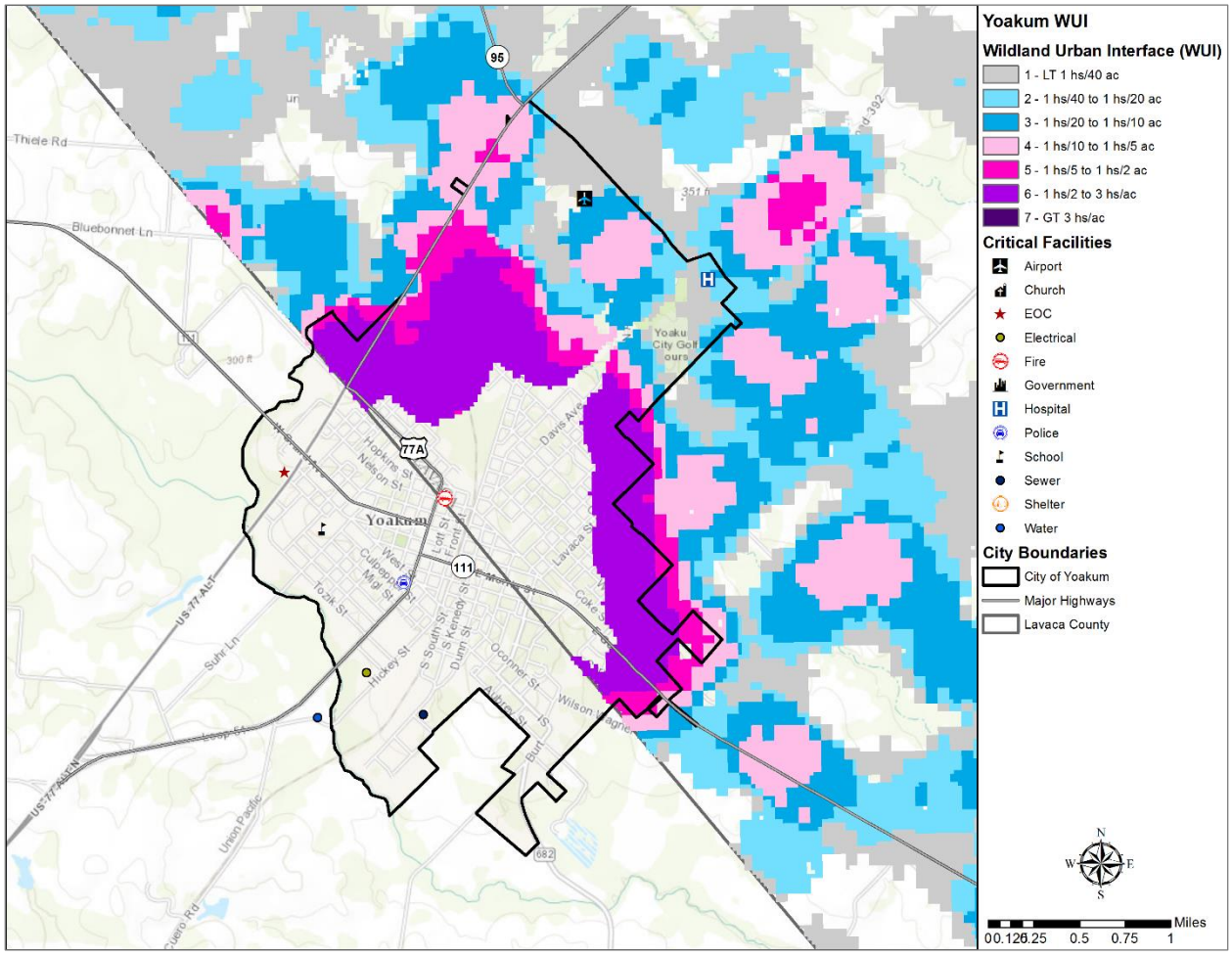
It is estimated that 93 percent of the total population in Moulton live within the WUI. However, the entire City of Moulton is at risk for wildfires.

Figure 12-4. Wildland Urban Interface Map – Shiner



It is estimated that 94 percent of the total population in Shiner live within the WUI. However, the entire City of Shiner is at risk for wildfires.

Figure 12-5. Wildland Urban Interface Map – Yoakum



It is estimated that 46 percent of the total population in Yoakum live within the WUI. However, the entire City of Yoakum is at risk for wildfires.

Extent

The intensity of a wildfire is determined by a variety of factors such as: type and continuity of fuel, topography, temperature, humidity, rainfall, and wind. 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.

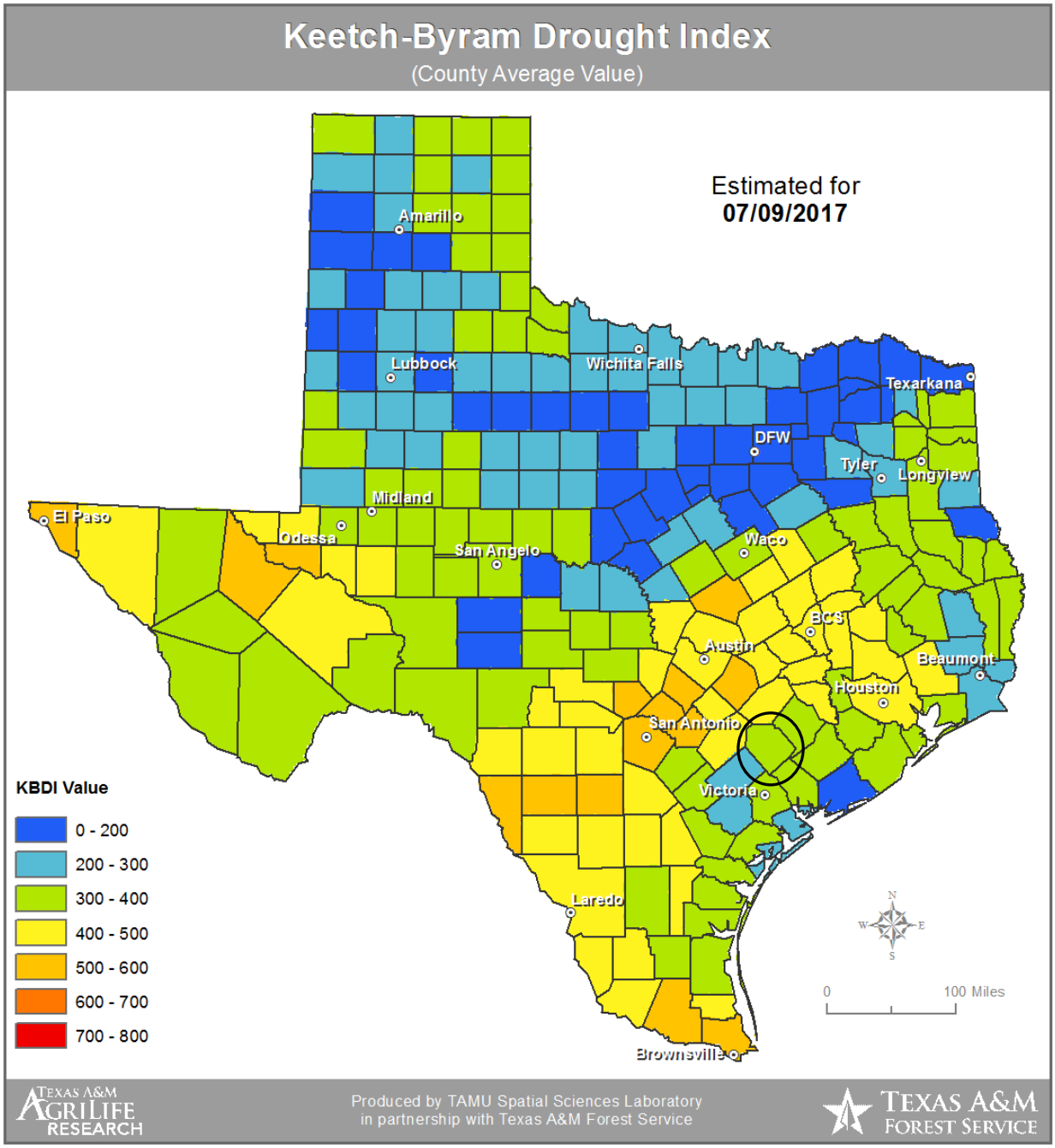
Potential for a wildfire event in Lavaca County is measured using the Keetch Byram Drought Index (KBDI) and the Texas Forest Service's Fire Intensity Scale (FIS). The KBDI is a mathematical system for relating current and recent weather conditions to potential or expected fire behavior to measure wildfire risk in terms of magnitude and intensity. The KBDI determines forest fire potential based on a calculated 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.[3]

Each color in Figure 12-6 represents the KBDI value per county. 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.

[3] http://twc.tamu.edu/kbdi

Figure 12-6. Keetch-Byram Drought Index (KBDI) for the State of Texas, 2017[4]



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.
- **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.

[4] Lavaca County is located within the black circle.

- **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 value for Lavaca County is within the 300-400 level. The average extent to be mitigated for the Lavaca County planning area is a KBDI of 489. At this level fires intensity begins to significantly increase and fires readily burn in all directions, exposing mineral soils in some locations. The KBDI is a good measure of the readiness of fuels to ignite in the event of a wildfire. The KBDI should be referenced in real time to explore the effect of changes in precipitation, soil moisture, and temperature change on the KBDI and exercise caution as the KBDI increases.

The Texas Forest Service's Characteristic FIS identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on weighted average of four percentile weather categories. There are five classes in the FIS and as the scale increases the risk increases tenfold, map displayed in half increments.

Potential fire intensity can be categorized in five classes in the FIS,[5] where each category represents a ten-fold increase in potential fire intensity:

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Lavaca County is currently at a predominantly low potential wildfire intensity. Figures 12-7 through 12-11 identifies the wildfire intensity for the Lavaca County planning area.

[5] https://www.texaswildfirerisk.com/Map/Public

Figure 12-7. Fire Intensity Scale Map – Lavaca County

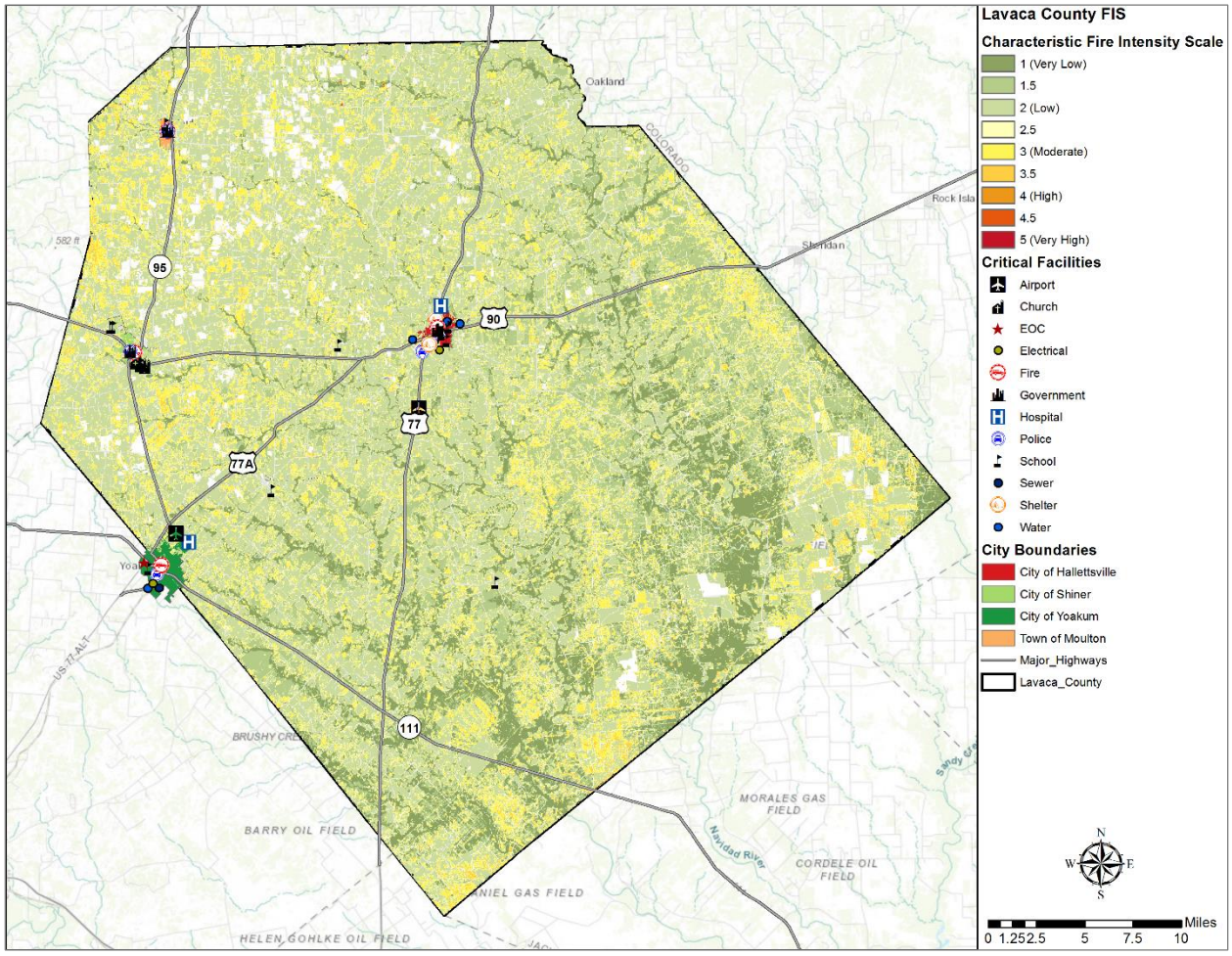


Figure 12-8. Fire Intensity Scale Map – Hallettsville

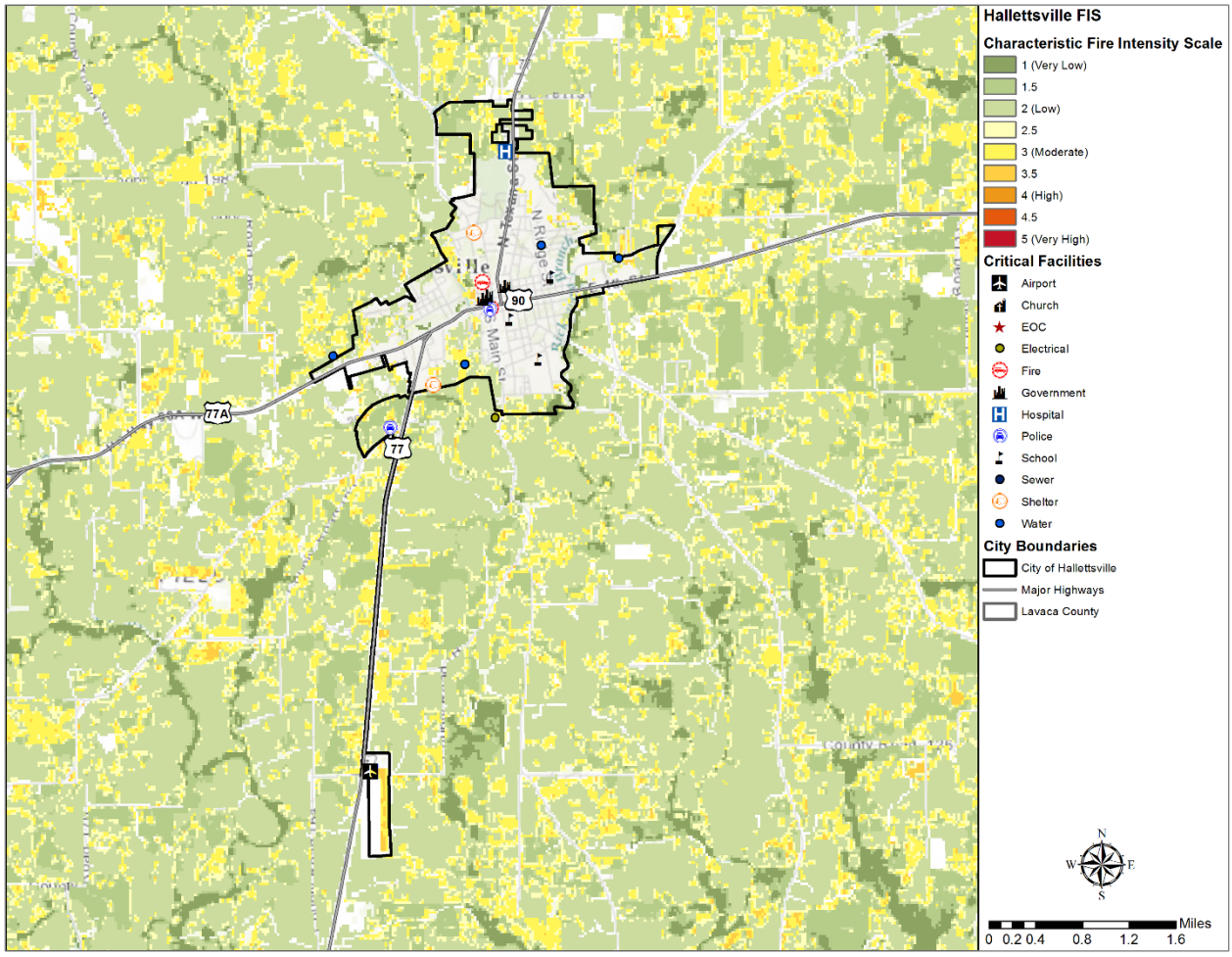


Figure 12-9. Fire Intensity Scale Map – Moulton

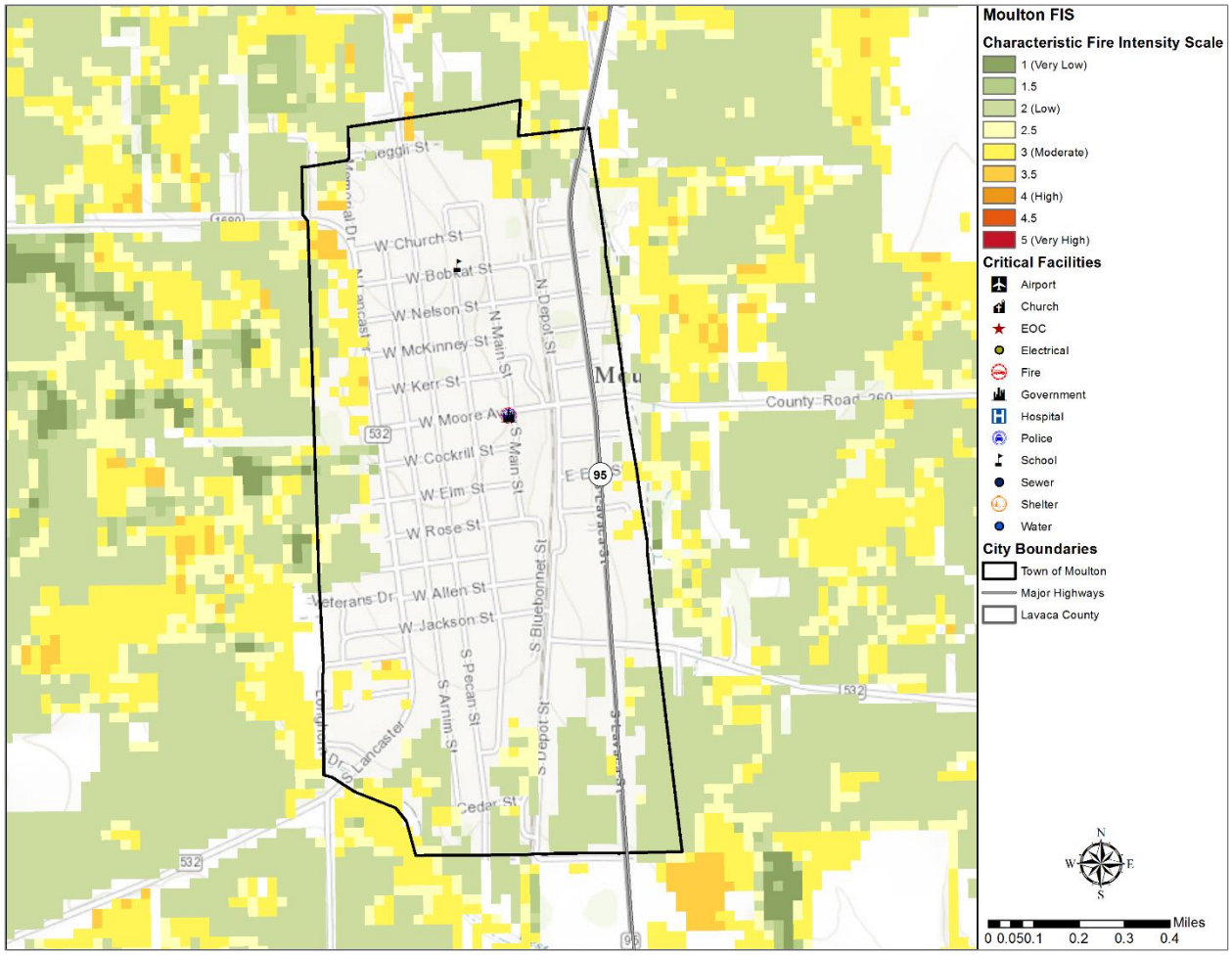


Figure 12-10. Fire Intensity Scale Map – Shiner

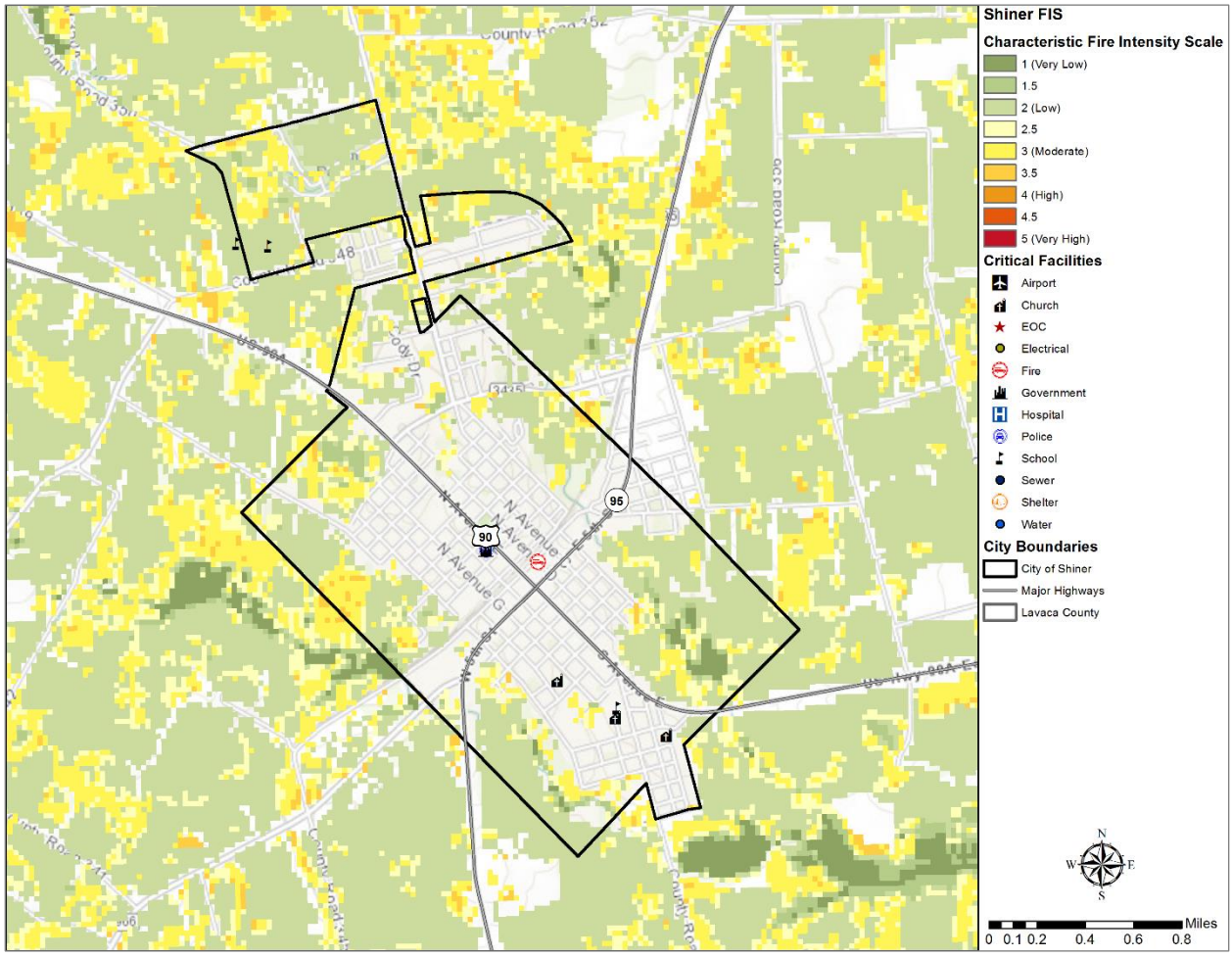
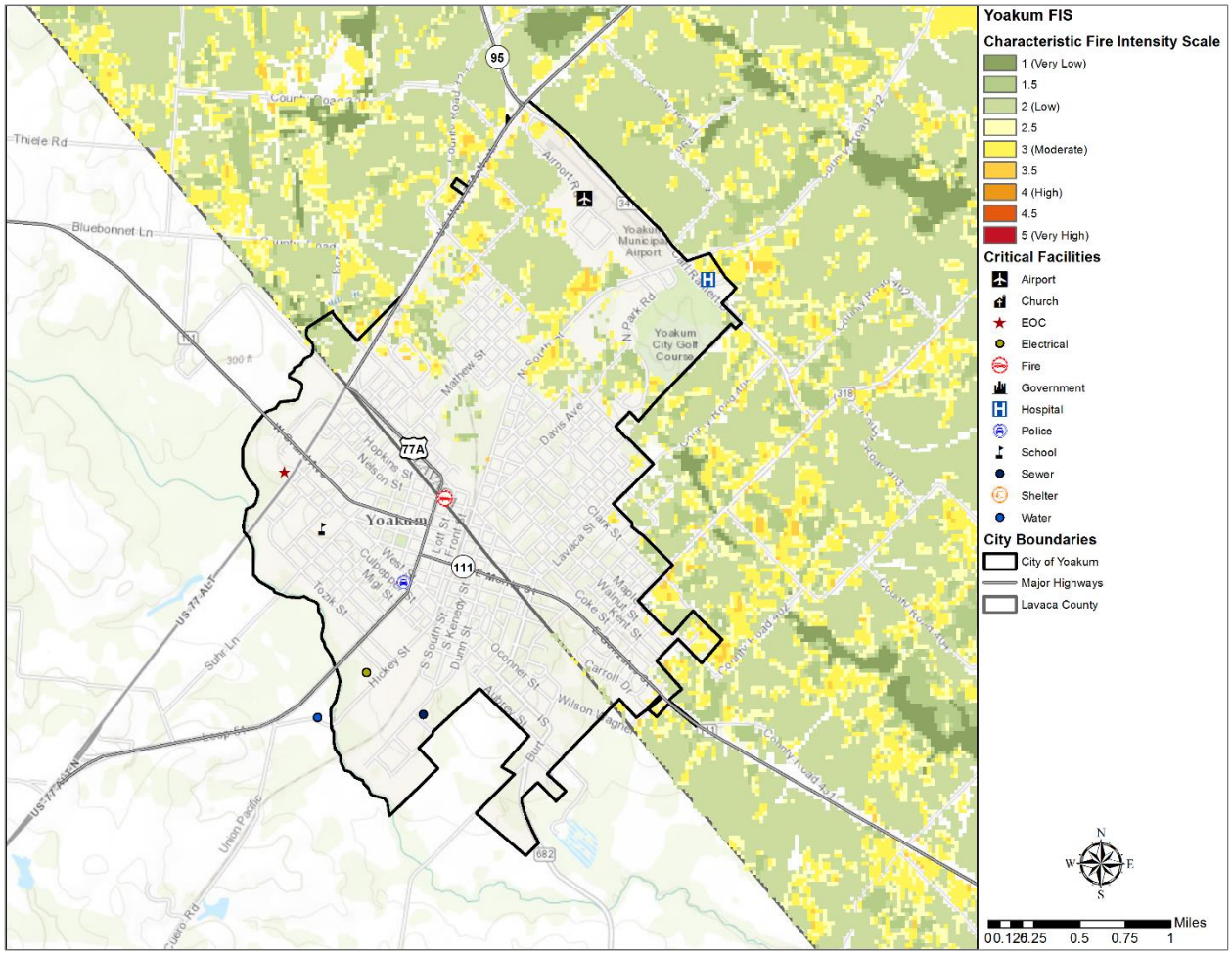


Figure 12-11. Fire Intensity Scale Map – Yoakum



Historical Occurrences

The Texas Forest Service reported 360 wildfire events in the Lavaca County planning area between 2005 and 2015. The Texas Forest Service (TFS) started collecting wildfire data in 1985 and volunteer fire departments started reporting events until 2005. Due to a lack of recorded data for wildfire events prior to 2005, frequency calculations are based on the eleven-year period from 2005 to 2015. The map below shows approximate locations of wildfires in Lavaca County, which can be grass or brushfires of any size (Figure 12-12). Table 12-1 identifies the number of wildfires by jurisdiction and total acreage burned.

Figure 12-12. Location and Historic Wildfire Events for Lavaca County, 2005 – 2015

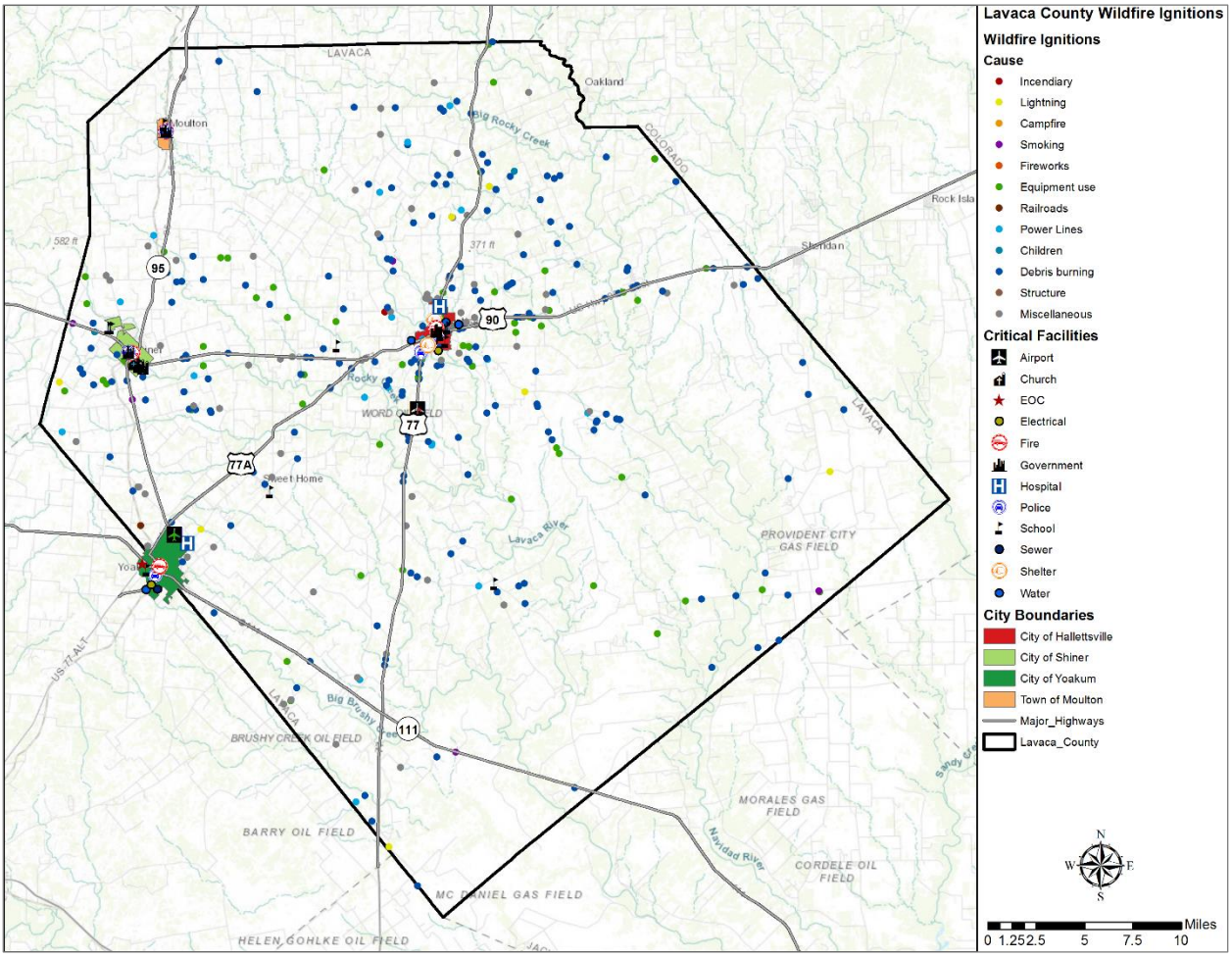


Table 12-1. Historical Wildfire Events in Lavaca County Summary, 2005 - 2015

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED
Lavaca County	335	1,497
Hallettsville	15	33
Moulton	0	0
Shiner	4	3
Yoakum	6	4

Table 12-2. Acreage of Suppressed Wildfire by Year, 2005 - 2015

JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Lavaca County	65	278	105	229	81	50	689	0	0	0	0
Hallettsville	1	14	3	0	0	0	15	0	0	0	0

JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Moulton	0	0	0	0	0	0	0	0	0	0	0
Shiner	0	0	0	0	0	0	3	0	0	0	0
Yoakum	0	2	1	0	0	0	1	0	0	0	0

Based on the list of historical wildfire events for the Lavaca County planning area (listed above), including all participating jurisdictions, 360 of the events have occurred since the 2006 Plan.

Probability of Future Events

Based on reported historical occurrences of wildfire, 360 events in an 11-year reporting period for Lavaca County provides an approximate probability of occurrence of 33 events per year. This frequency supports a highly likely probability of future events, meaning a wildfire event is probable within the next year. Moreover, as the jurisdictions within the county continue to expand further into wildland thus increasing the WUI, risk of future wildfire events increases.

Vulnerability and Impact

The severity of impact from major wildfire events can be substantial. Nationally, wildfire suppression activity costs the federal government up to $2 billion.[6] Such events have caused deaths and injuries, damaged and destroyed property and critical facilities, and disrupted infrastructure and services. Severity of impact is gauged by homes and structures lost, acreage burned, and the number of resulting injuries and fatalities.

Lavaca County does not experience wildfire risk evenly. The heavily populated, urban areas of Lavaca County are less likely to experience large, sweeping fires. The more rural areas of the County, like Moulton and sparsely populated unincorporated areas of Lavaca County are more vulnerable to large sweeping wildfire events. Areas in the WUI have an increased risk of being affected by wildfire where wildland and urban areas interface and areas of vegetation are not maintained (Figures 12-1 through 12-5). Within that context, unoccupied buildings and open spaces that have not been maintained have the greatest vulnerability to wildfire events. Areas along major highways in Shiner and Hallettsville, and throughout Lavaca County, have an increased vulnerability where empty lots and unoccupied areas are located.

The vulnerability of the jurisdictions in the planning area to wildfire events is increased where critical facilities are in the WUI as they are more likely to sustain damage from the hazard event. Table 12-3 lists the critical facilities that are in the Wildland Urban Interface (WUI) and are more susceptible to wildfire in each participating jurisdiction.

Table 12-3. Critical Facilities Located in WUI by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	2 Schools
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Government Facility, Hospital, 4 Schools

[6] https://www.fema.gov/media-library-data/1409003859391-0e8ad1ed42c129f11fbc23d008d1ee85/how_to_prepare_wildfire_033014_508.pdf

JURISDICTION	CRITICAL FACILITIES
Moulton	Police Station, Fire Station, 2 Schools, Government Facility
Shiner	Fire Station, 5 Schools, 3 Churches
Yoakum	Hospital, Airport

Another major impact of wildfires within Lavaca County is loss of acreage. A total of 360 fire events were reported from 2005 to 2015 in the planning area. Historic loss and annualized estimates due to wildfires are presented in Table 12-4 below.

Table 12-4. Historic Loss Estimates Due to Wildfire[7]

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED	ANNUAL ACRE LOSSES
Lavaca County	335	1,497	136.09
Hallettsville	15	33	3
Moulton	0	0	0
Shiner	4	3	0.27
Yoakum	6	4	0.36

Figures 12-13 through 12-17 show Lavaca County and the threat of wildfire to the County and participating jurisdictions.

[7] Events divided by 11 years of data.

Figure 12-13. Wildfire Ignition Density – Lavaca County

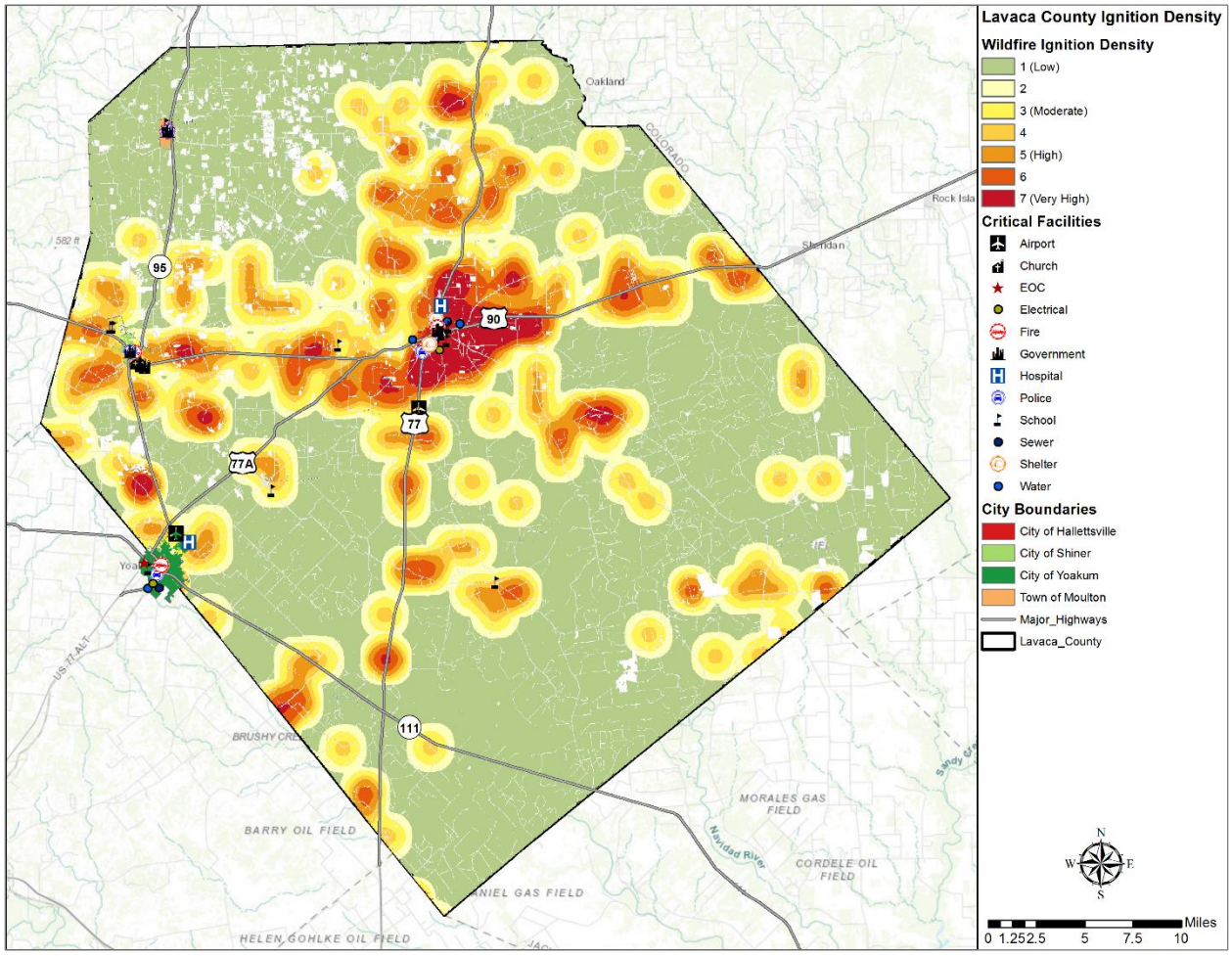


Figure 12-14. Wildfire Ignition Density – Hallettsville

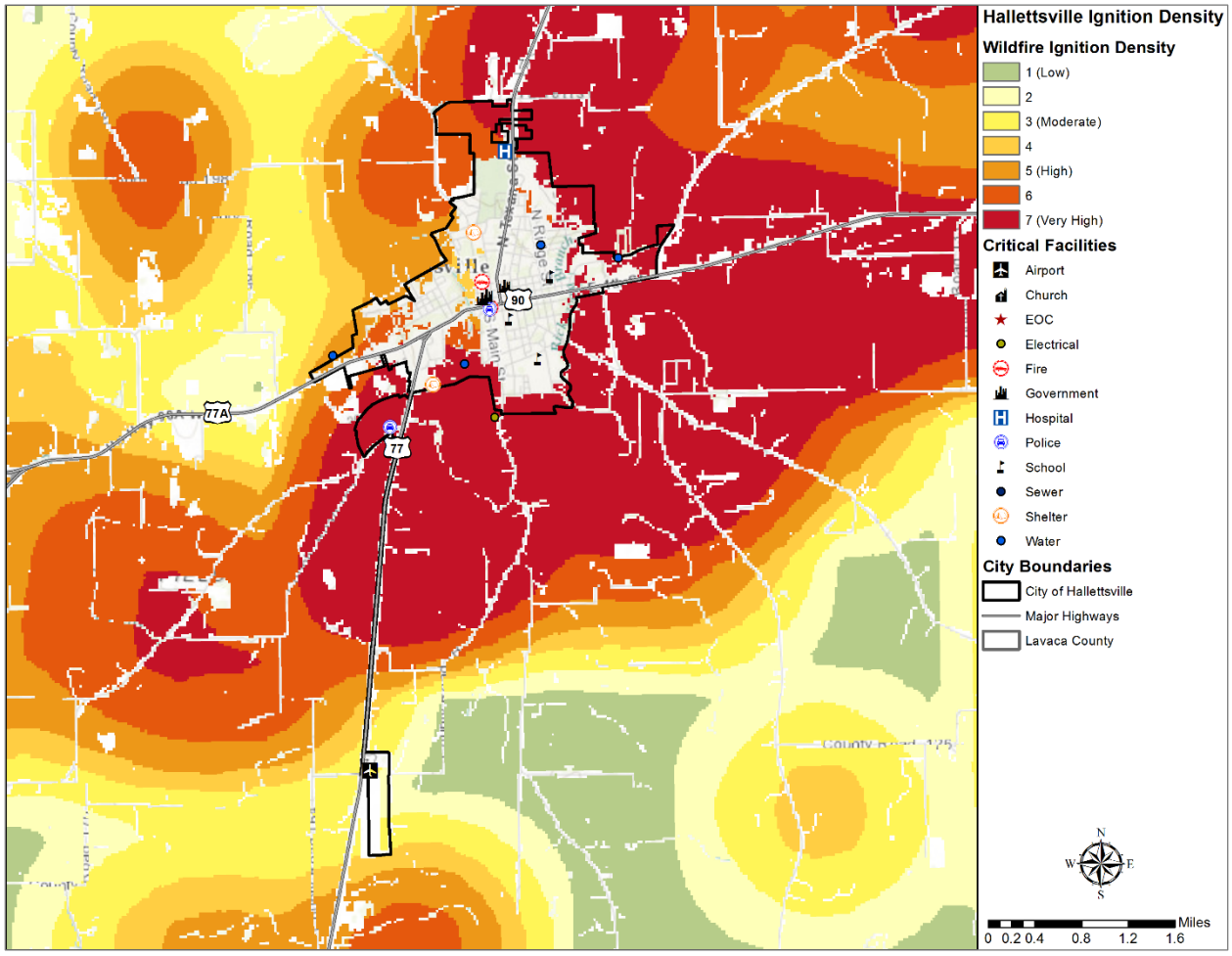


Figure 12-15. Wildfire Ignition Density – Moulton

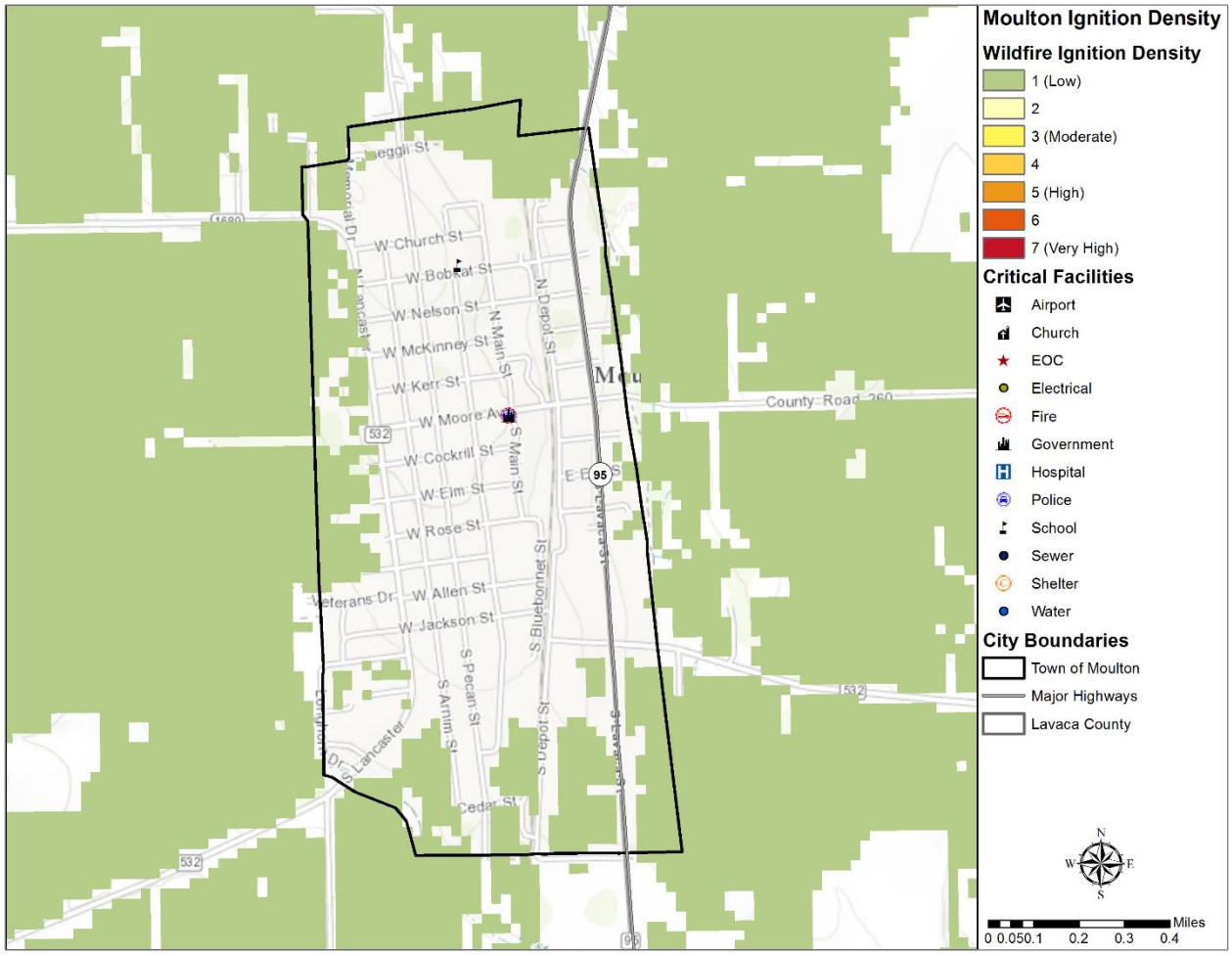


Figure 12-16. Wildfire Ignition Density – Shiner

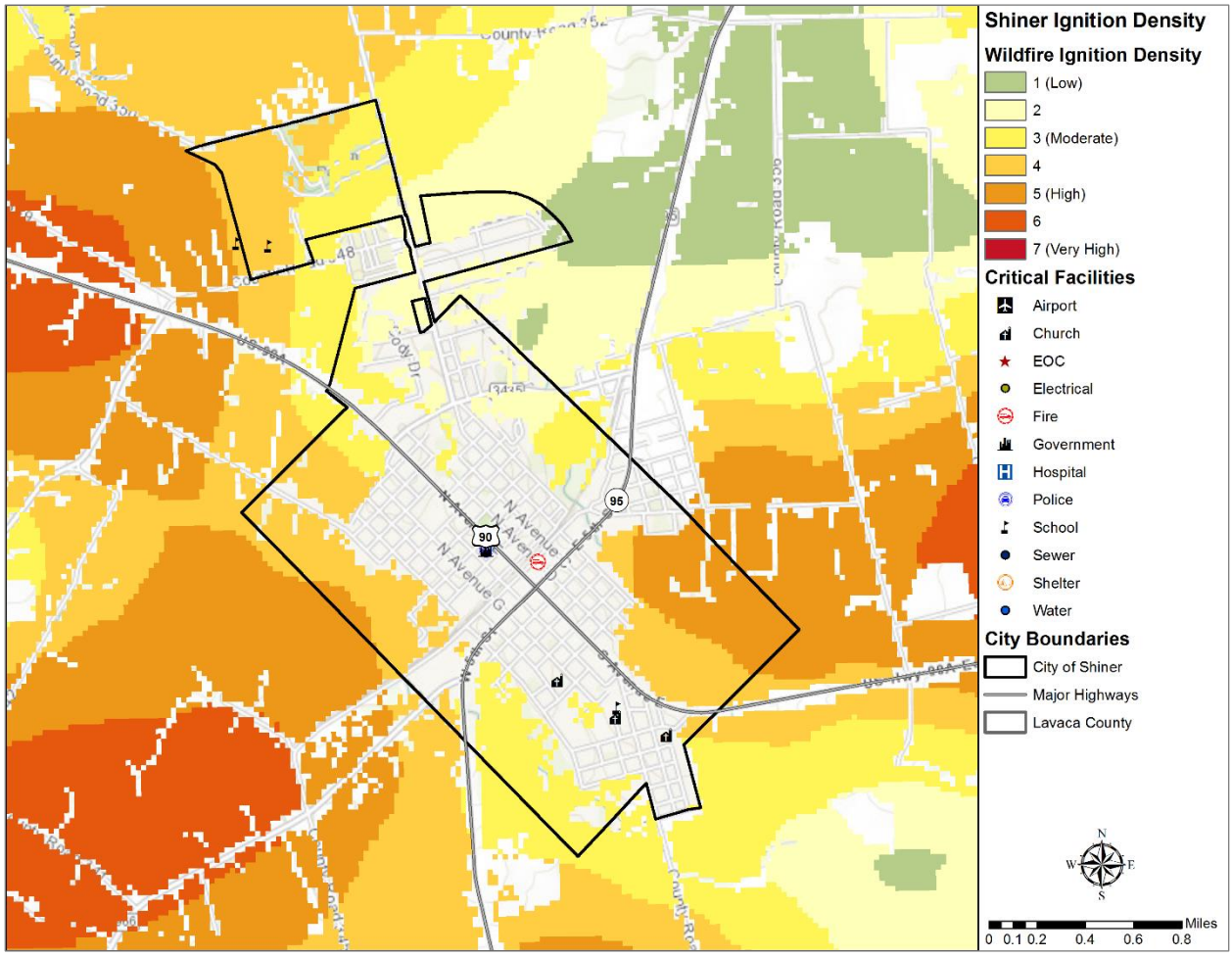
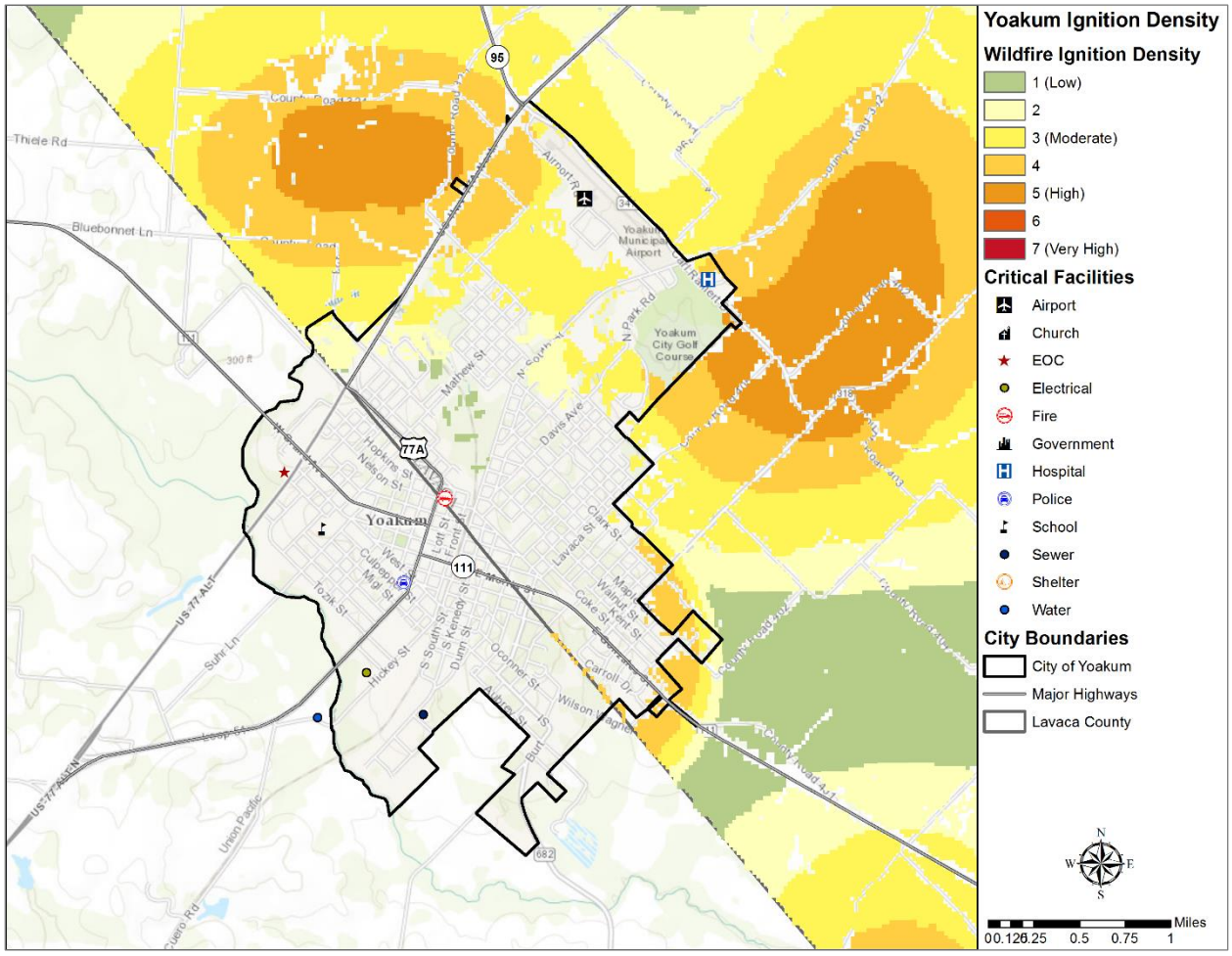


Figure 12-17. Wildfire Ignition Density – Yoakum



Wildfire can also cause human health effects to planning area residents. Diminished air quality is an example of an environmental impact that can result from a wildfire event and pose a potential health risk to the residents of Lavaca County. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too microscopic for the respiratory system to filter can cause immediate and possibly long term health effects. Older adults or those individuals with compromised respiratory systems may have increased vulnerability to the effects of diminished air quality after a wildfire event.

For the Lavaca 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.

Section 13: Tornado

Hazard Description

A tornado is a rapidly rotating column of air extending between, and in contact with, a cloud and the surface of the earth.[1] Tornadoes are among the most violent storms on the planet; the most violent are capable of tremendous destruction, with 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." Supercell 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 13-1. Tornado Variations

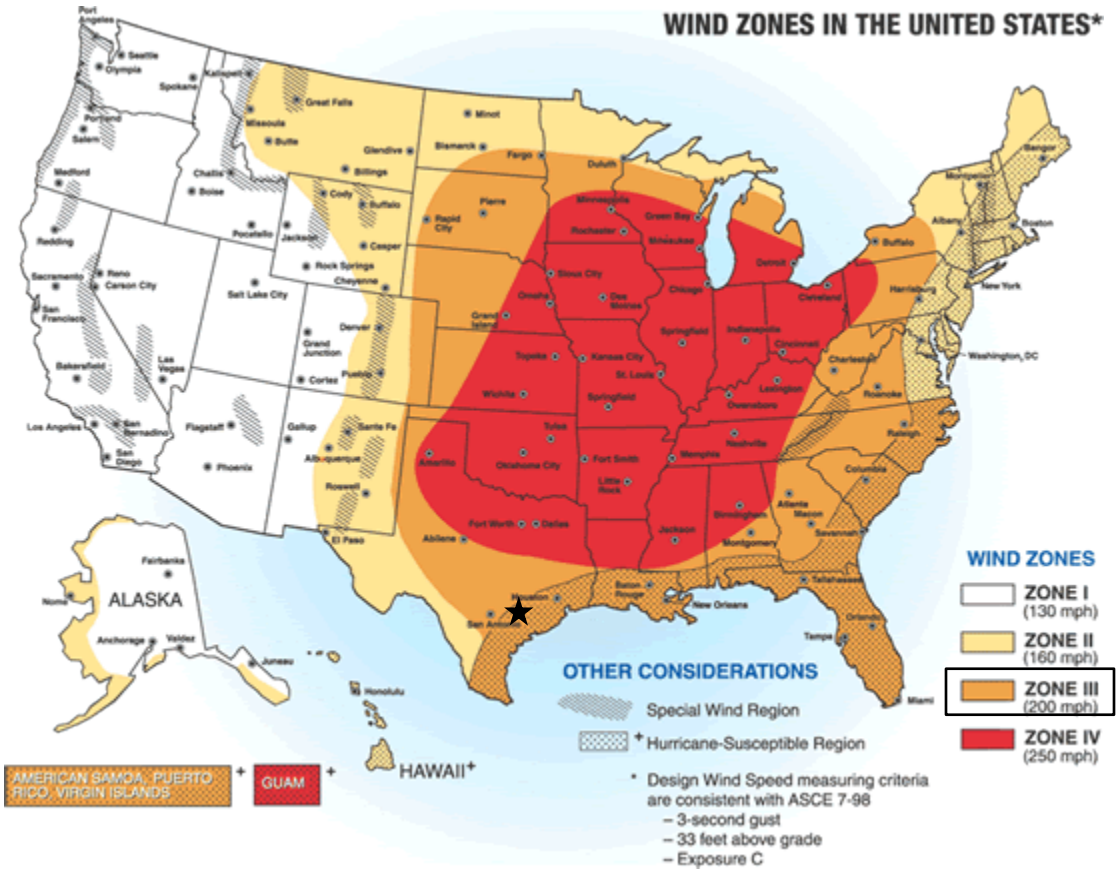
WEAK TORNADOES	STRONG TORNADOES	VIOLENT TORNADOES
• 69% of all tornadoes	• 29% of all tornadoes	• 2% of all tornadoes
• Less than 5% of tornado deaths	• Nearly 30% of all tornado deaths	• 70% of all tornado deaths
• Lifetime 1-10+ minutes	• May last 20 minutes or longer	• Lifetime can exceed one hour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

Location

Tornadoes do not have any specific geographic boundary and can occur throughout Lavaca County. It is assumed that the Lavaca County planning area, including all participating jurisdictions, is uniformly exposed to tornado activity. Lavaca County is located in Wind Zone III (Figure 13-1), where tornado winds can be as high as 200 mph.

[1] https://www.weather.gov/phi/TornadoDefinition

Figure 13-1. FEMA Wind Zones in the United States[2]



Extent

Tornado events can range from weak to violent 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).

Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (Table 13-2). Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale (Table 13-3), 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. To interpret historical occurrence data of tornado events, both the Fujita Scale and Enhanced Fujita Scale should be referenced since tornado events prior to 2007 will follow the original Fujita Scale.

[2] Lavaca County is indicated by the star.

Table 13-2. The Fujita Tornado Scale[3]

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% – 50%
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%

[3] Source: http://www.tornadoproject.com

Table 13-3. Enhanced Fujita Scale for Tornados

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.	

The events in Lavaca County have been between EF0 to an EF3 (Table 13-4). However, because Lavaca County is in Wind Zone III, the planning area could experience anywhere from an EF0 to an EF4. Therefore, the range of intensity that the Lavaca County planning area would be expected to mitigate is a tornado event that would be a low to severe risk, an EF0 to EF3.

Historical Occurrences

Figure 13-2 maps the locations of previous occurrences in the Lavaca County planning area, including all participating jurisdictions, from 1950 through 2017. A total of 36 events have been recorded by the Storm Prediction Center (NOAA) and NCEI databases for the Lavaca County planning area, including all participating jurisdictions. Only reported tornadoes were plotted and factored into the risk assessment, however it is likely that several occurrences have gone unreported over the past 67 years. The most significant event reported occurred in southwestern Lavaca County on September 20, 1967. The F32 tornado was 333 yards wide and stayed on the ground for approximately 4.3 miles.

Figure 13-2. Spatial Historical Tornado Events, 1950-2017[4]

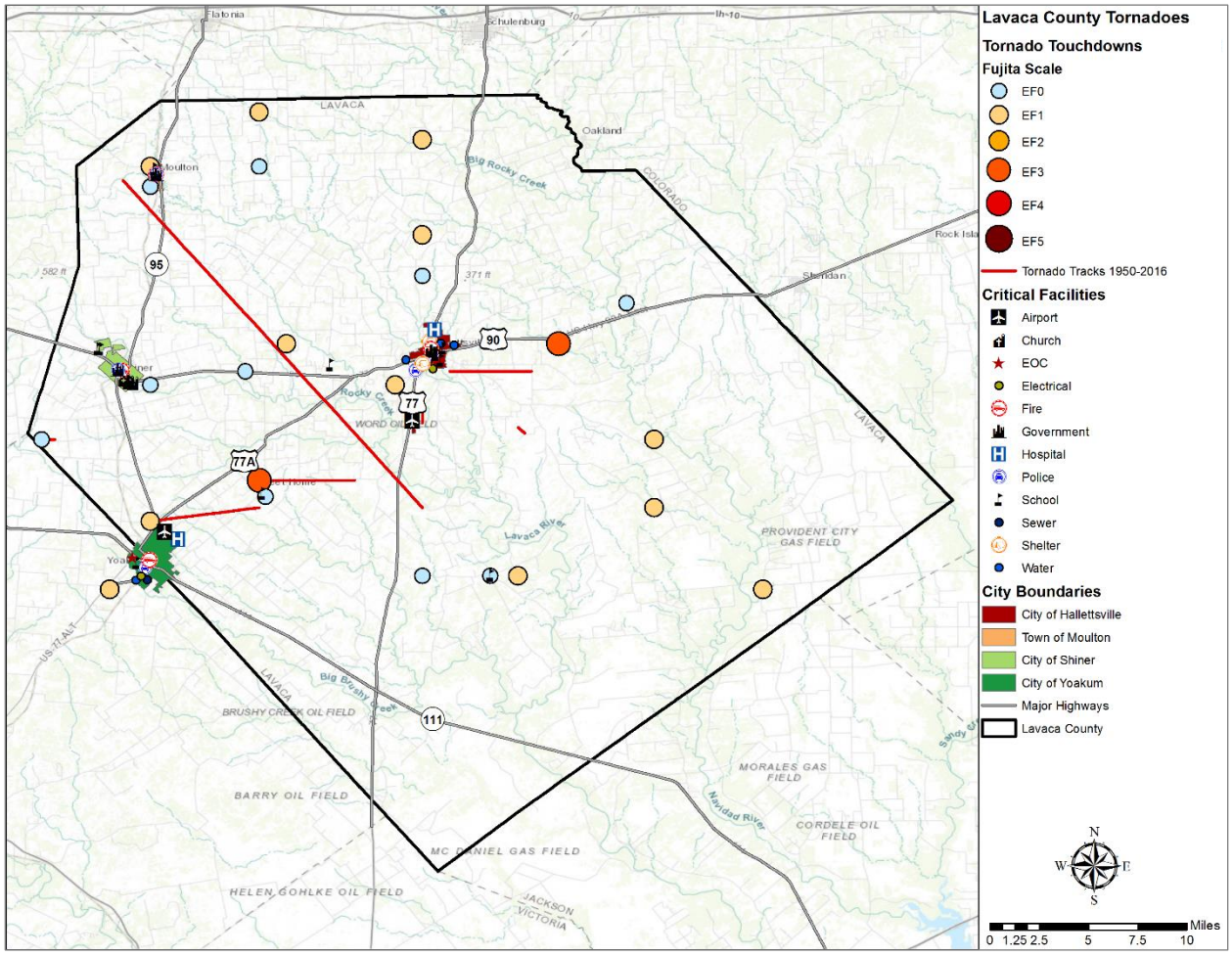


Table 13-4. Historical Tornado Events, 1950 - 2017[5]

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	5/18/1955	6:00 PM	F2	0	0	$227,242	$0
Lavaca County	5/19/1955	5:00 AM	F2	0	0	$227,242	$0
Lavaca County	5/3/1960	2:00 PM	F1	0	0	$20,575	$0
Lavaca County	3/20/1967	7:00 PM	F0	0	0	$18,234	$0
Lavaca County	9/20/1967	9:15 AM	F0	0	3	$182,338	$0
Lavaca County	9/20/1967	11:07 AM	F3	0	4	$18,233,757	$0
Lavaca County	9/20/1967	3:00 PM	F3	0	3	$182,338	$0

[4] Source: NOAA Records. Historical events are reported through August 2017.
[5] Values are in 2017 dollars. Historical events are reported through August 2017. Only those events resulting in damages, injuries or fatalities are included in the table.

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	2/25/1971	7:00 PM	F1	0	0	$15,037	$0
Lavaca County	3/20/1972	3:00 PM	F1	0	0	$14,570	$0
Lavaca County	3/20/1972	4:30 PM	F2	0	0	$145,696	$0
Lavaca County	5/16/1972	8:30 AM	F1	0	0	$14,570	$0
Lavaca County	7/30/1972	9:00 PM	F1	0	0	$14,570	$0
Lavaca County	10/30/1974	4:30 PM	F1	0	0	$12,353	$0
Lavaca County	5/4/1991	6:18 PM	F1	0	0	$447,142	$0
Lavaca County	5/13/1994	11:52 AM	F2	0	0	$82,187	$8,219
Moulton	5/13/1994	1:47 PM	F1	0	0	$821,872	$0
Lavaca County	5/30/1999	8:50 PM	F1	0	0	$14,622	$0
Hallettsville	5/30/1999	9:15 PM	F1	0	0	$73,110	$0
Shiner	11/12/2000	6:10 PM	F0	0	0	$14,147	$0
Hallettsville	3/31/2007	3:30 AM	EF1	0	0	$117,488	$821,872
Hallettsville	3/31/2007	3:45 AM	EF2	0	4	$88,116	$0
Lavaca County	9/29/2012	4:02 PM	EF0	0	0	$5,305	$0

Table 13-5. Summary of Historical Tornado Events, 1950 - 2017[6]

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	26	F3	0	10	$19,857,778	$8,129
Hallettsville	5	F2	0	4	$278,715	$821,872
Moulton	3	F1	0	0	$821,872	$0
Shiner	2	F0	0	0	$14,147	$0
Yoakum	0	N/A	0	0	$0	$0
TOTAL LOSSES	**36**	**(Max Extent)**	**0**	**14**	**$21,802,602**	

Based on the list of historical tornado events for the Lavaca County planning area (listed above), including all participating jurisdictions, 5 of the events have occurred since the 2006 Plan.

[6] Values are in 2017 dollars. Historical events are reported through August 2017.

Significant Events

September 20, 1967 – Lavaca County

The most significant tornado event during the recording period was a F3 tornado that occurred on September 20, 1967 in southwestern Lavaca County near the community of Sweet Home. The track was toward the west with a width of 333 yards and a path length of 4.3 miles. This tornado event resulted in over $18 billion in 2017 dollars and 4 injuries.

May 13, 1994 – Lavaca County/Moulton

A F1 tornado was officially reported by Moulton's Emergency Management Coordinator (EMC) just north of the city on May 13, 1994. Residents of Mouton reported seeing a funnel dip downward out of the thunderstorm and hearing a roaring sound as the tornado occurred. This tornado caused damage throughout the city, including: knocked down power lines and tree limbs, damaged roofs, destroyed farm outbuildings, injured cattle, and a mobile home that was blown off its blocks. The thunderstorm that brought this tornado also resulted in up to five inches of rain.

March 31, 2007 – Hallettsville

A series of tornados were reported in the Hallettsville area on March 31, 2007. The first tornado occurred around 3:30 AM and touched down near the community of Williamsburg, approximately 4 miles south of Hallettsville along US77, and tracked from just west of US77 northward along the highway, crossing the highway and dissipating on the east side of US77.

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, 36 events in a 67-year reporting period for Lavaca County provides a probability of occurrence of approximately once every year. This frequency supports a highly likely probability of future events for the Lavaca County planning area, including all participating jurisdictions, meaning that an event is probable in the next year.

Vulnerability and Impact

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities and populations in Lavaca 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 possibly cause a significant threat to people as they could be struck by flying debris, falling trees/branches, utility lines, and poles. First responders could also not be able to respond to calls due to blocked roads. Tornadoes commonly cause power outages which could cause health and safety risks to patients in hospitals or other vulnerable populations that rely on power for medical necessities.

The Lavaca County planning area features multiple mobile or manufactured home parks throughout the planning area and 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

all jurisdictions. These homes would also be more vulnerable. The US Census data indicates a total of 1,707 manufactured homes located in the Lavaca County planning area including all participating jurisdictions (Table 13-6). In addition, more than 59% (approximately 6,142 structures) of the residential structures in the Lavaca 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 suseptible to damages during significant tornado events.

Table 13-6. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Hallettsville	158	1,048
Moulton	18	364
Shiner	84	739
Yoakum	284	1,863
Lavaca County[7]	**1,707**	**6,142**

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

Table 13-7. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	2 Schools, Government Facility
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Public Works Plant, Evacuation Center, 2 Government Facilities, Hospital, Sheriff's Office, 6 Schools
Moulton	Police Station, Fire Station, Community Center, 2 Schools, 6 Water/Waste Water Facilities, Nursing Home, Government Facility
Shiner	Police Station, Fire Station, 5 School Facilities, 3 Churches, Government Facility
Yoakum	Police Station, Fire Station, School, Hospital, Airport, 2 Water/Waste Water Facilities, Electrical Sub-station, EOC/Government Facility

The average loss estimate of property and crop is $21,802,602 (in 2017 dollars), having an approximate annual loss estimate of $325,412. Based on historic loss and damages, the impact of tornado on the Lavaca County planning area can be considered "Major," with more than 25 percent of property expected to be destroyed or with major damage, injuries and/or illness that result in permanent disability, and critical facilities shut down for at least 2 weeks.

[7] Source: US Census Bureau data estimates for 2015.

Table 13-8. Potential Annualized Losses by Jurisdiction, 1950-2017[8]

JURISDICTION	PROPERTY AND CROP DAMAGE	ANNUAL LOSS ESTIMATE
Lavaca County	$19,865,997	$296,507
Hallettsville	$278,714	$4,160
Moulton	$1,643,744	$24,533
Shiner	$14,147	$211
Yoakum	$0	$0

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.

[8] Values are in 2017 dollars. Historical events are reported through August 2017.

Section 14: 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 Lavaca County usually begin as powerful cold fronts that push south from central Canada. The County is at risk to ice hazards and extremely cold temperatures, as well as snow. The effects and frequencies of winter storm events are generally mild and short-lived. As indicated in Figure 14-1, on average, the area experiences 1-10 cold days a year, meaning 1-10 days per year are at or around freezing temperatures. During these times of ice and snow accumulation, response times will increase until public works road crews are able to assist in making the major roads passable. Table 14-1 describes the types of winter storms possible to occur in Lavaca County.

Figure 14-1. Extreme Cold Days, 1960-2003[1]

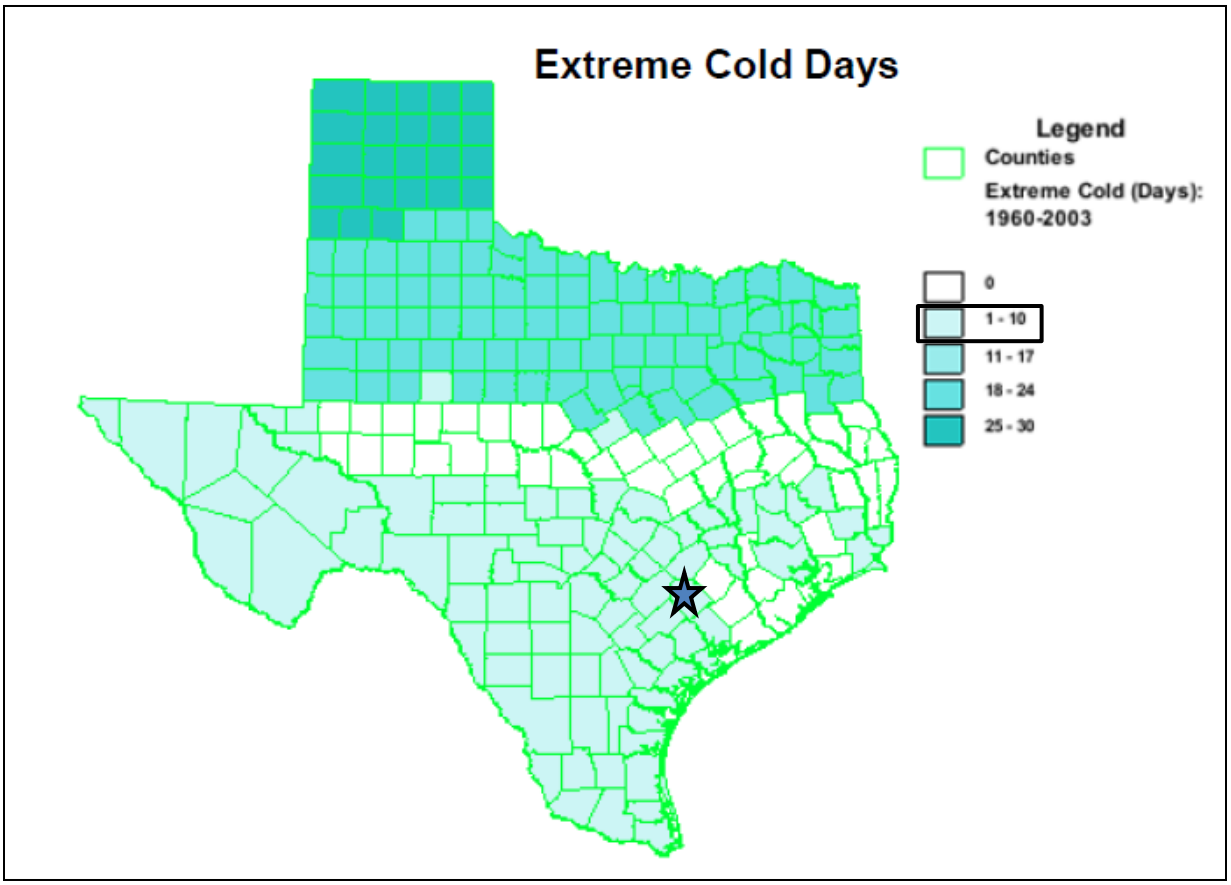


Table 14-1. Types of Winter Storms

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.
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.

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

TYPE OF WINTER STORM	DESCRIPTION
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 Lavaca County planning area, including all participating jurisdictions, are considered to be exposed to a winter storm hazard and could potentially be impacted.

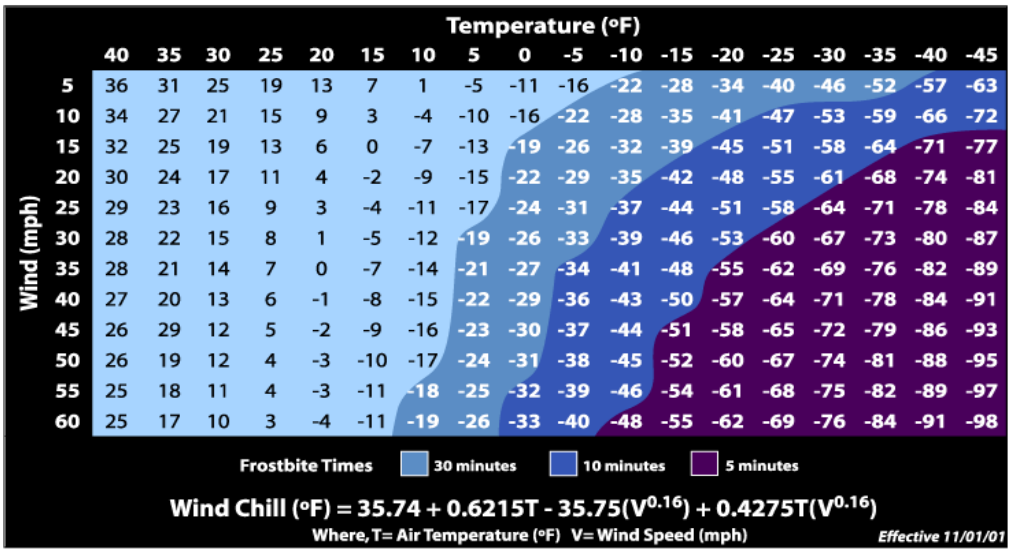
Extent

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 14-2. Table 14-2 should be read in conjunction with the wind-chill factor described in Figure 14-2 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 14-2. 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 14-2. Wind Chill Chart



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. Lavaca County has never experienced a blizzard, but based on 4 previous occurrences recorded from 1996 through August 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 county planning area. 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 14-2. Lavaca County planning area can expect anywhere between 0.1 to 3.0 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.

Historical Occurrences

Table 14-3 shows historical occurrences for Lavaca County from 1996 through August 2017 provided by the NCEI database. There have been 4 recorded winter storm events in Lavaca 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 all participating jurisdictions are provided on a county-wide basis per the NCEI database.

Table 14-3. Historical Winter Storm Events, 1996-2017[2]

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Lavaca County	1/11/1997	0	0	$0	$0
Lavaca County	12/25/2004	0	0	$0	$0
Lavaca County	2/3/2011	0	0	$0	$0
Lavaca County	2/9/2011	0	0	$0	$0
TOTALS		**0**	**0**	**$0**	

Based on the list of historical winter storm events for the Lavaca County planning area (listed above), including all participating jurisdictions, 3 of the events have occurred since the 2006 Plan.

Significant Events

December 25, 2004 – Lavaca County

An extremely unusual snow event turned into a white Christmas for Lavaca County. Snow began falling in the evening of December 24, with the heavier snowfall amounts in the southwest part of the County. Heaviest snow fall accumulations were recorded shortly after midnight and the snow continued to fall through the early morning. Maximum amounts were estimated at 6 inches in the southwest part of Lavaca County. The snow began melting in the mid-morning and was gone by noon.

Probability of Future Events

According to historical records (Table 14-3), Lavaca County experiences approximately one winter storm event every three years. Hence, the probability of a future winter storm event affecting the Lavaca County planning area is likely, with a winter storm likely to occur within the next three years. All participating jurisdiction events are included under the County.

Vulnerability and Impact

All infrastructure, critical facilities, populations, and buildings in the Lavaca County planning area, including all participating jurisdictions, are vulnerable to severe winter events.

Public and private infrastructure is a major aspect of Lavaca County which is vulnerable to winter storms. During periods of extreme cold and freezing temperatures, water pipes can freeze and crack. In addition, the buildup of ice can cause power lines and tree limbs to break under the weight, potentially causing damage to property or power lines. These events can disrupt electric service for long periods. Consumption of heating fuel will increase during a winter storm event, which may cause increased fuel prices and possible energy shortages. House fires can occur more frequently during winter storm events due to increased and improper use of alternative heating sources which can cause injury or deaths. Moreover, house fires during winter storms present a greater danger because water supplies may freeze and impede firefighting efforts. The following critical facilities would be vulnerable to Winter Storm events in each participating jurisdiction.

[2] Values are in 2017 dollars. Historical events are reported through August 2017.

Table 14-4. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Lavaca County	2 Schools, Government Facility
Hallettsville	Police Station, 2 Fire Stations, Wastewater Treatment Facility, Airport, 2 Emergency Shelters, Substation, 3 Water well/booster stations, Public Works Plant, Evacuation Center, 2 Government Facilities, Hospital, Sheriff's Office, 6 Schools
Moulton	Police Station, Fire Station, Community Center, 2 Schools, 6 Water/Waste Water Facilities, Nursing Home, Government Facility
Shiner	Police Station, Fire Station, 5 School Facilities, 3 Churches, Government Facility
Yoakum	Police Station, Fire Station, School, Hospital, Airport, 2 Water/Waste Water Facilities, Electrical Sub-station, EOC/Government Facility

People and animals are subject to direct health risks from extended exposure to cold air. Older adults 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 Lavaca County planning area is approximately 29.6% of the total population or an estimated total of 4,250[3] potentially vulnerable residents based on age (Table 14-5).

Table 14-5. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER
Hallettsville	581
Moulton	287
Shiner	467
Yoakum	891
Lavaca County[4]	**4,250**

No property or crop damages were reported in the 21 year period of analysis. Based on historical records, annual loss estimates are considered to be negligible.

Table 14-6. Potential Annualized Losses for Lavaca County

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Lavaca County	$0	$0

[3] US Census Bureau 2015 data for Lavaca County.

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

Section 14: Winter Storm

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. Based on the level of risk and historical occurrences for winter storms in the Lavaca County planning area, the impact for winter storm is "Limited", 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.

Section 15: Mitigation Strategy

Mitigation Goals

Based on the results of the risk and capability assessments, the Planning Team developed and prioritized the mitigation strategy. This involved utilizing the results of both assessments and reviewing the goals and objectives that were included in the previous 2006 Plan.

At the Mitigation Workshop in July 2017, Planning Team members reviewed the mitigation goals from the previous 2006 Plan. The goals were incorporated and expanded upon in the Plan Update. 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 16: 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 Update. Lavaca County reviewed the previous actions from the 2006 Plan and included all relevant actions in the Plan Update. Any actions that were completed or no longer relevant were excluded from the Plan Update. As an example, in the previous Plan there was an action to request new floodplain maps and the new FIRM maps for Lavaca County were completed in 2011.

For each of the new actions in this section were prioritized based on FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLE+E) 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 STAPLE+E 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 16-1).

Table 16-1. Lavaca 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	Flood	Hail	Hurricane	Lightning	Thunderstorm Wind	Extreme Heat	Drought	Wildfire	Tornado	Winter Storm
Lavaca County	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Hallettsville	XXXX	XXX	XXX	XXX	XXX	XX	XXX	XXXX	XXX	XXX
Moulton	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX
Shiner	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Yoakum	XX	XX	XX	XX	XX	XXX	XXX	XXXX	XX	XXX

Lavaca County

	Lavaca County – Action #1
Proposed Action:	**Purchase and distribute NOAA Weather Radios with uniform technology.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk to residents through early warning.
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, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$100,000
Potential Funding Sources:	HMGP Grants, PDM, Other Federal Grants
Lead Agency/Department Responsible:	County and Local Fire Departments
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 5

		Lavaca County – Action #2
	Proposed Action:	**Develop multi-hazard safe rooms. Utilize safe rooms as heating and cooling centers during extreme weather.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide, all participating jurisdictions – locations to be determined
	Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk to residents; increase likelihood of survival during tornado events; provide relief to vulnerable citizens during extreme heat and winter storm events; provide shelter during hurricane/tropical storm 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, Hurricane/Tropical Storm, Tornado, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	$1,000,000
Potential Funding Sources:	HMGP Grants, PDM, Other Federal Grants
Lead Agency/Department Responsible:	Lavaca County OEM in coordination with local jurisdictions
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

	Lavaca County – Action #3
Proposed Action:	**Implement residential safe room program.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to residents; increase likelihood of survival during tornado 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
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$5,000
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	Lavaca County OEM in coordination with local jurisdictions
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4

	Lavaca County – Action #4
Proposed Action:	**Purchase and distribute box fans to vulnerable residents during extreme heat events.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to residents.
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:	$22.00 per unit
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	Lavaca County OEM in coordination with local jurisdictions
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 5

	Lavaca County – Action #5
Proposed Action:	**Publish and distribute pamphlets on all hazards threatening the planning area. Provide mitigation measures to reduce risk of damages, injury or illness.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to residents through education 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:	Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$1,000
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	Lavaca County OEM in coordination with local jurisdictions
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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

	Lavaca County – Action #6
Proposed Action:	**Upgrade/improve bridges and culverts to prevent flood damages and ensure emergency access after an event.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk to infrastructure; increase stormwater capacity; ensure emergency access on roads and bridges after an event.
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:	$5,000,000
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	Lavaca County Road and Bridge Department in coordination with local jurisdictions
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Economically Sound = 4; and Environmentally Sound = 4

	Lavaca County – Action #7
Proposed Action:	**Provide back-up generators with permanent hard-wired quick connections to all critical facilities throughout the planning area.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Ensure continuity of critical services during and after a critical event.
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/Tropical Storm, Lightning, Thunderstorm Wind, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	$10,000 – $15,000 per unit
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	Lavaca County OEM in coordination with local jurisdictions
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

	Lavaca County – Action #8
Proposed Action:	**Adopt ordinance to require drought resistant landscaping at public facilities.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk of drought impacts through water reduction 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):	Low
Estimated Cost:	$1,000
Potential Funding Sources:	HMGP Grants, PDM, Operating Budgets (staff time)
Lead Agency/Department Responsible:	County and City Administration
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

	Lavaca County – Action #9
Proposed Action:	**Install rollaway storm shutters on Lavaca County Criminal Justice Center windows and doors.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Lavaca County Criminal Justice Center 38 FM 318, Hallettsville
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk of damage to facility as well as prevent injuries to essential personnel during extreme 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, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	$10,000
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5

Hallettsville

	Hallettsville – Action #1
Proposed Action:	**Cut firebreaks into public wooded areas according to risk factors.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City transfer station and other areas of city
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Quicker access for emergency personnel leading to faster response times; reduce risk of wildfire spread.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Natural Systems Protections

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000 – $25,000
Potential Funding Sources:	Federal grants; Local revenue
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	CWPP

COMMENTS
Includes primarily bulldozer work and related labor charges.
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 4

		Hallettsville – Action #2
	Proposed Action:	**Retrofit water supply systems to limit water main breaks increasing the reliability and saving labor and maintenance costs during times of drought.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City's water infrastructure
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce number of line breaks and cost of repairs; reduce water losses from leaks or broken pipes; ensure continuity of water services to residents and for fighting fires.
	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, Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	$300,000 – $1,500,000
Potential Funding Sources:	Federal grants; Local revenue
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drought Contingency Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

	Hallettsville – Action #3
Proposed Action:	**Protect power lines and infrastructure: Upgrade/retrofit existing power infrastructure; Adopt and implement tree trimming program around power lines; Adopt and implement design-failure mode for power line design to limit size of outages and allow faster restoration.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Maintain electric service and minimize disruption and downtime to businesses and residents; ensure continuity of critical services; protect citizens; reduce repair costs and damages associated with power outages.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure Project; Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Winds, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	$10,000 – 500,000
Potential Funding Sources:	Federal grants; Local revenue
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances, Capital Improvement Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

		Hallettsville – Action #4
	Proposed Action:	**Retrofit/harden equipment and critical facilities throughout the city. Provide back-up generators with permanent hard-wired quick connections to all critical facilities throughout the city.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	Critical city facilities
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of damages to residents and critical facilities and ensure continuity of critical 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/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000 – $500,000
Potential Funding Sources:	Federal grants; Local revenue
Lead Agency/Department Responsible:	City Administration, Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

		Hallettsville – Action #5
	Proposed Action:	**Adopt and implement program to regularly clean and clear debris and deposits in stormwater drains, drainage channels, in riverbeds, and along riverbanks (particularly near aerial lines).**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce the risk of loss to life and property to flood damage.
	Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Natural Systems Protection; Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$50,000 – $5,000,000
Potential Funding Sources:	Federal grants; Local revenue
Lead Agency/Department Responsible:	City Administration, Public Works
Implementation Schedule:	Within 12-48 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
Dredging and clearing deposits would reduce risk of flooding and restore and increase stormwater capacity.
Additional Considerations: The following STAPLE+E 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 = 3; Administratively Possible = 3; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

	Hallettsville – Action #6
Proposed Action:	**Improve/upgrade storm water drainage system throughout the city.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce the risk of loss of property during flooding events through improved 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:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$50,000 – $1,000,000
Potential Funding Sources:	Federal grants; Local revenue
Lead Agency/Department Responsible:	City Administration, Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 3; and Environmentally Sound = 4

	Hallettsville – Action #7
Proposed Action:	**Purchase and distribute NOAA Weather Radios.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risks to residents through early warning.
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, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$1,000
Potential Funding Sources:	Federal grant with local revenue
Lead Agency/Department Responsible:	City Administration, Public Works, Police
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

	Hallettsville – Action #8
Proposed Action:	**Upgrade/improve bridges and culverts to prevent flood damages and ensure emergency access after an event.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to infrastructure; increase stormwater capacity; ensure emergency access on roads and bridges after an event; protect citizens.
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):	Moderate
Estimated Cost:	$100,000 – $1,500,000
Potential Funding Sources:	HMGP Grants, PDM, Federal grants with local revenue
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plans

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Economically Sound = 4; and Environmentally Sound = 4

	Hallettsville – Action #9
Proposed Action:	**Develop and implement all hazards education program. Inform citizens of risks associated with hazards threatening the area and provide mitigation measures to reduce risk of damages, injury or illness.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to residents through outreach and public education 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:	Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	$100 – $2,500
Potential Funding Sources:	Federal grants with local revenue
Lead Agency/Department Responsible:	City Administration, Police Department
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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

		Hallettsville – Action #10
	Proposed Action:	**Retrofit at-risk structures with ignition-resistant materials.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide
	Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk of loss of property through improved construction materials.
	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:	$1,000 – $500,000
Potential Funding Sources:	Federal grant with local revenue
Lead Agency/Department Responsible:	City Administration, Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	CWPP

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 3; and Environmentally Sound = 5

	Hallettsville – Action #11
Proposed Action:	**Protect infrastructure including: elevating roads and bridges above base flood elevation, raising low lying bridges, and flood proofing wastewater treatment facilities.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Minimize losses to infrastructure from flood 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:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$300,000 – $1,500,000
Potential Funding Sources:	Federal grant with local revenue
Lead Agency/Department Responsible:	City Administration, Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 3; and Environmentally Sound = 5

Moulton

	Mouton – Action #1
Proposed Action:	**Install low flow faucets in all public buildings.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide public buildings
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce water consumption during times of drought.
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):	Low
Estimated Cost:	$50,000
Potential Funding Sources:	HMGP Grants
Lead Agency/Department Responsible:	City Administration
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 5

	Moulton – Action #2
Proposed Action:	**Implement a community outreach and awareness program for all hazards. Educate citizens of hazards that may threaten the community and provide mitigation measures to reduce potential damages and injuries.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to all hazards through education outreach programs throughout the city.
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, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to residents and existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	City Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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

		Moulton – Action #3
	Proposed Action:	**Purchase and install generators with permanent quick connections at all critical facilities.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide critical facilities
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to citizens and property through continuity of critical 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/Tropical Storm, Lightning, Thunderstorm Wind, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to residents and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$100,000
Potential Funding Sources:	HMGP Grants, PDM
Lead Agency/Department Responsible:	City Administration
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

Shiner

	Shiner – Action #1
Proposed Action:	**Upgrade and expand City of Shiner emergency warning system used to warn residents of severe weather, flooding, natural disasters, etc. as not all residents have capabilities to receive warnings.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City of Shiner
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Protect citizens; prevent loss of life.
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, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	$50,000
Potential Funding Sources:	HMGP Grants
Lead Agency/Department Responsible:	County EMC, Shiner Fire Department
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Response Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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

Yoakum

	Yoakum – Action #1
Proposed Action:	**Protect critical facilities and equipment by installing back-up power generation with permanent quick connections.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Fire Station and Brush Creek Water Plant
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce downtime at critical facilities during severe weather event and ensure continuity of 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/Tropical Storm, Lightning, Thunderstorm Wind, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	$30,000 – $100,000 per site
Potential Funding Sources:	Federal grants with local funding
Lead Agency/Department Responsible:	Fire Department, Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Response Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 4

		Yoakum – Action #2
	Proposed Action:	**Protect critical facilities and equipment by installing lightning arrestors.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	All water and waste water facilities and critical communication systems
	Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce downtime at critical facilities during severe weather event and ensure continuity of 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):	High
Estimated Cost:	$10,000 – $20,000 per site
Potential Funding Sources:	Federal grants with local funding
Lead Agency/Department Responsible:	Police and Fire Department in coordination with Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 4

	Yoakum – Action #3
Proposed Action:	**Improve/upgrade sections of Kennedy Ditch and drainage outfall.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Kennedy Ditch from May Street south to receiving creek in County
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Decrease the risk of flooding of real and personal property and reduce potential loss of life.
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:	$100,000 – $500,000
Potential Funding Sources:	Federal grants with local funding
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

		Yoakum – Action #4
	Proposed Action:	**Training for first responders regarding weather related risks.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide, first responders and communication professionals
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Increase knowledge of protocols to first responders and city dispatch.
	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:	Extreme Heat, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk of injury, loss of life and property loss
Priority (High, Moderate, Low):	High
Estimated Cost:	$1,000
Potential Funding Sources:	Local Funding
Lead Agency/Department Responsible:	Fire/EMS, Police
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

	Yoakum – Action #5
Proposed Action:	**Community outreach to increase membership in CodeRed Emergency Notification System.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Prevent injury and loss of life through early warning of natural hazards and environmental risks.
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, Flood, Hail, Hurricane/Tropical Storm, Thunderstorm Wind, Lightning, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	$1,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Fire/EMS, Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Community Outreach

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 3; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

	Yoakum – Action #6
Proposed Action:	**Develop and implement plan to expand clearing of easements along main electrical and water distribution lines.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	All main line electrical distribution lines
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Increase service access for ongoing inspection and reduce downtime within electric service area during severe weather event; ensure continuity of 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, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$50,000 – $150,000
Potential Funding Sources:	Federal grants with local funding
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

		Yoakum – Action #7
	Proposed Action:	**Develop and implement plan to improve drainage and reduce street flooding along Koether#2 and Tozik Streets in high school area.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	Koether#2/Tozik/McKinnon Streets to Brushy Creek
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Decrease the risk of flooding of real and personal property and reduce potential loss of life.
	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):	Moderate
Estimated Cost:	$200,000 – $350,000
Potential Funding Sources:	Federal grants with local funding
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
High School facilities serve as place of refuge for community during weather events.
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

		Yoakum – Action #8
	Proposed Action:	**Cut fire breaks and access areas along railroad and creek beds.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Increase access to first responders and city crews; reduce spread of wildfire.
	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 and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$80,000 – $150,000
Potential Funding Sources:	Federal grant and local funding with in-kind services
Lead Agency/Department Responsible:	Fire/EMS, Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

	Yoakum – Action #9
Proposed Action:	**Clear debris from drainage inlet, culverts, underground pipes and drainage ways serving arterial and collector streets.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Along all arterial and collector streets
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Decrease the risk of flooding of real and personal property and reduce potential loss of life.
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 of property loss and road damage
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$50,000 – $100,000
Potential Funding Sources:	Federal grants with local funding and in-kind services
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 24-48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

		Yoakum – Action #10
	Proposed Action:	**Proactively replace aged water service lines and hydrants.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Replacement of aged water lines; elimination of dead end loops; upgrade of fire hydrants.
	Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure Project (Preparedness)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Drought, Wildfire
Effect on New/Existing Buildings:	Reduce risk of injury, loss of life and property loss
Priority (High, Moderate, Low):	Low
Estimated Cost:	$50,000 per main extension
Potential Funding Sources:	Federal grant with local revenue
Lead Agency/Department Responsible:	Fire/EMS, Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

	Yoakum – Action #11
Proposed Action:	**Periodic update of City's drought contingency plan and water conservation plan.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Protect water resources in response to high demand and loss of supply.
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, Drought, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	$5,000
Potential Funding Sources:	Federal grant with local revenue
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

	Yoakum – Action #12
Proposed Action:	**Purchase and distribute NOAA Weather radios.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risks to residents through early warning.
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, Flood, Hail, Hurricane/Tropical Storm, Thunderstorm Wind, Lightning, Drought, Wildfire, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to residents and existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	$5,000
Potential Funding Sources:	Federal grants
Lead Agency/Department Responsible:	Fire/EMS
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Emergency Response Plan

COMMENTS
Target radios to households and businesses without internet service.
Additional Considerations: The following STAPLE+E 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 = 5; Politically Acceptable = 4; Legal = 5; Economically Sound = 2; and Environmentally Sound = 4

		Yoakum – Action #13
	Proposed Action:	**Provide weather resistant storage for emergency response vehicles and critical equipment.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City Hall, Police Department, Transfer Station and Rodeo Arena
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Increase response time and reduce damage to critical equipment during severe weather event.
	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/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Winter Storm, Extreme Heat
Effect on New/Existing Buildings:	Reduce risk to existing and future assets
Priority (High, Moderate, Low):	Low
Estimated Cost:	$50,000 – $75,000 per site
Potential Funding Sources:	Federal grants with local funding
Lead Agency/Department Responsible:	Police, Fire, Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLE+E 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 = 4; and Environmentally Sound = 4

Section 17: Plan Maintenance

Plan Maintenance Procedures

The following is an explanation of how Lavaca 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

Lavaca 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 Lavaca County will incorporate elements of the mitigation plan into other planning mechanisms.

Process of Incorporation

Once the Plan is adopted, Lavaca 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.

Lavaca 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 Update, 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.

Lavaca County is committed to supporting the cities, communities, and participating jurisdictions as they implement their mitigation actions. Lavaca County and participating planning team members will review and revise, as necessary, the long-range goals and objectives in strategic plans 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 17-1 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts. The team members, listed in Table 17-2 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 17-1. Methods of Incorporation of the Plan

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
Grant Applications	Lavaca County: Deputy Emergency Management Coordinator City of Hallettsville: City Secretary/Administrator City of Moulton: City Secretary City of Shiner: Emergency Management Coordinator City of Yoakum: Fire Chief	The Plan will be evaluated by Lavaca 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.
Annual Budget Review	Lavaca County: Deputy Emergency Management Coordinator City of Hallettsville: City Secretary/Administrator City of Moulton: City Secretary City of Shiner: Emergency Management Coordinator City of Yoakum: Fire Chief (in coordination with the City Manager)	Various departments and key personnel that participated in the planning process for Lavaca 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.

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
Regulatory Plans	Lavaca County: Deputy Emergency Management Coordinator City of Hallettsville: City Secretary/Administrator City of Moulton: City Secretary City of Shiner: Emergency Management Coordinator City of Yoakum: Fire Chief	Currently, Lavaca County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, and Post-disaster Recovery 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.
Drought Contingency Plan	Lavaca County: Deputy Emergency Management Coordinator City of Hallettsville: City Secretary/Administrator City of Moulton: City Secretary City of Shiner: Emergency Management Coordinator City of Yoakum: Fire Chief	Participating jurisdictions have a Drought Contingency Plans written into their local code of ordinances. The Plan will be consulted when County and City departments review or revise their current Drought Contingency Plan. Drought actions identified in Section 16 of the plan may be implemented to compliment water restriction regulations currently in place.
Floodplain Management Plans	Lavaca County: Floodplain Manager City of Hallettsville: Floodplain Manager City of Moulton: Floodplain Manager City of Shiner: Floodplain Manager City of Yoakum: Floodplain Manager	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 5 of this Plan discussing the people and property at risk to flood, will be reviewed and revised when Lavaca County updates their management plans or develops new plans.

Monitoring and Evaluation

Periodic revisions of the Plan are required to ensure that its goals, objectives, and mitigation actions are kept current. Revisions may be required to ensure the Plan continues to be in compliance with federal and state statutes and regulations. This section outlines the procedures for completing Plan revisions, updates, and review. Table 17-2 indicates the department and title of the party responsible for Plan monitoring, evaluating, updating, and review of the Plan.

Table 17-2. Team Members Responsible for Plan Monitoring, Evaluating, Updating, and Review of the Plan

JURISDICTION	TITLE
Lavaca County	Deputy Emergency Management Coordinator – Team Lead

JURISDICTION	TITLE
Hallettsville	City Secretary/Administrator
Moulton	City Secretary
Shiner	Emergency Management Coordinator
Yoakum	Fire Chief

Monitoring

Designated Planning Team members are responsible for monitoring, updating, and reviewing the Plan, as shown in Table 17-2. Individuals holding the title listed in Table 17-2 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 the hazards that pose a risk to the planning area and updating the risk assessment when warranted; 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 if changes to the Plan are needed, such as recommending an action for funding. 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 including 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. 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 Lavaca 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 review 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 Lavaca County's website where officials and the public are invited to provide ongoing feedback via email to eoc@co.lavaca.tx.us.

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 Lavaca County Hazard Mitigation Plan Update was organized using a direct representative model. An Executive Planning Team from Lavaca 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 representatives from other county departments that participated throughout the planning process. Table A-3 is comprised of stakeholders who were invited to provide Plan update input. Public outreach efforts and meeting documentation is provided in Appendix D.

Table A-1. Executive Planning Team

JURISDICTION/DEPARTMENT	TITLE
Lavaca County	County Sheriff
Lavaca County	Deputy Emergency Management Coordinator
Lavaca County	Executive Assistant
City of Hallettsville	City Secretary/Administrator
City of Moulton	City Secretary
City of Shiner	Emergency Management Coordinator
City of Shiner	Police Chief
City of Yoakum	Fire Chief
City of Yoakum	City Manager

Table A-2. Advisory Planning Team

JURISDICTION/DEPARTMENT	TITLE
Lavaca County	County Auditor
Lavaca County	County Judge
Lavaca County	County Treasurer

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, independent school districts, and legislators. The public were also invited to participate via e-mail throughout the planning process. For a list of attendees at meetings, please see Appendix D[1].

Table A-3. Stakeholders

AGENCY	TITLE
Sweet Home Independent School District	Superintendent
Moulton Independent School District	Superintendent
Shiner Independent School District	Superintendent
Vysehrad Independent School District	Superintendent
Yoakum Independent School District	Superintendent
DeWitt County	Judge
Gonzales County	Judge
Fayette County	Judge
Colorado County	Judge
Wharton County	Judge
Texas House of Representatives	State Representative for the Area
Texas Senate	State Senator for the Area

[1] Information contained in Appendix E is exempt from public release under the Freedom of Information Act (FOIA).

Appendix B: Public Survey Results

Overview

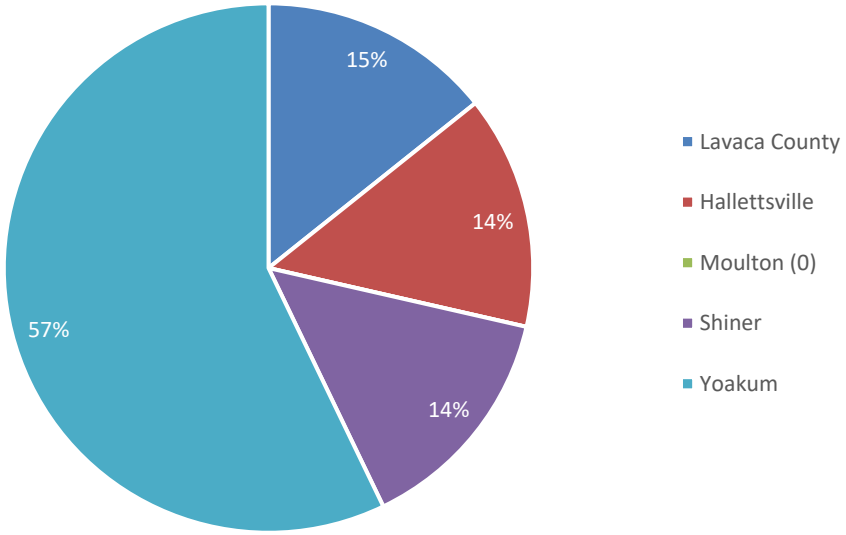
Lavaca County prepared a public survey that requested public opinion on a wide range of questions relating to natural hazards. The survey was made available on websites, including Lavaca County's website. This survey link was also distributed at public meetings and stakeholder events throughout the planning process.

A total of 7 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.

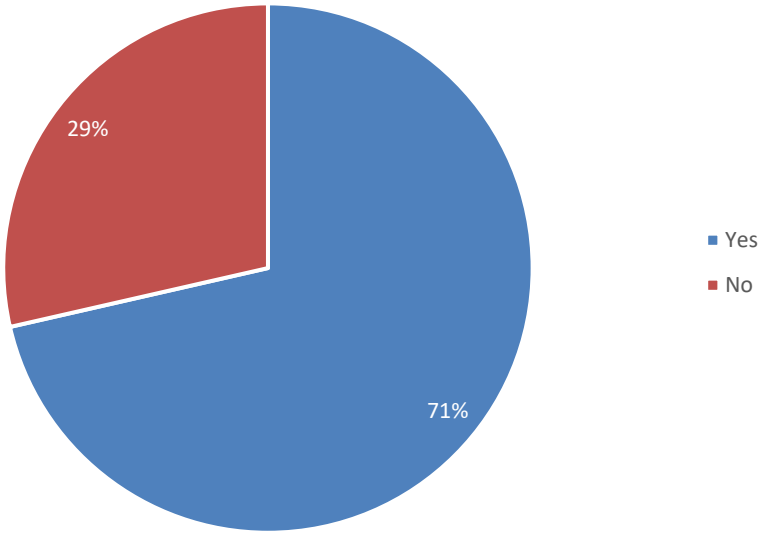
The following survey results depict the percentage of responses for each answer. Similar responses have been summarized for questions that did not provide a multiple-choice answer or that required an explanation.

Public Survey Results

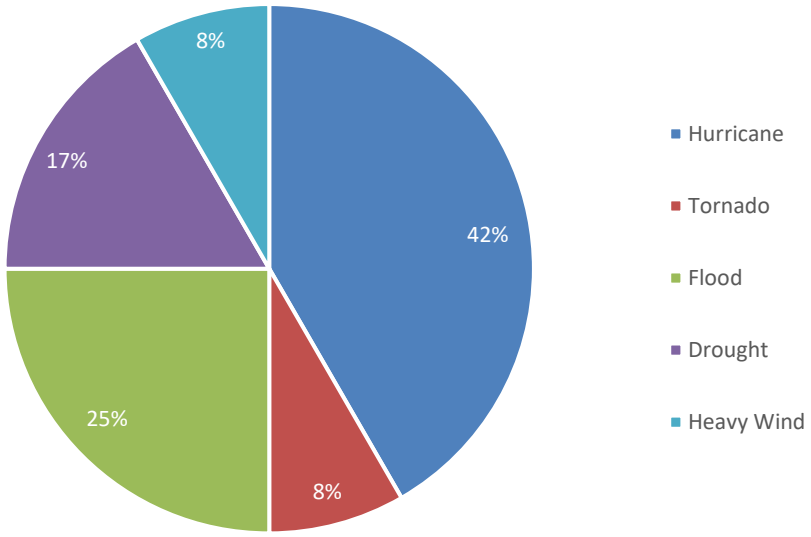
1. Please state the jurisdiction (city or community) where you reside.



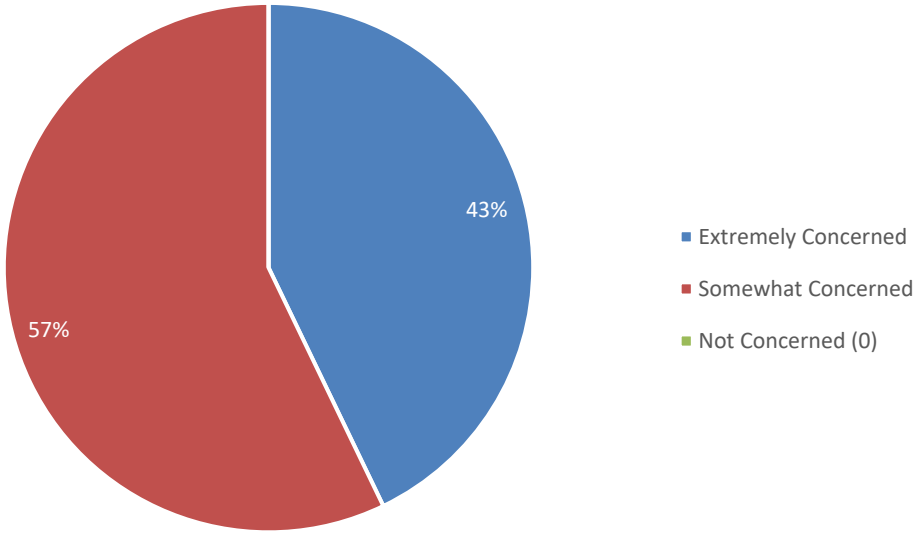
2. A. Have you ever experienced or been impacted by a disaster?



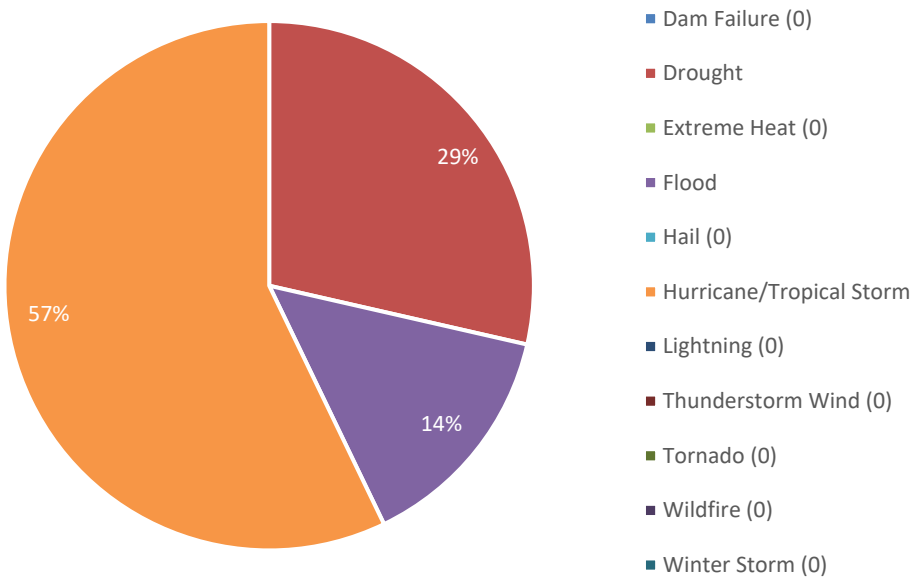
2. B. If “Yes”, please explain:



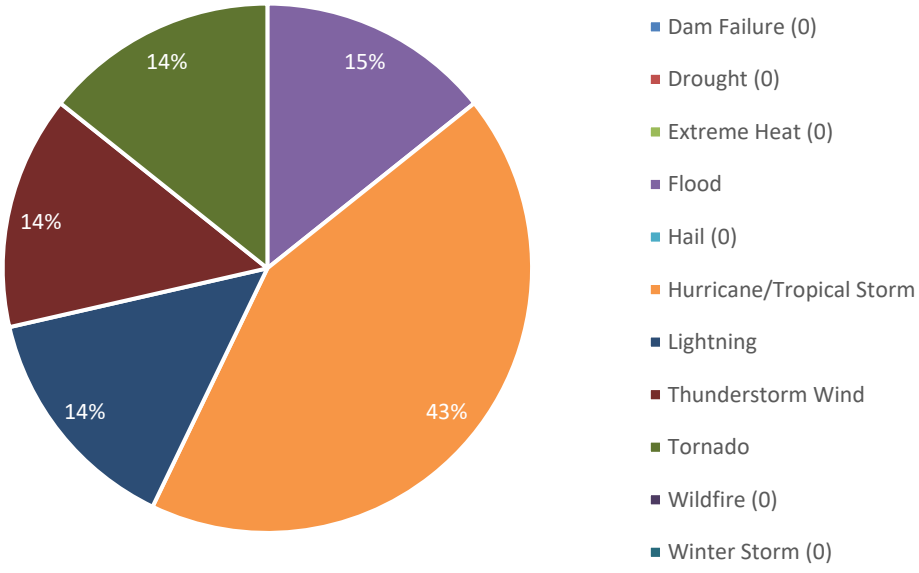
3. How concerned are you about the possibility of your community being impacted by a disaster?



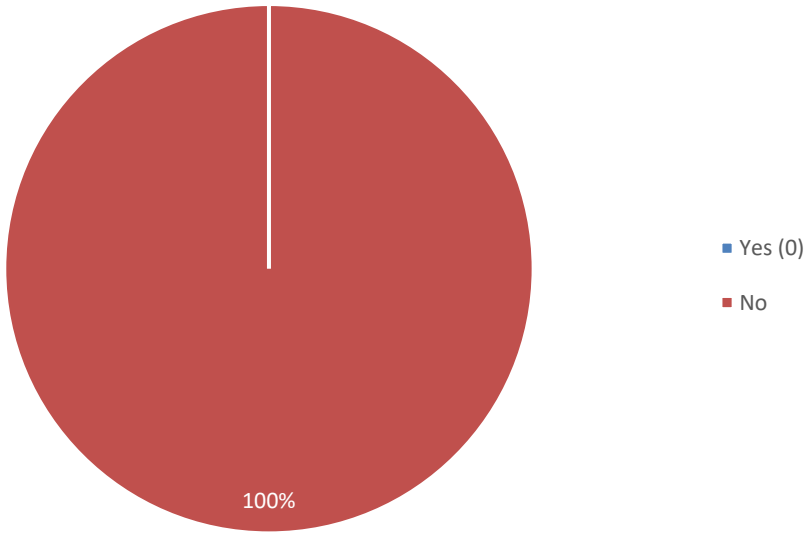
4. Please select the one hazard you think is the highest threat to your neighborhood:



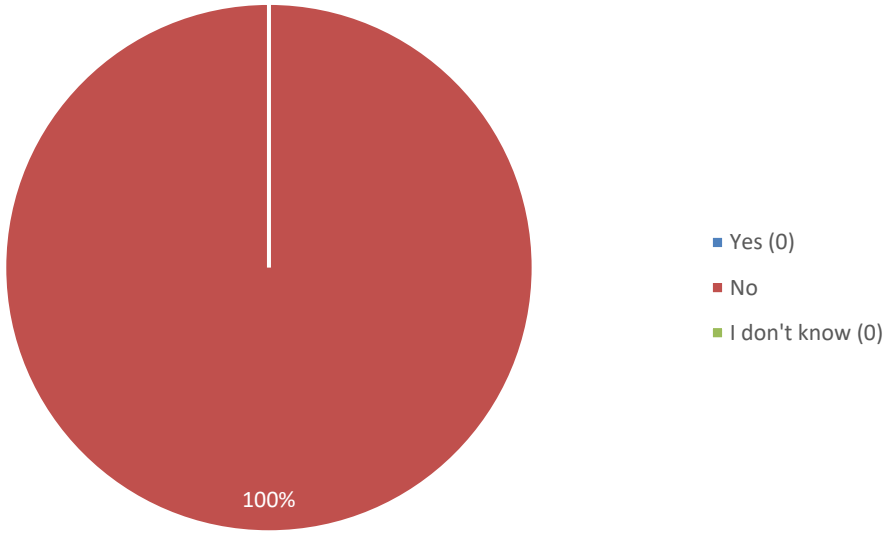
5. Please select the one hazard you think is the second highest threat to your neighborhood:



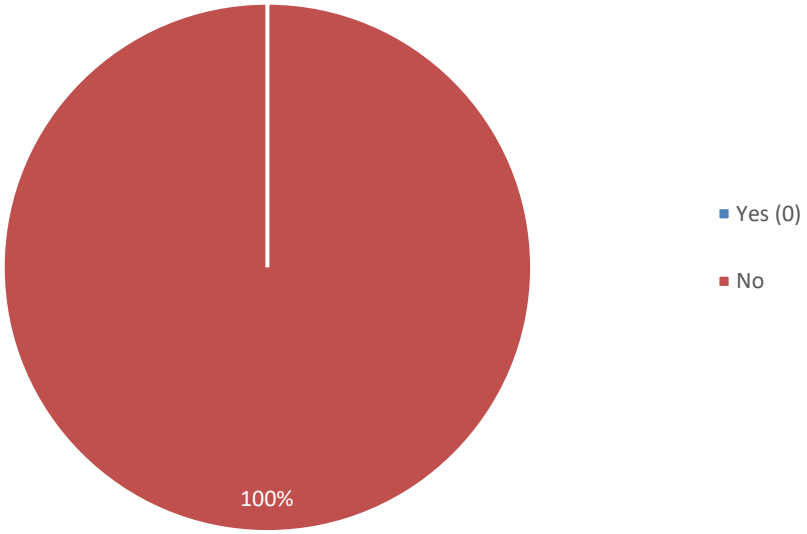
6. A. Are there hazards not listed above that you think are a wide-scale threat to your neighborhood?



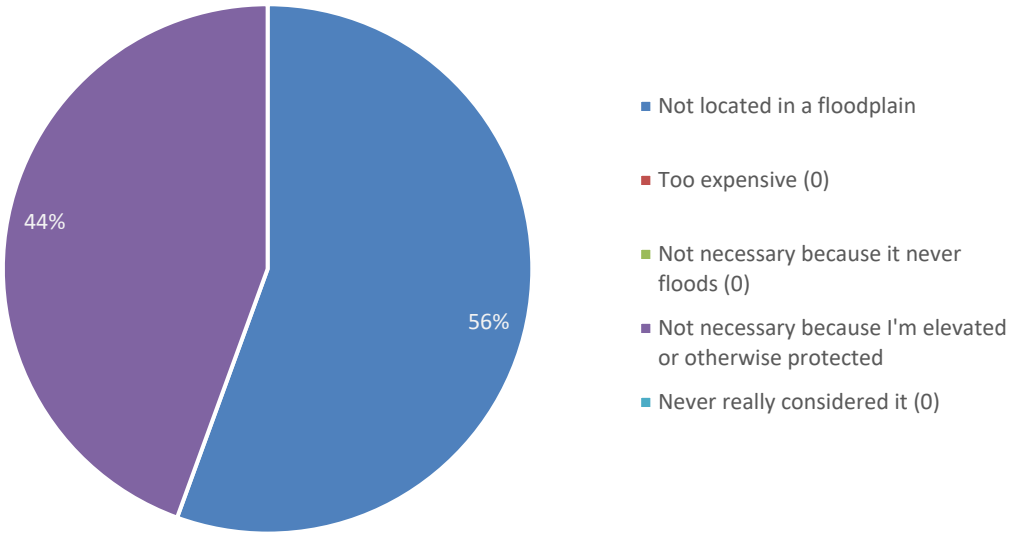
7. Is your home located in a floodplain?



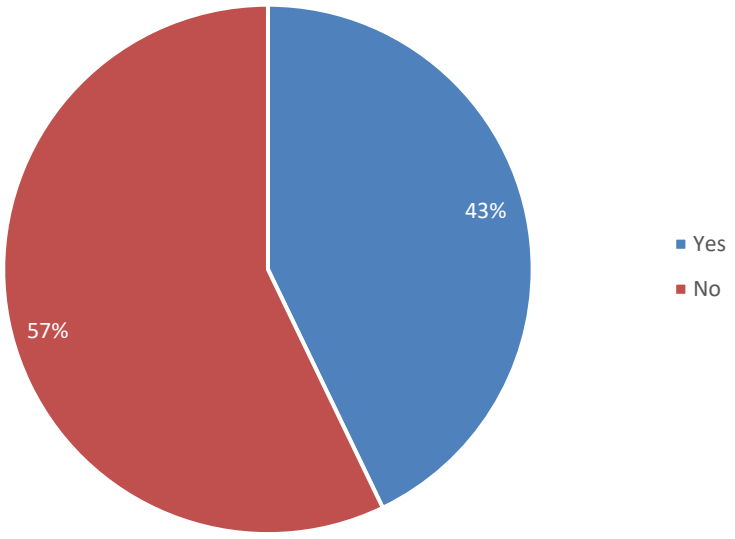
8. Do you have flood insurance?



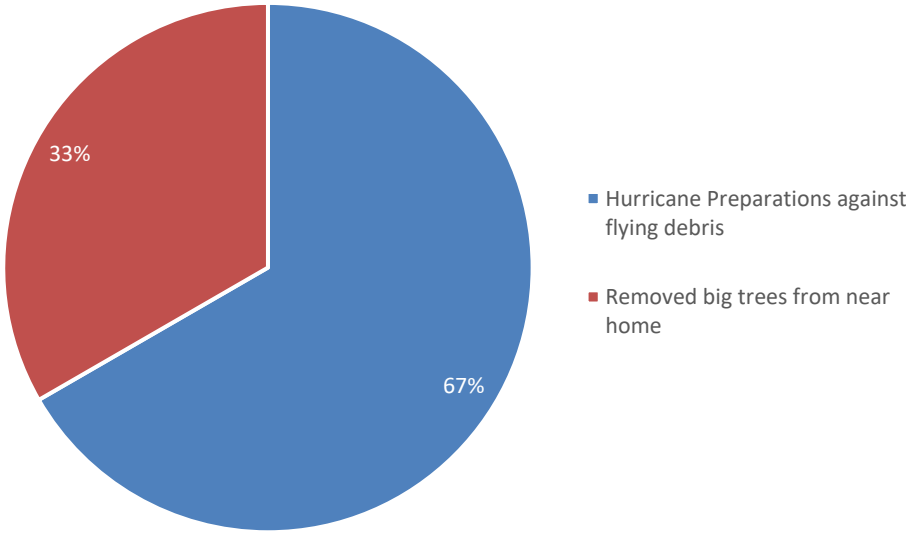
9. If you do not have flood insurance, why not?



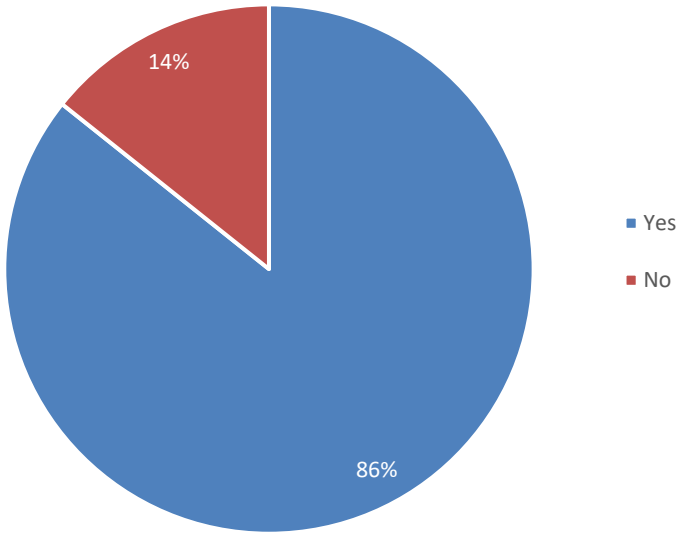
10. A. Have you taken any actions to make your home or neighborhood more resistant to hazards?



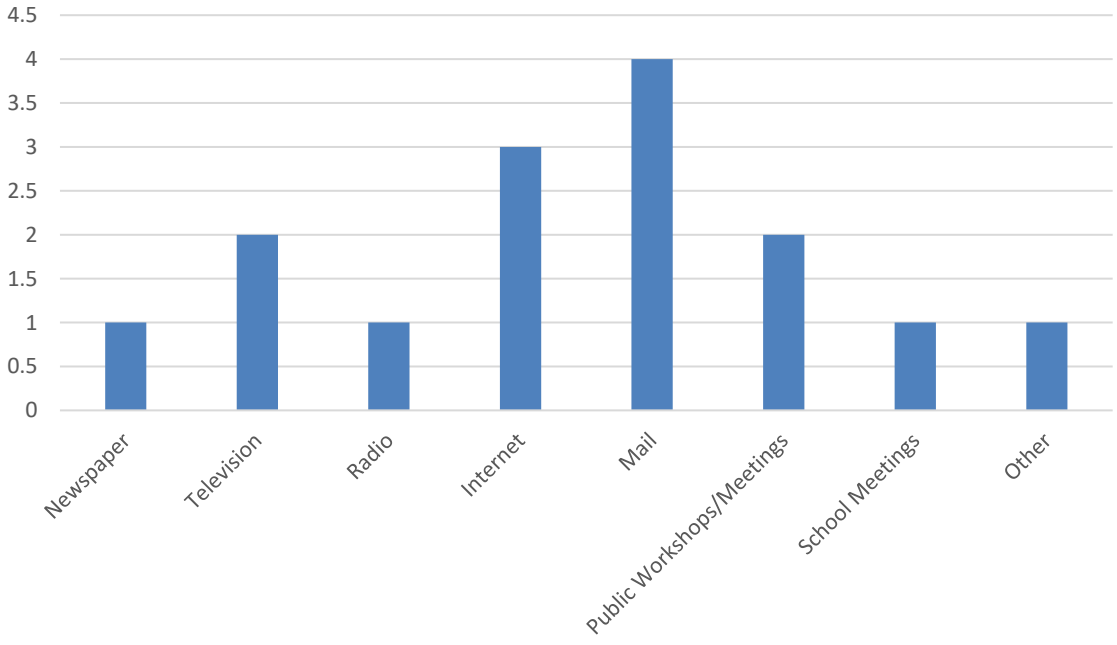
10. B. What have you done?



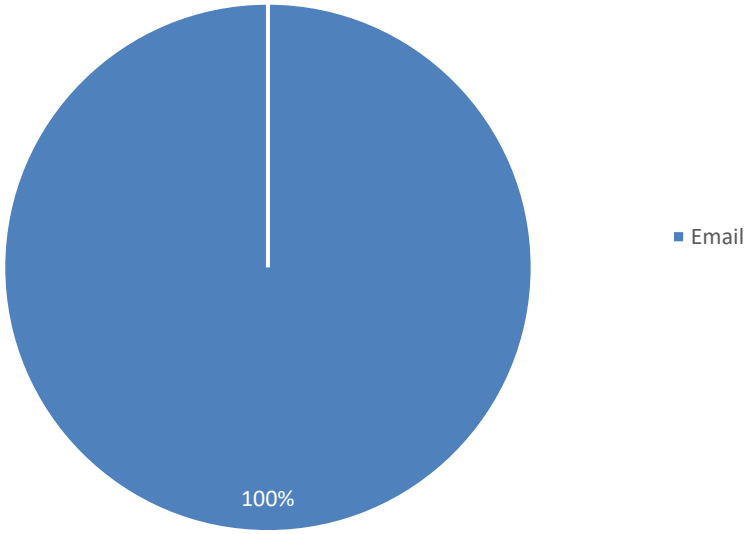
11. Are you interested in making your home or neighborhood more resistant to hazards?



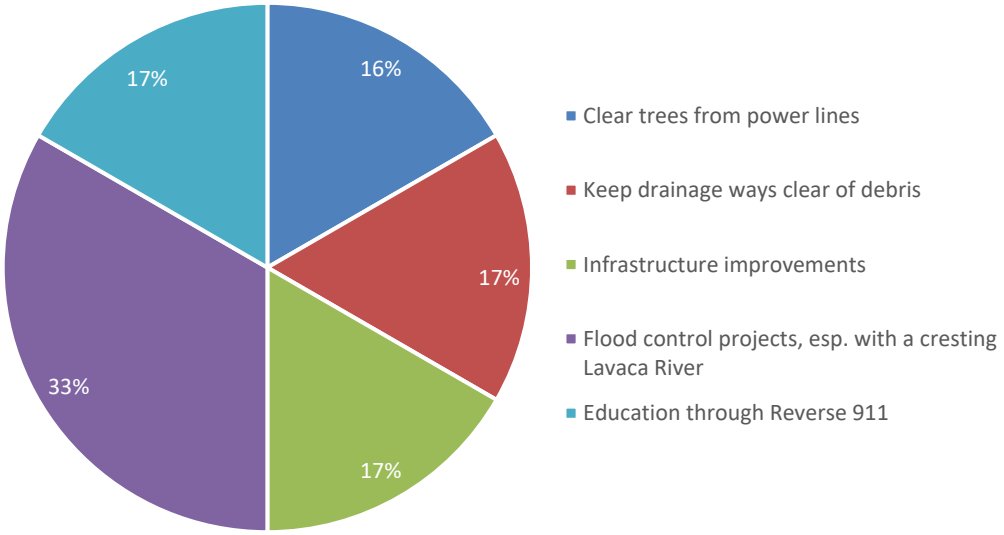
12. A. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?



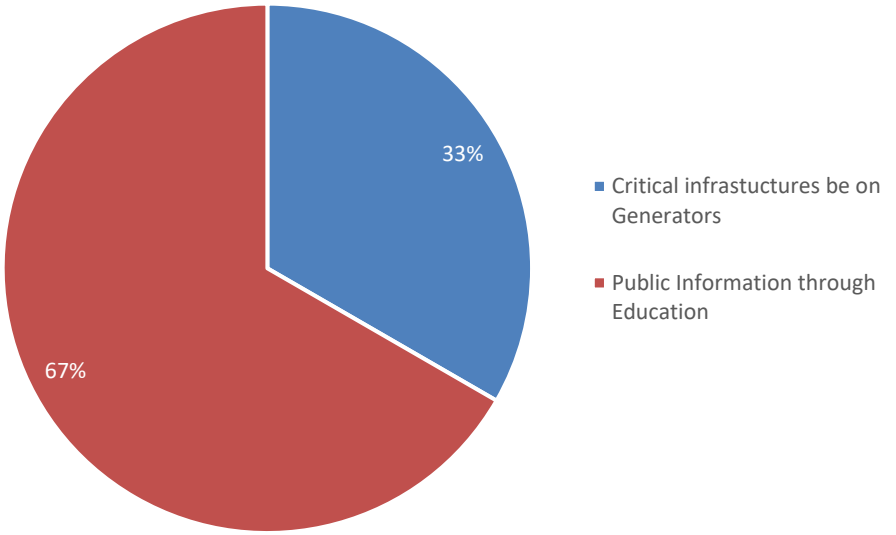
12. B. If “Other”, please specify.



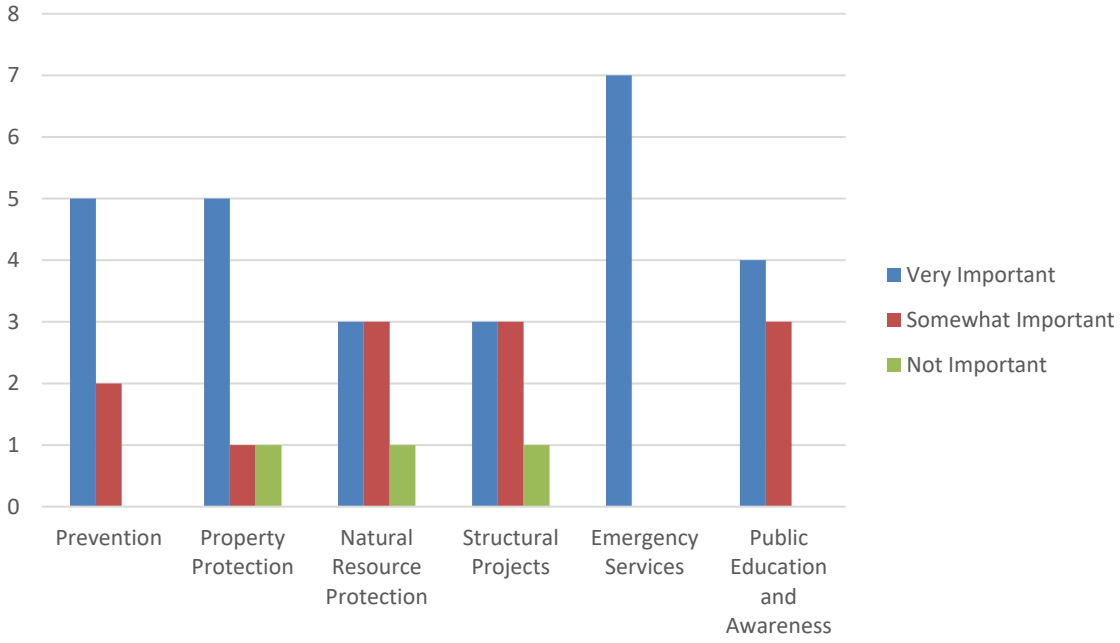
13. In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?



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

Overview

This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under FOIA. Figures C-1 through C-5 locate all critical facilities that were included in the risk assessment. Mapped facilities were provided by Planning Team members. Tables C-1 through C-5 note the critical facilities by type.

Critical Facilities

Figure C-1. Critical Facilities in Lavaca County

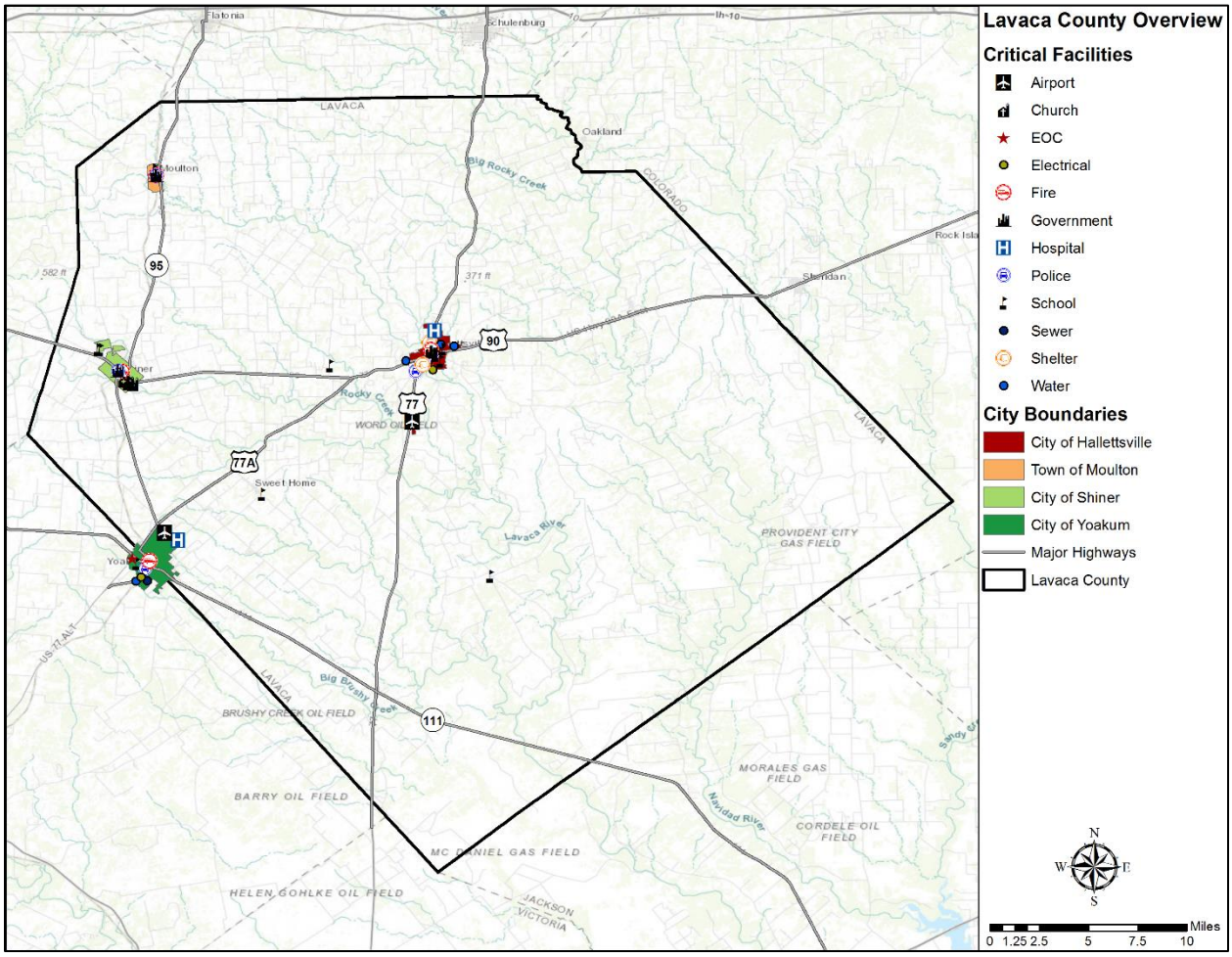


Table C-1. Critical Facilities by Type in Lavaca County

TYPE	NUMBER
Police Department	3
Fire Station	3
Government Building	4
Law Enforcement	1
Hospital	1
Airport	1
School	14
Evacuation Center	1

Figure C-2. Critical Facilities in the City of Hallettsville

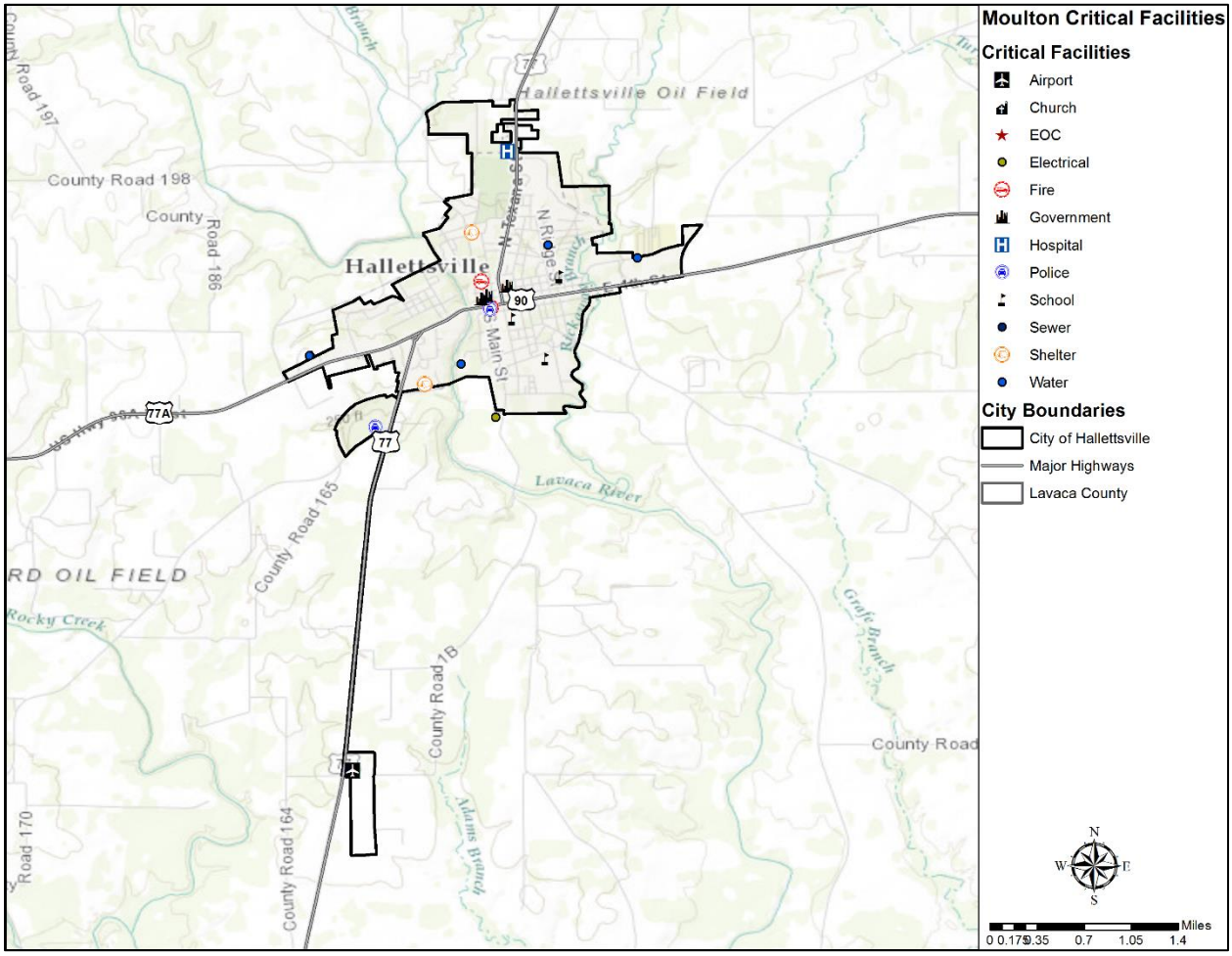


Table C-2. Critical Facilities by Type in the City of Hallettsville

TYPE	NUMBER
Police Department	1
Fire Department	1
Wastewater Treatment Facility	1
Municipal Airport	1
Emergency Shelter	1
Substation	1
Water well and booster station	3
Heavy Equipment Storage	1

Figure C-3. Critical Facilities in the City of Moulton

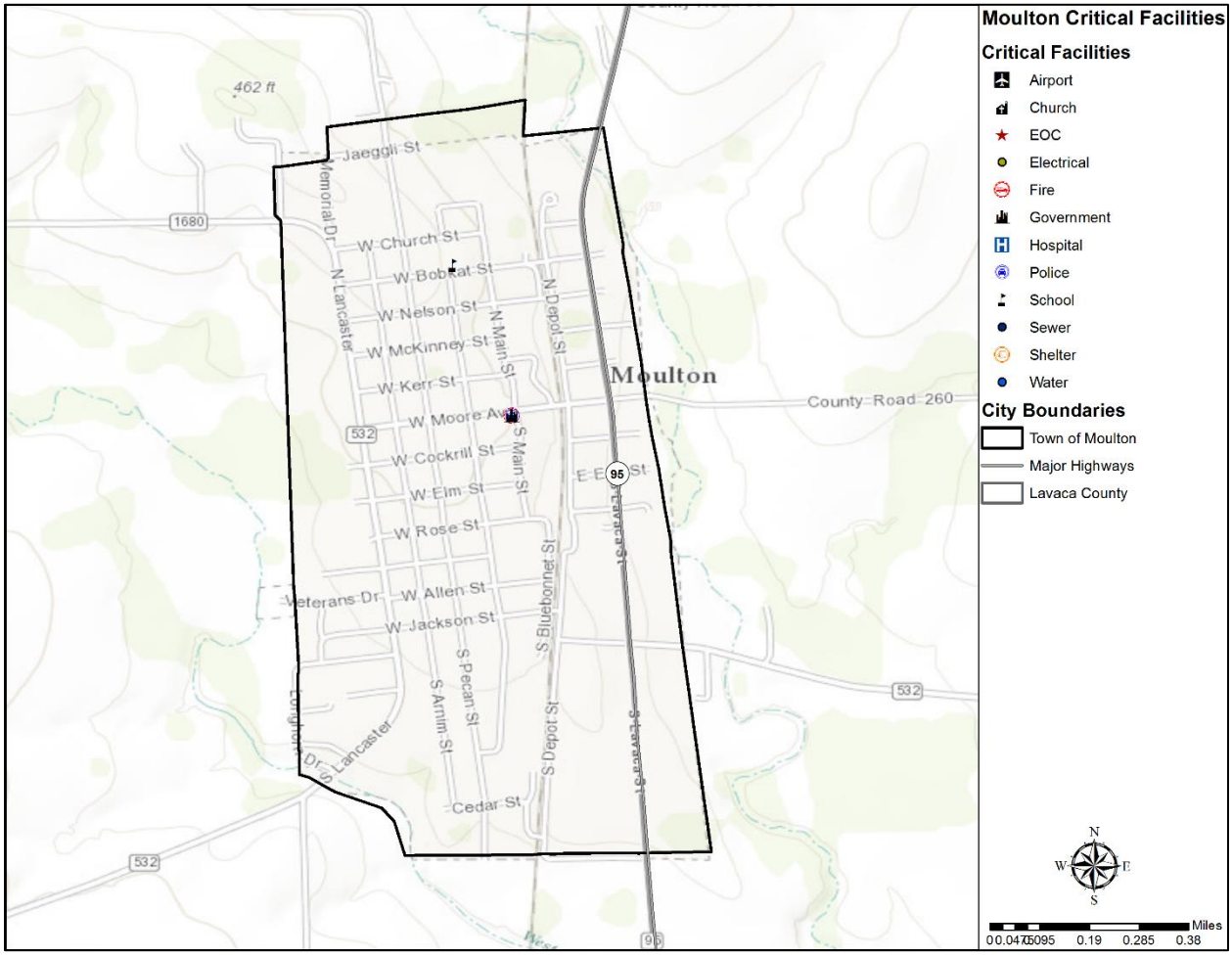


Table C-3. Critical Facilities by Type in the City of Moulton

TYPE	NUMBER
City Hall Building	1
Police Department	1
Fire Department	1
Community Center	1
High School	1
Nursing Home	1
Water Plant	1
Sewer Plant	1
Water Well Facility	4

Figure C-4. Critical Facilities in the City of Shiner

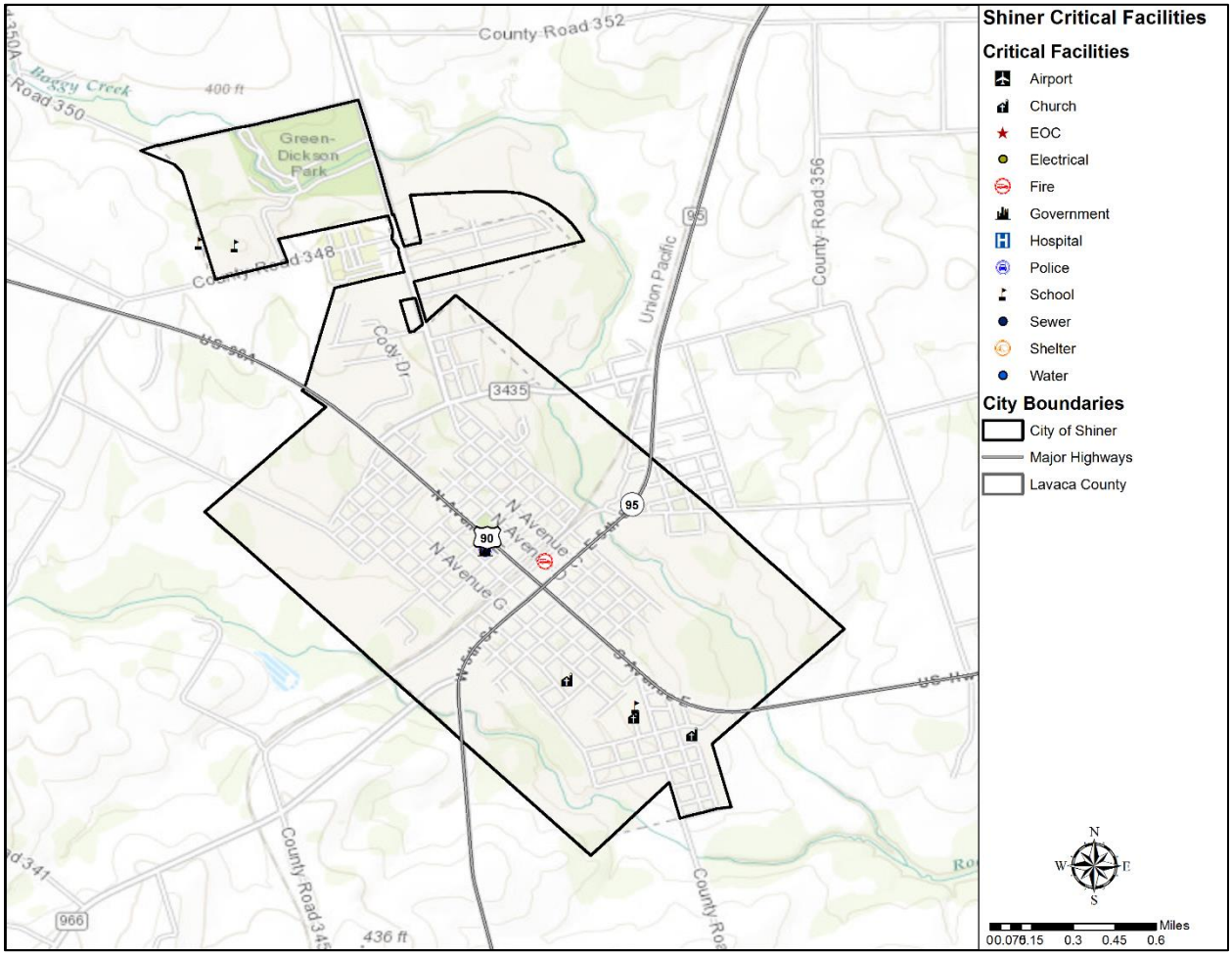


Table C-4. Critical Facilities by Type in the City of Shiner

TYPE	NUMBER
Police Station	1
Fire Station	1
School	1
Church	3

Figure C-5. Critical Facilities in the City of Yoakum

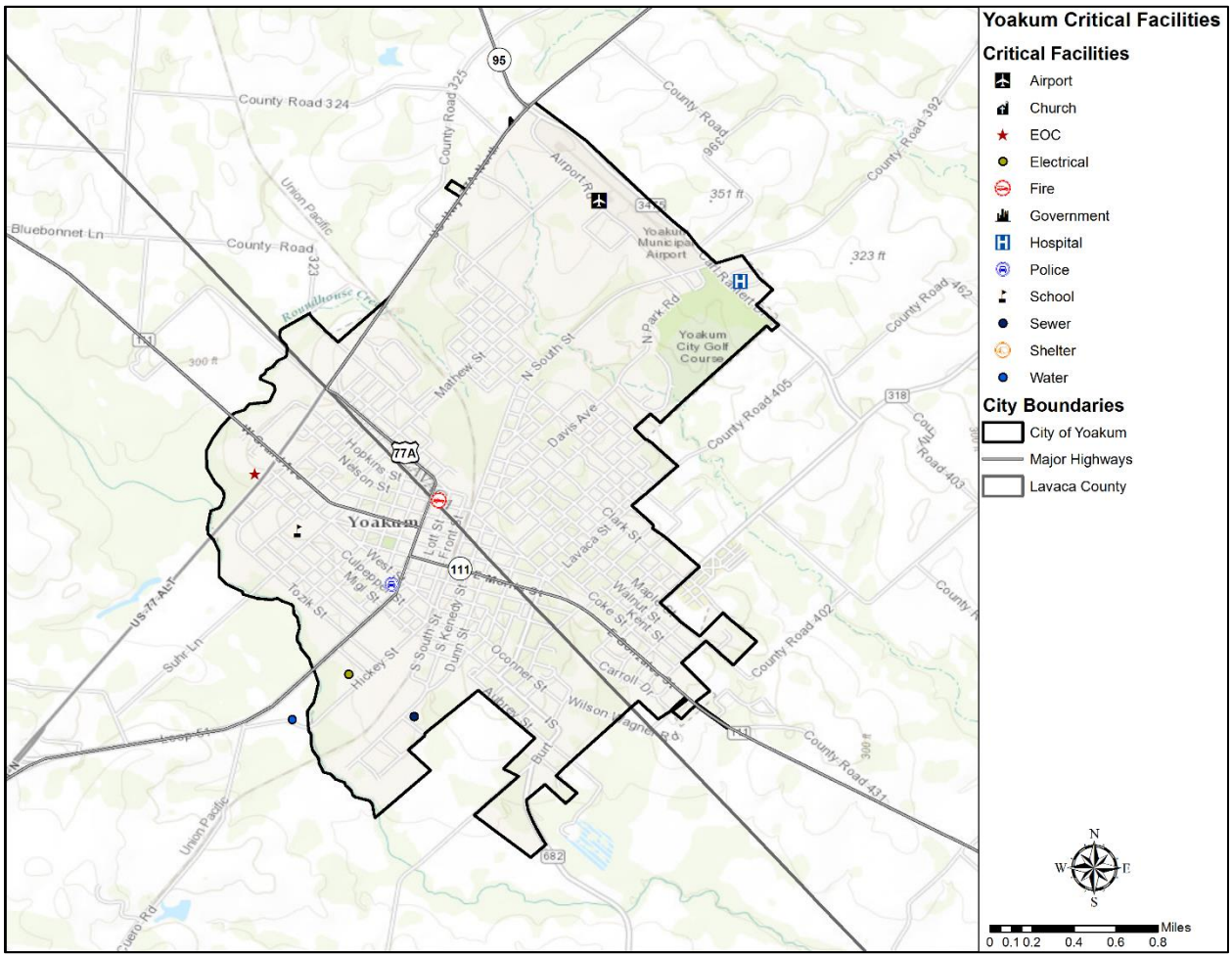


Table C-5. Critical Facilities by Type in the City of Yoakum

TYPE	NUMBER
Hospital / Heliport	1
Police / Dispatch	1
Fire / EMS	1
School / Emergency Shelter	1
City Hall / EOC	1
Airport	1
Sewer Treatment Plan	1
Water Plant	1
Electrical Substation	1

Appendix D: Meeting Documentation

Workshop Documentation

Appendix D is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

Lavaca County held a series of Planning Team workshops: a Kickoff Workshop on December 15, 2016, a Risk Assessment Workshop on April 20, 2017, and a Mitigation Workshop on July 12, 2017. At each of these workshops members of the Planning Team were informed of the planning process, expressed opinions, and volunteered information. Lavaca County hosted three public meetings (following each workshop). The sign-in sheets for each workshop and public meeting are included below. For more details on the workshops and planning process, see Section 2.

Figure D-1. Lavaca County, Kickoff Workshop, 12.15.16

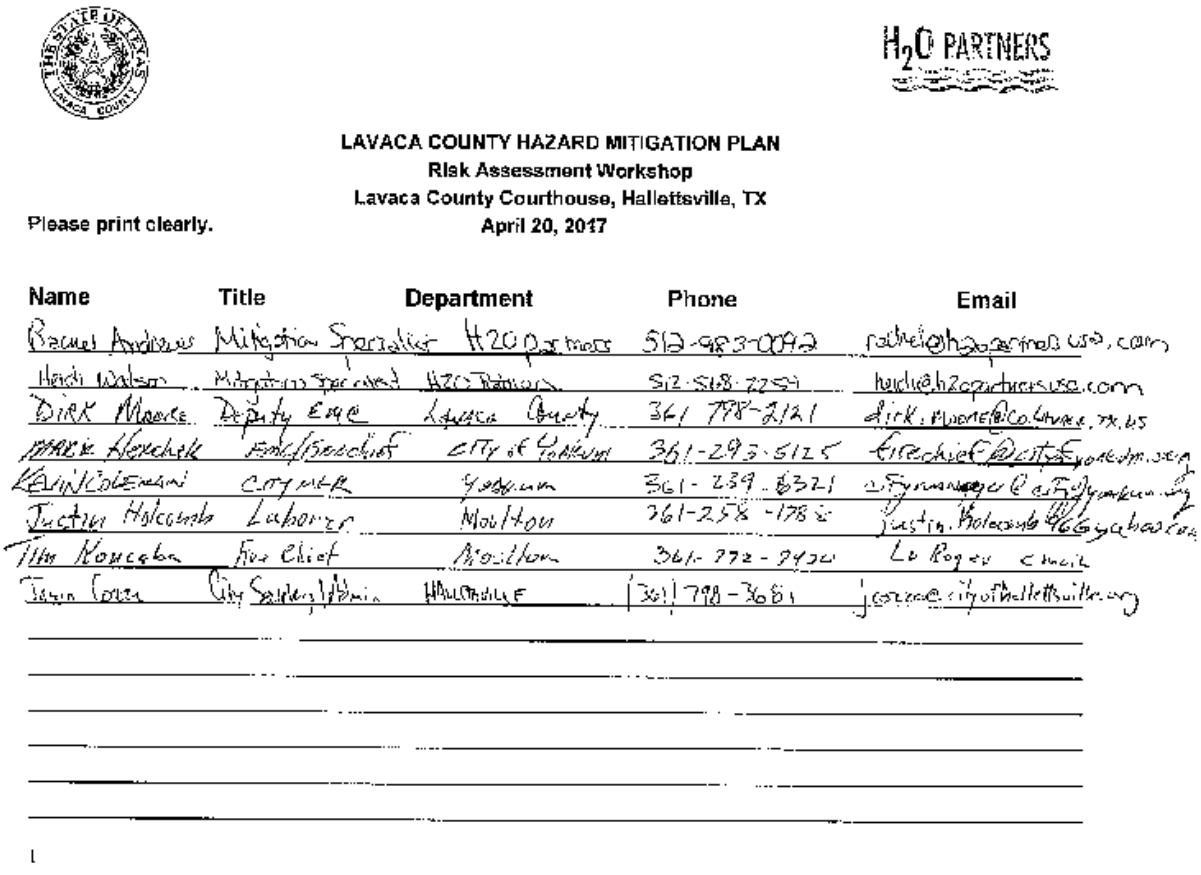
H20 PARTNERS

LAVACA COUNTY HAZARD MITIGATION PLAN
Kick Off Workshop
Lavaca County Courthouse, Hallettsville, TX
December 15, 2016

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H20 Partners	512-983-0092	rachel@h2opartnersusa.com
Shana Opela	Co. Auditor	Auditor	361-798-2711	sopela@lavacaco.net
Dirk Moore	Dep. EMC	Lavaca County	361 798-2121	dirk.moore@co.lavaca.tx.us
Mark Herchek	EMC/Franchise	City of Yoakum	361-293-5125	franchise@cityofyoakum.org
MICAH HARMON	EMC/SHERIFF	LAVACA Co.	361-798-2121	MHARMON@CO-LAVACA.TX.US
Jeanmer Wolter	County Judge	Lavaca Co	361-798-2301	JudgeTW@lavacacounty.net
James G. Pustka	EMC	City of Shiner	361-772-1109	jpustka@shinerbbl.net

Figure D-2. Lavaca County Risk Assessment Workshop, 04.20.17



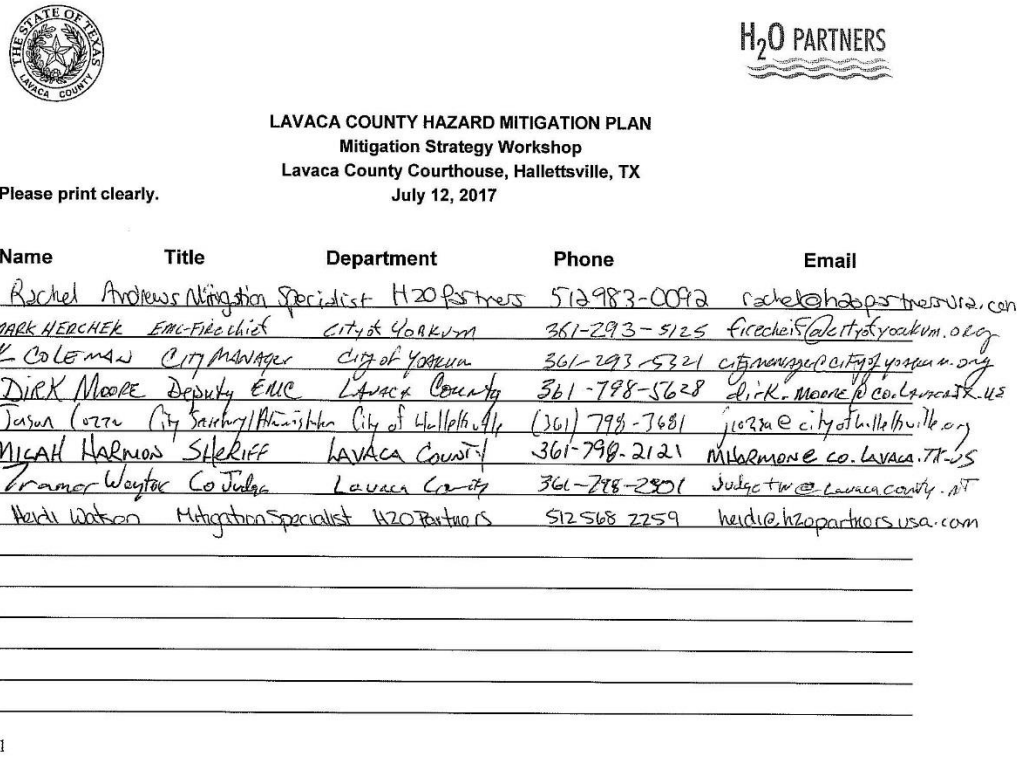
H2O PARTNERS

LAVACA COUNTY HAZARD MITIGATION PLAN
Risk Assessment Workshop
Lavaca County Courthouse, Hallettsville, TX
April 20, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512-983-0042	rachel@h2opartnersusa.com
Heidi Watson	Mitigation Specialist	H2O Partners	512-568-2259	heidi@h2opartnersusa.com
DIRK Moore	Deputy Emc	Lavaca County	361 798-2121	dirk.moore@co.lavaca.tx.us
MARK Herchek	Fire/EMS Chief	City of Yoakum	361-293-5125	firechief@cityofyoakum.com
KEVIN COLEMAN	CITY MGR	Yoakum	361-239-6321	citymanager@cityofyoakum.org
Justin Holcomb	Laborer	Moulton	361-258-1781	justin.holcomb466@yahoo.com
Tim Moncebe	Fire Chief	Moulton	361-772-9420	Lo Rogers email
Jason Cook	City Secretary/Admin	Hallettsville	361 798-3681	jcook@cityofhallettsville.org

Figure D-3. Lavaca County Mitigation Strategy Workshop, 07.12.17



H2O PARTNERS

LAVACA COUNTY HAZARD MITIGATION PLAN
Mitigation Strategy Workshop
Lavaca County Courthouse, Hallettsville, TX
July 12, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512983-0092	rachel@h2opartnersusa.com
MARK HERCHEK	EMC-Fire Chief	City of Yoakum	361-293-5125	firechief@cityofyoakum.org
K COLEMAN	CITY MANAGER	city of YOAKUM	361-293-5321	citymanager@cityofyoakum.org
DIRK MOORE	Deputy EMC	Lavaca County	361-798-5628	dirk.moore@co.lavaca.tx.us
Jason Cozzo	City Secretary/Administrator	City of Hallettsville	(361) 798-3681	jcozzo@cityofhallettsville.org
MICAH HARMON	SHERIFF	LAVACA COUNTY	361-798-2121	MHARMON@co.lavaca.TX.US
Kramer Weyton	Co Judge	Lavaca County	361-798-2801	Judgektw@lavacacounty.NET
Heidi Watson	Mitigation Specialist	H2O Partners	512 568 2259	heidi@h2opartnersusa.com

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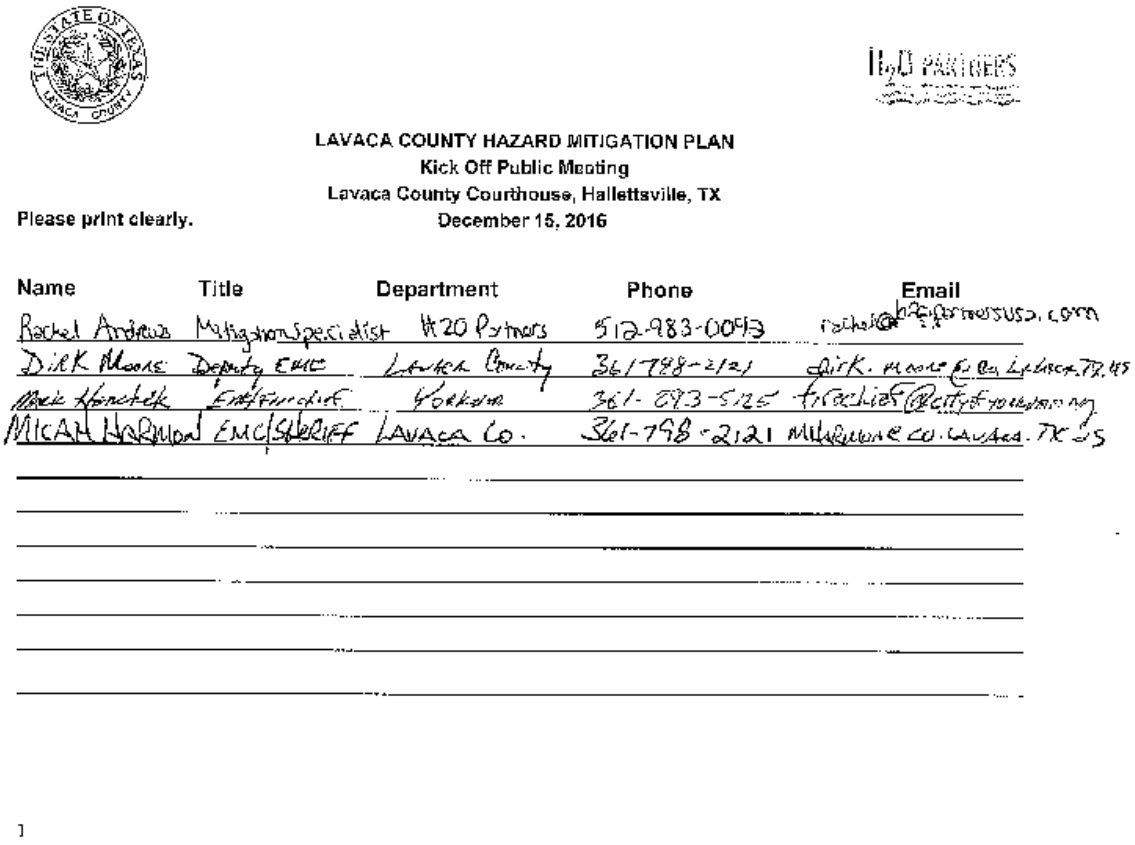
Public Meeting Documentation

As discussed in Section 2, a series of three public meetings were held in conjunction with each of the Lavaca County workshops. Survey respondents were asked if they wanted to be informed about public meetings, and these respondents were invited to the public meetings. Documentation in the form of sign-in sheets for each of the meetings follows.

Figure D-4. Lavaca County Public Kickoff Workshop Public Meeting, 12.15.16



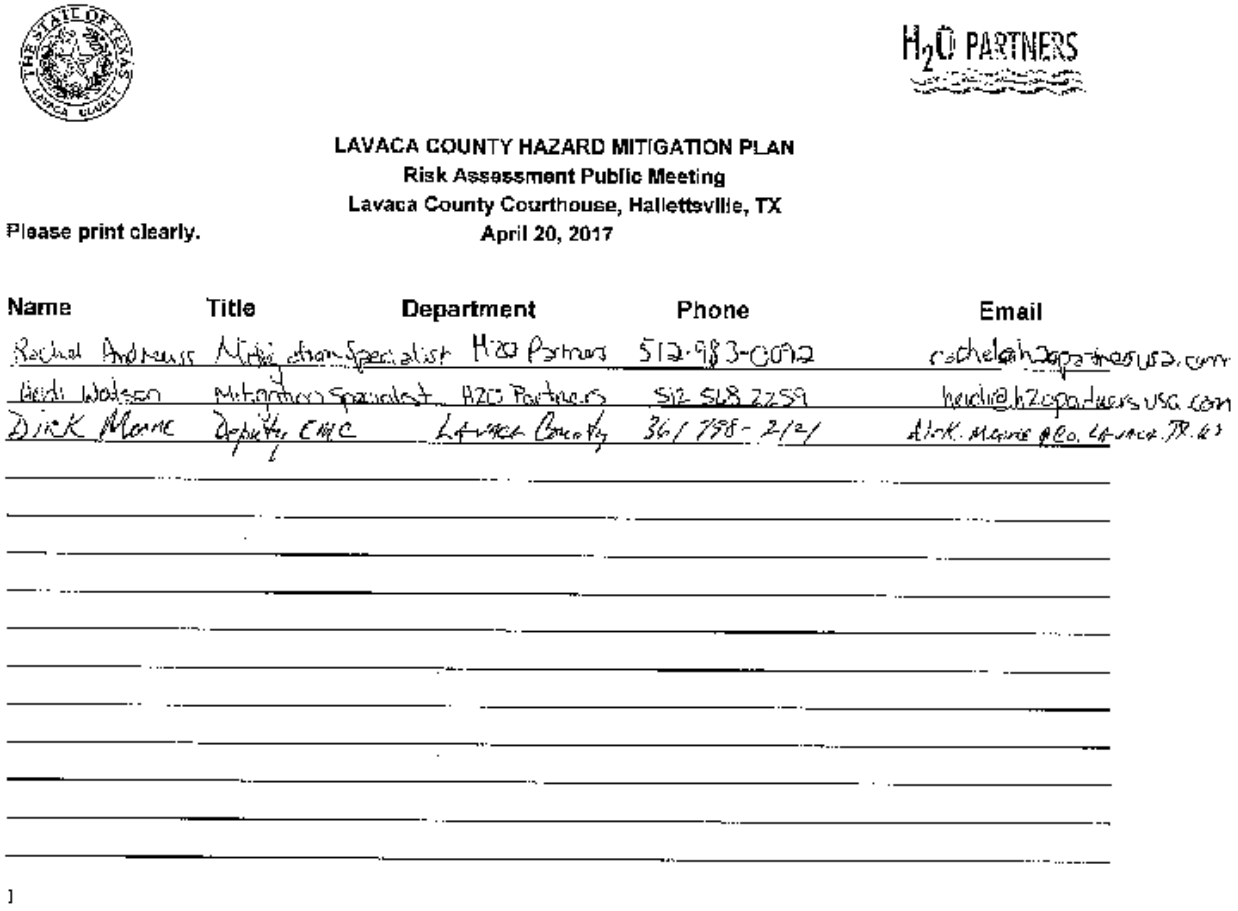
H20 PARTNERS

LAVACA COUNTY HAZARD MITIGATION PLAN
Kick Off Public Meeting
Lavaca County Courthouse, Hallettsville, TX
December 15, 2016

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H20 Partners	512-983-0093	rachel@h2opartnersusa.com
Dirk Moore	Deputy EMC	Lavaca County	361/798-2121	dirk.moore@co.lavaca.tx.us
Mark Havelka	Fire Marshal	Yoakum	361-893-5125	firechief@cityofyoakum.org
MICAH HARMON	EMC/SHERIFF	LAVACA CO.	361-798-2121	MHARMON@CO.LAVACA.TX.US

Figure D-5. Lavaca County Public Risk Assessment Public Meeting, 04.20.17



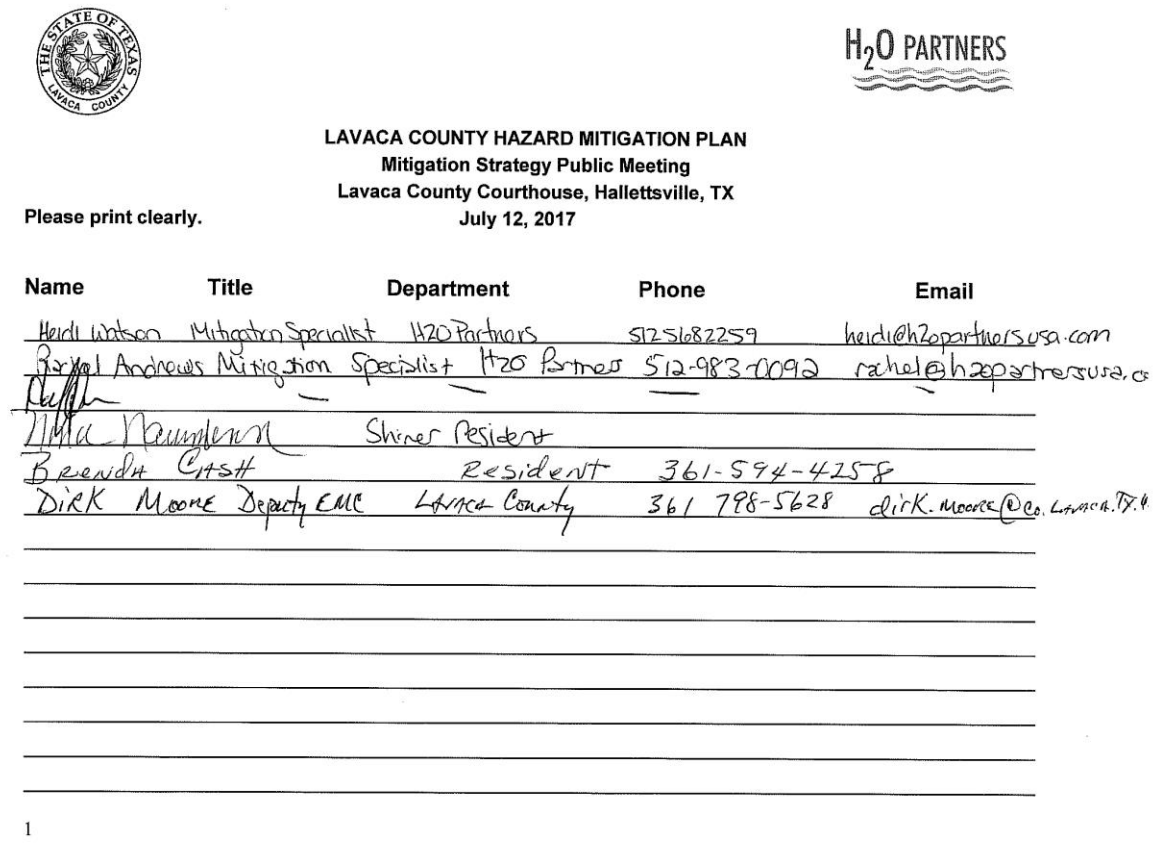
H2O PARTNERS

LAVACA COUNTY HAZARD MITIGATION PLAN
Risk Assessment Public Meeting
Lavaca County Courthouse, Hallettsville, TX
April 20, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512-983-0012	rachel@h2opartnersusa.com
Heidi Watson	Mitigation Specialist	H2O Partners	512-568-2259	heidi@h2opartnersusa.com
Dick Moore	Deputy, EMC	Lavaca County	361/798-2121	dick.moore@co.lavaca.tx.us

Figure D-6. Lavaca County Mitigation Strategy Workshop Public Meeting, 07.12.17



H2O PARTNERS

LAVACA COUNTY HAZARD MITIGATION PLAN
Mitigation Strategy Public Meeting
Lavaca County Courthouse, Hallettsville, TX
July 12, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Heidi Watson	Mitigation Specialist	H2O Partners	5125682259	heidi@h2opartnersusa.com
Rachel Andrews	Mitigation Specialist	H2O Partners	512-983-0092	rachel@h2opartnersusa.c
[illegible]				
[illegible]	Shiner Resident			
Brenda Gast	Resident		361-594-4258	
Dirk Moore	Deputy EMC	Lavaca County	361 798-5628	dirk.moore@co.Lavaca.TX.U

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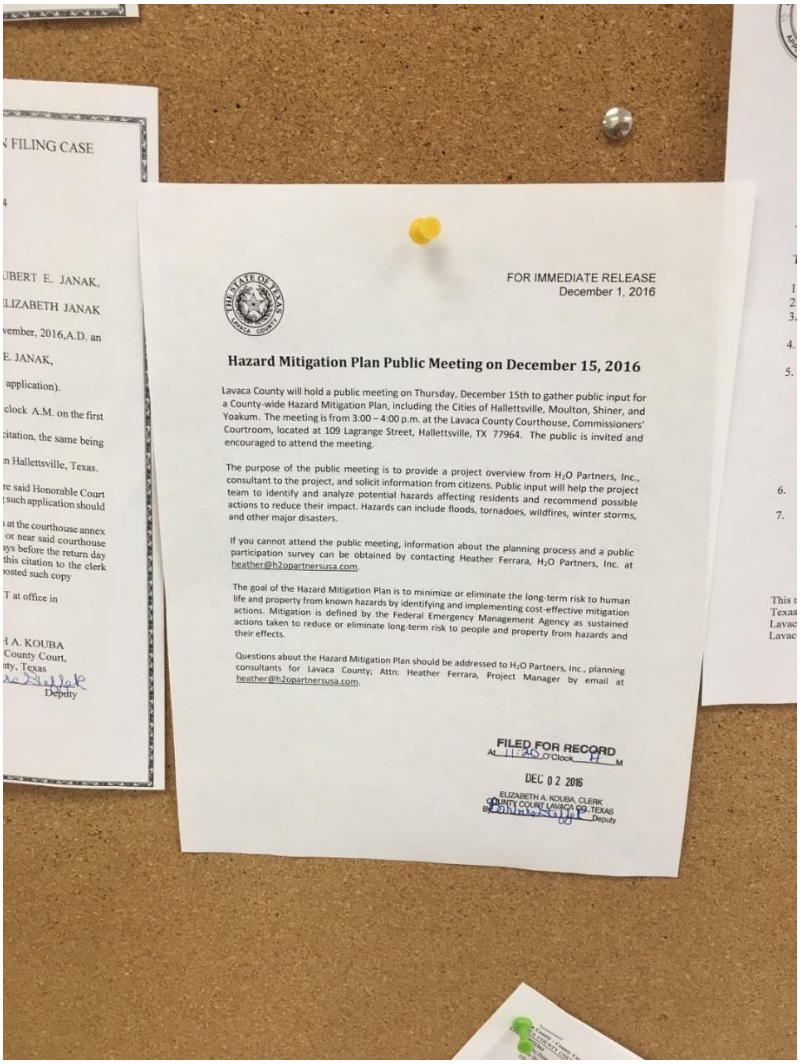
Public Notices

Public notices to announce Lavaca County's participation in the Plan Update development process were posted on various websites, outside of community offices, and Facebook (including participating jurisdictions within the County) as shown in Figures D-7 through D-10. Additionally, as seen in Figure D-10, the County and participating jurisdictions invited the public to participate in the survey.

Figure D-7. Filed Public Notice, Kickoff Public Meeting, County Bulletin Board



FOR IMMEDIATE RELEASE
December 1, 2016

Hazard Mitigation Plan Public Meeting on December 15, 2016

Lavaca County will hold a public meeting on Thursday, December 15th to gather public input for a County-wide Hazard Mitigation Plan, including the Cities of Hallettsville, Moulton, Shiner, and Yoakum. The meeting is from 3:00 – 4:00 p.m. at the Lavaca County Courthouse, Commissioners' Courtroom, located at 109 Lagrange Street, Hallettsville, TX 77964. The public is invited and encouraged to attend the meeting.

The purpose of the public meeting is to provide a project overview from H_2O Partners, Inc., consultant to the project, and solicit information from citizens. Public input will help the project team to identify and analyze potential hazards affecting residents and recommend possible actions to reduce their impact. Hazards can include floods, tornadoes, wildfires, winter storms, and other major disasters.

If you cannot attend the public meeting, information about the planning process and a public participation survey can be obtained by contacting Heather Ferrara, H_2O Partners, Inc. at heather@h2opartnersusa.com.

The goal of the Hazard Mitigation Plan is to minimize or eliminate the long-term risk to human life and property from known hazards by identifying and implementing cost-effective mitigation actions. Mitigation is defined by the Federal Emergency Management Agency as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.

Questions about the Hazard Mitigation Plan should be addressed to H_2O Partners, Inc., planning consultants for Lavaca County; Attn: Heather Ferrara, Project Manager by email at heather@h2opartnersusa.com.

FILED FOR RECORD
DEC 02 2016
ELIZABETH A. KOUBA, CLERK
COUNTY COURT LAVACA CO. TEXAS
Deputy

Figure D-8. Filed Public Notice, Risk Assessment Public Meeting, County Bulletin Board

FOR IMMEDIATE RELEASE
March 27, 2017

Hazard Mitigation Plan Public Meeting on April 20, 2017

Lavaca County and participating jurisdictions will hold a public meeting on Thursday, April 20th to gather public input for a County-wide Hazard Mitigation Plan. The meeting is from 3:30 – 4:30 p.m. at the Lavaca County Courthouse, Lavaca County Courthouse, Commissioners' Courtroom, located at 109 Lagrange St. Hallettsville, TX 77964. The public is invited and encouraged to attend the meeting.

The purpose of the public meeting is to provide a project overview from H_2O Partners, Inc., consultant to the project, and solicit information from citizens. Public input will help the project team to identify and analyze potential hazards affecting residents and recommend possible actions to reduce their impact. Hazards can include floods, tornadoes, wildfires, winter storms, and other major disasters.

The goal of the Hazard Mitigation Plan is to minimize or eliminate the long-term risk to human life and property from known hazards by identifying and implementing cost-effective mitigation actions. Mitigation is defined by the Federal Emergency Management Agency as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.

The public is also invited to take a survey which is found at https://www.surveymonkey.com/r/LavacaCountyHMAP.

Questions about the Hazard Mitigation Plan should be addressed to H_2O Partners, Inc., planning consultants for Lavaca County; Attn: Heather Ferrara, Project Manager by email at heather@h2opartnersusa.com.

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At 3:10 O'Clock P M

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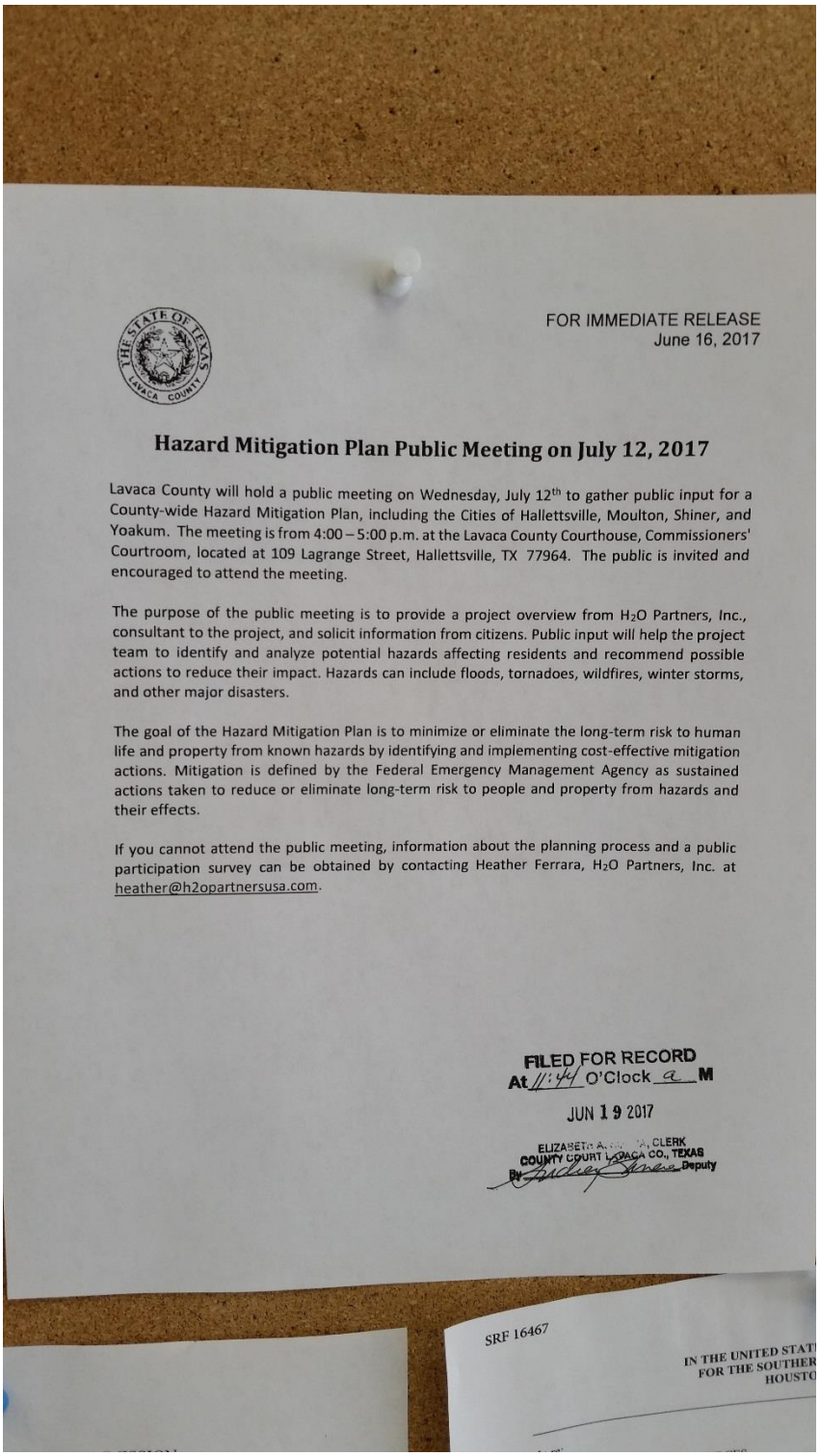
ELIZABETH A. KOUBA, CLERK
COUNTY COURT LAVACA CO. TEXAS
By [illegible] Deputy

Figure D-9. Filed Public Notice, Mitigation Strategy Public Meeting, County Bulletin Board



FOR IMMEDIATE RELEASE
June 16, 2017

Hazard Mitigation Plan Public Meeting on July 12, 2017

Lavaca County will hold a public meeting on Wednesday, July 12th to gather public input for a County-wide Hazard Mitigation Plan, including the Cities of Hallettsville, Moulton, Shiner, and Yoakum. The meeting is from 4:00 – 5:00 p.m. at the Lavaca County Courthouse, Commissioners' Courtroom, located at 109 Lagrange Street, Hallettsville, TX 77964. The public is invited and encouraged to attend the meeting.

The purpose of the public meeting is to provide a project overview from H_2O Partners, Inc., consultant to the project, and solicit information from citizens. Public input will help the project team to identify and analyze potential hazards affecting residents and recommend possible actions to reduce their impact. Hazards can include floods, tornadoes, wildfires, winter storms, and other major disasters.

The goal of the Hazard Mitigation Plan is to minimize or eliminate the long-term risk to human life and property from known hazards by identifying and implementing cost-effective mitigation actions. Mitigation is defined by the Federal Emergency Management Agency as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.

If you cannot attend the public meeting, information about the planning process and a public participation survey can be obtained by contacting Heather Ferrara, H_2O Partners, Inc. at heather@h2opartnersusa.com.

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At 11:44 O'Clock a M
JUN 19 2017
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COUNTY COURT ...VACA CO., TEXAS
By ... Deputy

SRF 16467

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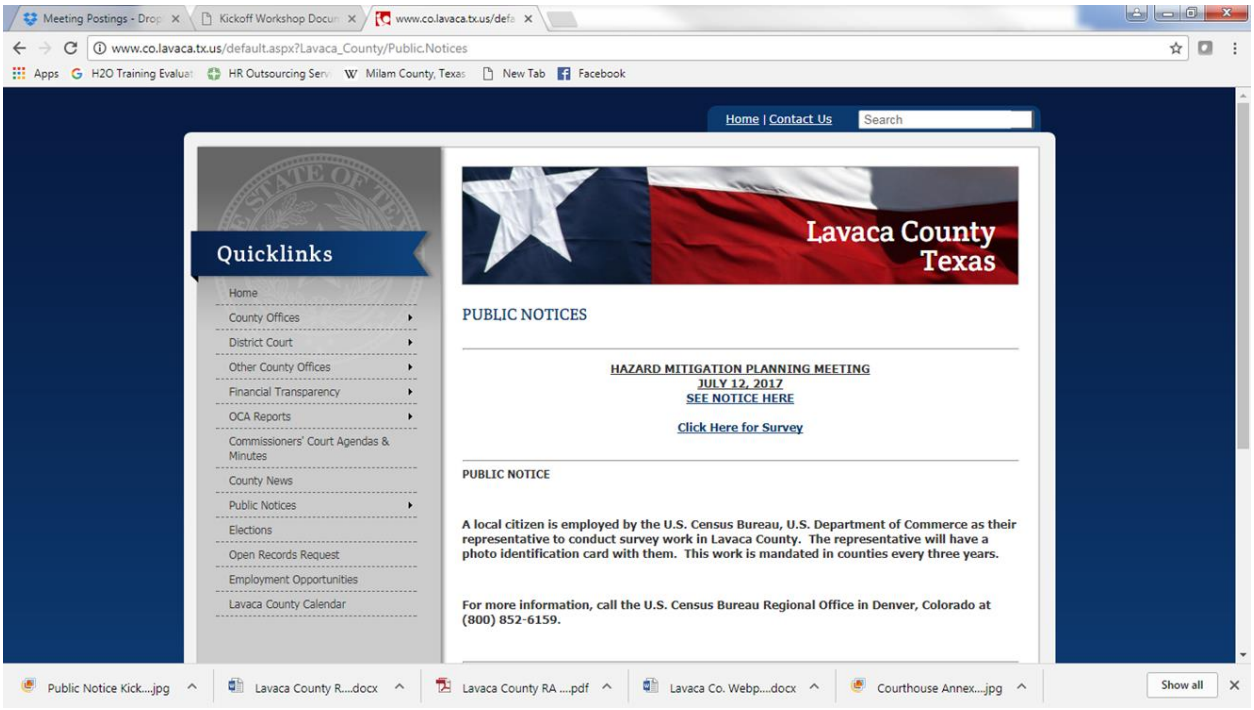
FOR THE SOUTHER...
HOUSTO...

Figure D-10. Public Notice, Lavaca County, Mitigation Strategy Public Meeting and Survey Invitation



Appendix E: Capability Assessment

Overview

A Community Capability Assessment is an integral component of the Hazard Mitigation Planning process. It is an invaluable tool in assessing a community's existing planning and regulatory capabilities to support implementation of mitigation strategy objectives.

Each participating community has a unique set of capabilities including policies, programs, staff, funding, and other resources available to accomplish hazard mitigation objectives and reduce long-term vulnerability. The Planning Team identified existing capabilities in each jurisdiction that currently reduce disaster losses or could be used to reduce losses in the future, and capabilities that inadvertently increase risks in the community.

Beginning on Page 2, a completed Capability Assessment Checklist provides information on existing policies, plans, and regulations in place for Planning Team members at the local level or that may be provided by the County on an as-needed basis. ***Participation is denoted with an "x" on the Checklist.***

Community Capability Assessments

COMMUNITY CAPABILITY CHECKLIST	*Lavaca County*	*Hallettsville*	*Moulton*	*Shiner*	*Yoakum*
Plans					
Capital Improvements Plan					
Master or Comprehensive Plan					
Emergency Operations Plan			x	x	x
Hazard Mitigation Plan					
Post-disaster Recovery Plan					x
Policies/Ordinances					
Building Codes		x			x
Zoning Ordinance/Land Use Restrictions					x
Watershed Ordinance					
Stormwater Ordinance					
Site Plan Review Requirements					x
Real Estate Disclosure Requirements					
Programs					
National Flood Insurance Program Participant	x	x	x	x	x
NFIP Community Rating System Participant					
Property Acquisition Program					
Public Education/Awareness Programs					x
Stream Maintenance Program					
Storm Drainage Systems Maintenance Program					
Staff/Departments					
Planner					
Building Code Official		x			x
GIS and/or HAZUS Specialist					
Emergency Manager	x	x	x	x	x
Engineer/Public Works Official			x		
Floodplain Administrator	x	x	x	x	x

17307

RESOLUTION FOR COUNTY OF LAVACA
APPROVAL OF HAZARD MITIGATION PLAN UPDATE

WHEREAS, natural hazards in Lavaca County, Texas, historically have caused significant disasters with losses of life and property and natural resources damage; and

WHEREAS, the Federal Disaster Mitigation Act of 2000 and Federal Emergency Management Agency (FEMA) require communities to adopt a hazard mitigation action plan to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, FEMA requires that communities update Hazard Mitigation Action Plans every five years in order to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, the County of Lavaca has assessed the community's potential risks and hazards and is committed to planning for a sustainable community and reducing the long-term consequences of natural and man-caused hazards; and

WHEREAS, the Lavaca County Hazard Mitigation Plan Update outlines a mitigation vision, goals and objectives; assesses risk from a range of hazards; and identifies risk reduction strategies and actions for hazards that threaten the community.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Lavaca County Hazard Mitigation Plan Update is approved in its entirety;
2. The County of Lavaca will pursue available funding opportunities for implementation of the proposals designated therein, and will, upon receipt of such funding or other necessary resources, seek to implement the actions contained in the mitigation strategies;
3. The County of Lavaca vests with the County Judge the responsibility, authority, and means to inform all parties of this action; assure that the Hazard Mitigation Plan Update will be reviewed at least annually; and that any needed adjustments will be presented to the County Commissioners for consideration; and
4. The County of Lavaca agrees to take such other action as may be reasonably necessary to carry out the objectives of the Plan Update and report on progress as required by FEMA and the Texas Division of Emergency Management (TDEM).

ADOPTED this **12th** day of **March, 2018**.

Tramer J. Woytek, Lavaca County Judge

Edward Pustka, Commissioner Pct. 1

Ronald Berckenhoff, Commissioner Pct. 2

R. W. Brown, Commissioner Pct. 3

Absent

Dennis W. Kocian, Commissioner Pct. 4

Attest:

Elizabeth A. Kouba, Lavaca County Clerk

COMMISSIONERS COURT STATE OF TEXAS COUNTY

RESOLUTION NO. 456-18

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF HALLETTSVILLE, TEXAS APPROVING THE LAVACA COUNTY HAZARD MITIGATION PLAN UPDATE AND MAKING COMMITMENTS TO OBTAIN AVILABLE FUNDING FOR MITIGATION EFFORTS AND ENSURING THE PLAN REMAINS UP-TO-DATE.

****

WHEREAS, the City of Hallettsville has assessed the community's potential risks and hazards and is committed to planning for a sustainable community and reducing the long-term consequences of natural and man-caused hazards; and

WHEREAS, the Lavaca County Hazard Mitigation Plan Update outlines a mitigation vision, goals and objectives; assesses risk from a range of hazards; and identifies risk reduction strategies and actions for hazards that threaten the community; and

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF HALLETTSVILLE, TEXAS:

Section 1. The Lavaca County Hazard Mitigation Plan Update is approved in its entirety.

Section 2. The City of Hallettsville will pursue available funding opportunities for implementation of the proposals designated therein, and will, upon receipt of such funding or other necessary resources, seek to implement the actions contained in the mitigation strategies.

Section 3. The City of Hallettsville vests with the Mayor the responsibility, authority, and means to inform all parties of this action; assure that the Hazard Mitigation Plan Update will be reviewed at least annually; and that any needed adjustments will be presented to the City Council for consideration.

Section 4. The City of Hallettsville agrees to take such other action as may be reasonably necessary to carry out the objectives of the Plan and report on progress as required by FEMA and the Texas Division of Emergency Management (TDEM).

INTRODUCED, READ and PASSED, by the affirmative vote of the City Council of the City of Hallettsville this the 19th day of March, 2018.

Stephen Hunter

Stephen Hunter, Mayor

ATTEST:

CITY OF HALLETTSVILLE TEXAS

Jason Cozza, City Secretary

RESOLUTION NO. 04102018-01

A RESOLUTION OF THE CITY OF MOULTON, TEXAS, APPROVING AND ADOPTING THE LAVACA COUNTY HAZARD MITIGATION PLAN UPDATE; AND CERTIFYING THAT THE CITY OF MOULTON IS ELIGIBLE TO RECEIVE PROGRAM ASSISTANCE

WHERAS, natural hazards in the City of Moulton area historically have cause significant disasters with losses of property and natural resources damage; and

WHEREAS, the Federal Disaster Mitigation Act of 2000 and Federal Emergency Management Agency (FEMA) require communities to adopt a hazard mitigation action plan to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, the FEMA requires that communities update hazard mitigation action plans every five years in order to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, the City of Moulton has assessed the community's potential risks and hazards and is committed to planning for a sustainable community and reducing the long-term consequences of natural and man-caused hazards; and

WHEREAS, the Lavaca County Hazard Mitigation Plan Update outlines a mitigation vision, goals and objectives; assesses risk from a range of hazards; and identifies risk reduction strategies and actions for hazards that threaten the community.

NOW THEREFORE, BE IT RESOLVED THAT:

1. The Lavaca County Hazard Mitigation Plan Update is approved in its entirely;
2. The City of Moulton will pursue available funding opportunities for implementation of the proposals designated therein, and will, upon receipt of such funding or other necessary resources, seek to implement the actions contained in the mitigation strategies;
3. The City of Moulton vests with the Mayor the responsibility, authority, and means to inform all parties of this action; assure that the Hazard Mitigation Plan Update will be reviewed at least annually, and that any needed adjustments will be presented to the City Council for consideration; and
4. The City of Moulton agrees to take such other action as may be reasonably necessary to carry out the objectives of the Plan and report on progress as required by FEMA and the Texas Division of Emergency Management (TDEM).

PASSED AND APPROVED BY THE CITY COUNCIL OF MOULTON, TEXAS ON THIS 10th DAY OF APRIL, 2018.

CITY OF MOULTON

Mark Zimmerman
Mayor

LuAnn D. Rogers, TRMC
City Administrator, Secretary

RESOLUTION FOR CITY OF SHINER

APPROVAL OF HAZARD MITIGATION PLAN UPDATE

WHEREAS, natural hazards in the City of Shiner area historically have caused significant disasters with losses of life and property and natural resources damage; and

WHEREAS, the Federal Disaster Mitigation Act of 2000 and Federal Emergency Management Agency (FEMA) require communities to adopt a hazard mitigation action plan to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, FEMA requires that communities update hazard mitigation action plans every five years in order to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, the City of Shiner has assessed the community's potential risks and hazards and is committed to planning for a sustainable community and reducing the long-term consequences of natural and man-caused hazards; and

WHEREAS, the Lavaca County Hazard Mitigation Plan Update outlines a mitigation vision, goals and objectives; assesses risk from a range of hazards; and identifies risk reduction strategies and actions for hazards that threaten the community.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Lavaca County Hazard Mitigation Plan Update is approved in its entirety;
2. The City of Shiner will pursue available funding opportunities for implementation of the proposals designated therein, and will, upon receipt of such funding or other necessary resources, seek to implement the actions contained in the mitigation strategies;
3. The City of Shiner vests with the Mayor the responsibility, authority, and means to inform all parties of this action; assure that the Hazard Mitigation Plan Update will be reviewed at least annually; and that any needed adjustments will be presented to the City Council for consideration; and
4. The City of Shiner agrees to take such other action as may be reasonably necessary to carry out the objectives of the Plan and report on progress as required by FEMA and the Texas Division of Emergency Management (TDEM).

ADOPTED this 7th day of May, 2018.

(Mayor)

(Clerk)

RESOLUTION NO. 2018-06

A RESOLUTION OF THE CITY OF YOAKUM, TEXAS, APPROVING AND ADOPTING THE LAVACA COUNTY HAZARD MITIGATION PLAN UPDATE; AND CERTIFYING THAT THE CITY OF YOAKUM IS ELIGIBLE TO RECEIVE PROGRAM ASSISTANCE

WHEREAS, natural hazards in the City of Yoakum area historically have caused significant disasters with losses of property and natural resources damage; and

WHEREAS, the Federal Disaster Mitigation Act of 2000 and Federal Emergency Management Agency (FEMA) require communities to adopt a hazard mitigation action plan to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, FEMA requires that communities update hazard mitigation action plans every five years in order to be eligible for the full range of pre-disaster and post-disaster federal funding for mitigation purposes; and

WHEREAS, the City of Yoakum has assessed the community's potential risks and hazards and is committed to planning for a sustainable community and reducing the long-term consequences of natural and man-caused hazards; and

WHEREAS, the Lavaca County Hazard Mitigation Plan Update outlines a mitigation vision, goals and objectives; assesses risk from a range of hazards; and identifies risk reduction strategies and actions for hazards that threaten the community.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Lavaca County Hazard Mitigation Plan Update is approved in its entirety;
2. The City of Yoakum will pursue available funding opportunities for implementation of the proposals designated therein, and will, upon receipt of such funding or other necessary resources, seek to implement the actions contained in the mitigation strategies;
3. The City of Yoakum vests with the Mayor the responsibility, authority, and means to inform all parties of this action; assure that the Hazard Mitigation Plan Update will be reviewed at least annually; and that any needed adjustments will be presented to the City Council for consideration; and
4. The City of Yoakum agrees to take such other action as may be reasonably necessary to carry out the objectives of the Plan and report on progress as required by FEMA and the Texas Division of Emergency Management (TDEM).

PASSED, APPROVED and ADOPTED this the 13th day of March, 2018.

Anita R. Rodriguez, Mayor
City of Yoakum, Texas

ATTEST:

Theresa A. Bowe
City Clerk

CITY OF YOAKUM TEXAS