



Calhoun County

Multi-Jurisdictional Hazard Mitigation Plan





The following Hazard Mitigation Plan (HMP) is an updated and revised version of the HMP adopted in 2017 by Calhoun County and the Cities of Port Lavaca, Seadrift, and Point Comfort. Updates to the HMP (Plan) were completed by KSBR LLC in collaboration with the mentioned jurisdictions and various stakeholders. A list of the stakeholders is listed in Appendix A.

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Background

In 2005, the Guadalupe Blanco River Authority (GBRA) facilitated the creation of a Hazard Mitigation Action Plan (HMAP) to protect the Guadalupe River Basin against all hazards. This plan was approved by the Federal Emergency Management Agency (FEMA) and involved seven counties and nineteen cities, including Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort. GBRA updated the plan in 2011 and again in 2018. The latest version of the plan, along with the County's 2017 Hazard Mitigation Plan (HMP), were used as references to review and update this Plan.

Figure 1. Map of Calhoun County and Cities Port Lavaca, Seadrift, and Point Comfort



Scope

The Plan focuses on mitigating hazards classified as “high” or “moderate” risk as determined through a hazard risk assessment and a cost-benefit review. Hazards that pose a “low” risk will continue to be evaluated during future updates to the plan, but they may not be fully addressed until they are determined to be of “high” or “moderate” risk. This enables us to prioritize mitigation actions based on hazards that present the greatest risk to lives and property.

Purpose

This plan was led by Calhoun County using consulting support from KSBR LLC. The purpose was to include and collaborate with the cities of Port Lavaca, Seadrift, and Point Comfort, and all jurisdictions that are located within Calhoun County. These updates provided a new opportunity to evaluate successful mitigation actions and explore ways to avoid future disaster loss.



In updating the Plan, participants identified natural and man-caused hazards to be addressed to minimize or eliminate long-term risks to human life and property. FEMA defines Mitigation as “*sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects*”. Therefore, the purpose of the HMP is to continue developing successful mitigation projects to bring together the cities and counties to reduce the future risk of loss of life or damage to property.

Through this update process, Plan participants seek to:

- Assess previous mitigation projects and develop unique mitigation strategies to meet future development and risks;
- Encourage improvements in floodplain management, participation in the National Flood Insurance Program (NFIP), and qualifying for FEMA’s Community Rating System, thereby reducing flood insurance premiums for citizens;
- Devise solutions to strengthen emergency management by addressing “high” and “moderate” risk natural and man-caused hazards; and,
- Update and implement a comprehensive Hazard Mitigation Plan for the planning area, defined as the unincorporated area of Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort.

Authority

The Plan Update is tailored specifically for Calhoun County and the Cities of Port Lavaca, Seadrift, and Point Comfort. The Plan complies with all requirements promulgated by the Texas Division of Emergency Management (TDEM) and all applicable provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390), and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108-264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Additionally, the Plan complies with the Interim Final Rules for the Hazard Mitigation Planning and Hazard Mitigation Grant Program (44 CFR, Part 201), which specify the criteria for approval of mitigation plans required in Section 322 of the DMA 2000 and standards found in FEMA’s “Local Mitigation Plan Review Guide” (October 2011) and the “Local Mitigation Planning Handbook” (March 2013). The Plan is also developed in accordance with FEMA’s Community Rating System (CRS) Floodplain Management Plan standards and policies.



Summary of Sections

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Section 2 - Hazard Identification and Assessment of Risks

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Section 5 - Mitigation Strategies and Actions

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Summary of Appendices¹

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Appendix B - Capability Assessments

Appendix C - Survey and Survey Responses

Appendix D - Detailed lists of Assets and Critical Infrastructure, Lifelines, and Hazardous Materials

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¹For privacy concerns, the Appendices will not be made available to the public.



Section 1 - Planning Process

Plan Preparation and Development

Mitigation planning involves bringing together multiple components and players to create more disaster-resistant communities. This section provides an overview of the planning process, highlighting key steps and a detailed description of how stakeholders and the public were involved.

This Plan meets FEMA's requirement to provide updated hazard mitigation plans every five years. Many of the natural and man-caused disasters that affect Calhoun County, and the cities of Port Lavaca, Seadrift, and Point Comfort are the same as the hazards addressed in the 2018 GBRA Hazard Mitigation Plan.

However, this updated 2023-2028 Hazard Mitigation Plan includes current data that reflect changing demographics and mitigation strategies for each participating jurisdiction.

According to 44 CFR 201.6 (d) (3), the Plan must describe the process used to revise each section.

Kick Off Meeting

On January 12, 2023, the County met with KSBR, LLC (KSBR), the Texas Department of Emergency Management (TDEM), and the Texas General Land Office (GLO) to have a Kickoff Meeting and initiate the conversation about the process and expectations for updating the County's multi-jurisdictional HMP.

Planning and Development

From February to July of 2023, KSBR worked on start-up documentation, data collection, and research to prepare for the first Planning Committee (Team) meeting and the public meetings that would follow.

On June 28, 2023, the first Planning Committee meeting was held, and it was composed of the city of Port Lavaca, Seadrift, Point Comfort, Calhoun County, KSBR, and invited stakeholders. During this meeting, the Team reviewed, analyzed, and commented on sections of the County's 2017 HMP and the GBRA 2018 HMAP. Upon review of the risk assessment's introductory and overview sections, the Committee decided to keep the same hazards in this updated plan while adding winter storms as an identified hazard and including a new section addressing climate change. Section 3 of this HMP addresses changes in climate.

After the first team meeting, KSBR began working on the Risk Assessment. For this work, we also considered the jurisdictions' capabilities and vulnerabilities. Critical facilities, building counts, and losses were updated to reflect changes over the past five years. The overall goals of the 2018 GBRA Hazard Mitigation Plan were reviewed, and it was determined that two goals would remain in the Plan. Goal 1 protects public health and safety, and Goal 2 increases intergovernmental entities' coordination and cooperation in hazard mitigation. We have kept these goals in mind while updating the County's HMP. After holding a Planning Committee meeting and establishing its members, public meetings were conducted.



The Risk Assessment and HMP requirements for updating the current HMP were shared at the first public meeting. At the second public meeting, a public survey was introduced, and stakeholders from each jurisdiction were encouraged to share their thoughts and ideas for the HMP updates via survey, phone, or email. Stakeholders were given three weeks, from September 7 to September 28, 2023, to submit their survey responses.

Along with input from the Planning Committee, risk assessment findings, and information collected from the public survey and meetings, KSBR began updating the County's multi-jurisdictional HMP.

Public and Stakeholder Involvement

A vital component of mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community gives the planning team a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions.

Public Participation

Public involvement in the plan's development was sought through public meetings, a survey, and the draft plan available for public review on the Calhoun County website and all governmental offices.

Public Meetings

Public meetings were held in Calhoun County. Sign-in Sheets from the meetings and workshops can be found in Appendix E.

- The first public meeting was held on July 5, 2023, in Port Lavaca, during a Commissioners Court Meeting.
- The second public meeting was held on September 7, 2023, in Seadrift, TX during one of the City Council meetings.
- A third public meeting was held on April 17, 2024, in Port Lavaca, during a Commissioners Court meeting.
- Each jurisdiction approved the final draft of the HMP at their May meetings and the draft was submitted to TDEM on by May 31, 2024.

Public Participation Survey

In addition to the open public meetings, the Cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County received input from citizens and stakeholders through a public participation survey. This survey was designed to collect data and information from residents in the cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County. The information gathered from the public participation survey was evaluated and included in identifying and ranking the hazards that our coastal communities are exposed to.

The public participation survey was distributed via a QR code at the second public meeting made available via a link on the Calhoun County website and published in the local newspaper. The public responses to the survey are provided in Appendix B.



Stakeholder Involvement

Stakeholders provide an essential service in hazard mitigation planning. Throughout the planning process, members from community groups, local businesses, schools, surrounding communities, regional agencies, and hospitals were invited to provide feedback regarding the HMP and attend the public meetings.

The targeted groups are listed below:

- Cities of Seadrift, Point Comfort, and Port Lavaca
- Calhoun County
- Guadalupe Blanco River Authority (GBRA)
- Memorial Medical Center
- Calhoun County Independent School District (CCISD)
- Calhoun County 911 Emergency
- Calhoun County Office of Emergency Management
- Seadrift, Point Comfort, and Port Lavaca Fire/Police
- Our Lady of the Gulf Catholic School
- All jurisdictions within the Calhoun County boundaries (incorporated and unincorporated)

Section 2 – Hazard Identification and Assessment of Risks

Following the kickoff meeting, KSBR, LLC began submitting start-up documents for the GLO grant and collecting data for the next meeting. Planning Team members from the cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County met to conduct hazard identification and discuss a plausible schedule for completing the HMP updates.

A risk assessment for the updated HMP was completed. Potential dollar losses from each hazard were estimated. The assessments examined the impact of various hazards on the built environment (e.g., residential, commercial, industrial), critical facilities, lifelines, and infrastructure. The resulting risk assessment profiled hazard events provided information on previous occurrences, estimated the probability of future events, and detailed the extent and magnitude of impact on people and property.

The hazards identified as significant are listed in Table 1. These hazards are divided into two main categories: natural and technological. Natural hazards include hazards categorized as atmospheric, hydrologic, and other. Atmospheric hazards are events or incidents associated with weather-generated phenomena; these include extreme heat, hurricane/tropical storms, hailstorms, lightning, tornados, wildfires, winter storms, and windstorm events. Hydrologic hazards are events or incidents associated with water-related damage and account for over 75 percent of Federal disaster declarations in the United States. Hydrologic hazards classified as significant include coastal erosion, drought, expansive soils, floods, and land subsidence. For the purpose of risk assessment, “other” natural hazards consist of infectious diseases.

The term “technological hazards” refers to the origins of incidents that can arise from human activities, such as dam failure. Such hazards are those in manufacturing, transportation, storage, and use of hazardous material, the use of gas and oil pipelines, and an act of terrorism.



These hazards are distinct from natural hazards primarily in that they originate from human activity. While the risks presented by natural hazards may be increased or decreased due to human activity, they are not inherently human-induced.

Table 1. List of Identified Hazards

Hazard	Description	Updates
<u>Atmospheric</u>		
Hurricanes/ Tropical Storms	Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which winds rotate counterclockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) with a diameter averaging 10 to 30 miles across. When maximum sustained winds reach or exceed 39 mph, the system is designated a tropical storm, named, and closely monitored by the National Hurricane Center. The storm is deemed a hurricane when sustained winds reach or exceed 74 mph. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves, and tidal flooding, which can be more destructive than cyclone wind.	
Extreme Heat	Extreme heat is the condition whereby temperatures hover ten degrees or more above the average elevated temperature in a region for an extended period.	
Hailstorms	Any storm that produces hailstones that fall to the ground; usually used when the amount or size of the hail is considered significant.	
Wildfires	A large, destructive fire that spreads quickly. For example, 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,	This hazard was added to the atmospheric hazard list as it is not only caused by man. In recent years, wildfires have been caused



	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/wild land interface. Wildfires are part of the natural management of forest ecosystems; however, most are caused by human factors.	by extreme heat and drought.
Lightning	The flashing of light produced by a discharge of atmospheric electricity; <i>also</i> : the discharge itself.	
Windstorms	A storm with high winds or violent gusts but little or no rain.	
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 storm's intensity, size, and duration.	
Winter storms	A winter storm is a combination of heavy snow, blowing snow and/or dangerous wind chills. A winter storm is life-threatening. Blizzards are dangerous winter storms that combine blowing snow and wind, resulting in low visibility.	This hazard was added due to the number of winter storms over the past 5 years.
<u>Hydrologic</u>		
Coastal Erosion	The wearing away of land and the removal of beach or dune sediments by wave action, tidal currents, wave currents, drainage, or high winds.	
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.	
Expansive Soils	Soils that expand when water is added and shrink when they dry out. This continuous	



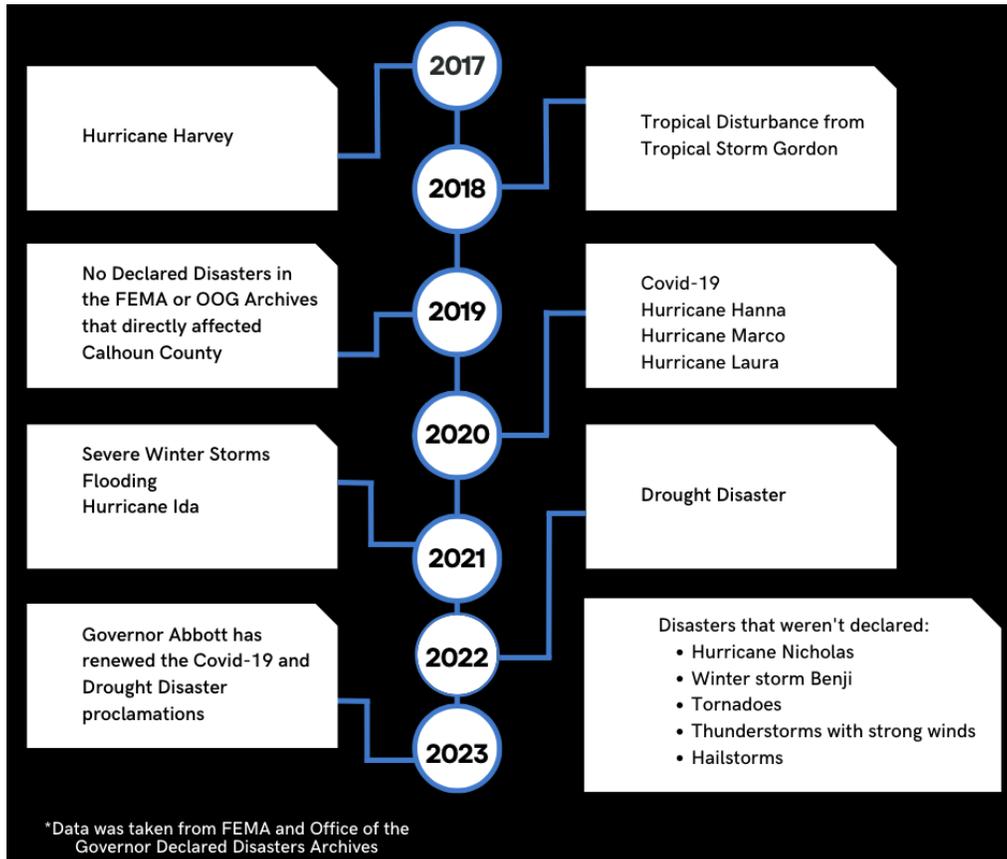
	change in soil volume can cause homes built on this soil to move unevenly and crack.	
Flooding	The accumulation of water within a water body, which results in the overflow of excess water onto adjacent lands, usually floodplains. A floodplain is the land adjoining the river, stream, ocean lake or other watercourse or water body susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, or shallow flooding.	
Land Subsidence	The gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials.	
<u>Other</u>		
Infectious Disease	Infectious diseases are illnesses caused by germs (such as bacteria, viruses, and fungi) that enter the body, multiply, and can cause an infection. Some infectious diseases are contagious (or communicable), meaning they can spread from one person to another.	This definition was updated to include bacteria, viruses, and fungi.
<u>Technological</u>		
Dam Failure	A dam failure is an uncontrolled release of water from a reservoir through a dam due to structural failures or deficiencies. Dam failures can range from minor to catastrophic and can harm human life and property downstream.	This definition was updated to reflect what dam failure is and not just the description of a dam.
Hazardous Materials Release	Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. A hazardous material (HAZMAT) incident involves a substance outside normal safe containment in sufficient concentration to threaten life, property, or the environment.	
Pipeline Failure	An estimated 2.2 million miles of pipelines in the United States carry hazardous materials such as oil and natural gas. Pipelines are out of sight and unnoticed yet have caused fires and explosions that have	This definition was updated to include examples of pipeline failure.



	<p>killed. Pipelines are damaged mechanically when subjected to external interferences. Mechanical defects such as dents, cracks, gouges, and scratches are prevalent in pipes. This damage can sometimes occur close to one another, resulting in a single defect in the pipe wall.</p>	
Terrorism	<p>Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom.</p>	

Calhoun County 2017 Multi-jurisdictional HMP, 2023 Risk Assessment, and Planning Committee discussions.

Figure 2. Hurricane, Tropical Storm, and Flooding Occurrences Over the Last Five Years



All jurisdictions affected by these; including data from 2017-2023

Section 3 – Changes in Climate

According to FEMA, the Federal Emergency Management Agency is committed to promoting resilience. Resilience refers to the ability to adapt to changing conditions and rapidly recover from disruptions due to emergencies.



The concept of resiliency, especially in a community, includes adopting mitigation strategies that will allow the community to be better prepared for future hazards. Finding ways to incorporate comprehensive mitigation measures includes preparing for the impacts of climate change.

It is no secret that the climate is changing. It is snowing in areas that aren't used to snow, and wildfires are prevalent due to decreased precipitation and increased heat. As the Committee and stakeholders met to discuss the HMP updates, they considered climate change as a factor and highlighted weather patterns that are becoming increasingly hazardous to the community. For this reason, wildfires and winter storms have been added to the list of atmospheric hazards, and mitigation strategies for these are also included in Section 4 below.

FEMA's Resilience and Climate Change Job Aid

Section 4 – Hazards

4.1 Atmospheric:

- *Hurricanes and Tropical Storms*

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

A tropical depression intensifies into a tropical storm when maximum sustained winds increase to between 39-73 mph. At these wind speeds, the storm becomes more organized and circular and begins to resemble a hurricane. Tropical storms can be equally problematic without even becoming a hurricane. However, most problems a tropical storm causes stem from heavy rainfall, high winds, and tidal surge. Incipient hurricane development is evident once barometric pressure in the center decreases and winds increase. If atmospheric and oceanic conditions are favorable, the disturbance can intensify into a tropical depression. The system becomes a tropical storm when maximum sustained winds reach or exceed 39 mph.

Hurricanes are categorized according to the strength of their winds using the Saffir-Simpson Hurricane Scale (See Figure 3). A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. This scale only ranks wind speed, but lower-category storms can inflict greater damage than higher-category storms depending on where they strike, other weather they interact with, and how slow they move.

The ingredients for a hurricane include a pre-existing weather disturbance, warm tropical oceans, moisture, and relatively light winds aloft. Persistent, favorable conditions can produce violent winds, destructive waves, torrential rains, and powerful floods. Annually, an average of ten tropical storms develop over the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. Many of these storms become hurricanes. In an average 3-year period, roughly five hurricanes strike the US coastline, killing 50 to 100 people anywhere from Texas to Maine. Of these, two are typically "major" or "intense" hurricanes (a Category 3 or higher storm on the Saffir-Simpson Hurricane Scale). See the figures below for more information.



Figure 3. Saffir- Simpson Hurricane Scale

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

<https://ialert.com/blog/weather-articles/saffir-simpson-hurricane-wind-scale/>

Figure 4. Hurricane Intensity Scale (Wind Damage) Depictions



https://riskfactor.com/county/calhoun-county-tx/48057_fsid

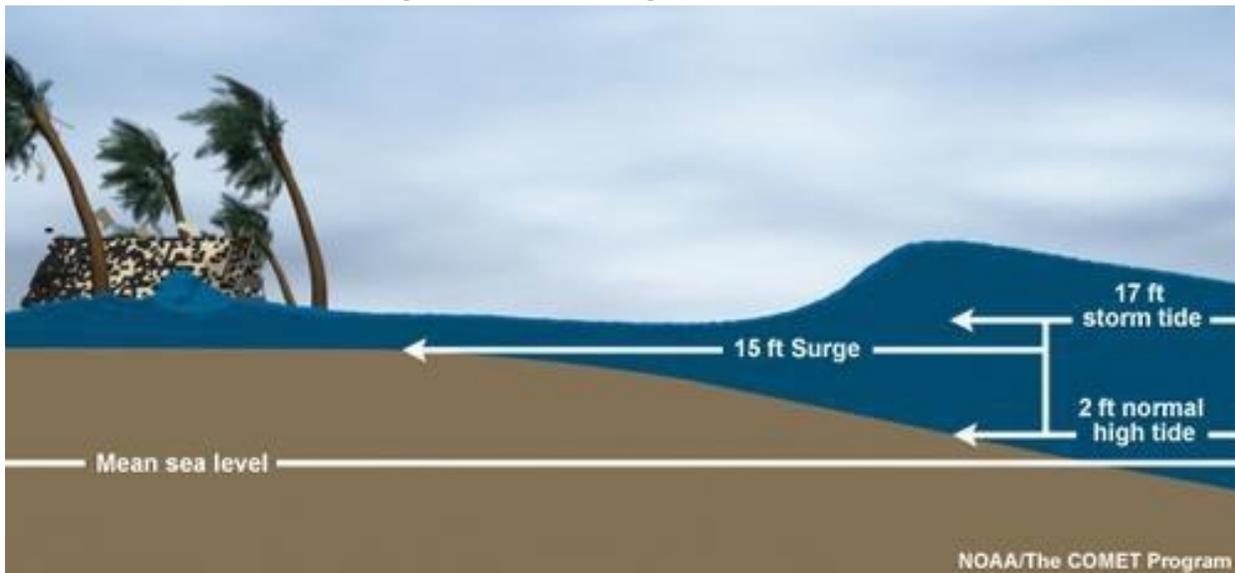
According to the National Hurricane Center, the greatest potential for loss of life related to a hurricane is from the storm surge. Low pressure and high circular winds “pile” the water into a dome shape that can be 50-100 miles wide.



The surge travels with the storm and is most severe on the right side of the storm, relative to the direction the storm travels. Surge can be 15 feet deep, topped by waves, and make landfall ahead of the eye. Wind-driven waves are superimposed on the storm tide.

This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with normal high tides. Figure 5 is a diagram from the National Oceanic and Atmospheric Administration (NOAA) that depicts the possible level of storm surge, compared to sea level and a normal high tide.

Figure 5. Storm Surge vs Storm Tide



https://riskfactor.com/county/calhoun-county-tx/48057_fsid

Location - All jurisdictions in this plan are coastal communities surrounded by San Antonio Bay, Lavaca Bay, and Matagorda Bay and facing the Gulf of Mexico. Calhoun County has more than 560 miles of shoreline, making all jurisdictions vulnerable to high-force winds, storm surges, and flooding. Coastal flood inundation is where there is potential for damage to property and loss of life due to storm surge-induced high-velocity wave action.

Extent - All jurisdictions have been affected by hurricanes and tropical storms in the past. The extent of a hurricane for all our jurisdictions can range from Category 1 to Category 5 and have a devastating effect from wind and storm surges.

The city of Port Lavaca is the county seat and the largest town in Calhoun County. It supplies other cities and unincorporated areas with medical services, grocery stores, gasoline, and other critical facilities. If these services were interrupted by a hurricane or tropical storm, then this area would need outside assistance.



The cities of Point Comfort and Seadrift also rely on Port Lavaca for critical facilities. Without the services Port Lavaca supplies, our county would have to request assistance outside this county. Calhoun County industries employ numerous persons from all jurisdictions and if these industries were shut down due to a hurricane, then our local economy and citizens would be substantially affected.

Historical Occurrences - Figure 2, shown in Section 1, lists Declared Disasters that took place from 2017-2022, including hurricanes. Of the disasters listed, six are hurricanes. Hurricane Harvey was the strongest of the hurricanes, lasting from August 17 to September 3, 2017. To date, the jurisdictions listed in this plan are still recovering from this Category 4 hurricane that brought on wind speeds surpassing 130 mph.

Next is Hurricane Hanna, which occurred from July 23 to 26, 2020. Although only a Category 1 hurricane, Hanna caused severe damage and is known as the first July Hurricane to make landfall in Texas since Hurricane Dolly, which happened in July 2008. Following Hurricane Hanna are Hurricanes Marco and Laura, which took place back-to-back from August 20 to 29, 2020.

Hurricane Marco peaked at Category 1 with winds speeds up to 75 mph. However, Hurricane Laura peaked at Category 4. Although it caused more damage in Louisiana, Hurricane Laura brought tornado warnings and strong winds in the Calhoun County area.

In 2021, Hurricane Ida began as a tropical storm that became a Category 4 Hurricane. Like Hurricane Laura, Hurricane Ida led the County to experience adverse effects from the storm but not its full capacity. Hurricane Ida took place from August 26 to September 4, 2021, and was followed by Hurricane Nicholas from September 12 to 18, 2021.

Hurricane Nicholas was also a Category 1 and made landfall at 75 mph. Changes in the climate and data indicate that the Texas Coast, including Calhoun County, will continue to see increases in Hurricanes in the years ahead.

Probability of Future Events - Hurricanes occur in seasonal patterns between June 1st and November 30th. Warning time for hurricanes has lengthened due to modern and early warning technology. Based on the historical frequency of significant hurricane wind and surge events, the probability of future hurricane or tropical storm events is at least once a year. By importing the data in Figure 2 into the formula Occurrence/Time Frame = Probability of Future Events, we can predict that hurricanes have a 100% chance of occurring and tropical disturbances a 16.7% chance.

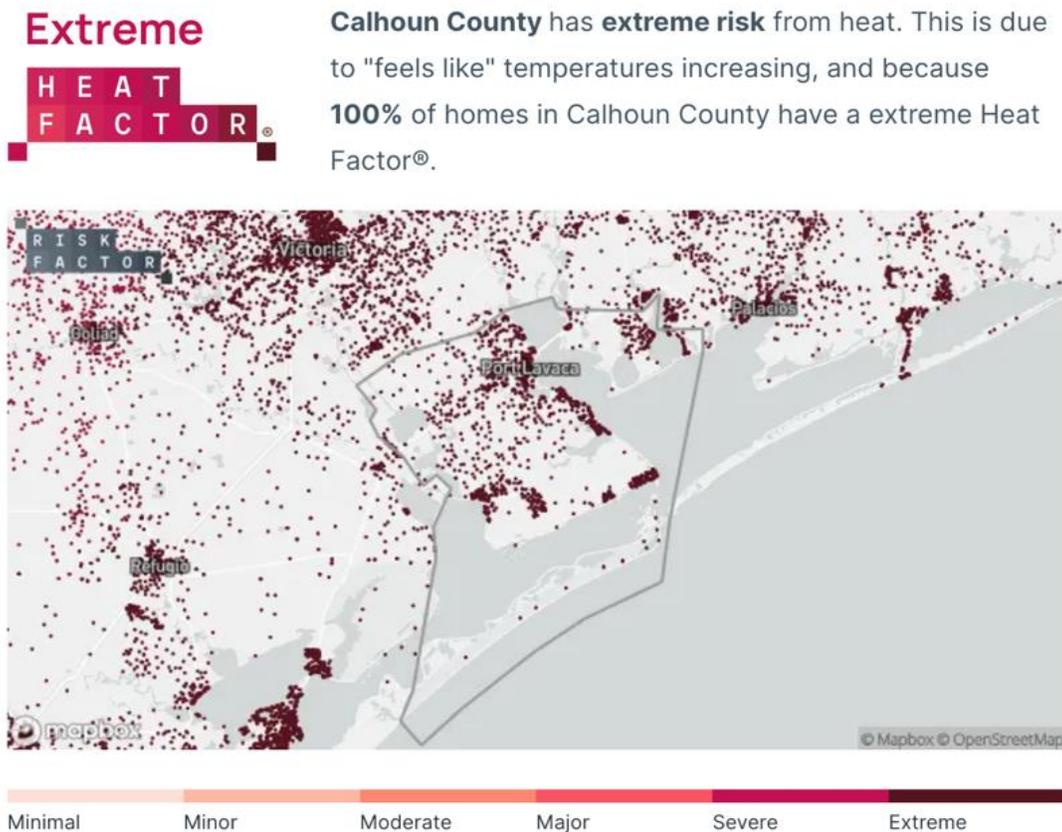
Assets, Vulnerabilities, and Impact - The following tables present vulnerability and impact, both to infrastructure and critical facilities that are potentially at risk. The tables provide information on the infrastructure and lifelines, including building values, oil and gas pipelines, highways, railroads, hazardous material sites, and approximate locations of critical facilities in the cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County. Critical facilities are also listed in detail in Appendix D¹.



- **Extreme Heat**

Hazard Description – Severe and excessive heat is characterized by exceptionally high temperatures and humidity. When these conditions persist, it is called a heat wave. 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 extreme heat include heat cramps, sunburn, dehydration, fatigue, heat exhaustion, and even heat stroke. The most vulnerable populations to heat casualties are children and the elderly or infirmed, who frequently live on low fixed incomes and cannot afford to run air-conditioning regularly. This population is throughout all jurisdictions and is sometimes isolated, with no immediate family or friends to look out for their well-being. Severe heat is an invisible killer.

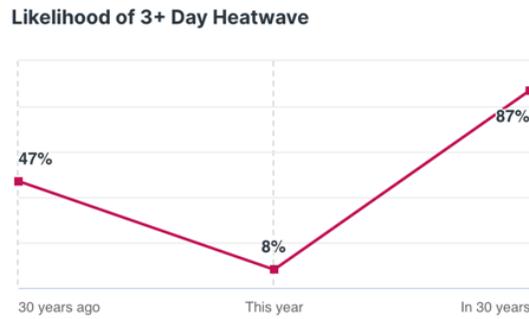
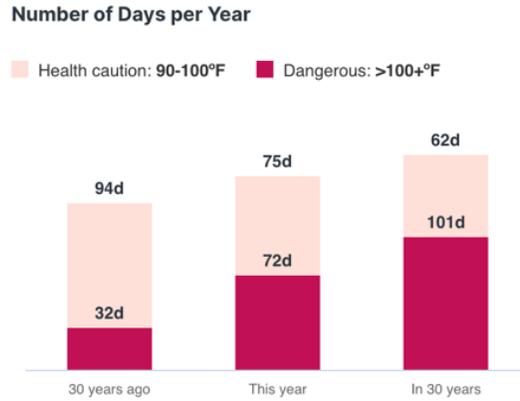
Figure 6. Extreme Heat Risk Factor in Calhoun County



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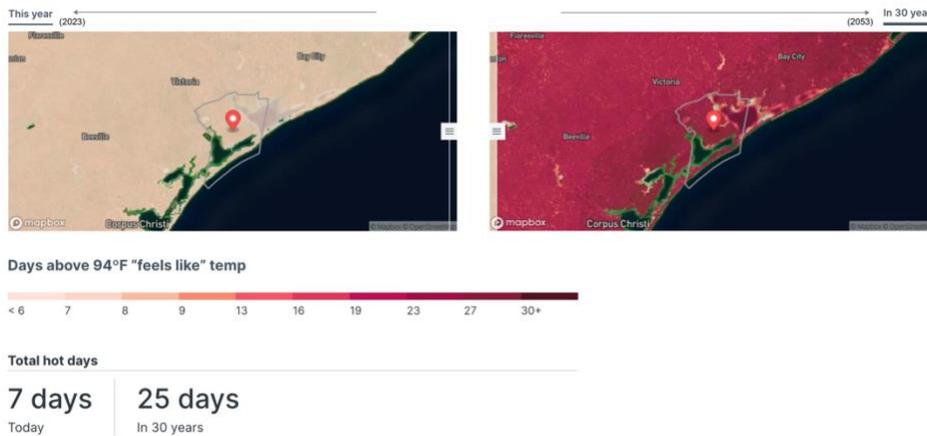


Figure 7. Number of Days Per Year with High Temperatures for Calendar Year 2022



https://riskfactor.com/county/calhoun-county-tx/48057_fsid

Figure 8. A Comparison of Total Hot Days Today vs. In 30 Years (2022)



https://riskfactor.com/county/calhoun-county-tx/48057_fsid



Location - All jurisdictions are susceptible to extreme heat at least once every year. Though injuries or deaths from extreme heat have been recorded, there is no specific geographic scope to the extreme heat hazard. Extreme heat could occur anywhere.

Extent - Higher than normal humidity and temperatures can cause an extreme heat event or heat wave to occur. A heat wave is a prolonged period of excessive heat, most often in very humid conditions.

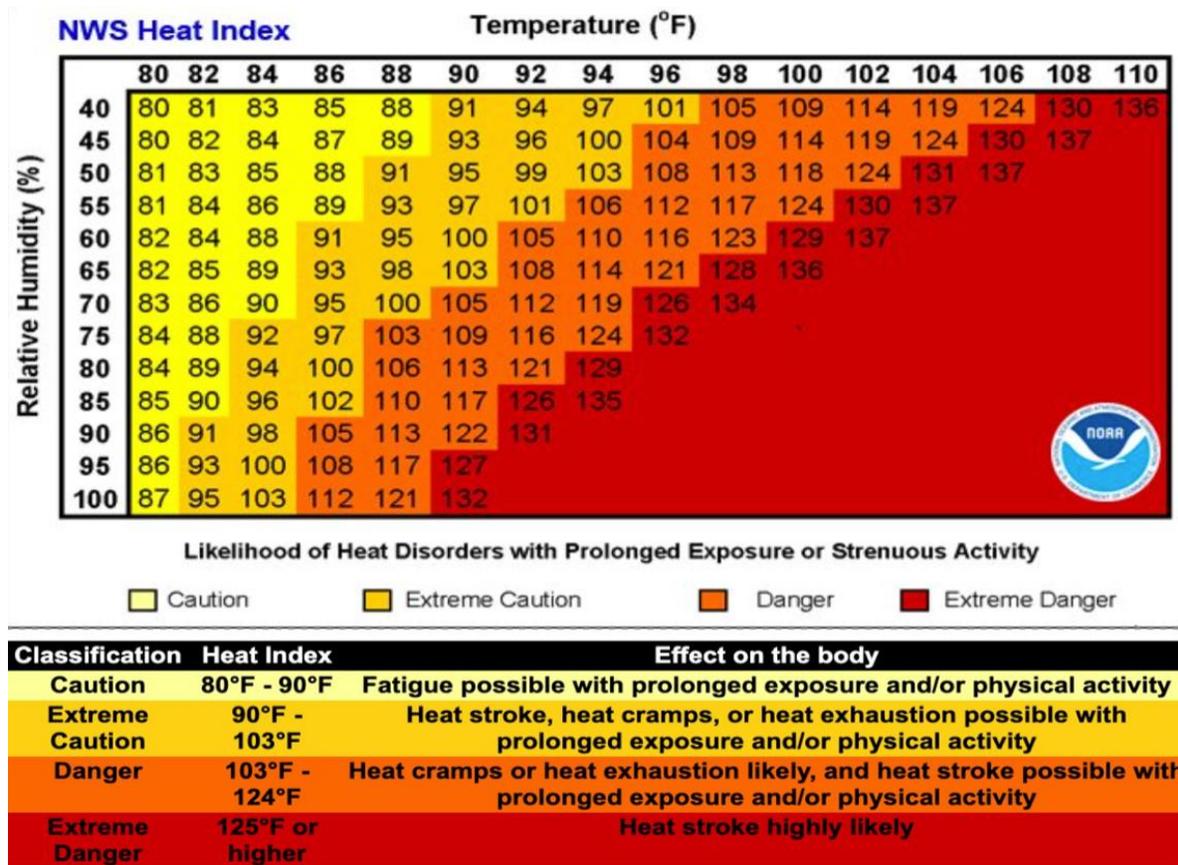
The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the “Heat Index” and is depicted in Figure 9. This index measures how hot it feels outside when humidity is combined with high temperatures. The extent scale in Figure 9 displays varying degrees of caution depending on the relative humidity combined with the temperature. For example, when the temperature is at 90 degrees Fahrenheit 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 level of intensity where fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps, or heat exhaustion are possible, whereas 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 Figure 9. Based on the extent scale in Figure 9, an extreme summer heat event could occur with an air temperature as low as 80 degrees Fahrenheit if the percentage of humidity was equal to or greater than 40 percent. Even though this temperature seems relatively low, given the high humidity, fatigue is possible.

Citizens, especially children and the elderly in all jurisdictions, should exercise caution by staying out of the heat for prolonged periods at this temperature and relative humidity. As the chart indicates, fatigue is only possible but can occur with prolonged exposure or physical activity. Citizens who work outdoors should exercise caution even at the lower temperature if the humidity is at a high degree. With prolonged exposure or physical activity, fatigue could set in, causing dizziness, headaches, or nausea.



Figure 9. Heat Index



<https://www.weather.gov/ama/heatindex>

Table 2. Extreme Summer Heat Warnings

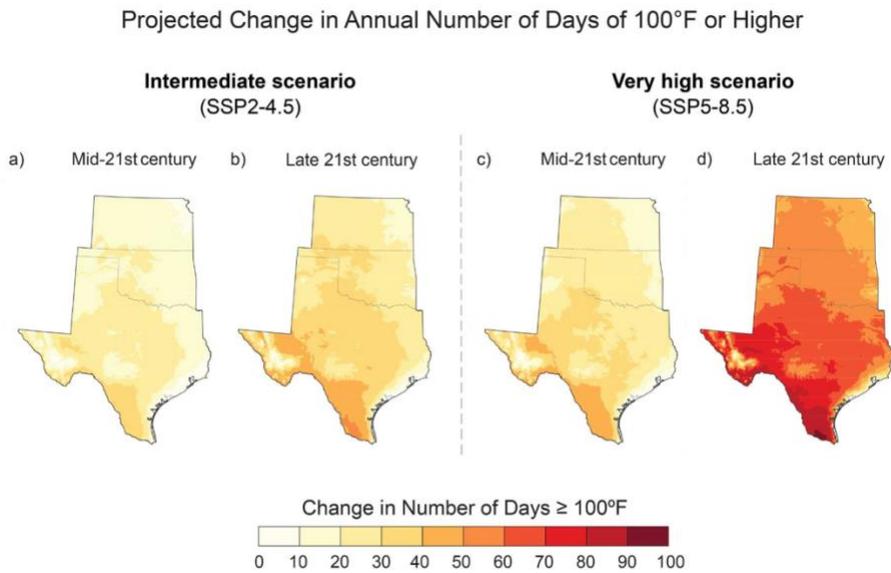
Intensity	Detailed Description
Excessive Heat Warning- Take Action	An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105 degrees or higher for at least 2 days, and nighttime air temperatures will not drop below 75 degrees; however, these criteria vary across the county, especially for areas not used to extreme heat conditions. If you don't take precautions immediately when conditions are extreme, you may become seriously ill or even die.
Excessive Heat Watches- Be Prepared	Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. They are used when the risk of a heat wave has increased, but its occurrence and timing are still uncertain.



Heat Advisory-Take Action	A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100 degrees or higher for at least 2 days, and nighttime air temperatures will not drop below 75 degrees; however, these criteria vary across the country, especially for areas that are not used to dangerous heat conditions. Take precautions to avoid heat illness. If you don't take precautions, you could become seriously ill or even die.
Excessive Heat Outlooks	These are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.

Historical Occurrences – According to the U.S. Climate Resilience Toolkit’s Fifth National Climate Assessment, Texas has and will continue to experience an increase in extreme temperatures, endangering outside activities, and putting those who participate in them at risk. The next two figures show the increase in temperatures through 2023.

Figure 10. Projected Change in Annual Number of Days of 100 °F or Higher



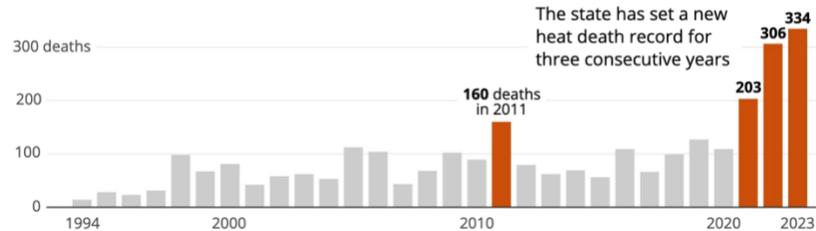
<https://nca2023.globalchange.gov/chapter/26/>



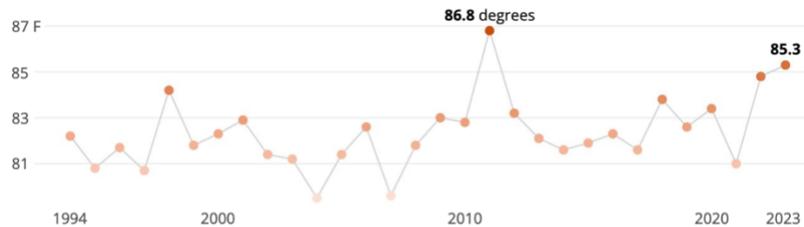
Figure 11. Number of Deaths due to Heat in Texas in 2023

A record number of people died due to heat in Texas in 2023

In 2023, 334 people died from heat-related causes in Texas according to state data. That's more than double the number recorded in 2011, which was the record high until 2021.



Meanwhile, 2023 saw the second-highest average summer temperatures on record.



Note: Death data includes heat-related deaths which occurred in Texas, regardless of where the person lived. Death data from 2021 to 2023 is not final and data for 2023 is current through the end of November. Temperature data represents statewide average temperatures from June to August, and the record goes back to 1895. Source: Texas Department of State Health Services, National Oceanic and Atmospheric Administration Credit: Yuriko Schumacher

<https://www.texastribune.org/2024/01/12/texas-heat-deaths-2023-record-climate-change/>

Probability of Future Events - The future probability of occurrence of excessive summer heat is yearly, with at least one event possible every year. Extreme drought conditions and above-average temperatures can affect all jurisdictions in any given year. In the past, Calhoun County has issued burn bans to prevent the occurrence of wildfires due to extreme heat and dry conditions.

Assets, Vulnerabilities, and Impact – Though the potential impact of excessive summer heat was viewed as minor in the 2017-2022 HMP, there is enough evidence to consider the impact of extreme heat more seriously. The Fifth National Climate Assessment points out that “Climate change is beginning to alter how we live in... putting us at risk from climate hazards that degrade our lands and waters, quality of life, health and well-being, and cultural interconnectedness... Many climate hazards are expected to become more frequent, intense, or prolonged; to broaden in spatial extent; and to result in more people experiencing costly, deadly, or stressful climate-related conditions”.

While all jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by extreme heat events, unless the events cause a wildfire.



Therefore, any estimated property losses associated with these hazards are anticipated to be minimal. However, extreme temperatures present significant life and safety threats to the population and significantly impact livestock and agriculture.

- **Hailstorms**

Hazard Description - 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. Frozen droplets gradually accumulate into ice crystals until they fall as precipitation that is round or irregularly shaped masses of ice greater than 0.75 inches in diameter. The size of hailstones is a direct result of the size and severity of the storm. High-velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a byproduct of heating on the Earth’s surface. Higher temperature gradients above the Earth’s surface result in increased suspension time and hailstone size.

Location - Hailstorms vary tremendously in terms of size, location, intensity, and duration but are considered frequent occurrences throughout our area. All jurisdictions are uniformly exposed to hail events just as they are exposed to the thunderstorms that produce the hail events.

Extent - The severity of hail events ranges based on the hail size, winds, and structures in the path of a hailstorm. Storms that produce high winds in addition to hail are most damaging and can result in numerous broken windows and damaged siding. Fortunately, most hailstorms produce marble-size or smaller hailstones. These can cause crop damage, but they usually do not damage buildings or automobiles. Larger hailstones can destroy crops, livestock, and wildlife and can cause extensive damage to buildings, including roofs, windows, and outside walls. Vehicles can be total losses. A scale showing intensity categories is included in Table 3 below.

The range of intensity for a hailstorm event is anywhere from H0 to H10 on the Hail Intensity Scale. Based on historical occurrences, the city of Port Lavaca has experienced a hailstorm of H3, the city of Seadrift experienced H3, the city of Point Comfort has no recorded events, and Calhoun County has experienced H10.

Table 3. TORRO Hailstorm Intensity Scale

Size Code	Intensity Category	Size (Diameter in mm)	Descriptive Term	Typical Damage
H0	Hard Hail	5-9	Pea	No damage
H1	Potentially Damaging	10-15	Mothball	Slight damage to plants and crops
H2	Potentially Damaging	16-20	Marble /Grape	Significant damage to plants and crops



H3	Severe	21-30	Walnut	Severe damage to plants and crops
H4	Severe	31-40	Pigeon's egg > squash ball	Widespread glass and auto damage
H5	Destructive	41-50	Golf ball > Pullet's egg	Widespread destruction of glass, roofs, and risk of injuries
H6	Destructive	51-60	Hen's egg	Aircraft bodywork dented and brick walls pitted
H7	Very Destructive	61-75	Tennis ball > cricket ball	Severe roof damage and risk of serious injuries
H8	Very Destructive	75-90	Large orange > soft ball	Severe damage to all structures
H9	Super Hailstorms	90-100	Grapefruit	Extensive structural damage, could cause fatal injuries
H10	Super Hailstorms	>100	Melon	Extensive structural damage, could cause fatal injuries

<https://www.torro.org.uk/research/hail/hscale>

Historical Occurrences – According to the NCDC (National Climatic Data Center), there were no hailstorms in Calhoun County from 2015 to 2023.

Probability of Future Events – There were 18 occurrences between 1950-2015, therefore, the probability of a hailstorm happening again is approximately 25%.

It is possible that additional hail events may have occurred since 1950 that were not reported to NCDC are not accounted for in this analysis.

Assets, Vulnerabilities, and Impact – A hailstorm’s impact depends on the hail's size and the location it affects. An H3 to H10, which has affected all jurisdictions, can result in fatal injuries, extensive structural damage that could shut down critical facilities and services for 24 hours or more, and affected properties could be destroyed or suffer major damage. All current and future buildings, crops, facilities, livestock, wildlife, and populations within all jurisdictions are vulnerable to hailstorms that are classified as H3 to H10.



These storms have the potential to cause significant damage, leading to the possible closure of our local hospital, medical clinics, schools, utilities, and critical infrastructure that services the cities and county.

- **Wildfires**

Hazard Description - 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 urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors.

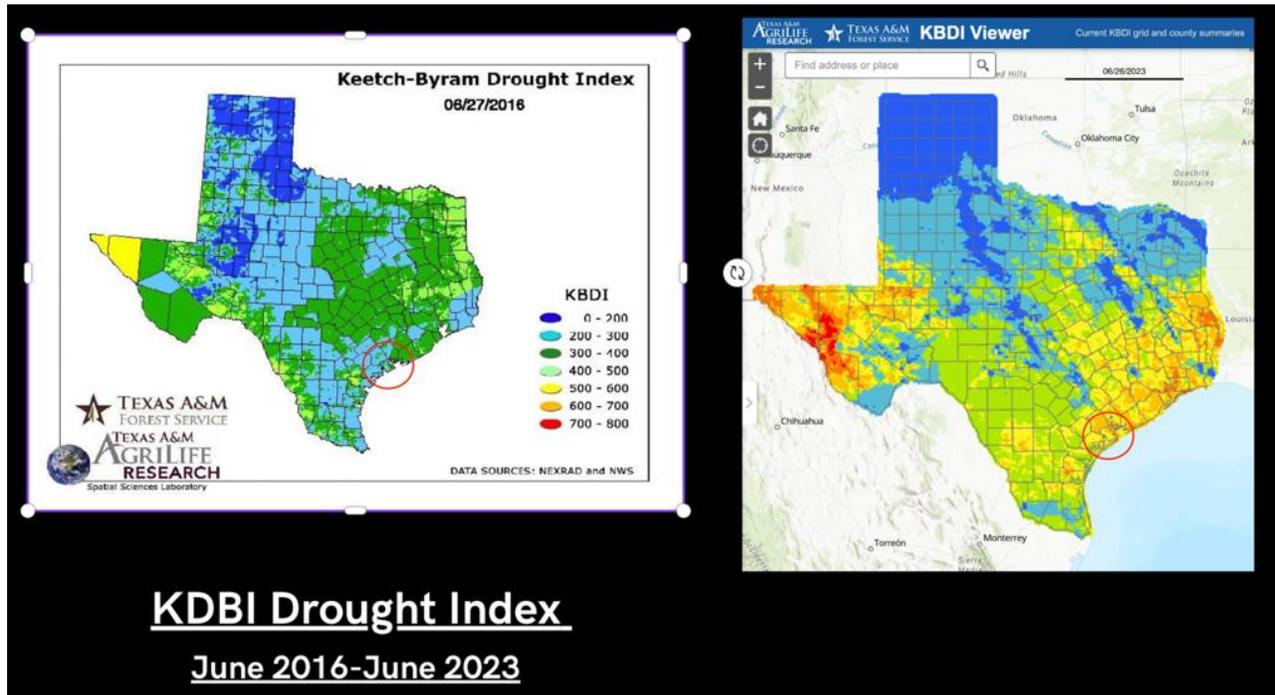
Texas has seen a huge increase in the number of wildfires in the past 30 years. Years of fire suppression have significantly disturbed natural fire occurrences- nature's renewal process. The result has been the gradual accumulation of understory and canopy fuels to levels of density that can feed high-energy, intense wildfires and further increase the hazards from and exposure to interface problems.

Location - Calhoun County is a coastal community located on the mid-Texas coast. It consists of 540 square miles. The county is surrounded by several Bays, which include San Antonio Bay, Matagorda Bay, Lavaca Bay, Carancahua Bay, and Espiritu Santo Bay. Calhoun County is a rural area with large open fields susceptible to wildfires from many sources.

Extent - Fire risk is measured in terms of magnitude and intensity using the Keetch-Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI determines forest fire potential and is based on a daily water balance, where a drought factor is balanced 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. Figure 12, below, shows the difference in the drought index from June 2016 to June 2023. In the last 7 years, precipitation has decreased and the potential for drought has increased by at least 33% for all jurisdictions.



Figure 12. KDBI Drought Index June 2016 vs. June 2023



2017 HMP and <https://tfsweb.tamu.edu/DroughtStudy/>

Each color on the map above represents the drought index at that location. The drought index ranges from 0 to 800, where a drought index of 0 represents no moisture depletion, and an index of 800 represents absolutely dry conditions.

All jurisdictions can be affected by wildfires by shutting down facilities, evacuations, and dense smoke. The city of Port Lavaca can be affected by wildfire from the north, west, and south sides. The city of Seadrift can be affected on the west, north, and east sides. The city of Point Comfort’s most vulnerable side is the north as it is surrounded by highways.

Historical Occurrences - Information from the National Centers for Environmental Information shows that between 1950 and 2023 there were 4 fires in Calhoun County. Although many fires were responded to, only these 4 were entered into the database.

Table 4. Reported Wildfires in Calhoun County

Calhoun County	Date	Total Acres Burned
Seadrift Area	01/01/2008	400
Welder Claiborne Ranch	03/02/2009	500
Powderhorn II Ranch	03/11/2009	3000
Matagorda Island	04/15/2018	500

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Wildfire&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=12&endDate_dd=31&endDate_yyyy=2023&county=CALHOUN%3A57&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitButton=Search&statedfips=48%2CTEXAS



Probability of Future Events - Wildfires can occur at any time of the year. 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 these types of fires. The intensity of fires and the rate at which they spread are directly related to wind speed, temperature, and relative humidity. Although Calhoun County is along the coast, where we experience a moist and humid climate, the probability of a future wildfire event is once every 10 years.

Assets, Vulnerabilities, and Impact - Depending on climate, the risk of wildfires varies monthly. Often warning time for wildfire events is minimal to none. The impacts of wildfires on our community can cause economic hardship for farmers and ranchers affecting their ability to harvest crops and feed livestock. Wildfires can also disrupt emergency services due to blocking roads and dense smoke.

Such events can shut down medical services and industries such as Formosa, Alcoa, Ineos, Dow, Seadrift Coke, and the Port of Port Lavaca/Point Comfort, which can have a severe impact on the local economy and possibly have a release of hazardous materials.

- **Lightning**

Hazard Description - Lightning damage can result in the electrocution of humans and animals, vaporization of materials along the path of the strike, fire caused by the high temperature produced by the strike, and sudden power surges that can damage electrical and electronic equipment. Millions of dollars of direct and indirect damages result from lightning strikes on electric utility substations and distribution lines. While property damage is the major hazard associated with lightning. According to the CDC (Center for Disease Control), lightning strikes kill an average of 28 people in the United States each year and Texas is one of the states with the most recorded lightning deaths.

<https://www.cdc.gov/disasters/lightning/victimdata/infographic.html#:~:text=On%20average%2C%2028%20people%20in,reported%20from%202006%20through%202021.>

Location - Calhoun County and the Cities of Port Lavaca, Seadrift, and Point Comfort are all affected by lightning from thunderstorm activity. All jurisdictions have experienced direct and indirect lightning strikes from severe thunderstorm activity, from offshore to inland storms.

Extent – Lightning activity level (LAL) is a scale that describes degrees and types of lightning activity. Values are labeled 1–6. Lightning is very infrequent, with 1–5 cloud-to-ground strikes in a five-minute period. Lightning is infrequent, with 6 –10 cloud-to-ground strikes in a five-minute period.

The extent of lightning strikes can disrupt public safety services and medical services, and cause fires to structures and farmland, taxing all jurisdictions’ response capabilities. The entire planning area can expect an LAL 5, 1-5 cloud-to-ground strikes in a minute. Structures without adequate lightning protection and those with large concentrations of electronic equipment like computers, servers, and printers are most vulnerable to lightning strikes, as are outdoor locations with outside crowds during a lightning event.



Figure 13. Lightning Activity Level Scale (LAL)

Lightning Activity Level (LAL)	
Is a scale which describes lightning activity. Values are labeled 1-6:	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

<https://graphical.weather.gov/definitions/defineLAL.html>

Historical Occurrences - It is important to note that only reported lightning occurrences are included in the table below. However, a high number of instances have likely gone unreported. No lightning-inflicted property or crop damage dollars have been recorded for the planning area.

Table 5. Number of Lightning Deaths and Occurrences in Calhoun County (1950-2023)

Location	Date	Deaths	Injuries
Calhoun County – Port Alto Beach	11/24/2007	0	0
Port Lavaca	05/21/2015	1	1

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Lightning&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=12&endDate_dd=31&endDate_yyyy=2023&county=CALHOUN%3A57&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=48%2CTEXAS

Probability of Future Events - If you hear thunder, you are within striking distance of the storm. Spring is usually when severe thunderstorms threaten all jurisdictions in this plan, and these events will continue a minimum of a hundred times each year. Most lightning deaths and injuries occur during the summer months when the combination of lightning and outdoor activities reaches a peak.



People involved in activities such as boating, swimming, fishing, bicycling, golfing, jogging, walking, hiking, camping, or working outdoors all need to take the appropriate actions in a timely manner when thunderstorms approach.

Since the jurisdictions are located on the coast, this places people on, in, or near water at risk of a lightning strike during thunderstorms. Swimming is particularly dangerous, as not only do swimmers protrude from the water, presenting a potential channel for electrical discharge, but also because water is a good conductor of electricity.

Assets, Vulnerabilities, and Impact - Thunder is an immediate warning of dangerous conditions outside. If thunder is heard, anyone outside is in danger of being struck by lightning.

Since Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort are coastal communities our citizens and visitors spend numerous hours outdoors, making them vulnerable to lightning, both on land and on water. Lightning strikes, on or near boats, can cause them to become disabled or damaged and in need of assistance. Beachgoers are also vulnerable to lightning strikes.

Most lightning strikes for all jurisdictions have not been documented but have been affected by lightning strikes, causing radio equipment, antennas, and computers to be damaged, or destroyed making emergency communications a challenge. It can also cause fires and injuries.

- **Windstorms**

Hazard Description - Windstorms are storms with high winds or violent gusts but little or no rain. Windstorms are generally considered a common occurrence in Texas. Windstorms can be extremely dangerous as they are often strong and fast in their approach.

Meteorologists refer to the force that states the wind flowing as the pressure gradient force. There is no set number that divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with the speed given, usually in miles per hour or knots. A Wind Advisory is issued when winds are forecast to be sustained at 25 to 39 mph and/or gusts to 57 mph.

Location - Windstorms occur randomly; therefore, it is impossible to predict where they will strike within a county or city. Thus, it is assumed that some areas may be affected while others may not. All jurisdictions in this plan have been affected by windstorms.

Extent - A severe windstorm is measured in terms of intensity based on the strength of the wind speeds or significant winds associated with the thunderstorm event. Figure 14 depicts the intensity of windstorms according to wind magnitude.



A severe windstorm event is typically defined by the NCDC based on the intensity and magnitude of the wind event which can affect the planning area randomly. Since the magnitude of a severe windstorm does not consider wind speeds from a hurricane or tornado, but specifically significant winds, the extent to which it can affect the planning area ranges from a Force 9 to a Force 12. On average, an intense wind event to be mitigated could have wind speeds ranging from 50 mph, a Force 9 on the Beaufort Wind Scale.

Figure 14. Beaufort Wind Chart

Beaufort Number	Description	Wind speed	Wave height	Sea conditions	Land conditions	
0	Calm	< 1 knot < 1 mph < 2 km/h	0 ft 0 m	Sea like a mirror	Smoke rises vertically	
1	Light air	1-3 knots 1-3 mph 2-5 km/h	0-1 ft 0-0.3 m	Ripples	Direction shown by smoke drift	
2	Light breeze	4-6 knots 4-7 mph 6-11 km/h	1-2 ft 0.3-0.6 m	Small wavelets	Wind felt on face	
3	Gentle breeze	7-10 knots 8-12 mph 12-19 km/h	2-4 ft 0.6-1.2 m	Large wavelets	Leaves and small twigs in constant motion	
4	Moderate breeze	11-16 knots 13-18 mph 20-28 km/h	3.5-6 ft 1-2 m	Small waves	Raises dust and loose paper	
5	Fresh breeze	17-21 knots 19-24 mph 29-38 km/h	6-10 ft 2-3 m	Moderate waves	Small trees and leaves begin to sway	
6	Strong breeze	22-27 knots 25-31 mph 39-49 km/h	9-13 ft 3-4 m	Large waves	Large branches in motion	
7	High wind, moderate gale, near gale	28-33 knots 32-38 mph 50-61 km/h	13-19 ft 4-5.5 m	Sea heaps up	Whole trees in motion	
8	Gale, fresh gale	34-40 knots 39-46 mph 62-74 km/h	18-25 ft 5.5-7.5 m	Moderately high waves	Twigs break off trees	
9	Strong/severe gale	41-47 knots 47-54 mph 75-88 km/h	23-32 ft 7-10 m	High waves	Slight structural damage	
10	Storm, whole gale	48-55 knots 55-63 mph 89-102 km/h	29-41 ft 9-12.5 m	Very high waves	Trees uprooted, considerable structural damage	
11	Violent storm	56-63 knots 64-72 mph 103-117 km/h	37-52 ft 11.5-16 m	Exceptionally high waves	Widespread damage	
12	Hurricane force	≥ 64 knots ≥ 73 mph ≥ 118 km/h	≥ 46 ft ≥ 14 m	Exceptionally high waves, sea is completely white	Devastation	

<https://www.science-sparks.com/what-is-the-beaufort-scale/>

Historical Occurrences-Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort have all endured windstorms. In 2012, the City of Port Lavaca reported a windstorm of 70 knots while Seadrift reported 78 knots. Point Comfort reported 56 knots in 2021 and Calhoun County’s highest report was 87 knots in 1980. Since 1950, these jurisdictions have reported over 50 strong winds ranging from 0-87 knots.

Probability of Future Events - The probability of occurrence for future windstorms, according to the NCEI reported historical occurrences, is all jurisdictions in this plan can expect a 77% chance of experiencing severe



windstorms every year. Given this regular frequency of occurrence, it can be expected that future windstorms will continue to threaten life and cause minor property damage.

Assets, Vulnerabilities, and Impact - All jurisdictions are vulnerable and have been impacted by windstorms that have interrupted electricity, caused fires from downed power lines, and blown debris into roadways. High winds have caused our causeway that connects two cities to be impassable for emergency responders and traffic.

According to the available data for previous occurrences, high winds are common when accompanied by thunderstorms. If another Beaufort event of 10 or higher were to occur, this area would be susceptible to structural damage to structural facilities, especially roofs and windows. Injuries may also occur as a result of debris that is carried by strong gusts or twigs and branches that are broken off from the force of the wind. Traffic disruptions may also occur as traffic lights could be damaged or flying debris could cause accidents on the road. This would hinder the ability of critical services staff to travel to and from work.

Impacts to the planning area can include:

- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Private sector entities that all jurisdictions in the planning area rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until complete services can be restored.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damage without a backup power source.

- ***Tornadoes***

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

The most powerful tornadoes are produced by “super-cell thunderstorms.” These storms are affected by horizontal wind shears (winds moving in different directions at different altitudes) that 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.



Severe thunderstorms can produce tornadoes, high winds, and hail, any of which can cause extensive property damage and loss of life. Thunderstorms form when warm, moist air and cooler, drier air collide. Since these masses tend to come together during the transition from summer to winter, most thunderstorms occur during the spring and fall months.

Tornadoes occasionally accompany tropical storms and hurricanes that move over land. Tornadoes are the most common to the right and front of the storm center path as it comes ashore. Tornadoes vary in duration, wind speed, and toll, as shown in Table 6.

Table 6. Variations Among Tornadoes

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

Calhoun County 2017 HMP

Location - While historical tornado events for Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort total 30 from 1950 to 2023, locations of these incidents are completely random and unpredictable. The most vulnerable areas may be in unincorporated areas of the county where construction codes are not enforceable.

Since tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities, and populations are considered exposed to this hazard and could be impacted. It is important to note that only reported tornadoes have been factored into this vulnerability assessment.

Extent - Currently a tornado is given a Fujita rating of EF 0-5, based on the most intense damage along its path. The Fujita wind estimates are intended to be based on the expected damage to a well-built residential structure. Poorly built structures can suffer significant structural damage under lesser winds than the Fujita Scale might suggest. Commercial properties may or may not experience the same failures under high wind speeds as a residence. Thus, the Fujita scale is largely a residential scale, with much more care required in assessment after wind damage to a commercial structure.

Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale, which retains the same basic design as its predecessor with six strength categories. The newer scale reflects more refined assessments of tornado damage surveys, standardization, and damage consideration to a wider range of structures. Tornadoes occasionally accompany tropical storms and hurricanes that move over land.



Figure 15. A Side-by-Side Comparison of the Fujita and Enhanced Fujita Scales

Fujita Scale		Enhanced Fujita Scale* <small>* In use since 2007</small>	
F-0	40–72 mph winds	EF-0	65–85 mph winds
F-1	73–112 mph	EF-1	86–110 mph
F-2	113–157 mph	EF-2	111–135 mph
F-3	158–206 mph	EF-3	136–165 mph
F-4	207–260 mph	EF-4	166–200 mph
F-5	261–318 mph	EF-5	>200 mph

<https://www.tornadofacts.net/tornado-scale.html>

Figure 16. Detailed EF Scale for Tornadoes

Enhanced Fujita Scale for Tornadoes

The Enhanced Fujita Scale (EF), introduced in 2007, provides estimates of tornado strength based on damage surveys. The original scale was developed by Dr. Theodore Fujita and implemented in 1971.

Wind Speed	EF Scale	Typical Damage
65-85 mph	0	Peels surface off some roofs, some damage to gutters or siding
86-110 mph	1	Roof severely stripped, mobile homes overturned or badly damaged, loss of exterior doors, windows and other glass broken
111-135 mph	2	Roofs torn off well-constructed homes; foundations of frame homes shifted; mobile homes completely destroyed
136-165 mph	3	Entire stories of well-constructed homes destroyed; severe damage to large buildings such as shopping malls
166-200 mph	4	Well-constructed houses and whole-frame homes completely leveled
200+ mph	5	Strong frame houses leveled off foundations and swept away; high-rise buildings have significant structural deformation

Source: Weather Underground (www.wunderground.com/resources/severe/fujita_scale.asp)



Historical Occurrences - The jurisdictions have mostly been affected by F0 or EF0 tornadoes; however, the extent that all jurisdictions in this plan will continue to mitigate for is an EF5. Historical evidence shows that all jurisdictions are vulnerable to tornadic activity. This hazard can result from severe thunderstorm activity or during a major tropical storm or hurricane. Table 7 shows a listing of historical tornadoes that hit the study area reported and documented.

Table 7. Historical Tornado Occurrences (1950-2023)

Area	Number of Events	Magnitude (Fujita Scale and Enhanced Fujita Scale)						Maximum F or EF Scale
		F0	F1	F2	EF 0	EF 1	EF2	
Calhoun County	25	13	6	5	1	0	0	F2
Port Lavaca	3	2	0	0	1	0	0	F0
Seadrift	2	0	0	0	1	1	0	EF1
Point Comfort	0	0	0	0	0	0	0	N/A

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Tornado&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=12&endDate_dd=31&endDate_yyyy=2023&county=CALHOUN%3A57&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitButton=Search&statefips=48%2CTEXAS

Probability of Future Events - Although Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort are at a lower risk than other Texas counties, it is expected that there will be one to two tornadoes annually. Seasonal patterns are relevant to tornadoes. Thunderstorms form when warm, moist air collides with cooler, drier air. Since these masses tend to come together during the transition from summer to winter, most thunderstorms and resulting tornadoes occur during the spring (April through June) and fall (October through December). Warning time for tornadoes is minimal and ranges from no warning time to 30 minutes.

Assets, Vulnerabilities, and Impact - All jurisdictions are vulnerable and can be impacted by tornadoes. While 30 tornado events have been recorded to impact the planning areas from 1950 to 2015, no fatalities in the planning areas have been reported and less than 10 percent of property was destroyed or suffered major damage.

- **Winter storms**

Hazard Description - A winter storm is a combination of heavy snow, blowing snow, and/or dangerous wind chills. A winter storm is life-threatening. Blizzards are dangerous winter storms that combine blowing snow and wind, resulting in low visibility.

Location – Since 2021, each jurisdiction has been susceptible to winter storms. Climate changes have caused temperatures to drop during the winter months and over the past 3 years (2021-2023) have caused numerous power outages and damage to power lines.



Extent – Currently, it is expected that new climate patterns will continue to surface as the climate changes; although since the last three winter storms are unique, it cannot be predicted that the mentioned jurisdictions will encounter yearly winter storms; however, it should be noted that they will prepare for them, regardless.

Historical Occurrences – February 11-20, 2021, marked a historical winter event that engulfed the entire state of Texas; no city or county was safe. Known as the “Great Freeze”, this time was noted as the coldest winter in Texas since 1989. The most vulnerable were rural areas with high populations of senior citizens. Jurisdictions experienced power outages and nearly 10 million people were left without heat or electricity. Texas also experienced winter storms in 2022 and 2023.

<https://www.ncei.noaa.gov/news/great-texas-freeze-february-2021#:~:text=On%20February%2011%2D20%2C%202021,the%20entire%20state%20of%20Texas.>

Probability of Future Events – From 2017-2023, there have been three disastrous winter storm events. Referencing these numbers alone, the probability of the jurisdictions encountering future winter storms is about 50%.

Assets, Vulnerabilities, and Impact – The winter storms of 2021, 2022, and 2023 caused temporary damage to power lines, trees, and homes. In the future, all jurisdictions mentioned would potentially experience similar impacts and should plan for such events.

4.2 Hydrologic:

- *Coastal Erosion*

Hazard Description – Texas has one of the longest coastlines in America coupled with some of the highest rates of coastal erosion in the nation. Calhoun County is bordered from the southwest to the southeast by major inland bays and the Gulf of Mexico with more than 560 miles of coastline.

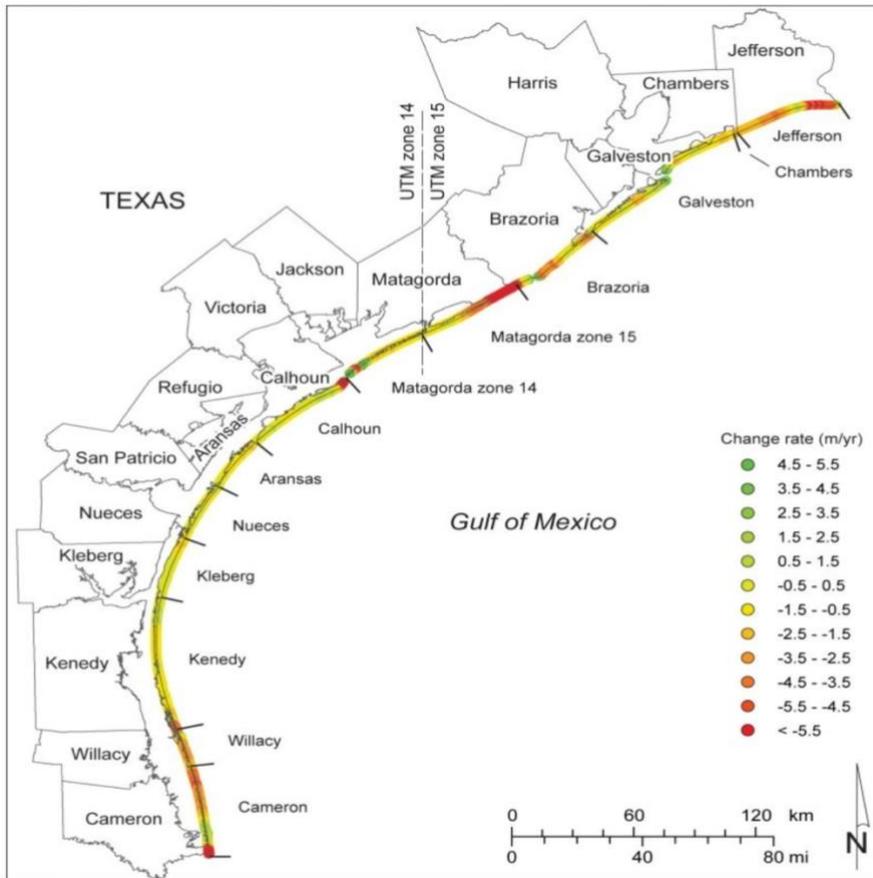
Coastal erosion is the wearing away of land and the removal of beach or dune sediments by wave action, tidal currents, wave currents, drainage, or high winds. Calhoun County including the cities of Port Lavaca, Seadrift, and Point Comfort, are all coastal communities with erosion taking its toll.

Location - All jurisdictions are on the mid-Texas coast where U.S. Highway 87 begins and the Guadalupe River ends. Port Lavaca is the county seat on Lavaca Bay. The city of Point Comfort lies on the east side of Lavaca Bay and the city of Seadrift is located on San Antonio Bay.

Extent - The following map shows coastal erosion locations in eroding values for Texas. Calhoun County and the Cities of Port Lavaca, Seadrift, and Point Comfort are being affected yearly. The eroding values for all jurisdictions range from 2.5 to -5.5. These values are based on the map in Figure 17. These eroding values determine the extent of the coastal erosion for all jurisdictions in the planning area.



Figure 17. Erosion Along the Texas Coast



2017 HMP and <https://coastal.beg.utexas.edu/shorelinechange2019/>

Historical Occurrences - All jurisdictions are affected yearly by astronomically high tides and winds which cause excessive wave action causing erosion. Hurricanes and Tropical systems that come into the Gulf of Mexico also have a large impact on the tidal currents and waves. The ports at Port Lavaca and Point Comfort also contribute to coastal erosion from the ships and tankers that come into the Port causing wave action.

From 2017-2023, seven storm surges measuring several feet have contributed to coastal erosion and extensive damage to piers and the coastline due to wave actions throughout all jurisdictions.

Probability of Future Events - Texas has some of the highest coastal erosion rates in the country. With miles of coastline in Calhoun County, the yearly impact depends on the severity of the high winds, hurricanes, and high tides that affect this area directly and indirectly. The future probability of occurrence of coastal erosion is at least one 2 feet per year.



Assets, Vulnerabilities, and Impact - Impacts from coastal erosion include loss of residential land in all jurisdictions, and agricultural land in Calhoun County, and affects the protected wetlands and marsh areas located in the county. Loss of land impacts the county by not having enough area for the development of new industries or companies affecting the local economy.

Other impacts of erosion are decreased property values, tourism suffers, and farming and fishing industries are impacted. There could also be a complete loss of structures adjacent to the coast and damage to local infrastructure, including roads, bridges, and piers.

Major Industries in Calhoun County including Formosa, Alcoa, Ineos, Seadrift Coke, and Dow are impacted and are vulnerable to erosion because they are located near the coastline and use water from the bays for the production or transportation of products. Homes and businesses can be lost, and ports, roads, and industrial infrastructure are at risk. Without healthy beaches, dunes, and wetlands to protect the coast, there is day-to-day wear making the coast more vulnerable to major storms. Coastal marshes and wetlands are an essential part of the ecosystem and are vulnerable to erosion.

- ***Drought***

Hazard Description - Drought is a period without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 8 presents information on these different types of droughts.

Droughts are among 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 is a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Table 8. Drought Classification Definitions

Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrologic Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural Drought	Soil moisture deficiencies relative to water demands of plant life, usually crops.



Socioeconomic Drought	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.
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Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

Location - All jurisdictions in the planning area are affected by drought. Droughts occur regularly throughout Texas and are a normal condition. However, they can vary greatly in their intensity and duration. There is no distinct geographic boundary to drought; therefore, it can occur throughout the planning area equally.

Extent - Figure 12, above, shows the difference in the drought index from June 2016 to June 2023. In the last 7 years, precipitation has decreased and the potential for drought has increased by at least 33% for all jurisdictions. All jurisdictions in this plan have experienced a D-3 (extreme drought), as described in Table 10.

Long-term drought is cumulative, with its intensity during the current month dependent on current weather patterns plus previous months' cumulative patterns. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop. Table 9 depicts the magnitude of drought, while Table 8 describes the classification definitions.

Table 9. 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 +2.00	+3.00 to +3.00	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above

Calhoun County 2017 HMP

Table 10. Palmer Drought Category Descriptions

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	-1.0 to -1.9



		average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams reservoirs or well 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

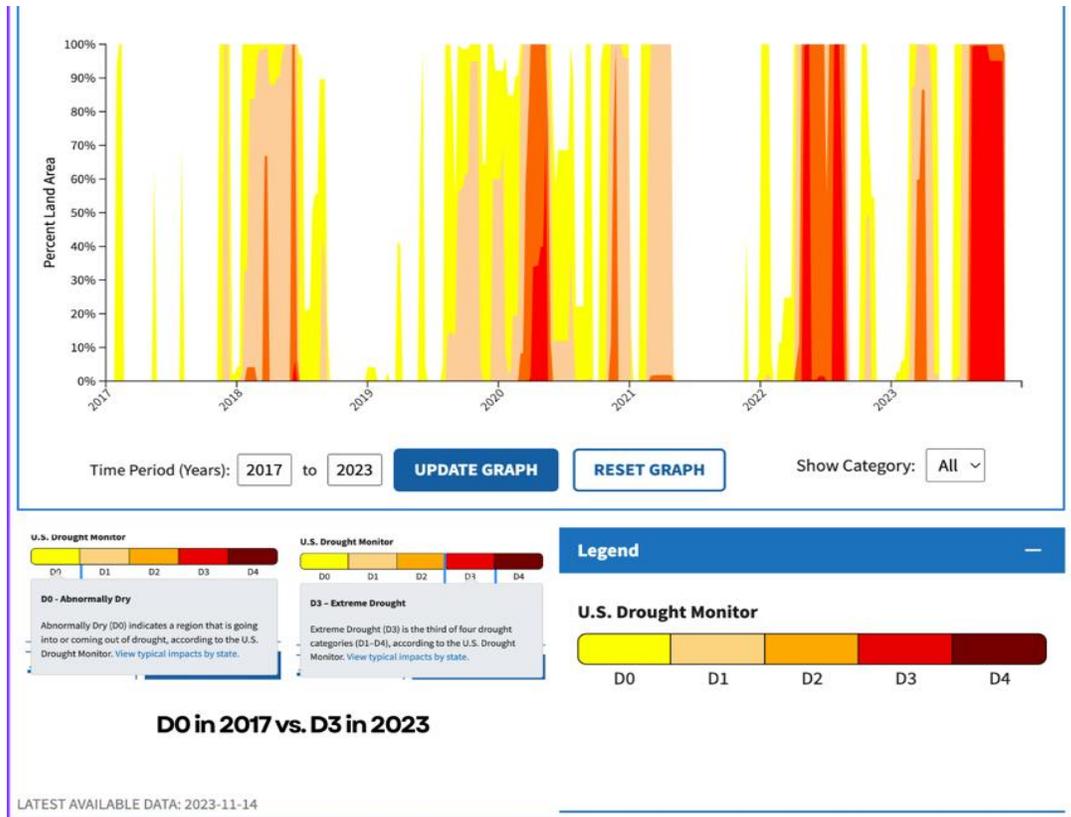
Calhoun County 2017 HMP

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

Based on the historical occurrences and the data in this section, all jurisdictions can anticipate a range of drought from abnormally dry to extreme or D0 to D3 based on the Palmer Drought Category.



Figure 18. Historical Drought Occurrences



<https://www.drought.gov/historical-information?dataset=0&selectedDateUSDM=20120131&state=Texas>

Historical Occurrences – According to the NCDC, Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort have been affected by 46 historic events from 2017 to 2023.

Probability of Future Events – Based on historical drought information in Texas and Calhoun County, all jurisdictions can expect seven drought occurrences every year.

It is possible that additional drought events that may have occurred since 1950 that were not reported to NCDC are not accounted for in this analysis.

Assets, Vulnerabilities, and Impact - Drought impacts large areas and crosses jurisdictional boundaries. Drought impacts for Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings.



The economic impact of droughts can be significant for all jurisdictions as they produce a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to industries and businesses to produce goods and provide services. The direct and indirect economic impact can be significant if droughts extend over years.

Based on the previous occurrences and potential exposure to the hazard, the potential severity of drought impact is substantial for all jurisdictions, especially considering the economic losses that may result.

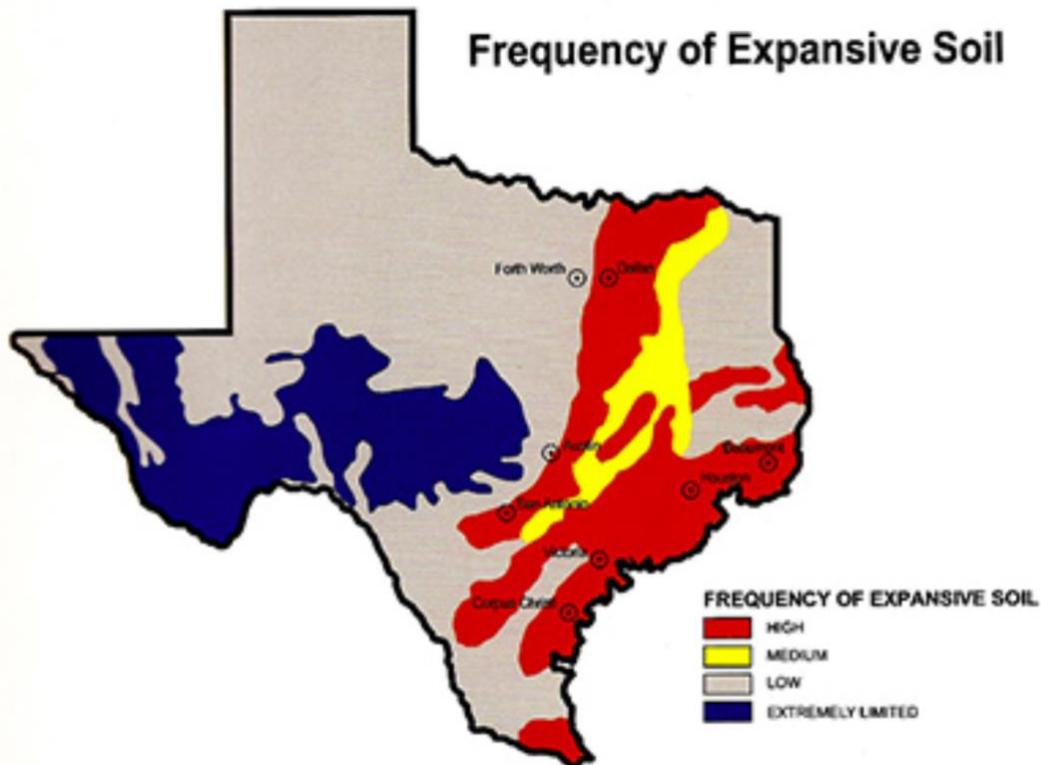
- *Expansive Soils*

Hazard Description - Soil that expands when wet and shrinks when dry is expansive soil. Expansive soils contain minerals that are capable of absorbing water. When they absorb water, they increase in volume. The more water they absorb, the more their volume increases. Expansions of ten percent or more are not uncommon. This volume change can exert enough force on a building or other structure to cause damage. Expansive soils will also shrink when they dry out. This shrinkage can remove support from buildings or other structures and result in damaging subsidence. Fissures in the soil can also develop and these fissures can facilitate the deep penetration of water when moist conditions or runoff occurs; this produces a cycle of shrinkage and swelling that places repetitive stress on structures.

Location - The potential for expansive soils is linked to the soil type as illustrated in the following map. The expansive soil threat is across all jurisdictions in this plan.



Figure 19. Frequency of Expansive Soil in Texas



<https://tellafirma.com/find-texas-expansive-soils/>

Extent - Expansive soils are present throughout all jurisdictions in this plan. Figure 19 shows that all jurisdictions fall within the red area, defined to have a high frequency of expansive soil. In a typical year in the United States, expansive soils cause a greater financial loss to property owners than earthquakes, floods, hurricanes, and tornadoes combined.

Historical Occurrences – Even though expansive soils cause enormous amounts of damage, most people have never heard of them. This is because the damage is done slowly and cannot be attributed to a specific event. The damage done by expansive soils is attributed to poor construction practices or a misconception that all buildings experience this type of damage as they age. All jurisdictions are affected by expansive soils from uneven sidewalks, foundation cracks, cracked walls, and pavement. There are no recorded historical occurrences, but local experience shows that our planning areas suffer from expansive soil.

Probability of Future Events – Since the cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County are directly on the coast of Texas, tropical systems delivering enormous amounts of rain followed by periods of drought are a yearly concern and the probability of expansive soil is every year.

Assets, Vulnerabilities, and Impact- All jurisdictions are vulnerable to expansive soils and have been impacted by one or more of the following issues:



- Foundation cracks;
- Heaving and cracking of floor slabs and walls;
- Jammed doors and windows;
- Ruptured pipelines; and
- Heaving and cracking of sidewalks and roads

- ***Flooding***

Hazard Description - Floods generally result from excessive precipitation, and the severity of a flooding event is typically 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. Generally, floods are long-term events that may last for several days. The primary types of general flooding include inland and coastal flooding.

Inland or Riverine flooding is a function of excessive precipitation levels and water runoff volumes within a stream or river's watershed. It is natural and inevitable as the overbank flooding of rivers and streams typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area. 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.

Coastal flooding results from storm surges, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, and other large coastal storms. Flooding in the coastal environment can be further exacerbated by tidal influence in the low-lying coastal areas. Higher tides will increase stream and river stage heights from the mouth while floodwaters rush in from upland areas. Coastal flooding is covered within storm surges in Section 5.

Location – For the purpose of the HMP, Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort are called out below. Our flood zones throughout all jurisdictions are identified as X (shaded), X (unshaded), AE, and VE. Figures 24 and 25 define these flood zones. All jurisdictions have endured flooding due to excessive rainfall from Tropical Storms to Thunderstorms. Since our area is a coastal area with a very flat terrain, the depth of the flooding depends on several factors such as high tide and drainage of the area receiving heavy rainfall. Most of the cities' flash flooding events are not in flood hazard areas, just in low areas where the excessive rainfall has no place to go.



Figure 21. Flood Zones - Seadrift

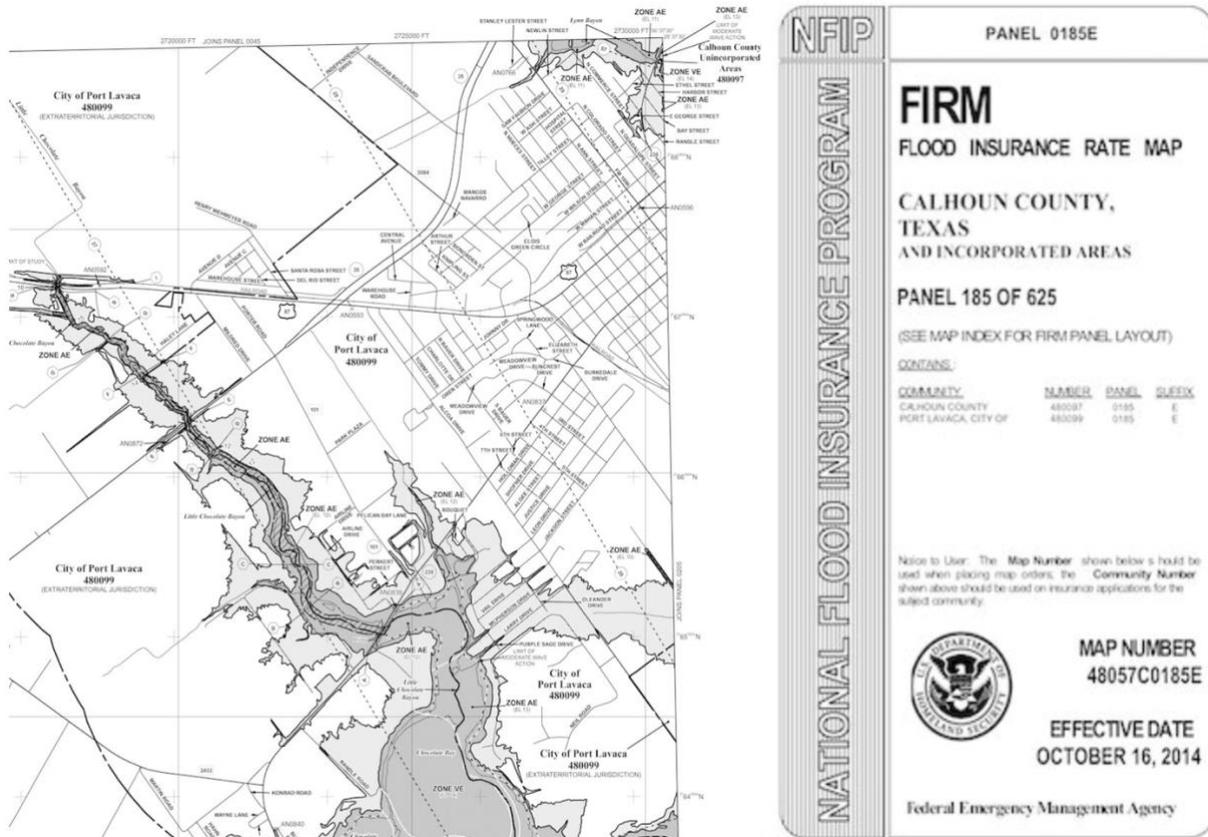


Figure 22. Flood Zones - Point Comfort





Figure 23. Flood Zones - Port Lavaca



Figures 20-23: <https://www.fema.gov/flood-maps>

Extent - Determining the intensity and magnitude of a flood event depends upon the flood zone and the location of the flood hazard area. Flood hazard areas identified on the Flood Insurance Rate Map are identified as Special Flood Hazard Areas (SFHA). SFHA is defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. The figures below describe the flood zones that we have in Calhoun County.

All jurisdictions have a yearly threat of flooding due to the proximity to the coast and the torrential rains that can come from tropical storms and rain events. All jurisdictions have experienced 1 to 2 feet of water during these events. Figure 26 was taken from the NFIP website, indicating the number of NFIP claims and their total dollar amount in Calhoun County from 2017-2022.



**Figure 24. FEMA Flood Zones
LEGEND**

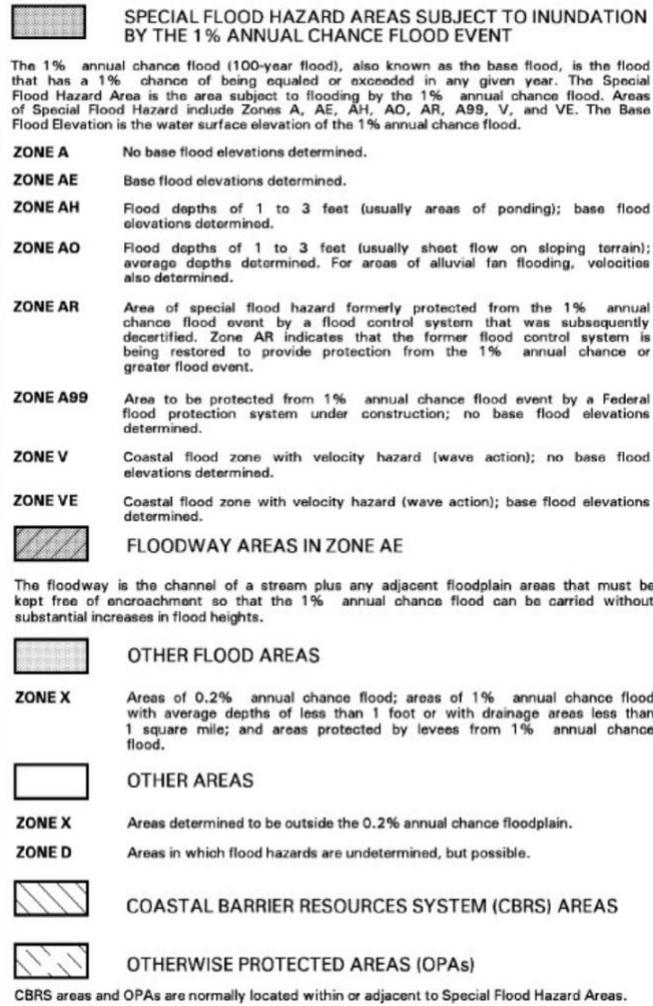


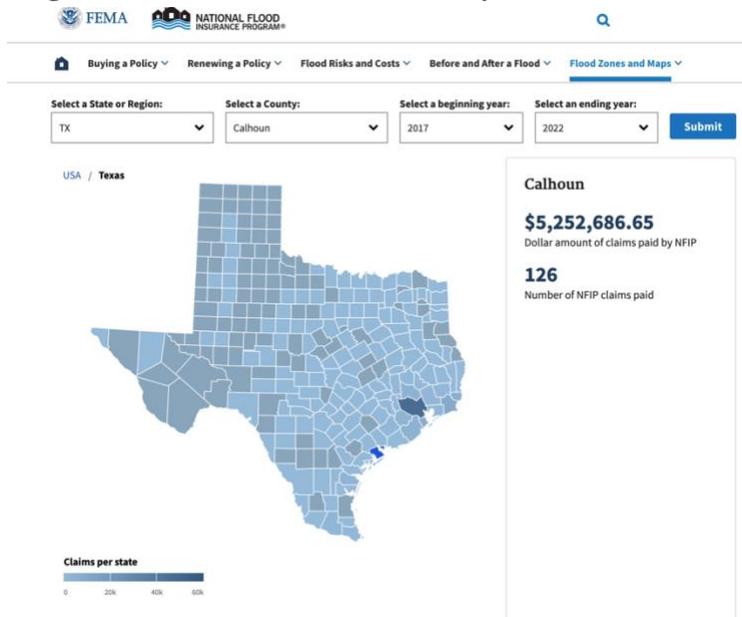
Figure 25. Definition of FEMA Flood Zones

Risk Type	Zone	Description
Low to Moderate	X (unshaded)	Area of minimal flood hazard
Low to Moderate	X (shaded)	0.2% Annual Chance Flood
High Risk	A	1% Annual Chance Flood <i>Inland floodplains that do not have a base flood elevation (BFE)</i>
High Risk	AE	1% Annual Chance Flood <i>Special flood hazard area that has a determined elevation & wave height < 3 ft</i>
High Risk - Coastal	VE	1% Annual Chance Flood <i>Velocity zone that has a determined elevation & wave height > 3 ft</i>

Figures 24 and 25: <https://www.fema.gov/flood-maps> and <https://www.fema.gov/blog/fema-flood-maps-and-zones-explained>



Figure 26. NFIP – Calhoun County Claims 2017-2022



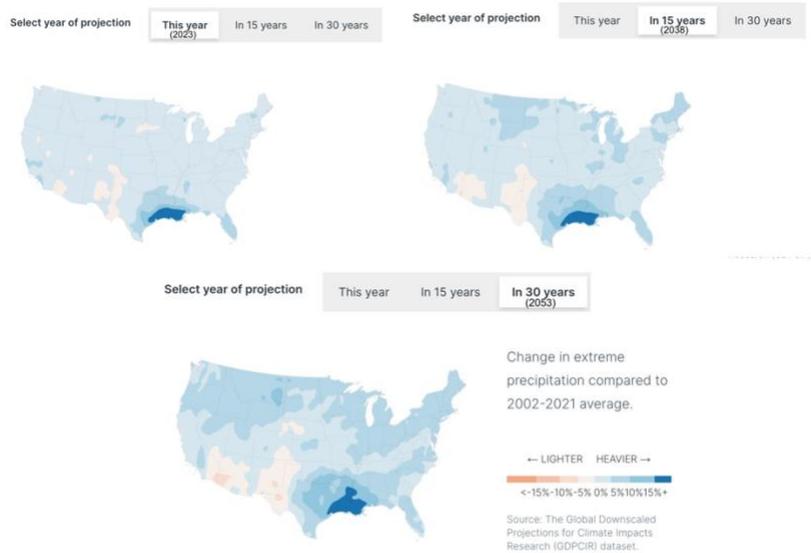
Environmental Factors that Contribute to Flooding

27.1 Sea Surface Temperatures

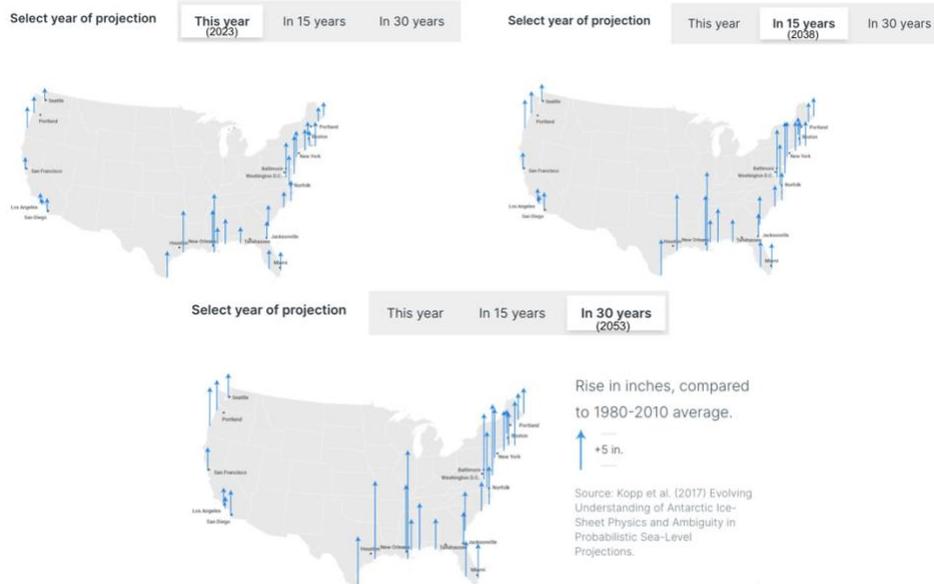




27.2 Precipitation Changes



27.3 Sea Level Rise



Figures 27.1-27.3: https://riskfactor.com/county/calhoun-county-texas/48057_fsid

Historical Occurrences - All jurisdictions are susceptible to flooding, especially flash flooding. Riverine flooding is localized to the Guadalupe River in the unincorporated Calhoun County area. State Highway 35, which is a major transportation route for trucking and traffic runs across the Guadalupe River and has been inundated several times during extreme riverine flooding events. The Guadalupe River flooding inundates State Hwy 35, a major through fare for traffic going from Corpus Christi to Houston, and blocks access to Port Lavaca, Seadrift, and Point Comfort.



Hurricanes and Tropical Storms have also contributed to numerous flooding occurrences. Figure 2 in Section 1 provides a list of Declared Disasters from 2017-2022; including those that led to flooding.

Probability of Future Events - Based on historical occurrences and extent, flooding is expected at least once every two years. All jurisdictions are prone to both flash flooding and coastal flooding. Coastal flooding is typically caused by storm surges, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, and other large coastal storms.

Assets, Vulnerabilities, and Impact - A building vulnerability assessment was conducted, which determined that most of Calhoun County including the cities of Port Lavaca, Seadrift, and Point Comfort, would be susceptible to major damages during a heavy rain event due to the proximity to the coast and tide levels at the time of the heavy rain event. Based on the assessment, any major event could completely shut down facilities for 30 days or more, and more than half of all property destroyed or substantially damaged. Table C in Appendix D is the value data from the County's 2022 tax assessment that shows current values of residential and commercial properties per jurisdiction.

These values are for all flood zones. Impacts from flood events can be significant if the hurricane affects the areas as addressed in Appendix D, Table C.

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 a flood hazard. According to FEMA's current list of communities participating in NFIP, Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort all participate in the NFIP. <https://www.fema.gov/cis/TX.html>

The Floodplain Administrator/Building Official is responsible for regulating floodplain development in their jurisdictions and updating their floodplain ordinance/order. As an additional indicator of floodplain management responsibility, communities may choose to participate in FEMA's Community Rating System (CRS). This incentive-based program allows communities to undertake flood mitigation activities that go beyond NFIP requirements.

NFIP Compliance, Maintenance, Capabilities, and Expanding - Each jurisdiction strives to maintain compliance with the NFIP while continuously updating ordinances, codes, and floodplain regulations. They collaborate on mitigation projects and have each identified projects that are awaiting grant funding or other resources. These actions can be found in Section 5, Table 15. At present, the jurisdictions' capabilities are constrained by funding. Nonetheless, each jurisdiction diligently seeks out funding opportunities and makes mitigation achievement a top priority whenever possible. For this Plan, each jurisdiction completed a Capability Assessment that can be found in Appendix B.

Flooding was identified as a high-risk hazard. In addition, many of the mitigation actions were developed with flood mitigation in mind. Many flood actions address public awareness, public safety, and flood reduction.



These include disseminating NFIP brochures on the availability of flood insurance in public libraries and public meeting places. The “Turn Around, Don’t Drown” program is also being embraced as an important educational tool for coastal and inland public awareness. Additional actions related to flooding are comprised of a variety of stormwater projects to reduce local flooding.

Table 11. Community Participation in the NFIP

Jurisdiction	NFIP Compliance/Maintenance
Calhoun County	Calhoun County has implemented a flood damage prevention ordinance that is regularly updated as necessary.
Point Comfort	Point Comfort is working towards compliance, and the City Council votes on those decisions.
Port Lavaca	The City of Port Lavaca complies with the enforcement of the Flood Damage Prevention Ordinance in Chapter 12, Article III of its codes of ordinances.
Seadrift	Seadrift possesses its own set of ordinances, which are formally adopted by its City Council to uphold and ensure compliance.

Examples of Codes that the Jurisdictions have adopted and enforced are - the 2021 International Building, Residential, Mechanical, Plumbing, Fuel Gas, Energy Conservation, Fire Code Council Performance, Property Maintenance Codes, the 2020 National Electric Code, a Flood Damage Prevention Ordinance, a Substandard Building Ordinance, an Environmental and Health Ordinance involving No Smoking areas, Accumulations on Property, Junk and Abandoned Vehicles, Noise and Vegetation control, and regulating subdivisions and platting.

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 insured under the NFIP. The Texas Water Development Board (TWDB) administers the SRL grant program for the State of Texas. A list of the County's and Cities’ repetitive losses can be found in Appendix J.

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 (including building and contents) over \$5,000 each, and the cumulative amount of such claim's payments exceed \$20,000; or
- For which 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.
- For both instances, at least two of the reference claims must have occurred within any ten-year period and must be greater than 10 days apart.



- **Land Subsidence**

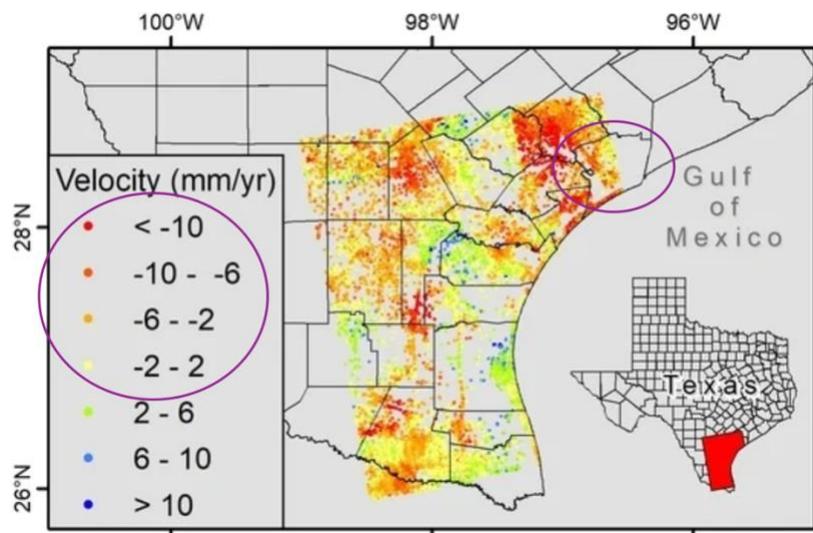
Hazard Description - Land Subsidence is the sudden sinking or gradual downward settling of land with little or no horizontal motion, caused by a loss of subsurface support, which may result from several natural and human-caused occurrences, including subsurface mining, the pumping of oil or groundwater. These events, depending on their location, can pose significant risks to health and safety, and interruption to transportation and other services. Subsidence occurs in coastal areas when water levels are lowered from groundwater withdrawal and oil and gas production, causing the clay to begin to dry and compact.

Location - With the removal of groundwater, all jurisdictions in the planning area could be affected by the loss of surface elevation. Karst landscapes imply the existence of land subsidence, generally in the form of sinkholes caused by sinking soils resulting from caves or cavities below.

Evaporated rock is soluble in water and can potentially cause large cavity formations. Sinkholes occur when underground holes are created either naturally or artificially and collapse due to induced force. Carbonate rocks are also prone to void formation but are less soluble and, therefore take much more time to form all the remaining constant. The jurisdiction lies atop these types of rocks.

Extent - All jurisdictions in Calhoun County are affected by land subsidence. The extent of land subsidence is measured by the number of feet of land lost or sunk. The figure below shows the subsidence rates for the Texas Coastal Bend, including the County. The participating jurisdictions are affected by land subsidence at a rate of up to 2 feet per year. The area circled in purple in Figure 28 identifies Calhoun County and all participating jurisdictions at these rates.

Figure 28. Graphical Abstract of Land Subsidence Velocity of the Texas Coastal Bend



<https://www.mdpi.com/2072-4292/14/1/192>



Historical Occurrences - Subsidence is a continuous hazard, and its effects are intimately intertwined with those of other natural forces and episodic hazardous events. There are no recorded historical occurrences, but local experience shows all participating jurisdictions suffer from land subsidence.

Probability of Future Events - Even with the restrictions on groundwater and oil/gas extraction in our coastal area, subsidence may continue to develop from other types of below-ground withdrawals or natural forces.

Assets, Vulnerabilities, and Impact - All jurisdictions are vulnerable and impacted by land subsidence, which includes loss of residential land, agricultural, industrial, wetlands, and marsh areas. Land subsidence could create financial impacts on residential and commercial properties and critical facilities and infrastructure. Saltwater intrusion, flooding and storm surge, and loss of submerged aquatic vegetation may be expected for these jurisdictions.

4.3 Other Hazards:

- *Infectious Disease*

Hazard Description - An infectious disease is caused by pathogenic microorganisms, such as bacteria, viruses, parasites, or fungi. The diseases can spread, directly or indirectly, from one person to another.

Zoonotic diseases are infectious diseases of animals that can cause disease when transmitted to humans. Infectious diseases are a major threat around the world, killing millions globally each year. Transmission of an infectious disease may occur through one or more means, including physical contact with infected individuals. These infecting agents may also be transmitted through liquids, food, bodily fluids, contaminated objects, airborne inhalation, or vector-borne dissemination.

Three terms are commonly used to classify disease impacts: endemic, epidemic, and pandemic. An endemic is always present at a low frequency (such as chicken pox). An epidemic is a widespread occurrence of an infectious disease in a community at a particular time (e.g., the bubonic plague during Medieval times), and a pandemic is an epidemic that becomes very widespread and affects a whole region, a continent or the world (e.g., the 2019 COVID-19 Pandemic that has to this date claimed 1,176,639 lives in the U.S. and over 7,000,000 lives worldwide.).

Pandemic threats have risen as our globalized economy and growing population fosters large-scale international travel and trade. Also, growing populations increase the vulnerability of all areas to disease as it can travel more quickly and create difficulty in preventing the spread of infection.

<https://data.who.int/dashboards/covid19/deaths?n=c>
<https://covid.cdc.gov/covid-data-tracker/#datatracker-home>

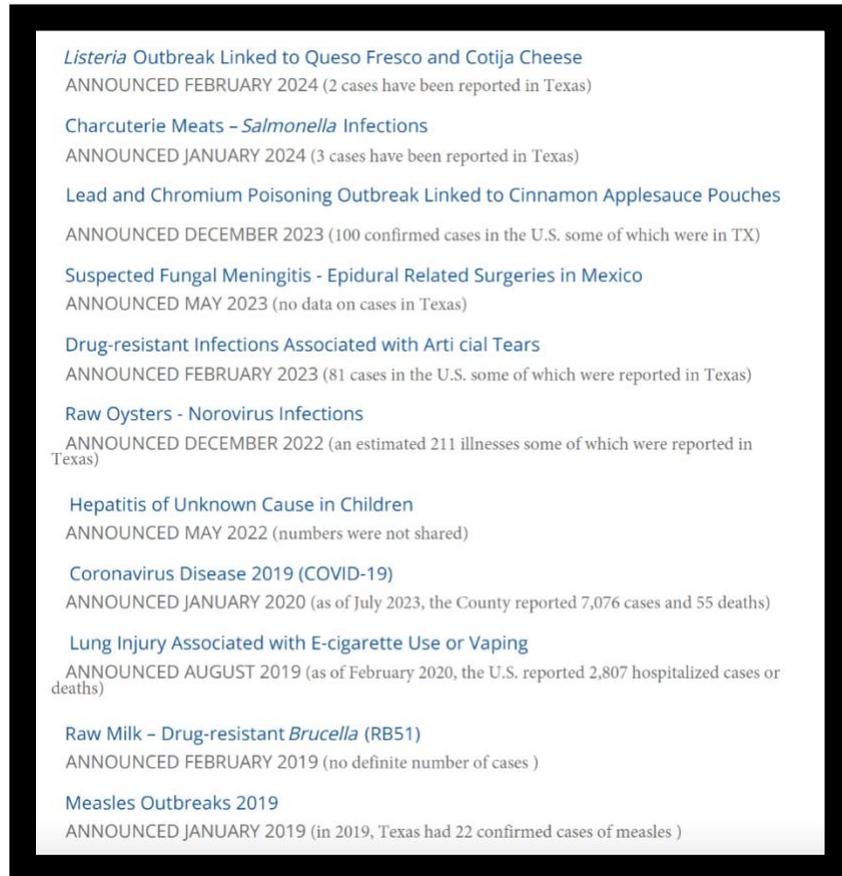
Location - Infectious disease is random and can lead to pandemics from any location.

Extent – It is difficult to determine the extent of infectious disease, especially disease that would lead to an epidemic or pandemic.



Historical Occurrences – There have been various outbreaks in the U.S. from 2017 to 2024. Figure 29 shares an account of those listed by the CDC.

Figure 29. List of Most Recent Outbreaks in the U.S. (2017-2024)



<https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/state/texas/county/calhoun-county/>
<https://www.cdc.gov/outbreaks/index.html#print>
<https://www.dshs.texas.gov/vaccine-preventable-diseases/measles-rubeola/measles-rubeola-2019>

Probability of Future Events - Disease impacts all areas of the world, and all areas are vulnerable. Third-world countries have fewer resources to fight disease and may be more vulnerable than more industrialized nations. In the United States, the public health system works at the federal, state, and local levels to monitor diseases, plan and prepare for outbreaks, and prevent epidemics where possible. However, in the age of air travel and worldwide shipping, it is becoming increasingly difficult to contain localized outbreaks as infected or exposed people travel and work, sending the disease across the globe in hours. Future occurrences are highly likely. There is no seasonal pattern associated with infectious outbreaks. Outbreaks can last weeks, months, or years at a time. There is no warning time. Infectious disease cannot be detected until it is diagnosed. Condensed populations are more susceptible than rural areas.



Assets, Vulnerabilities, and Impact - Based on historical occurrence, the potential severity of the impact of an infectious disease outbreak could be substantial resulting in multiple deaths and a complete shutdown of facilities and public buildings for 30 days or more. Property may not be destroyed directly by a disease outbreak.

4.4 Technological:

- ***Dam Failure***

Hazard Description - Dams are water storage, control, or diversion structures that impound water upstream in reservoirs. Dam failure can take several forms, including a collapse or breach in the structure. While most dams have storage volumes small enough that failures have few or no repercussions, dams storing large amounts can cause significant flooding downstream. Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping of the embankment;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, or maintain gates, valves, and other operational components;
- Improper design or use of improper construction materials;
- Failure of upstream dams in the same drainage basin;
- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion;
- Destructive acts of terrorists; and
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, lead to structural failure.

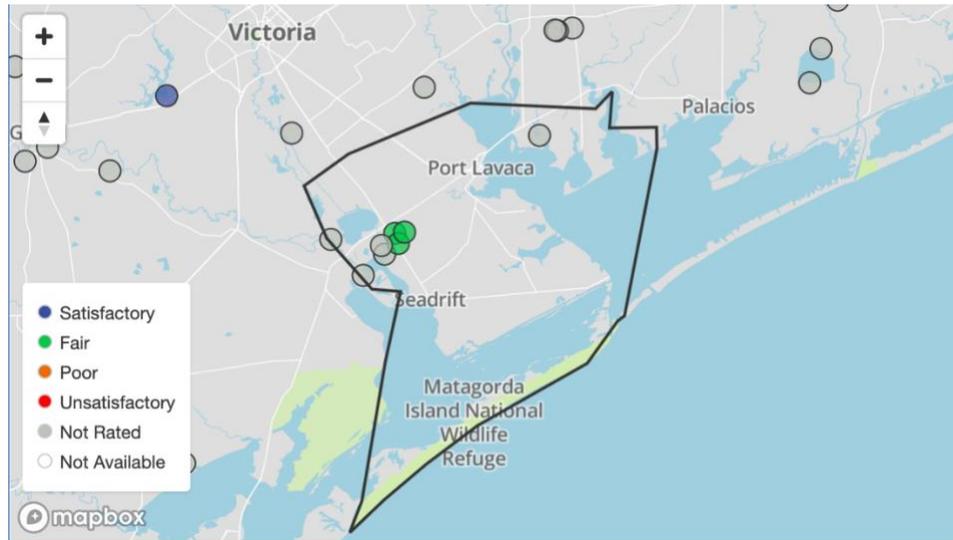
Dams provide benefits such as water supplies for drinking, irrigation, and industrial uses, flood control, hydroelectric power, recreation, and navigation. At the same time, they also represent a risk to public safety. Dams require ongoing maintenance, monitoring, safety inspections, and sometimes even rehabilitation to continue safe service.

In the event of a dam failure, the water's energy stored behind the dam can cause rapid and unexpected flooding downstream, resulting in loss of life and significant property damage. A devastating effect on water supply and power generation could also be expected.

Location - There are seven dams located in Calhoun County, as per the National Inventory of Dams. Out of these dams, six are privately owned and the state owns the seventh one. It's important to note that Calhoun County or its jurisdictions do not own or operate any of the listed dams making it difficult for them to have a say on how these dams are managed and maintained. The only information made available regarding these dams was found through the National Inventory of Dams and public online records. Table 12, below, provides a summary of the data found on these dams.



Figure 30. Dams in Calhoun County



<https://infrastructurereportcard.org/state-item/texas/>
<https://data.rgj.com/dam/texas/calhoun-county/48057/>
TAC 299.14

Extent - The extent or magnitude of a dam failure event can be measured in terms of the dam's classification. Calhoun County has never experienced a dam failure but has private dams located within its borders. The inundation depth from a dam failure would be 1 to 2 feet of water within the immediate ½ mile area of the failure.

Low Hazard -

- No loss of human life expected and minimal economic loss;
- No permanent habitable structures downstream of the dam; and
- Dams located in rural areas where failure may damage, occasional farm building, limited agricultural improvements, and minor highways.

Significant Hazard -

- Possible loss of human life located in the breach inundation area downstream of the dam and appreciable economic loss;
- 1 to 6 lives or 1 to 2 habitable structures;
- Damage to isolated homes;
- Damage to secondary highways (defined by TCEQ);
- Damage to minor railroads; and
- Interruption of service or use of public utilities



High Hazard -

- The expected loss of life located in the breach inundation area downstream of the dam and excessive economic loss;
- Seven or more lives or three or more habitable structures;
- Public facilities (i.e., water/ wastewater plants, pump stations, power transmission facilities, etc.);
- Agricultural, industrial, or commercial facilities;
- Main highways (defined by TCEQ); and
- Railroads used as major transportation.

The table below outlines the data for the dams located in Calhoun County. Any limitations to these dams are not under the discretion of the County or its cities, therefore, neither the County nor its cities can address any deficiencies. Deficiencies for these dams are not currently known.

Table 12. Dams Found in Calhoun County

Dam Name	NID ID	Owner Type	Hazard Potential Classification
Boiler Feed Basin	TX04742	Private	Significant
Operating Basins 1-5	TX04743	Private	Significant
Operating Basin No 6 Levee	TX03686	Private	Significant
Coxs Creek Dam	TX03683	Private	Low
Goff Bayou Saltwater Barrier	TX09352	State	Low
Operating Basin No 1 Levee	TX03687	Private	Low
Crawfish Isle Plantation	TX06012	Private	Low

<https://nid.sec.usace.army.mil/#/dams/search/&viewType=detail&resultsType=Dam%20Details&advanced=false&hideList=false&eventSystem=false>

Historical Occurrences - There has not been a recorded dam failure event in Calhoun County or an upstream dam failure. The dams listed in Calhoun County are not high-hazard dams.

Probability of Future Events - No historical events of dam failure have been recorded for Calhoun County. Due to the lack of historical occurrences, it is difficult to determine the probability of future events.

Assets, Vulnerabilities, and Impact - In 2019, the Association of State Dam Safety Officials estimated the cost to rehabilitate all non-federal dams in Texas at around \$5 billion. The Texas State Soil and Water Conservation Board estimates that \$2.1 billion is needed to repair or rehabilitate dams included in the Small Watershed Programs. All but one dam is privately owned, and the 7th is owned by the Guadalupe Blanco River Authority.

- **Hazardous Materials Release**

Hazard Description - Hazardous materials are substances that, if released or misused, can cause death, serious injury, long-lasting health effects, and damage to structure and other properties as well as to the environment.



Many products containing hazardous chemicals are routinely used and stored in homes. These products are also shipped daily on the nation’s highways, railroads, waterways, and pipelines. Varying quantities of hazardous materials, from industrial chemicals and toxic waste to household chemicals, are transported daily. Hazardous material incidents can range from an industrial chemical spill to groundwater contamination by naturally occurring methane gas.

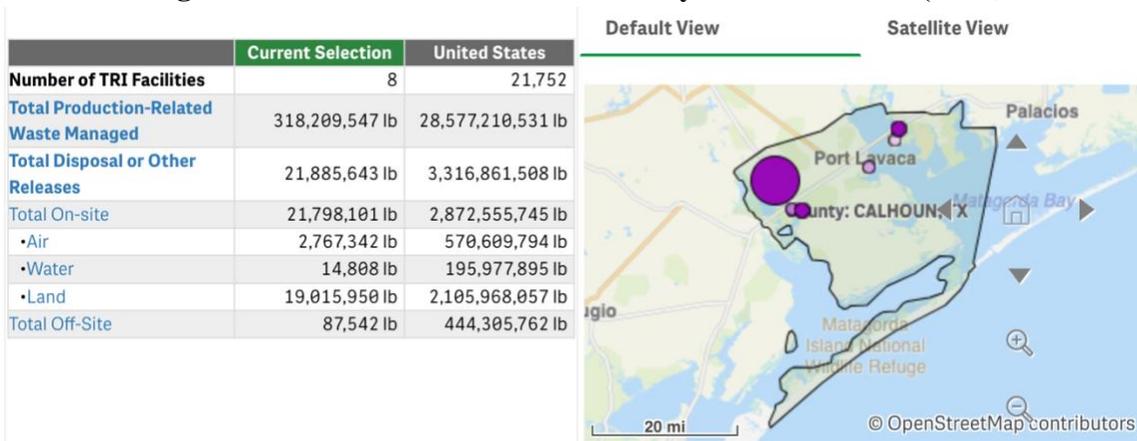
Residents located near industries or other properties that use hazardous materials have a higher risk of a hazardous materials incident. However, many hazardous materials are transported regularly over our highways and by rail, and if released during transport, can spread quickly to nearby communities. Human error is the probable cause of most transportation incidents involving the release of hazardous materials.

Location - The Toxics Release Inventory (TRI) is a publicly available database from the Federal Environmental Protection Agency (EPA) that contains information on toxic chemical release and other waste management activities reported annually by certain covered industry groups and federal facilities.

This inventory was established under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and expanded by the Pollution Prevention Act of 1990. Each year, facilities that meet certain activity thresholds must report their releases and other waste management activities for listed toxic chemicals to the EPA and the State of Texas.

Tier II data is a publicly available database from the Texas Commission on Environmental Quality (TCEQ) Tier II Chemical Reporting Program. Under the Community Right-to-Know program laws upheld at the state and federal level, all facilities that store significant quantities of hazardous chemicals must share this information with state and local emergency responders and planners. Facilities in Texas share this information by filing annual hazardous chemical inventories with the state, with Local Emergency Planning Committees (LEPCs), and with local fire departments. The Texas Tier II reports contain facility identification information and detailed chemical data about hazardous chemicals stored at the facility.

Figure 31. Locations of Calhoun County’s TRI Facilities (2022)



CALHOUN, TX ranks 20 out of 2,474 counties nationwide based on total releases (Rank 1 = highest releases)



Extent – The extent of a hazardous material release will depend on whether it is from a mobile or fixed site and the size of the impact. The range of intensity will vary greatly depending on the circumstances. These factors and conditions include the material, toxicity, duration of the release, and environmental conditions such as wind and precipitation.

Table 13 and Figure 32 reflect the data from EPA’s (Environmental Protection Agency) TRI Toxics Tracker for Calhoun County in 2022.

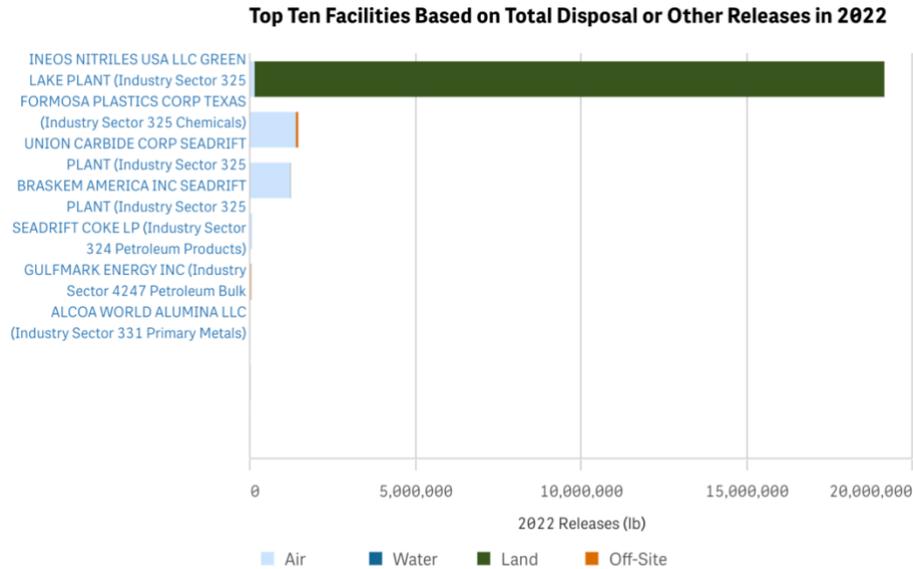
Table 13. Calhoun County TRI Summary in Pounds for Waste Management Activities (2022)

Facility	Released	Waste Mgmt. Recycling	Energy Recovery	Recovery / Treatment
Formosa	1,357,008.20	60,973,281	92,310,318	102,886,319
Alcoa	.83	0	0	0
GulfMark Energy	274.71	0	0	0
Ineos	19,149,890.01	0	13,007,000	1,209,593.04
Seadrift Coke	25,951.20	0	0	274,020
Braskem America	51,436.24	3,871,656.76	0	1,296,946.67
Union Carbide	1,211,416	98,795	0	20,485,640

<https://www.epa.gov/toxics-release-inventory-tri-program#trisearch>



Figure 32. Calhoun County’s Top Facilities Based on Total Disposal or Other Releases (2022)



Releases: includes air emissions, discharges to bodies of water or runoff, land disposal, and off-site transfers for disposal.

<https://www.epa.gov/toxics-release-inventory-tri-program#trisearch>

Historical Occurrences - Calhoun County includes the cities of Port Lavaca, Seadrift, and Point Comfort. Although major releases are occasional, they do occur. State Highway 35 is a major transportation thoroughfare running through the center of Port Lavaca from Corpus Christi to Houston, with numerous trucks carrying hazardous materials daily. These trucks also serve the local industries with products needed to sustain their operation. Highway 87 is also a major thoroughfare that services Calhoun County and Port Lavaca.

Probability of Future Events - The transport of hazardous material and explosives is regulated by the Texas Department of Transportation (TxDOT). Hazardous materials are transported through Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort using major highways and thoroughfares. The risk of hazardous spills during transport exists and may increase in areas with continued industrial development and major highways. In addition, our county has multiple hazardous material sites, and therefore, the probability of future occurrences is occasional.

Assets, Vulnerabilities, and Impact - Hazardous material or toxic releases can have a significant negative impact. Such events can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. In a hazardous materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Weather conditions will directly affect how the hazard develops. The micro-meteorological effect of the building and terrain can influence the travel of agents. Shielding in the form of sheltering-in-place can protect people from harmful effects. Non-compliance with fire and building codes, as well as failure to maintain existing fire and containment features, can substantially increase the damage from a hazardous materials release. The duration of a hazardous materials incident can range from hours to days. Warning time is minimal to none.



- ***Pipeline Failure***

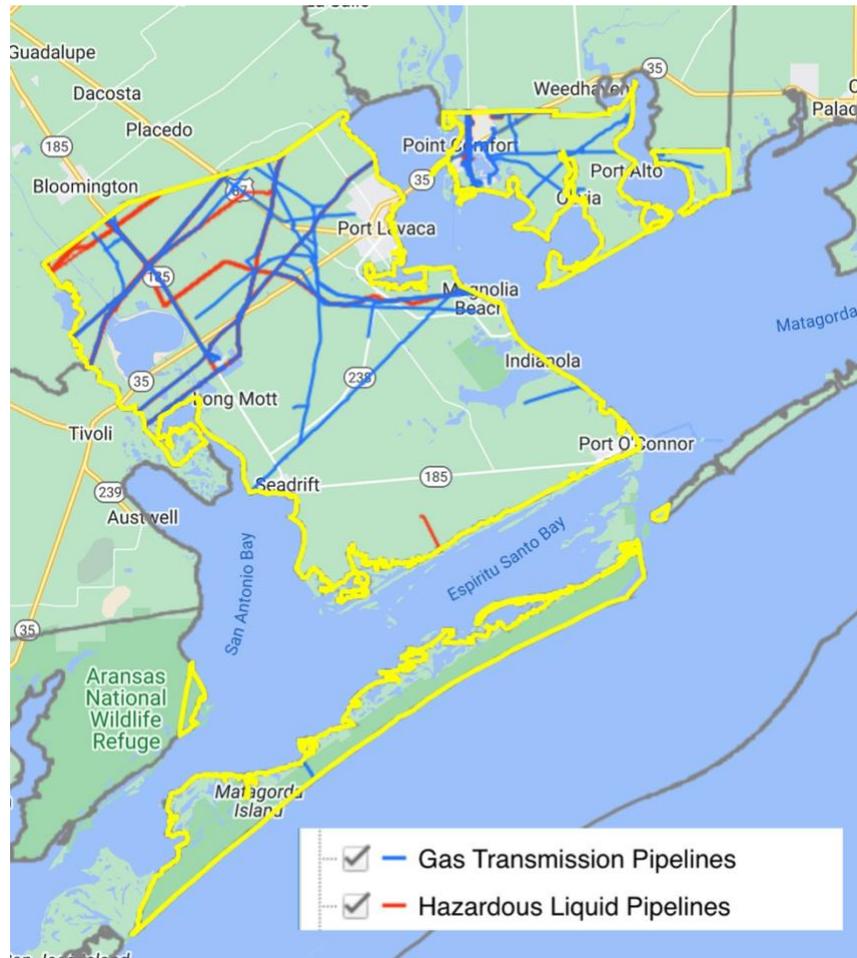
Hazard Description - Fuel pipeline breach or pipeline failure addresses the rare, but serious hazard of an oil or natural gas pipeline. An estimated 2.2 million miles of pipelines in the United States carry hazardous materials. Natural gas pipelines transport natural gas and oil, or liquid petroleum pipelines transport crude oil and refined products from crude oils, such as gasoline, home heating oil, jet fuel, and kerosene in addition to liquefied propane, ethylene, butane, and some petrochemical products. Sometimes oil pipelines are also used to transport liquefied gases, such as carbon dioxide.

Pipeline failure is rare but can cause extensive property damage and loss of life. Pipelines have caused fires and explosions that killed more than 200 people and injured more than 1,000 people nationwide and 50 people in Texas in the last decade.

Location - Figure 33 on the following page shows the locations of gas and oil pipelines throughout the County. It is important to note that due to scale, some pipelines cannot be seen on maps where one pipeline runs directly over another or where pipelines appear too close together to be visible on the map. If any of these energy pipelines were to rupture, such an event could endanger property and lives in the immediate area. Immediate impacts can occur within a half-mile area, and secondary impacts can occur within a mile of the incident. Therefore, due to the location of both oil and gas pipelines, Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort face a moderate to high risk.



Figure 33. Locations of Oil and Gas Pipelines in Calhoun County



*The yellow lines outline the County.
<https://pvnpm.phmsa.dot.gov/PublicViewer/>

Extent - While many accidents are relatively small in terms of the amount of property damage that is reported, the amount of pipelines throughout the county is substantial. With this amount of product being moved through the pipelines there is always a chance of failure.

Historical Occurrences - The causes of pipeline failures can range from internal issues such as corrosion or material defects to outside forces. Such forces can include damage from natural hazards, such as earthquakes or intentional destruction by humans.

Probability of Future Events - Based on previous data and the location of pipelines in Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort, the possibility of a future occurrence is likely.



Assets, Vulnerabilities, and Impact - Pipeline failure can have a substantial impact. Such events can cause multiple deaths, completely shut down facilities for thirty days or more, and cause more than fifty percent of affected properties to be destroyed or suffer major damage. Industries in Calhoun County rely on pipelines for the manufacture of products.

- **Terrorism**

Hazard Description - Terrorism can strike in any community regardless of size. While no amount of planning and mitigation can remove 100 percent of the risk from terrorism, hazard mitigation and preparedness can help reduce the risk.

Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for the purpose of intimidation, coercion, or ransom. There are two categories of terrorism in the United States:

- **Domestic Terrorism** - is terrorist activities that focus on facilities or populations without foreign direction.
- **International Terrorism** - is terrorist activities that are foreign-based and/or sponsored by organizations or groups outside the U.S.

The distinction between domestic or international terrorism refers not to where the terrorist act takes place but rather to the origin of the individuals or groups responsible for it. For example, the 1995 bombing of the Murrah Federal Building in Oklahoma City was an act of domestic terrorism, but the attacks of September 2001 were international in nature.

International terrorism poses the greatest threat to our national security. Global trends indicate that the growing number of terrorist groups will become more networked and even harder to identify and track.

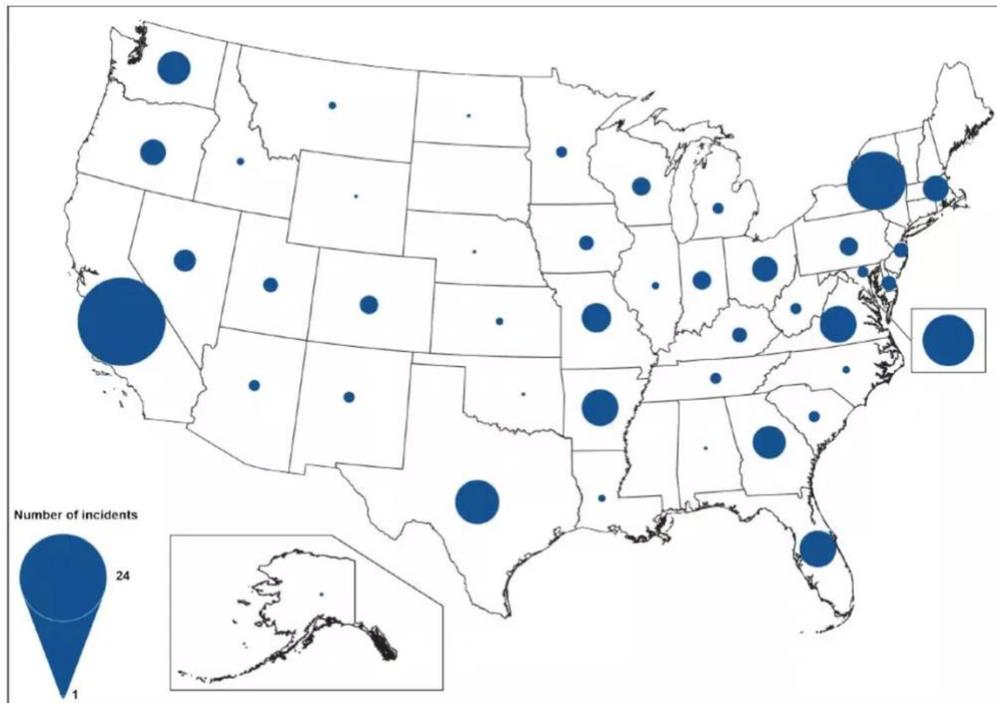
Terrorists often use threats to create fear among the public, to convince citizens that the government is powerless to prevent terrorism, and to get immediate publicity for their causes. Weapons of mass destruction (WMD) encompasses nuclear, radiological, chemical, and biological agents, as well as other weapons capable of causing significant harm to many people or substantial damage to buildings, natural structures, or the biosphere, thus posing a threat of a catastrophic incident. Terrorism includes the following hazards:

- Conventional bomb
- Biological agents
- Chemical agents
- Nuclear bomb
- Radiological agents
- Arson/incendiary attack
- Armed attack
- Agroterrorism
- Intentional hazardous materials release
- Cyberattacks



Location - The form and locations of many natural hazards are identifiable and even, in some cases, predictable. However, there is no defined geographic boundary for terrorism. Based on previous events, it is presumed that critical facilities and services and large gatherings of people are at higher risk. The figure below was taken from a report from the U.S. Government Accountability Office (GAO), and it shows that domestic terrorism is on the rise in all states, including Texas.

Figure 34. U.S. Domestic Terrorism Incidents by State (2010 through 2021)



Source: GAO analysis of Department of Homeland Security Counterterrorism Mission Center data | GAO-23-104720

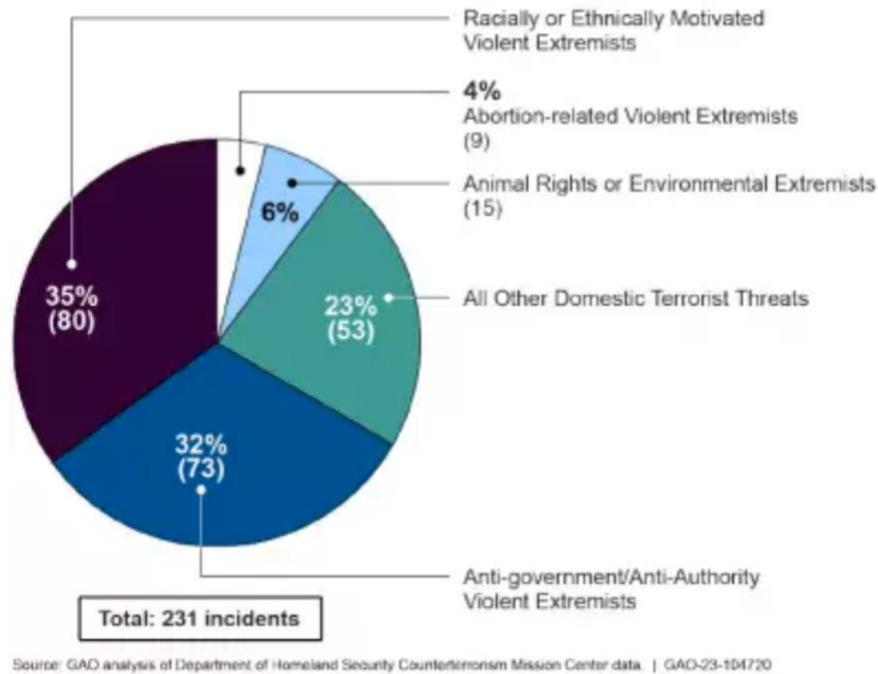
<https://www.gao.gov/blog/rising-threat-domestic-terrorism-u.s.-and-federal-efforts-combat-it>

Extent – The GAO reported that “all but eight states across the U.S. experienced at least one incident of domestic terrorism between 2010 and 2021. And over the last 10 years, domestic terrorism-related investigations have grown by 357%”. Terrorism cannot be forecasted with any accuracy; therefore, terrorist acts can occur anywhere and at any time.

Historical Occurrences – According to the U.S. Department of Homeland Security (DHS), about 35% of domestic terrorism cases in the last 10 years were racially- or ethnically motivated. Anti-government or anti-authority motivated violent extremism came in second, and other incidents were linked to animal rights extremists and abortion-related violent extremists. Additionally, the U.S. has unfortunately also seen a rise in mass shootings. According to an article by Forbes magazine, Texas was ranked second in the most mass shootings in 2023.



Figure 35. U.S. Domestic Terrorism-Related Incidents by Category (2010 through 2021)



<https://www.forbes.com/sites/ariannajohnson/2023/05/08/texas-has-the-second-most-mass-shootings-in-2023-how-its-other-gun-violence-crimes-measure-up/?sh=1adfd3bf54b0>

Probability of Future Events - Unfortunately, terroristic events are difficult to predict; however, the DHS has provided insightful information for all jurisdictions regarding terrorist threats and how to stay informed. All this can be found at <https://www.dhs.gov/ntas/advisory/national-terrorism-advisory-system-bulletin-may-24-2023>.

Assets, Vulnerabilities, and Impact - Because there is no defined geographic hazard boundary, all people and property in Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort are potentially exposed to risk from damage from a terrorist event.

While we may not be able to prevent an attack, it is well within our ability to lessen the likelihood and/or the potential effects of an incident. Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort continue to improve their readiness to respond to a terrorist incident through participation in state and federal programs that provide training and equipment for agencies that would respond to a local terrorist incident and in exercises that help to improve agency coordination and test local response plans.



Section 5 – Mitigation Strategies

Mitigation Goals

The planning team developed a mitigation strategy for the Plan by reviewing the plan and the goals included in the previous plans.

Planning team members reviewed the mitigation strategy from the 2017 HMP, and all members present agreed that the Updated HMP’s goals should match those of the GRBA’s 2018 Hazard Mitigation Action Plan and remain the same:

- **Goal 1 - Protect public health and safety.**
- **Goal 2 - Increase the coordination and cooperation among intergovernmental entities in carrying out hazard mitigation.**

The planning team evaluated each action. As a result of this review, a priority was assigned to each mitigation action. The overall priority was denoted within each action by team members as High, Moderate, or Low. Considering the social, technical, administrative, political, legal, economic, and environmental factors necessary for the implementation of each action, the planning team prioritized each action. Actions that the funding sources are local funds will be prioritized based on available funds regardless of priority. Priority rankings are classified as indicated in the table below.

Table 14. Priority Rankings for Classifying Hazard Mitigations

Priority	Description
High	Benefits of mitigating the risk of death or severe bodily injury outweigh the costs to implement actions rated as high priorities
Moderate	Reducing vulnerability to threats and improving quality of life and peace of mind are benefits for actions rated as moderate priorities.
Low	Awareness of low-risk/low-impact hazards offers the benefits of time to assess, plan, and integrate low-priority mitigation actions as time, need, and funding permits.

All jurisdictions used this priority and the cost-benefit review to determine that all jurisdictions would implement the new mitigation actions based on ranking. The following pages are the actions for Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort. Although some Past Actions may have been completed, they will continue to be included in the list of Action Items in case maintenance, repair, recovery, or mitigation is needed on these items in the future.



Table 15. Proposed Mitigation Measures / Action Items

#	Proposed Action	Priority High (H), Moderate (M), or Low (L)	Anticipated Cost / Time Frame	Funding Sources	Jurisdiction	Status Deferred (D), Ongoing (O), New (N), or Completed (C)	Hazard Being Addressed
1	Produce Public Education pamphlets on how to mitigate the hazards	M	\$5,000 / Unknown	Grants, Loans, or Local Funds	All	O	All
2	Purchase generators and wiring harnesses for Fire Depts, Law Enforcement, Public Works, City and County offices, and other critical infrastructures to mitigate the hazards.	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	All
3	Purchase and install weather radios in critical facilities to mitigate hazards.	M	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	All weather-related hazards
4	Purchase and install low-flow water fixtures to help mitigate drought.	M	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Drought
5	Education of engineers, road, bridge, and	L	Unknown / Unknown	Grants, Loans, or	All	O	Expansive soils



	public works employees on expansive soil construction techniques for all participating jurisdictions.			Local Funds			
6	Update ordinances or policies to reduce groundwater depletion.	L	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Land Subsidence
7	Apply calcium soil stabilizers to areas known to have expansive soil.	L	\$150K / Unknown	Grants, Loans, or Local Funds	All	O	Expansive Soils
8	Enhance/Restore wetland areas with marsh or other mitigation mechanisms to reduce erosion. This could include rock structures and beach re-nourishment.	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Coastal Erosion
9	Construct a FEMA Safe Room	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Mitigation Goal #1
10	Update, reconstruct, or purchase new equipment for existing sewer lift stations.	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	Hazards causing power outages



11	Protect, enhance, and restore wetland areas with mats or other mitigation mechanisms to reduce erosion. This could include rock structures, beach re-nourishment, and dredge channels using this material to re-nourish the beach.	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Erosion and Storm Surge
12	Drainage Improvement Projects that address Drainage	H	\$400K - \$3M / Unknown	Grants, Loans, or Local Funds	All	O	Flooding
13	Promote NFIP flood insurance and public awareness by printing and distributing brochures on the dangers of floods, storm surges, and river flooding.	M	\$20K / Unknown	Grants, Loans, or Local Funds	All	O	Mitigation Goal #1
14	Construct an underground fiber line from the Courthouse to	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	O	Mitigation Goal #1



	the Combined Dispatch						
15	Coastal Protection and Barrier Restoration / Construction Projects	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Flooding, Land Subsidence, and Coastal Erosion
16	Public Facilities improvements	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Mitigation Goal #1
17	Community Cooling and Heating Centers	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	O	Extreme Heat
18	Provide critical facilities, such as hospitals, with MMC Emergency Mobile Units	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	Mitigation Goal #1
19	Projects to reroute rainwater	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	Flooding
20	Hazard Mitigation Plan Updates	M	\$100K / Unknown	Grants, Loans, or Local Funds	All	O	Mitigation Goal #1
21	Training and travel expenses for first responders	M	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	Mitigation Goals #1 and #2
22	Upgrade portable and mobile radios to include base stations at both stations and at PD and SO to become	M	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	Mitigation Goals #1 and #2



	more compatible with the all critical facilities and schools.						
23	Purchase Emergency vehicles for critical facilities such as Fire Stations and Police Departments, and EMS (ex. Pumper, Ladder, and Tanker trucks)	M	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	All
24	Repair, reconstruct, and/or expand wastewater, water, and sewer treatment plants	H	Unknown / Unknown	Grants, Loans, or Local Funds	All	N	All
25	Construct shade structures at various Public Parks	M	\$100K each / Unknown	Grants, Loans, or Local Funds	All	N	Extreme Heat
26	Elevate and upgrade Ocean Drive	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	O	Flooding
27	New Training Drill Tower to be at Drill Field on Stringham Dr.	M	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	Mitigation Goal #1
28	Mobile Data Information Systems (MDIS) and maintenance	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	Mitigation Goals #1 and #2



29	Purchase Mobile Data Terminal Tablets	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	Mitigation Goals #1 and #2
30	CCSO: Mobile Command Post Trailer	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	All
31	Purchase Cell on Wheels (COW)	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	Mitigation Goals #1 and #2
32	Purchase Night Vision equipment	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	Mitigation Goals #1 and #2
33	Satellite Phone located at Station 1	H	Unknown / Unknown	Grants, Loans, or Local Funds	Calhoun County	N	Mitigation Goal #1
34	High profile rescue vehicles to be purchased and kept at Port Lavaca Fire Station	H	Unknown / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Mitigation Goal #1
35	Purchase of Rescue Boats to be kept at Port Lavaca Fire Station	H	Unknown / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Mitigation Goal #1
36	Acquire UPRR right-of-way and construct a Stormwater Detention Pond to resolve flooding issue in area around Half League and George Street	H	\$8M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Flooding



	Replace/upgrade the concrete lined portion of Corporation Ditch	H	Unknown / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Flooding
37	Upgrade Corporation Ditch downstream of SH 238 to provide ease and safety to maintain and possible detention pond(s) along its length	M	\$2M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Flooding
38	Replace and upgrade failing CMP drainage culverts under the Railroad spur at the Harbor of Refuge where Helena rails in Hazardous Materials	H	\$800K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Flooding
39	Increase drainage capacity of storm sewer system along Live Oak from Lavaca Street to the Bay	H	\$4M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Flooding
40	New Fire Station located in the City of Port Lavaca	H	Unknown / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	All
41	Increase drainage capacity of storm sewer system in the George St. and Wilson St. area that drains to the Bay along E. Wilson Street	H	Unknown / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Flooding
42	Construct a North Relief Channel to divert storm water	H	Unknown / Unknown	Grants, Loans, or	Port Lavaca and	N	Flooding



	runoff coming from the north directly to the bay upstream of Lynn’s Bayou			Local Funds	Calhoun County		
43	Erosion Mitigation expand existing groins at Lighthouse Beach and Boat ramp	H	\$5M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Coastal Erosion
44	Construct Living Shoreline along wetlands of Lighthouse Beach Park	M	\$10M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Coastal Erosion
45	Construct shoreline protection of eastern shorelines of the Harbor of Refuge	H	\$10M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	N	Coastal Erosion
46	Corporation Ditch Project – includes storm drainage improvements and the construction of a retention pond	H	\$8.6M / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Flooding
47	Improvements to the Harbor of Refuge	H	\$524K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Mitigation Goal #1
48	Purchase and install quick connects for portable generators for all Port Lavaca sewer lift stations. Purchase	H	Unknown / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Mitigation Goal #1



	portable generators to include the Sewer Plant.						
2017 HMP – Past Actions							
49	Install larger culverts for increased drainage	H	\$500K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - O PC - C Co - O	Flooding
50	Create fire breaks around public critical facility buildings and properties	M	\$20K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - C Co - D	Wildfires
51	Plant drought-resistant plants at public parks and buildings	H	\$150K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - C Co - O	Drought
52	Incorporate into existing plans a policy on how to reduce groundwater depletion.	L	Unknown / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - O Co - O	Land Subsidence
53	Training for First Responders and Government employees on how to mitigate the hazards of infectious diseases	M	\$5K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - O Co - D	Infectious Disease
54	Install covers or shields over utility	M	\$25K / Unknown	Grants, Loans, or	All	PL - O S - C PC - O Co - O	Hailstorms



	systems such as HVAC			Local Funds			
55	Handheld sensors for first responders to have on vehicles when responding to HazMat incidents to mitigate exposure to hazardous materials.	M	\$5K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - O Co - O	Hazardous Materials Release
56	Training for field personnel and governmental employees to mitigate a pipeline failure	L	\$5.5K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - O Co - O	Pipeline Failure
57	Training for government employees on how to mitigate terrorism.	L	\$3K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - D PC - O Co - O	Terrorism
58	Establish cooling centers at public parks and/or critical facilities	M	\$5K / Unknown	Grants, Loans, or Local Funds	All	PL - O S - C PC - O Co - O	Extreme Heat
59	Install grounding/surge protection to all antennas/electronics	M	\$25K	Grants, Loans, or Local Funds	All	PL - O S - D PC - O Co - C	Lightning
60	Enhance public parks by recreational fields and equipment, playgrounds, new cabanas, community pavilions,	M	\$500K	Grants, Loans, or Local Funds	All	O	Flooding



	restrooms, and increased parking						
61	Install larger culverts and have an engineer complete a drainage plan for the area along the intercostal area (Boggy and Port O'Connor Community)	H	\$500K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Flooding
62	Boat Ramp (Alamo Beach)	H	\$150K	Grants, Loans, or Local Funds	Calhoun County	Co - C	Hurricanes
63	Boat Ramp (Magnolia Beach)	H	\$175K	Grants, Loans, or Local Funds	Calhoun County	Co - C	Hurricanes
64	New/Upgrade (one) Public Restroom and septic facilities at Indianola Beach	H	\$380K	Grants, Loans, or Local Funds	Calhoun County	Co - C	Hurricanes
65	Improve Olivia Park by adding a new fishing pier and protecting and enhancing the wetlands.	H	\$500K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Hurricanes
66	Harden County Precinct Barns to mitigate the effects of Tornadoes.	H	\$150K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Tornadoes
67	Install/repair bulkheads to mitigate coastal	H	\$400K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Coastal Erosion



	erosion at Precincts 1-4.						
68	Purchase and install riprap to mitigate coastal erosion.	H	\$100K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Coastal Erosion
69	Purchase portable warning signs and cones to mitigate dam failure	L	\$1.5K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Dam Failure
70	Include drainage systems plans on county buildings to mitigation expansive soils	L	\$1.5K	Grants, Loans, or Local Funds	Calhoun County	Co - O	Expansive Soils
71	Develop a county-wide plan or policy to reduce groundwater depletion to mitigate land subsidence.	L	Unknown	Grants, Loans, or Local Funds	Calhoun County	Co - O	Land Subsidence
72	Add Detention basins to reduce standing water and flooding.	H	Unknown	Grants, Loans, or Local Funds	Seadrift	O	Flooding
73	Renovate-Repair 1962 Era Seawall that has areas of severe deterioration at A.D Powers Park between 3 rd and 12 th streets	H	\$1M	Grants, Loans, or Local Funds	Seadrift	O	Hurricanes
74	Constructing breakwater and or additional seawall	H	\$750K	Grants, Loans, or Local Funds	Seadrift	O	Hurricanes
75	Construct new water	H	Unknown	Grants, Loans, or	Seadrift	O	Tornadoes



	treatment/producti on building with concrete block structure. The current structure is metal with severe metal rust and corrosion.			Local Funds			
76	Construct concrete block structure/control room at wastewater treatment plant to replace vulnerable portable building to help with continuity of service operations in the event of disaster.	H	Unknown	Grants, Loans, or Local Funds	Seadrift	O	Tornadoes
77	Develop and implement drought contingency plans.	H	\$3K	Grants, Loans, or Local Funds	Seadrift	C	Drought
78	Erosion Mitigation- Shoreline Restoration Construct Groins, breakwaters and/or additional seawall.	H	\$1M	Grants, Loans, or Local Funds	Seadrift	C	Coastal Erosion
79	Shoreline protection- allowing sea grasses to establish, enhancing wetlands	H	\$1M	Grants, Loans, or Local Funds	Seadrift	C	Coastal Erosion



	accretion-construct groins seaward of shoreline.						
80	Shoreline protection and erosion mitigation-construct bulkhead to prevent erosion from filling Harbor. Harbor infrastructure protecting shoreline and enhancing accessibility.	H	\$3.7M	Grants, Loans, or Local Funds	Seadrift	C	Coastal Erosion
81	Include expansive soils in building construction ordinances.	L	\$2K	Grants, Loans, or Local Funds	Seadrift	C	Expansive Soils
82	Equipment shelters for utilities for protection	M	\$15K	Grants, Loans, or Local Funds	Seadrift	D	Hailstorms
83	Install shutters on city buildings	H	\$50K	Grants, Loans, or Local Funds	Seadrift	C	Windstorm
84	Upgrade culverts and drainage along Pease Street and other areas.	H	\$250K	Grants, Loans, or Local Funds	Point Comfort	C	Flooding
85	Add storm water and detention basins to reduce flooding, standing water and poor drainage	H	Unknown	Grants, Loans, or Local Funds	Point Comfort	C	Flooding



86	Install hurricane shutters on City Hall to mitigate hurricane impacts.	H	Unknown	Grants, Loans, or Local Funds	Point Comfort	O	Hurricanes
87	Install bulkhead to ensure shoreline stabilization by mitigating hurricane damage.	H	\$100K	Grants, Loans, or Local Funds	Point Comfort	O	Hurricanes
88	Create fire breaks around city buildings to mitigate wildfires.	M	\$5K	Grants, Loans, or Local Funds	Point Comfort	C	Wildfires
89	Harden City Hall to mitigate the effects of tornadoes.	H	\$75K	Grants, Loans, or Local Funds	Point Comfort	C	Tornadoes
90	Harden the Police Station to mitigate tornadoes.	H	Unknown	Grants, Loans, or Local Funds	Point Comfort	O	Tornadoes
91	Install breakwaters/groins for erosion control	H	\$100K	Grants, Loans, or Local Funds	Point Comfort	O	Coastal Erosion
92	Enhancing/protecting wetlands by allowing sea grasses to be established to mitigate erosion.	H	\$40K	Grants, Loans, or Local Funds	Point Comfort	O	Coastal Erosion
93	Adopt building ordinance to include expansive soil requirements.	L	\$5K	Grants, Loans, or Local Funds	Point Comfort	O	Expansive Soils
94	Adopt building ordinance to include foundation	L	\$1K	Grants, Loans, or Local Funds	Point Comfort	O	Land Subsidence



	support for new structures.						
95	Adopt ordinances to require that temporary structures be anchored to mitigate windstorms.	H	\$5K	Grants, Loans, or Local Funds	Point Comfort	O	Windstorms
96	Update current building ordinances to require temporary structures to be strapped down to mitigate windstorms; including revising plans or policies, if needed.	M	\$2.5K	Grants, Loans, or Local Funds	Port Lavaca and Calhoun County	PL - C Co - O	Windstorm
97	Implement an ongoing program to remove debris and trees from Lynn Bayou drainage areas.	H	\$40K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Flooding
98	Replace Breakwater that is in disrepair.	H	\$400K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Hurricanes
99	Implement an ongoing program to remove debris and trees from	H	\$40K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Flooding



	Lynn Bayou drainage areas.						
100	Harden Water Treatment Plant	H	\$50K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	Privately Owned - D	Tornadoes
101	Increase splashover area at Bayfront	H	\$200K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Coastal Erosion
102	Repair and or install Bulkhead along the coastline	M	\$100K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Coastal Erosion
103	Include drainage system plans on city buildings	L	\$1.5K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Expansive Soils
104	Build Pavillion or covers in public areas and public parks, etc.	M	\$10K / Unknown	Grants, Loans, or Local Funds	Port Lavaca	O	Extreme Heat



Section 6 – Plan Integration and Maintenance

I. Integration into Local Planning Mechanisms

The cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County will implement the plan and continue to monitor, evaluate, and enhance the plan yearly if needed. To ensure that the Plan remains current and relevant, the following plan maintenance procedures will be addressed:

- Monitoring and Evaluating the Plan by each city and county yearly during budgets and other planning updates;
- Updating the Plan as needed from the completion of mitigation projects included in the Mitigation Plan or changes in the priorities of these projects;
- Incorporating the Plan into other Planning Projects during yearly budget sessions and upon obtaining Mitigation grants, etc.; and
- Continued Public Involvement through surveys available at the County courthouse Floodplain office or the Port Lavaca, Seadrift, or Point Comfort’s City Hall Building/Floodplain offices.

II. Monitoring and Evaluation

Periodic revisions of the plan are required to ensure that the goals and mitigation action plans are kept current. In addition, revisions may be necessary to ensure the plan fully complies with state and federal standards.

Monitoring and evaluating the Plan will be the responsibility of the member assigned from each jurisdiction. All jurisdictions have designated one person or department responsible for developing and implementing the Plan. This team member’s title is listed in Appendix A. The Public Works Director is responsible for the City of Port Lavaca’s monitoring implementation of the plan, the Mayor for the City of Seadrift, the Police Chief for the City of Point Comfort, and the Floodplain Administrator for Calhoun County. The Calhoun County Floodplain Administration office will be the lead agency responsible for working with all the jurisdictions to update the Hazard Mitigation Plan as needed.

Monitoring implementation and evaluating the effectiveness of the mitigation strategy are tasks effectively accomplished together. Monitoring implementation involves tracking progress and reasons for lack of progress through status reports, especially for updates on mitigation actions. A review of the new mitigation plans in Section 19 will be done annually at the Planning Group Meeting. The following criteria will be reviewed yearly to assess the effectiveness of the Hazard Mitigation Plan:

- Are the projects still cost-effective?
- Is there new funding available for Mitigation projects?
- Are there new hazards that could impact the area?
- Have mitigation actions been implemented or completed?

III. Updating and Plan Amendments

All jurisdictions will report the status of their mitigation actions or projects to the Calhoun County Floodplain Administrator yearly, which will incorporate these changes into the Plan for the next update. Minor technical changes can be made to the Plan at any time to keep it current.



However, any changes by any jurisdiction to the mitigation actions or modification in the overall direction of the Plan will be subject to formal adoption by the governing body of that jurisdiction. Once the amendment is approved, it will be transmitted to the Texas Division of Emergency Management (TDEM).

In determining whether to recommend approval or denial of a plan amendment request, the following factors will be considered:

- 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 Year Review

The Plan will be thoroughly reviewed by each planning team member for their jurisdiction at the end of three years from the date of adoption by the local governing body to determine whether any significant changes have necessitated changes in the types of mitigation actions proposed. New developments in identified hazard areas, increased exposure to hazards, disaster declarations, the increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the content of the updated plan.

This plan review will allow all jurisdictions to evaluate successful actions and document potential losses avoided by implementing specific mitigation measures. It also allows addressing mitigation actions that may not have been successfully implemented as assigned. The planning team will meet to review the plan at the end of the three years, as grant funds may be necessary to develop the five-year update. Due to the timelines for grant cycles, it is wise to begin the review process before the five-year deadline.

Following the review, any necessary revisions will be summarized and utilized according to the reporting procedures and plan amendment process outlined herein. After the review and the update/amendment process are completed and approved by the local governing body, the revised plan will be submitted to TDEM for final review and approval in coordination with FEMA.

Incorporation of the Plan Update

The cities of Port Lavaca, Seadrift, Point Comfort, and Calhoun County will review and incorporate the Hazard Mitigation Plan into their annual budget reviews and other plan updates. It is the responsibility of the City Council and Commissioner's Court in each jurisdiction, to ensure plan updates are considered. Table 16 identifies some of the planning mechanisms available for all jurisdictions and provides examples of how the Plan will be incorporated into current plans.



Table 16. Planning Mechanisms and Methods of Incorporation for Plan Updates

Planning Mechanism	Method of Incorporation
Grant Applications	Calhoun County and the cities of Port Lavaca, Seadrift, and Point Comfort shall consult the Plan during yearly grant funding cycles available through FEMA, including the Pre-Disaster Mitigation (PDM) cycle and when there is a Disaster Declaration for Texas triggering Hazard Mitigation Grant Program (HMGP) funds. The planning team members will review mitigation actions for each jurisdiction, and information will be updated to complete applications, such as maps and risk assessment data. An amendment may be developed if a project is not in the Plan.
Annual Budget Review	Each jurisdiction shall review the Update and mitigation actions when conducting annual budget reviews. When allocating funds for upcoming operating and construction budgets, high-priority mitigation actions will be reviewed during City Council and Commissioner Court meetings. Each Planning Team member will be responsible for bringing mitigation actions to their respective county or city to discuss the feasibility of the potential project in terms of the availability of funds, grant assistance, and preliminary cost-benefit review.
Emergency Planning	All jurisdictions are included in the Emergency Management Plan. The Hazard Mitigation Plan will be consulted during updates to the local emergency plans through the County Emergency Management Office. Risk assessment and vulnerability data will be pulled from the plan and reviewed with the Emergency Management Plan review. This data will either be included within the new emergency planning mechanism or included as an appendix. Mitigation projects related to prevention and protection will also be reviewed for relevance to determine if they should be included.
Capital Improvements	When Capital Improvement Plans (CIP) are updated, each jurisdiction shall review the Plan Update to ensure any risks are accounted for and mitigation measures listed are considered. Limiting public development in hazardous zones is one of the most effective long-term mitigation actions for local governments. Profile information and data regarding NFIP compliance and maintenance will be reviewed in conjunction with any developed CIP. This information should be added to the Plan Update if new census or land use data is available.



Floodplain Management and Fire Protection	The Plan Update will be utilized in updating and maintaining floodplain management and fire protection plans, as the goals of both planning mechanisms are similar. In updating or maintaining these plans the Plan Update will be consulted for NFIP compliance, flood risk, and fire/wildfire risk. Information from these sections will be reviewed for inclusion. In addition, mitigation actions that address fire/wildfire and flood will be reviewed for inclusion by jurisdictions.
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Public Involvement

Public input is integral to preparing this updated plan and will continue to be essential as it grows and changes. Significant changes to this plan will require opportunities for the public to make its views known. This Plan will be posted on the Calhoun County website, www.calhouncotx.org, and the websites of all jurisdictions, where available so that officials and the public can provide ongoing feedback. A copy of the updated plan will also be kept for public review in the Emergency Management/Floodplain office.