Austin County Hazard Mitigation Plan 2024 Update

Acknowledgements
Austin County Office of Emergency Management, The City of Bellville, The City of Brazos Country, The City of Industry, The Town of San Felipe, The City of Sealy, The City of South Frydek, The City of Wallis, Bellville ISD, Brazos ISD, and Sealy ISD

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List of Acronyms

ASDSO	The Association of State Dam Safety Officials
ASL	above sea level
ASTDR	The Agency for Toxic Substances and Disease Registry
CDC	The Centers for Disease Control and Prevention
COLE	Coefficient of Linear Extent
CRS	The Community Rating System
DBIR	Data Breach Investigations Report
DDoS	Distributed Denial of Service
DMA 2000	The Disaster Mitigation Act of 2000
EAL	Expected annual loss
EDT	Eastern Daylight Time
EID	Emerging Infectious Diseases
EM	Emergency
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
FIS	Characteristic Fire Intensity Scale
FMA	Flood Mitigation Assistance
FPF	Federal Policy Fee
FSA	Farm Service Agency
GIS	Geographic Information Systems
H-GAC	The Houston-Galveston Area Council
HHPD	High Hazard Potential Dam
HMA	Hazard Mitigation Assistance
HMC	Hazard Mitigation Committee
HMP	Hazard Mitigation Plan
ICC	Increased Cost of Compliance
K	Susceptibility of the soil to water erosion
LEP	Linear Extensibility Percent
LS	Combined effects of slope length and steepness
NCC	The Network Control Center
NCDC	The National Climatic Data Center
NCEI	The NOAA National Center for Environmental Information
NDFD	The National Digital Forecast Database
NFIP	National Flood Insurance Program
NHC	National Hurricane Center
NLDN	The National Lightning Detection Network
nmi	nautical miles
NOAA	The National Oceanic and Atmospheric Administration
NOHRSC	National Operational Hydrologic Remote Sensing Center
NRI	National Risk Index
NSSL	NOAA's National Severe Storms Laboratory

NWS	The National Weather Service
P	probability
PMT	Plan Maintenance Team
PT	Planning Team
PVI	Pandemic Vulnerability Index
R	Rainfall and runoff factor
RHMP	Regional Hazard Mitigation Plan
RL	repetitive loss
RUSLE	The Revised Universal Soil Loss Equation
S	severity
SED	State Executive Director
SFHA	special flood hazard areas
SPC	Storm Prediction Center
SRL	severe repetitive loss
SVI	Social Vulnerability Index
TCEQ	The Texas Commission on Environmental Quality
TDEM	The Texas Division of Emergency Management

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Section 1: Introduction

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In 2011, Austin County's Hazard Mitigation Plan was updated as part of a seven-county Regional Hazard Mitigation Plan (RHMP) led by the Houston-Galveston Area Council (H-GAC). In 2018, due to new regulations and planning recommendations, Austin County prepared a countywide multi-jurisdictional Hazard Mitigation Plan (HMP). Austin County partnered with H-GAC for the 2006, 2011, and 2018 plans and continued this partnership during the development and adoption of this most recent HMP update for 2023/2024.

Image source:
https://www.wikipedia.org/

History

On April 28, 2006, the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM) approved the first RHMP which was later updated in 2011. These RHMPs were a collaboration between 85 local governments to identify regional hazards, vulnerabilities, and 300+ mitigation projects that could be implemented within the region. The 2018, due to new regulation and planning recommendations, Austin County prepared a new countywide multijurisdictional HMP that included a more robust assessment of natural hazards, newly uncovered vulnerabilities, more advanced analysis techniques, and a more effective and informed mitigation strategy. Austin County partnered with the H-GAC for both the 2006 and 2011 plans and continued this partnership during the development and adoption of the 2018 HMP. In this HMP update for 2024, Austin County is continuing its partnership with H-GAC.

Purpose of Plan

The purpose of Austin County's HMAP is to reduce the loss of life and property within the county, lessen the negative impacts of natural disasters, and increase the resiliency of the county and communities within the county to hazards. Vulnerability to several natural hazards has been identified through a risk assessment, public input, research, and analysis. These hazards threaten the safety of residents and have the potential to damage or destroy both public and private property, disrupt the local economy, and impact the overall quality of life of individuals who live, work, and play in the county. While natural hazards cannot be eliminated, the effective reduction of a hazard's impact can be accomplished through thoughtful planning and action.

The concept and practice of reducing risks to people and property from known hazards is generally referred to as hazard mitigation. One of the most effective tools a community can use to reduce hazard vulnerability is developing, adopting, and updating a HMP as needed. A HMP establishes the broad community vision and guiding principles for reducing hazard risk, including the development of specific mitigation actions designed to eliminate or reduce identified vulnerabilities.

Planning Need

HMPs should serve as a living document that outlines the communities' long-term strategies to reducing damage to life, and property, and increasing the county and community's resilience to the natural hazards it is affected by. HMPs must be updated every 5 years per the Disaster Mitigation Act of 2000 (DMA 2000). This plan serves as the 2024 multijurisdictional HMP update to the 2018 Austin County HMP. The 2024 Austin County HMP adhered to the FEMA updated policy guide (FP-206-21-0002), Released on April 19, 2022. The new policy guide became effective on April 19, 2023. Updates included but were not limited to expanding outreach efforts to include those from various community lifelines within the county in the planning process, extensive mapping updates to critical facilities, community lifelines, and other data to visually highlight vulnerabilities to identified hazards, updating the process for risk and capability assessments, and including new hazards to incorporate based on recent events such as winter storms and the Covid-19 Pandemic.

Scope of the Plan

This HMP update includes the following participating jurisdictions:

- Austin County (Unincorporated)
- City of Bellville
- City of Brazos Country
- City of Industry*
- Town of San Felipe
- City of Sealy
- City of South Frydek*
- City of Wallis
- Bellville ISD*
- Brazos ISD*
- Sealy ISD*

Jurisdictions that were added to this most recent HMP update are denoted with a *

The HMP profiles the following hazards:

- Flooding
- Wildfire
- Severe Thunderstorms & Lightning
- Tornado/Microbursts
- Erosion
- Winter Weather
- Drought & Expansive Soils
- Windstorm
- Hail
- Hurricanes, Tropical Storms & Depressions
- Extreme Heat
- Dam/Levee Failure
- Emerging Infectious Disease
- Cybersecurity

Plan Organization

The 2024 Austin County HMP contains 8 sections:

Section 1 is the introduction of the plan. This section contains background context, the planning need, purpose, scope, and organization of the HMP.

Section 2 identifies the planning process, which involves a description of the HMP methodology and development process, identifying Planning Team members, Hazard Mitigation Committee members, roles and responsibilities of those members, stakeholder involvement efforts, meeting dates and summaries, and plan development resources.

Section 3 contains the county profile, which provides a history of hazard events, an overview of the planning area, geographic setting, land use and land cover, population demographics, vulnerable population information, housing and household arrangements, loss estimations, and critical facilities, repetitive loss, and severe repetitive loss properties, NFIP and CRS participants, and NFIP policies in force information can be found here.

Section 4 outlines the risk assessment procedures, identifies hazards ranked by risk, and summarizes the hazards that affect Austin County and the history of hazard events for those identified risks within the county.

Section 5 includes the capability assessment, which includes a summary and description of the existing plans, programs, and regulatory mechanisms that support hazard mitigation within the planning area.

Section 6 is broken down into subsections for each hazard of concern to the county and participating jurisdictions identified during the risk assessment. It contains descriptions of identified hazards, hazard location, extent, history of events, probability of future events, and climate change impacts. Additionally, vulnerability is addressed for all hazards and includes a probable risk level, an estimate of property and crop damages, hazard ranking, number of events, fatalities and injuries, average annual events, changes in frequency, and estimated annualized losses where applicable.

Section 7 is the mitigation strategy summary, which reviews changes in priorities, mitigation goals, and objectives in response to hazards of concern, evaluation of prior actions, progress in mitigation efforts, new actions, and the local mitigation strategy.

Section 8 covers plan maintenance procedures which includes information on monitoring, evaluating, and updating the plan, and description of how this HMP will be incorporated into existing programs.

The appendices cover the county-level hazard summary data (Hazus), maps, A comprehensive list of critical facilities, meeting documentation, and plan adoption.

Appendix A- Hazus Results
Appendix B- H-GAC Maps
Appendix C- Critical Facilities
Appendix D- Meeting Documentation
Appendix E- Survey Results
Appendix F- Plan Adoption

Section 2: Planning Process

This section summarizes the planning process, which involves a description of the HMP methodology and development process, identifying Planning Team members, Hazard Mitigation Committee members, roles and responsibilities of those members, stakeholder involvement efforts, meeting dates and summaries, and plan development resources.

Section 2: Planning Process

Overview

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to people and property from hazards and their effects. It includes long-term solutions that reduce the impact of disasters in the future. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by alleviating the need for emergency response, repair, recovery, and reconstruction.

Hazard mitigation planning is the process of identifying natural hazards, assessing hazard vulnerability and risk, understanding community capabilities and resources, and determining how to minimize or manage those risks. In partnership with Austin County, H-GAC approached the hazard mitigation planning process by establishing a Planning Team (PT) and a Hazard Mitigation Committee (HMC) as outlined in the tables below. The PT included H-GAC staff and the point of contact for the County's Office of Emergency Management. The HMC was comprised of representatives from Austin County, including the participating jurisdictions of the City of Bellville, City of Brazos Country, City of Industry, City of San Felipe, City of Sealy, City of South Frydek, City of Wallis, Bellville ISD, Sealy ISD, and Brazos ISD. Invitations were sent to a wide range of stakeholders within the County to participate in the HMC or attend an HMP meeting throughout the planning process via email, city websites, the H-GAC website, and social media postings. All meetings hosted for this plan update were open to the public.

HMC members were given a document titled "Hazard Mitigation Committee Expectations" to read and sign, which included the following:

1) *Participate in the process.*
   a) It must be documented in the plan that each participating jurisdiction participates in the process that generated the plan. At each meeting of the HMC for this planning process, we will be documenting attendance, participation, and the collection of any handouts or worksheets provided to you. If you cannot attend the scheduled HMC meeting, attendance can be supplemented with a 1-1 meeting with H-GAC staff.
2) *Consistency Review.*
   a) Review of existing documents pertinent to each jurisdiction
3) *Action Review.*
   a) For plan updates, a review of the strategies from your prior action plan to determine those that have been accomplished and how they were accomplished; and why those that have not been accomplished were not completed.
4) *Update Localized Risk Assessment.*
   a) Each jurisdiction will complete the Risk Identification/Risk Assessment by either working individually and averaging scores among all participating jurisdictions, working together as a group, or a combination of both to remove hazards not associated with the defined jurisdictional area or determining if any hazards need to be added or updated.
5) *Capability assessment.*
   a) Each planning partner must identify and review their individual regulatory, technical, and financial capabilities with regards to the implementation of hazard mitigation actions.
6) *Personalize mitigation recommendations & create an Action Plan.*
   a) Identify and prioritize mitigation recommendations specific to each jurisdiction's defined area.
7) *Incorporate Public Participation.*
   a) Representatives from a broad range of sectors, community lifelines, organizations that support underserved communities, the public and community-based organizations need to be given the

opportunity to provide input on, and participate in, the planning process. The HMC will assist with various tasks, when needed, for these types of events.

Planning Team

Austin County and H-GAC established the PT in February 2023 during a pre-kickoff meeting in preparation for the full kickoff meeting held on March 22, 2023. Members were asked to attend all public meetings either in person or online (if applicable). Meeting materials such as worksheets, forms, meeting notes, and documentation of events shared to the public are provided in Appendix D. Representatives from the County Office of Emergency Management served as liaisons between H-GAC and stakeholders, staff, and members of the public who were unable to attend the meetings.

Table 2.1: Austin County Planning Team Members

Representative Name & Position/Title	Jurisdiction
Roy Mercer, Emergency Management Coordinator	Austin County
Cheryl Mergo, Senior Manager	H-GAC
Amanda Ashcroft, AICP, Planner	H-GAC

Hazard Mitigation Committee

Austin County and H-GAC established the HMC in February 2023 in preparation for the kickoff meeting held on 3/22/2023. Members were asked to attend all public meetings either in person or online (if applicable). Meeting materials such as worksheets, forms, meeting notes, and documentation of events shared to the public are provided in Appendix D. Representatives from the County Office of Emergency Management served as liaisons between H-GAC and stakeholders, staff, and members of the public who were unable to attend the meetings.

Table 2.2: Austin County Hazard Mitigation Committee Members

Representative Name	Position/Title	Jurisdiction
Roy Mercer	Emergency Management Coordinator	Austin County
Chip Reed	County Commissioner	Austin County
Shannon Hanath	Precincts Administrative Assistant	Austin County
Jason Smalley	Police Chief / EMC	City of Bellville
Shawn Jackson	City Administrator	City of Bellville
ED. D. Michael Coopersmith	Executive Director of Administration	Bellville ISD
Bob Ray	Mayor	City of Brazos Country
Mary Lou Craig	City Secretary	City of Brazos Country
Scott C. Rogers	Chief Operations Officer	Brazos ISD
Maya Mable Meyers	Mayor	City of Industry
Bobby Byars	Mayor	City of San Felipe
Sue Foley	Town Secretary	City of San Felipe
Brandon Lewis	Project Manager of Public Works	City of Sealy
Brooke Kaiser	Public Works Admin/GIS Tech.	City of Sealy
Josh Brothers	Planner	City of Sealy
Kimbra Hill	City Manager	City of Sealy

Stephen Bozich	Director of Parks, Recreation, Streets, Drainage & Buildings	City of Sealy
Travis Cochran	Wastewater Superintendent	City of Sealy
Patrick Parsons	Director of Public Works	City of Sealy
Jerry Ebers	Clerk	City of South Frydek
Julie Ebers	Commissioner	City of South Frydek
Laura Meyer	Mayor	City of South Frydek
Clay Engelbrecht	Fire Chief	City of Wallis
Shawn Hiatt	Executive Director of Human Resources & Operations	Sealy ISD
Cheryl Mergo	Senior Manager	H-GAC
Amanda Ashcroft, AICP	Planner	H-GAC

Meeting Dates & Details

Members of the HMC, as well as stakeholders, met regularly to identify hazards, assess risks, review critical facilities, and assist at workshops or public events/hearings to organize, set-up, assist, and answer questions from the public. All members of the HMC had the opportunity to review the draft plan and assist with public outreach efforts and events. Table 2.1 below outlines the participation by each jurisdiction at various meetings held throughout the planning process. This does not reflect all planning activities conducted by the PT or HMC. There were various individual meetings between jurisdictions and the PT, phone calls, and other forms of correspondence that are not reflected here. All meeting materials, including agendas, notes, list of attendees, completed worksheets, and outreach notices for public meetings can be found in Appendix D.

Table 2.3: Participation Matrix

Participating Jurisdiction	Kickoff Meeting 3/22	Risk & Capability Assessment 4/26	Public Outreach Strategy 6/21	Public Hearing #1 7/19	Public Hearing #2 7/20	Our Mitigation Strategy 10/4	Our Mitigation Strategy, Pt II 10/25	Plan Draft Review 1/24
Austin County	x	x	x	x	x	x	x	x
City of Bellville	x			x		x		
City of Brazos Country		x	x			x	x	x
City of Industry	x	x	x			x	x	x
City of San Felipe		x	x			x	x	x
City of Sealy	x	x	x		x	x	x	x
City of South Frydek		x			x	x	x	x
City of Wallis	x	x	x			x	x	x
*Bellville ISD							x	x
*Sealy ISD							x	x
*Brazos ISD							x	x

*Entered the plan on 9/23/2023

March 22, 2023: Hazard Mitigation Kickoff Meeting

The PT hosted a kickoff meeting of the HMC on March 22, 2023, at the Sealy Fire Department located at 1207 Highway 90 W, Sealy, TX 77474. The purpose of the kickoff meeting was to introduce the hazard mitigation planning process and its importance to all attendees, to gather feedback and input about various hazards and local vulnerabilities, and to discuss the risk assessment for the county. The HMC was given a presentation covering the benefits of hazard mitigation, the planning process and timeline, updates to FEMA policies surrounding HMPs that took effect in April 2023, and expectations for those participating in the HMC. The committee discussed the next steps for the planning process, and the risk assessment, and used the remaining meeting time to work through and discuss the provided risk assessment worksheet to identify various natural and man-made hazards (both new and old) that could affect jurisdictions within the county. Before the meeting, community members and stakeholders were invited to attend and learn about the hazard mitigation planning process through meeting notices posted on social media, the H-GAC website, and participating jurisdictions' city websites.

April 26, 2023: Risk and Capability Assessment Meeting

The PT hosted a meeting to cover the risk and capability assessment worksheets and review topics, questions, and recap the kickoff meeting on April 26, 2023, at the Sealy Fire Department located at 1207 Highway 90 W, Sealy, TX 77474. The purpose of this meeting was to review risk assessment results from the kickoff meeting as well as worksheets that were turned in, compare those changes to the last plan update in 2017, and review the capability assessment worksheet and instructions. The HMC then reviewed the various sections of the capability assessment worksheet. The categories discussed were:

1) Prevention- Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning & zoning, building codes, open space preservation, and floodplain regulations.
2) Property Protection- Modification or removal of existing buildings to protect them from a hazard. Examples include purchase, relocation, raised elevation, and structural retrofits.
3) Natural Resource Protection- Preservation or restoration of the functions of natural systems while minimizing hazard losses. Examples include floodplain protection, forest management, and slope stabilization.
4) Structural Projects- Modification of the natural conditions for or progression of a hazard. Examples include dams, levees, seawalls, detention/retention basins, channel modification, retaining walls, and storm sewers.
5) Emergency Services- Protection of people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of emergency facilities.
6) Public Education and Awareness- Informing of citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach, school education, library materials, and demonstration events.

The capability assessment also had areas where participants would be tasked with identifying opportunities to enhance local capabilities to better integrate hazard mitigation into their plans, programs, and day-to-day operations.

The committee then discussed the online survey development that would be used to gather input from stakeholders within the county, the next steps for the planning process, the next meeting for public engagement event planning, and then used the remaining time to continue to work through the provided risk assessment worksheet to identify, rank, and categorize various natural and man-made hazards that could affect jurisdictions within the county. Before the meeting, community members and stakeholders were invited to attend and learn about the hazard mitigation planning process through meeting notices posted on social media, the H-GAC website, and participating jurisdictions' city websites.

June 21, 2023: Public Outreach Strategy

The PT hosted a meeting to discuss possible dates, locations, and timing for two public hearing events to solicit feedback on hazards, vulnerabilities, and other pertinent information to the HMP. The HMC decided public hearings should be held in the north and south portions of Austin County so that citizens could choose a location that was closer to them. Meeting times for these events were scheduled for 6:00-8:00 PM to accommodate the schedules of citizens outside of normal working hours. At the public hearings stakeholders will be introduced to the HMP, the update process, and be engaged in activities meant to gather public input on the plan. The HMC also overviewed survey results and website updates. All members agreed to push out the survey link and QR code flyers via their city websites, postings in City Hall, and via social media or citizen mailing lists. Flyers for the public hearing were also to be posted in the same methods after they were created and distributed to the HMC.

July 19 & 20, 2023: Public Hearing Events

Two public hearings were hosted on July 19th and July 20th, 2023, from 6:00- 8:00 PM. The purpose of these public hearings was to provide a hazard mitigation planning project overview from the PT and HMC members in attendance and solicit feedback and information from stakeholders. The July 19th public hearing was located at Austin County Fair and Expo Center located at 1076 TX-159, Bellville, TX 77418. Despite a low turnout for this public hearing with just two participants and two HMC members present, the conversations were robust and lasted for the entire duration of the allotted time. The public hearing on July 20th was hosted at the W.E. Hill Community Center located at 1000 Main St., Sealy TX 77474. This public hearing had 13 attendees in attendance. Feedback collected was done in a variety of formats from large, printed maps where participants could mark areas of concern within their community or add critical facilities to the map, an input exercise where participants had to assign dollars to mitigation project ideas, feedback worksheets that discussed how emergency notifications were received within the county and how these communications could be improved, and a dot exercise where participants had to notate their top three hazards of concern within the county using stickers. Public input helps the project team analyze potential hazards affecting residents and recommend possible actions to reduce their impact.

October 4 & 25, 2023: Our Mitigation Strategy *(Goals, Actions, and the Action Plan), Part I & II*

The PT hosted two meetings of the HMC and any members of the public that wished to attend regarding action items, plan goals, and the action plan. At these meetings a closing date for the online survey was set for October 31, 2023, a presentation was given discussing the action plan and how to form or update action items to go into this section of the HMP update, and H-GAC staff presented maps showcasing critical facilities and various risk data to all in attendance. During the Part II meeting the HMC updated language and finalized plan goals, H-GAC staff highlighted various resources to aid with the brainstorming of action items and presented those in attendance with printed packets containing all created maps, previous meeting notes, survey data, and public input collected. The HMC also discussed an online format to submit action items and an online SharePoint site for plan draft updates to be shared.

January 24, 2024: Draft Plan Review

The PT hosted a meeting of the HMC to discuss and provide feedback on draft sections of the plan that were completed. The HMC overviewed each section, changes since the last plan update, items needed, the BCA analysis, and next steps.

Participation & Public Input

Public input and participation are a crucial element of hazard mitigation planning. Public input was solicited and gathered via the following ways for this plan update:

1) Hazards of Concern Public Input Survey
    a) The online survey was open from May 8, 2023, to October 31, 2023. In total, there were 30 responses to the survey. Survey questions asked participants about hazards of concern, vulnerable community assets, how they receive information regarding hazards, what the county can do to better communicate about hazards, etc. A full list of survey results can be found in Appendix E.

2) Public Hearings
    a) There were two public hearings hosted on July 19, 2023, and July 20, 2023, from 6-8 PM on the North and South sides of the County. The purpose of these public hearings was to provide a hazard mitigation planning project overview from the PT and HMC members in attendance and solicit feedback and information from stakeholders. The public hearings included many interactive activities meant to gather input from the public regarding hazards of concerns, critical facilities, action items, etc. Feedback collected was done in a variety of formats from large, printed maps where participants could mark areas of concern within their community or add critical facilities to the map, an input exercise where participants had to assign dollars to mitigation project ideas, feedback worksheets that discussed how emergency notifications were received within the county and how these communications could be improved, and a dot exercise where participants had to notate their top three hazards of concern within the county using stickers.

3) Draft Plan Public Input Survey

a) The online survey was open from March 8, 2023, to gather public comments regarding the finished draft of the Austin County HMP update for 2024. A full list of survey results can be found in Appendix E

Feedback and input from the public were used to identify vulnerabilities in each jurisdiction, identify valuable assets, identify critical facilities, and further develop the risk assessment. Additionally, H-GAC hosted all HMP-related materials online and advertised meeting information, presentations, and meeting notes for those who were unable to attend through this public-facing website: https://www.h-gac.com/regional-hazard-mitigation-planning.

The HMC also had access to an online mitigation action portal for project submittal. This allowed jurisdictions to submit their proposed projects that were used to develop the mitigation strategy at any time in an easy-to-access format.

Plan Development Resources

The Austin County HMP was developed using existing plans, studies, reports, and technical information. Materials and historical data were used to inform participants throughout the planning process, evaluate and analyze hazards, and develop the mitigation strategy. For a full list of references, seen endnotes.

Plan Development Resources: Existing Documents and Data	
2023 Texas State Hazard Mitigation Plan	List of Reports and Publications | 2022 Census of Agriculture | USDA/NASS
2023 Data Breach Investigations Report | Verizon	Losing Ground: Flood Data Visualization Tool (nrdc.org)
2023 Texas State Hazard Mitigation Plan	Major Land Resource Area (MLRA) | Natural Resources Conservation Service (usda.gov)
American Community Survey (ACS) (census.gov)	Mayo Clinic
Association of State Dam Safety	MRLC Viewer
Census.gov	National Centers for Environmental Information (NCEI) (noaa.gov)
FEMA 2013 Mitigation Ideas	National Institute of Allergy and Infectious Diseases (NIAID) (nih.gov)
FEMA 2021 Mitigation Action Portfolio	National Institute of Environmental Health Sciences: NIEHS Home page (nih.gov)
FEMA 2022 Local Mitigation Planning Policy Guide	National Oceanic and Atmospheric Administration (noaa.gov)
FEMA 2023 Local Mitigation Planning Handbook	National Weather Service
FEMA Declared Disasters	NOAA National Severe Storms Laboratory
FEMA Flood Map Service Center	NOAA Storm Event Database
FEMA Hazardous Response Capabilities	Office of the Texas State Climatologist (tamu.edu)
Flood Insurance Data and Analytics (floodsmart.gov)	Plan Ahead for Disasters | Ready.gov
HEAT.gov - National Integrated Heat Health Information System	Texas A&M Forest Service Wildfire Risk Assessment Portal
H-GAC 2011 Regional Hazard Mitigation Plan	TSHA (tshaonline.org)
H-GAC 2018 Multijurisdictional Hazard Mitigation Plan	USGS HIFLD Open Data
H-GAC Regional Demographic Snapshot	Vaisala National Lightning Detection Network (NLDN) Flash Data (Restricted) (noaa.gov)
H-GAC Regional Flood Information	Web Soil Survey - Home (usda.gov)

Section 3: County Profile

This section contains the county profile, which provides a history of hazard events, an overview of the planning area, geographic setting, land use and land cover, population demographics, vulnerable population information, housing and household arrangements, loss estimations, critical facilities, repetitive loss, and severe repetitive loss properties, NFIP and CRS participants, and NFIP policies in force information can be found here.

Section 3: County Profile

History of Hazard Events

Austin County has persevered through many natural disasters. Table 3.1 below lists the presidentially declared emergency and major disaster declarations that the county has experienced since 1991. Each disaster is costly and challenging. Presidential disaster declarations are issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government. A presidential disaster declaration mobilizes federal recovery programs to assist disaster victims, businesses, and public entities. A review of these presidential disaster declarations helps establish the probability of reoccurrence and assists in identifying targets for risk reduction through potential mitigation actions.

Table 3.1: Presidential Disaster Declarations[1]

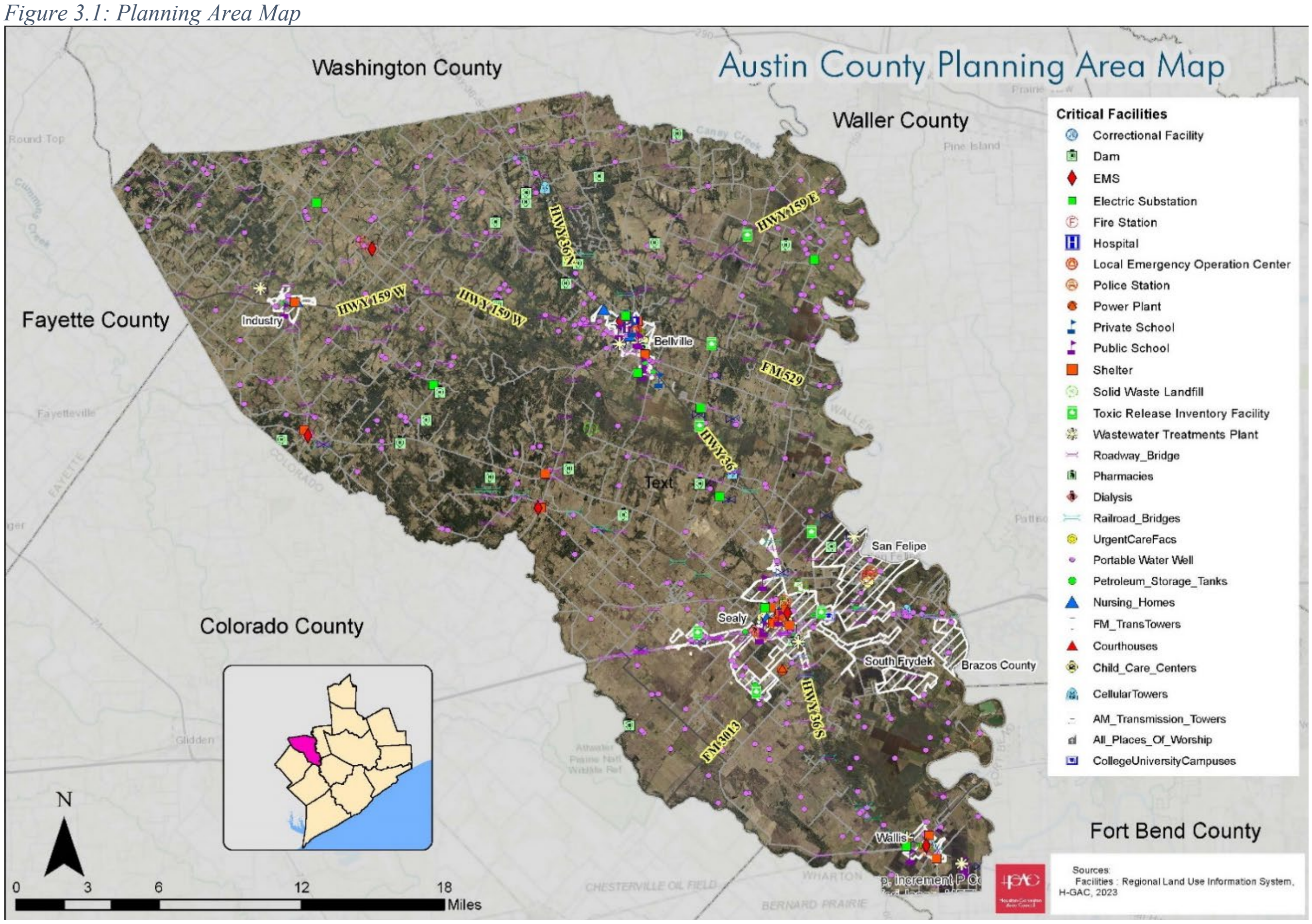
Declaration Date	Disaster No.	Declaration Type	Incident Type	Title
12/26/1991	930	Major Disaster Declaration	Flood	Severe Thunderstorms
9/10/1993	3113	Emergency Declaration	Drought	Extreme Fire Hazard
10/18/1994	1041	Major Disaster Declaration	Flood	Severe Thunderstorms and Flooding
8/26/1998	1239	Major Disaster Declaration	Severe Storm	Tropical Storm Charley
10/21/1998	1257	Major Disaster Declaration	Flood	TX-Flooding 10/18/98
9/1/1999	3142	Emergency Declaration	Fire	Extreme Fire Hazards
9/2/2005	3216	Emergency Declaration	Hurricane	Hurricane Katrina Evacuation
9/21/2005	3261	Emergency Declaration	Hurricane	Hurricane Rita
9/24/2005	1606	Major Disaster Declaration	Hurricane	Hurricane Rita
1/11/2006	1624	Major Disaster Declaration	Fire	Extreme Wildfire Threat
3/14/2008	3284	Emergency Declaration	Fire	Wildfires
8/29/2008	3290	Emergency Declaration	Hurricane	Hurricane Gustav
9/10/2008	3294	Emergency Declaration	Hurricane	Hurricane Ike
9/13/2008	1791	Major Disaster Declaration	Hurricane	Hurricane Ike
5/29/2015	4223	Major Disaster Declaration	Severe Storm	Severe Storms, Tornadoes, Straight-Line Winds and Flooding
4/25/2016	4269	Major Disaster Declaration	Flood	Severe Storms and Flooding
6/11/2016	4272	Major Disaster Declaration	Flood	Severe Storms and Flooding
8/25/2017	4332	Major Disaster Declaration	Hurricane	Texas Hurricane Harvey
3/13/2020	3458	Emergency Declaration	Biological	COVID-19
3/25/2020	4485	Major Disaster Declaration	Biological	COVID-19 Pandemic

2/14/2021	3554	Emergency Declaration	Severe Ice Storm	Severe winter storm
2/19/2021	4586	Major Disaster Declaration	Severe Ice Storm	Severe winter storms

Planning Area Overview

The largest industries in Austin County, TX are Retail Trade (2,268 people), Construction (1,807 people), and Manufacturing (1,408 people), and the highest-paying industries are Mining, Quarrying, & Oil & Gas Extraction ($92,691), Agriculture, Forestry, Fishing & Hunting, & Mining ($77,500), and Finance & Insurance ($68,393). The most common job groups, by number of people living in Austin County, TX, are Office & Administrative Support Occupations (1,646 people), Sales & Related Occupations (1,449 people), and Construction & Extraction Occupations (1,334 people).[2,3] The county's unemployment rate in 2022 was 3.9%, the same as the national average.[4,5]

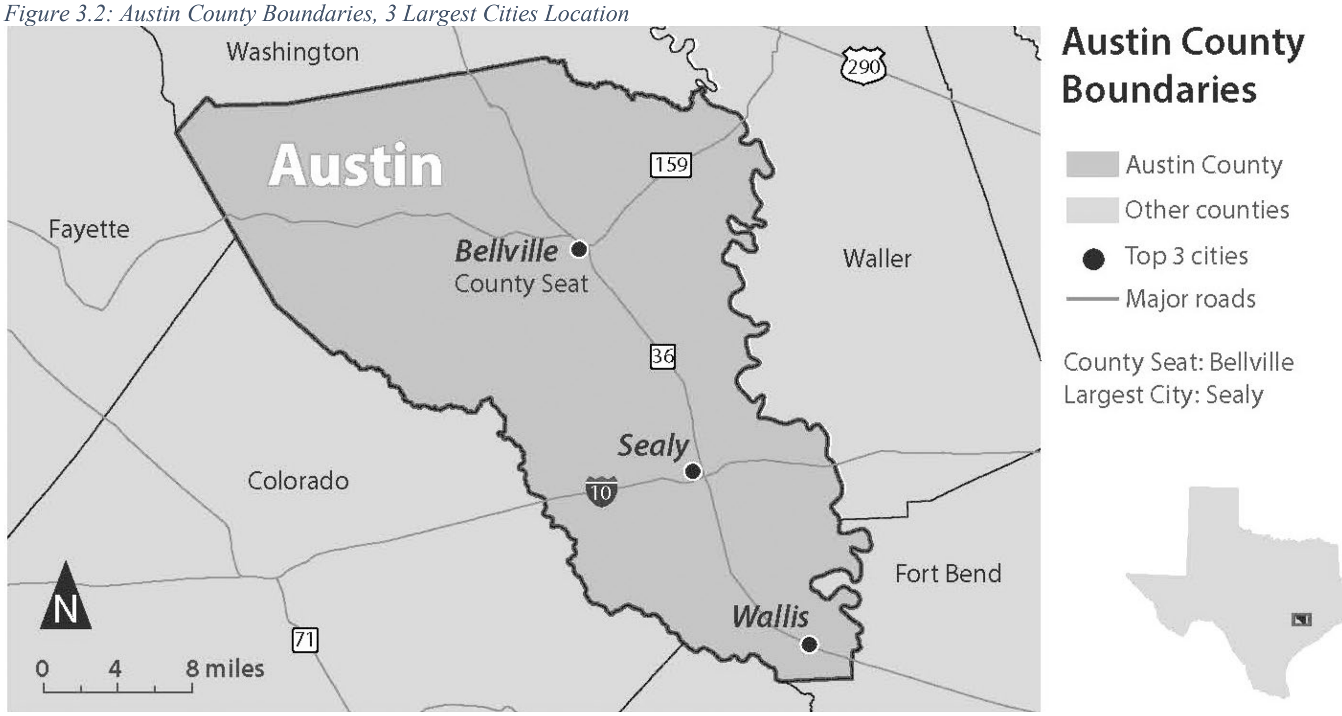
Figure 3.1: Planning Area Map



According to the 2020 US Census data, Austin County's population was 30,167 which is expected to expand due to Houston's continued westward growth. The most recent data available shows the Austin County population at 31,097 as of July 1, 2022. The annual median household income within the county was reported at $73,556, just above the $73,035 median income for the State of Texas.[6]

The three largest cities within the county are Sealy, Bellville, and Wallis. Sealy is at the crossroads of Interstate 10 and Highway 36, with 6,956 residents, Bellville, the county seat, boasts 4,108 residents and Wallis has around 1,296 residents. [7,8,9]

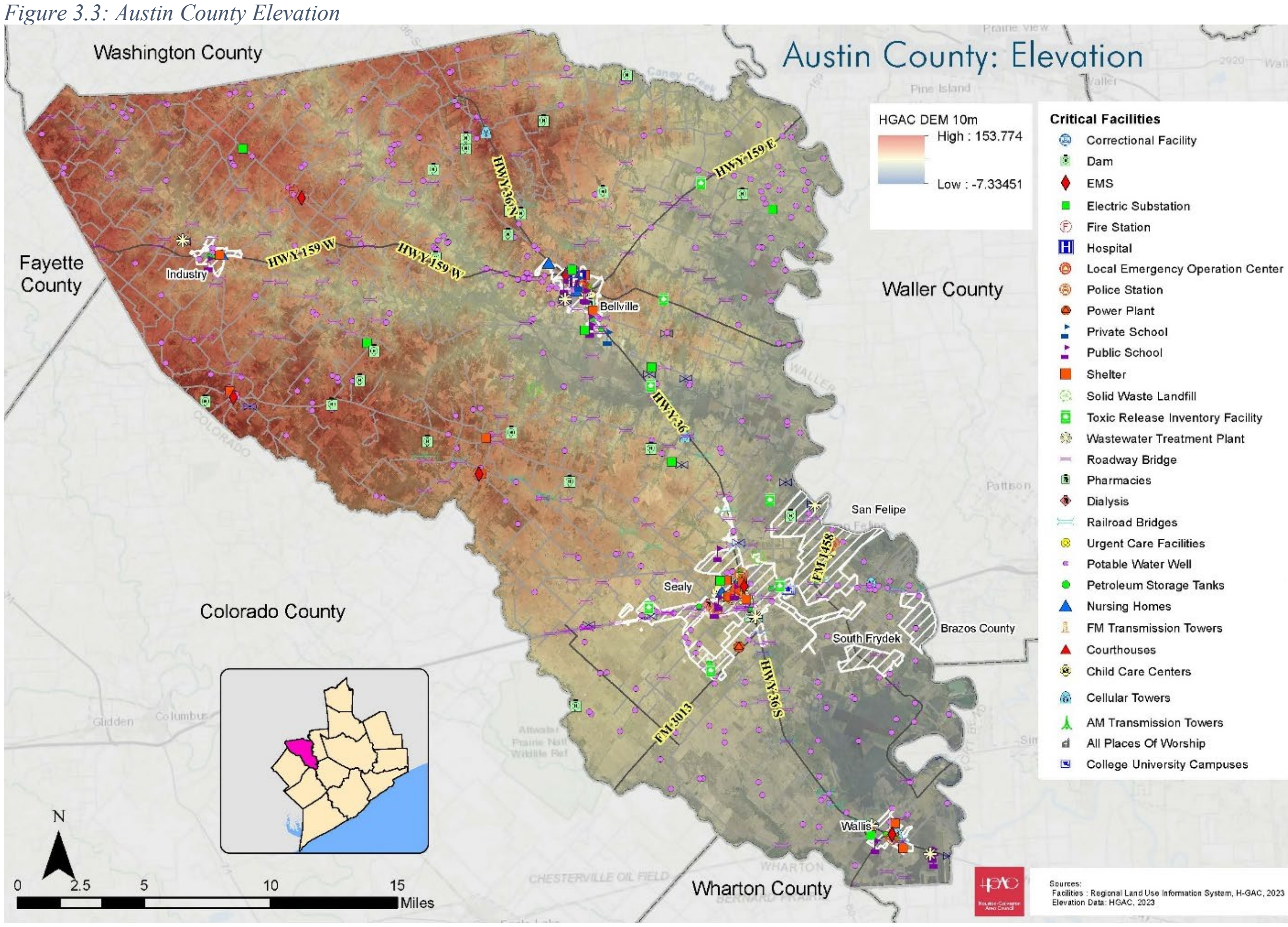
Figure 3.2: Austin County Boundaries, 3 Largest Cities Location



Geographic Setting

Austin County sits between the San Bernard River on the west and the Brazos River on the east and is located 35 miles west of Houston. State Highway 36 runs north-south through the center of the county, while Interstate 10 and State Highway 159 both cut across Austin County east-west. The county is largely rural and covered in prairie land and pastureland, with flat coastal prairies in the county's southern tip and hills to the north. Elevations range from 460 feet above sea level (ASL) in the northwest area of the county, to 120 feet ASL in the southeast. Figure 3.3 shows the elevation of the county. Neighboring counties include Washington County to the north, Waller and Fort Bend counties to the east, Wharton County to the south, and Colorado and Fayette counties to the west.[10]

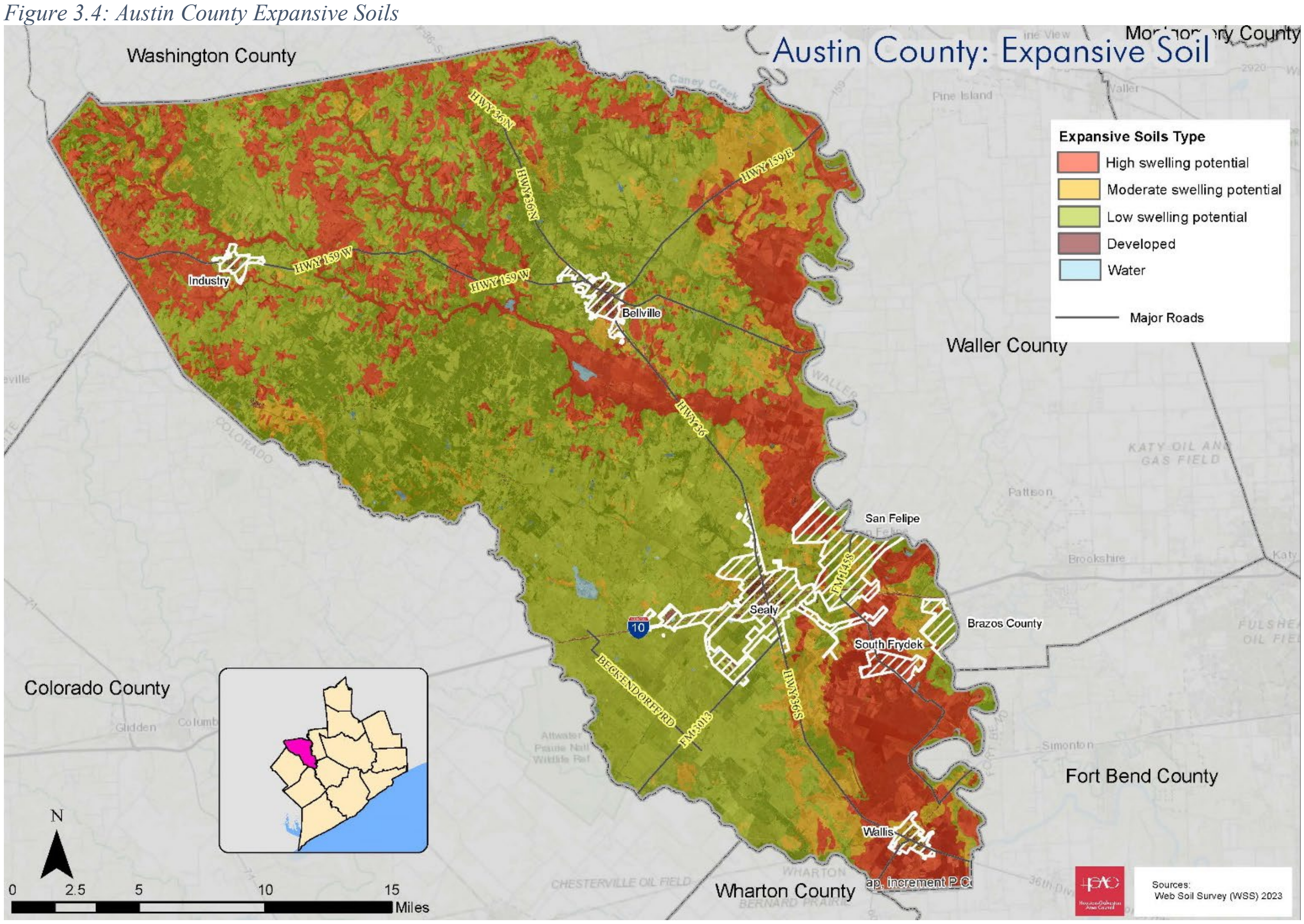
Figure 3.3: Austin County Elevation



Soil Composition

Austin County soils range from dark clays, clay loams, and sandy loams from within the major land resource areas of the Coast Prairie and Post Oak/Claypan Area.[11] Expansive soils refer to those that are clay rich. Due to their clay content, these soils can absorb large quantities of water that cause them to expand, whereas in dry periods the soils will contract and cause the ground to shrink and crack. In areas where development exists, these soils can cause issues with slab-on-grade foundations and infrastructure due to the potential uneven change in volume. This can cause subsidence, cracked foundations, broken pipes, or other detrimental effects to buried infrastructure. Austin County is covered primarily with low swell potential soils, followed closely by soils with high swelling potential.[12,13] Figure 3.4 below shows the expansive soils and shrink-swell potential for Austin County and participating jurisdictions. Full-size maps developed by H-GAC can be found in Appendix B.

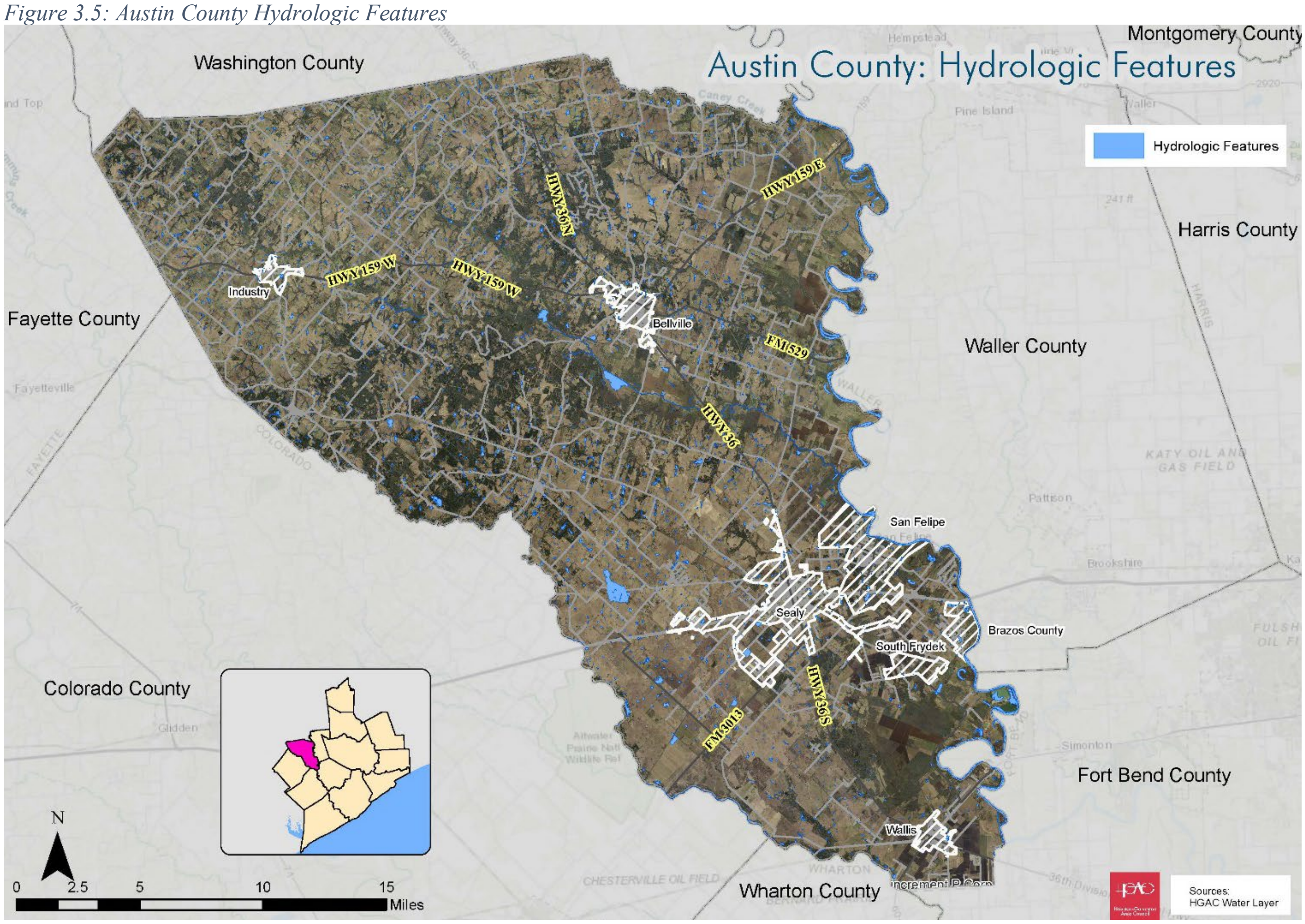
Figure 3.4: Austin County Expansive Soils



Hydrologic Features

9.9 square miles or 1.5% of Austin County is covered by surface water in rivers, creeks, and other hydrologic features. Most of the 656 square miles that comprise Austin County lie within the drainage basin of the Brazos River.[10] Figure 3.5 shows hydrologic features located across the county.

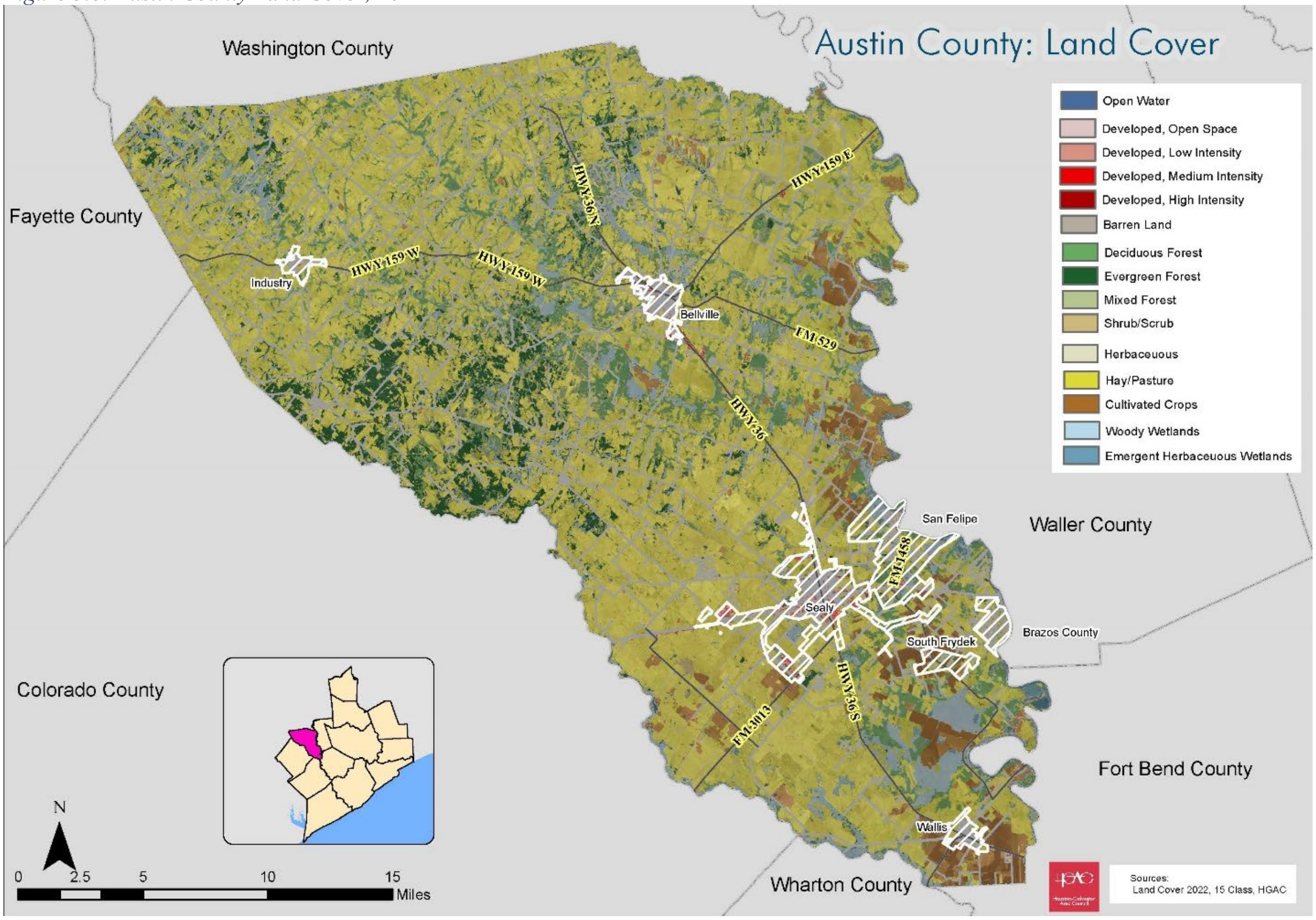
Figure 3.5: Austin County Hydrologic Features



Land Use and Land Cover

Land cover is primarily hay/pasture, wetlands, evergreen, and deciduous forest. Figure 3.6 shows the land cover composition of Austin County. The county hopes to preserve its rural character despite new development along the outskirts of the city brought in by the expansion seen from a growing City of Houston population. Citizens are worried this new development will bring in various land use patterns that may be incompatible with the county's current character.

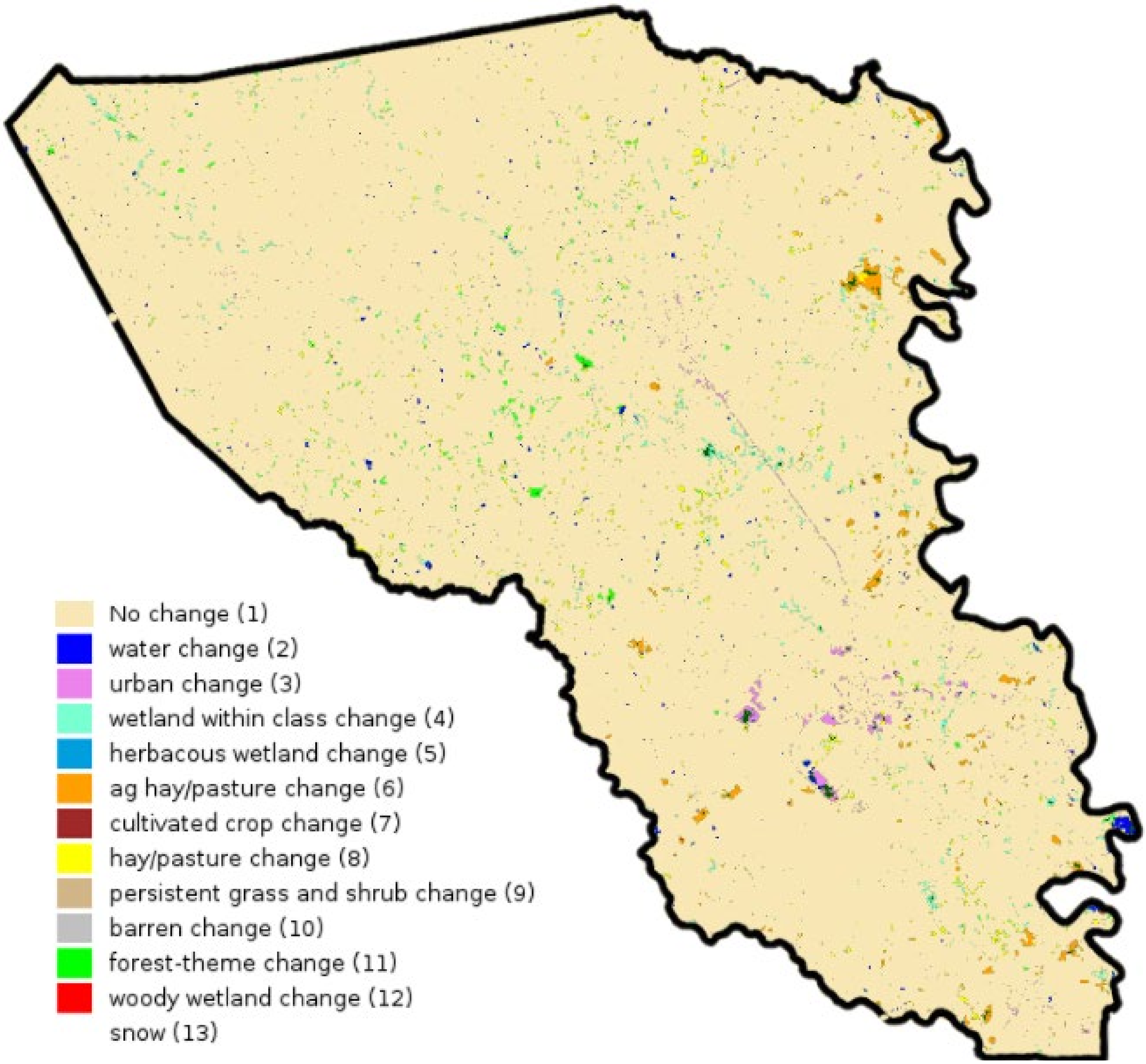
Figure 3.6: Austin County Land Cover, 2022



Land cover change from 2001-2021, as seen in Figure 3.7, has seen some urban expansion within the City of Sealy and along major thoroughfares such as HWY 36 heading towards the City of Bellville. An increase in agricultural uses and forest-themed/ tree cover makes up the remaining land use changes seen within the last 20 years.[14]

Zoning refers to the process by which a municipality divides its geographic area into different zones or districts, each with its own set of regulations governing land use, building heights, density, and other characteristics. The authority for Texas municipalities to regulate land use through zoning is found in Chapter 211 of the Texas Local Government Code. Specifically, Section 211.001 provides: “A municipality may regulate the use of land within its boundaries by establishing zoning districts for the municipality and by regulating the location, use, and construction of buildings, structures, and other improvements within those zoning districts.”[15] Zoning regulations are intended to promote orderly development, protect property values, and ensure that land uses are compatible with their surrounding areas. Zoning regulations can be used to accomplish a variety of goals, such as promoting residential, commercial, or industrial development in certain areas; protecting natural resources or historic landmarks, and separating incompatible land uses such as industrial and residential areas. There is currently no zoning within the county or participating jurisdictions.[16]

Figure 3.7: Austin County Land Cover Change, 2001-2021[14]



Population and Demographics

Austin County has seen its population grow steadily since 1970, with an average of a 1.6% increase per year. Population growth slowed from 2010 to 2020 at only 6% compared to other 10-year periods. Austin County saw population increases for 46 out of the 51 years where data is available.[17] The projected population for 2040 is expected to reach 50,000.[18] Figure 3.8 shows the population distribution per 1000 persons by census tract, while Table 3.2 highlights population change in the county since 1970.

Figure 3.8: Population Distribution Map

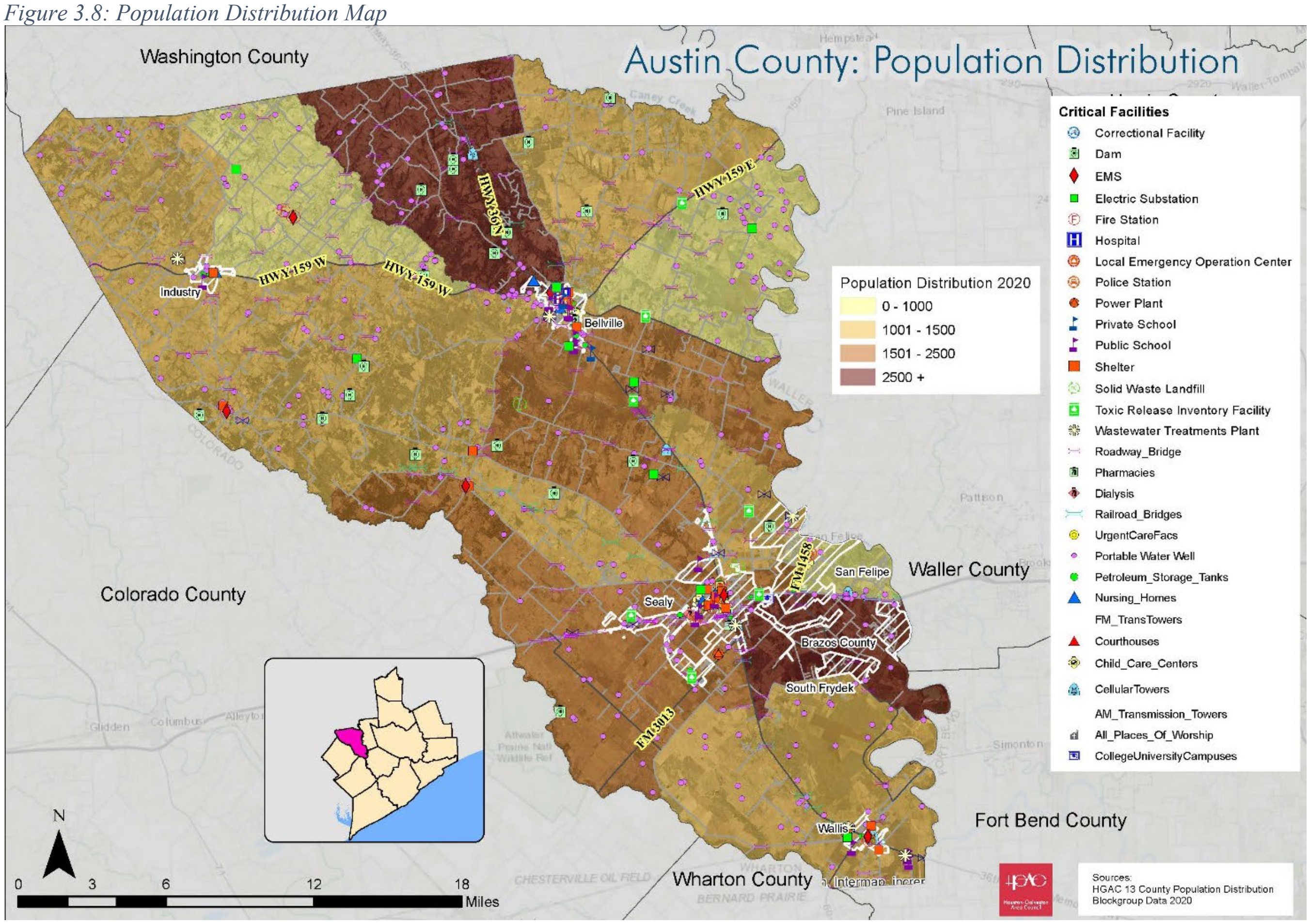


Table 3.2: Austin County Population Trends, 1970 to 2020

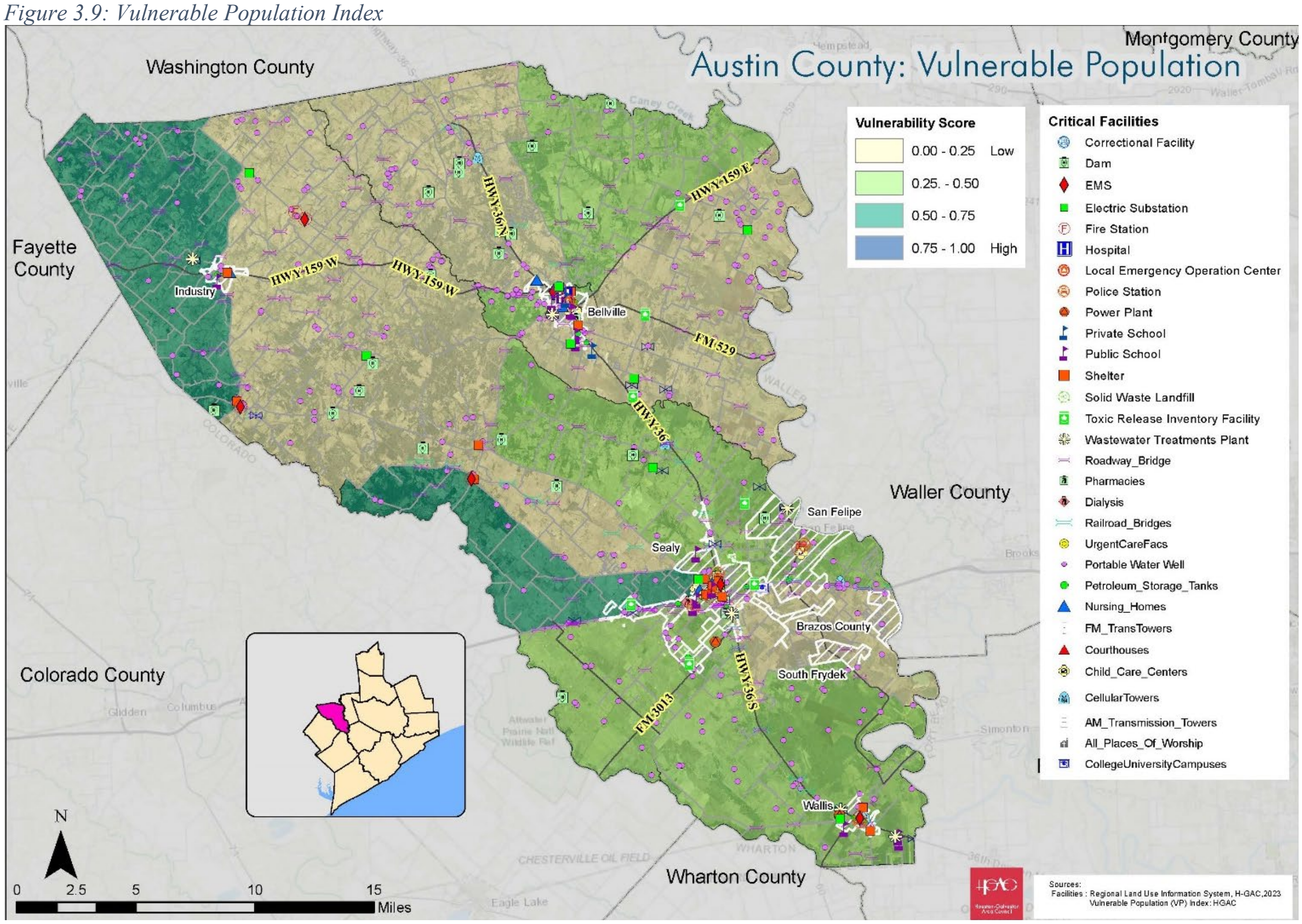
Year	Population Count	Population Change	Percent (%) Change
1970	14,160		
1980	17,859	3,699	26%
1990	19,891	2,032	11%
2000	23,836	3,945	20%
2010	28,372	4,536	19%
2020	30,131	1,759	6%

Austin County's population demographics, per the 2020 census, consists of 86.8% White population, a 28.9% Hispanic or Latino population, 9.4% African American population, 1% American Indian and Alaska Native population, and 1% Asian population. 20% of the population in Austin County is 65 or older, this is higher than the State average of 13.4%. The poverty rate for the County is 11.9%, less than the State average of 14%.[19]

Vulnerable Population

The Vulnerable Population Index, a dataset developed by H-GAC, identifies areas throughout Austin County that may not have the means or the resources to act when a natural disaster occurs. For this plan, vulnerable populations include any households without a car, single female households with a child or children in the home, individuals living below the poverty line, individuals who are disabled, Hispanic individuals, individuals who are non-Hispanic, and non-white, and individuals who are 65 years and older.[20] The areas in the county with the greatest proportion of these individuals are defined as the most vulnerable areas in Austin County, denoted by a higher vulnerability score in Figure 3.9. Defining and mapping vulnerable populations provides the opportunity to demonstrate where the most need is throughout the county.

Figure 3.9: Vulnerable Population Index



While age and income have been traditional indicators of vulnerable populations, the Centers for Disease Control and Prevention (CDC) in partnership with the Agency for Toxic Substances and Disease Registry (ASTDR) has developed a Social Vulnerability Index (SVI) that can be generated at the county level. This is a more recent tool used to identify socially vulnerable populations with additional risk factors. The CDC and ASTDR define socially vulnerable populations using factors such as poverty, lack of access to transportation, and crowded housing, to name a few. These factors may weaken a community's ability to prevent human suffering and financial loss in a disaster. The SVI uses U.S. Census data to determine the social vulnerability of every census tract. The SVI ranks each tract on a total of 16 social factors and groups them into four related themes. Figure 3.10 below depicts the social vulnerability of communities in Austin County by census tract.[21] Factoring in these additional aspects of social vulnerability and grouping them by themes gives the county a bigger picture of vulnerable populations. Austin County's social vulnerability score is 0.7613 overall. Scores range from 0-1, with 1 being the highest level of vulnerability within the nation.[21]

Figure 3.10: Austin County Overall CDC/ASTDR Social Vulnerability

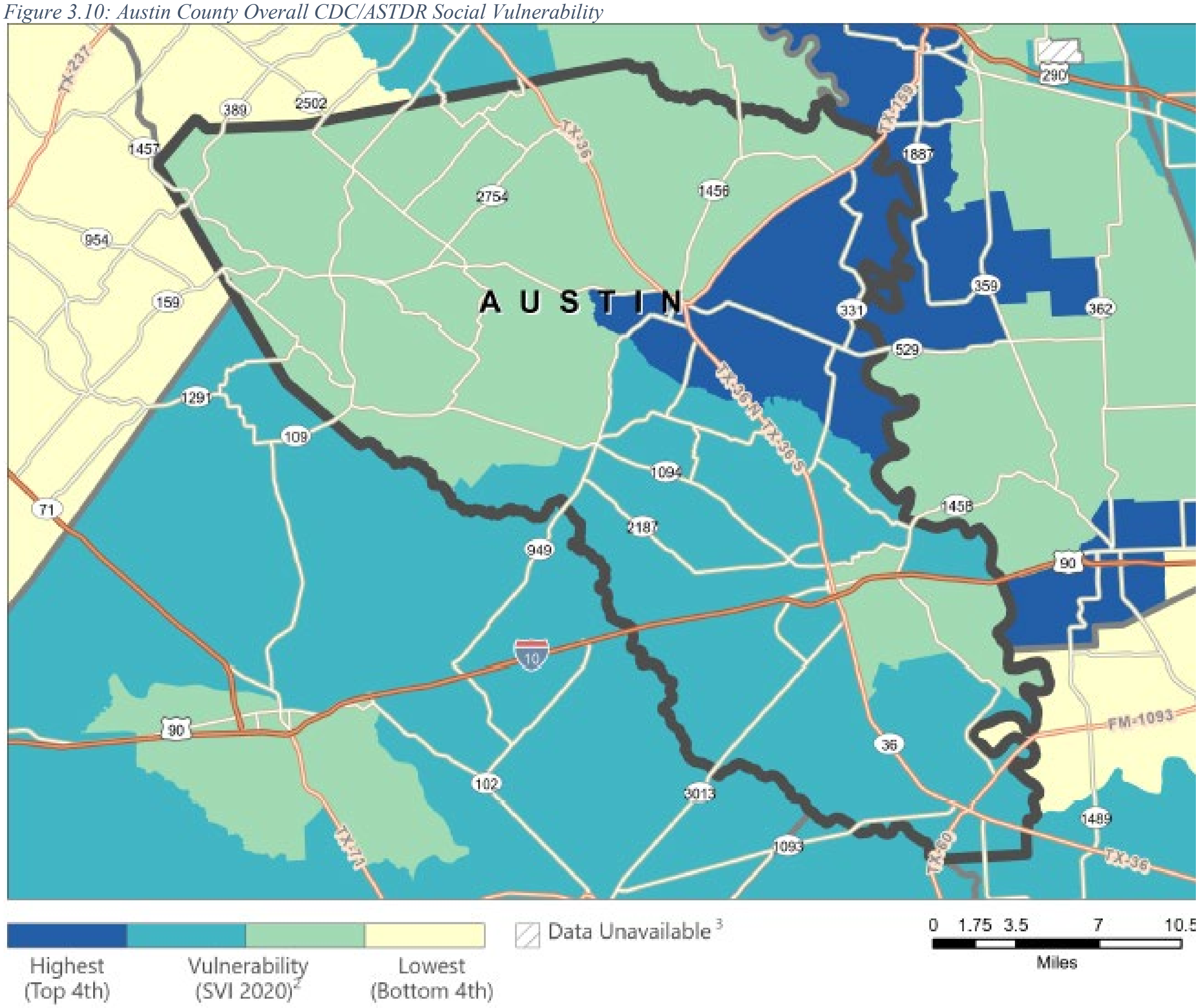
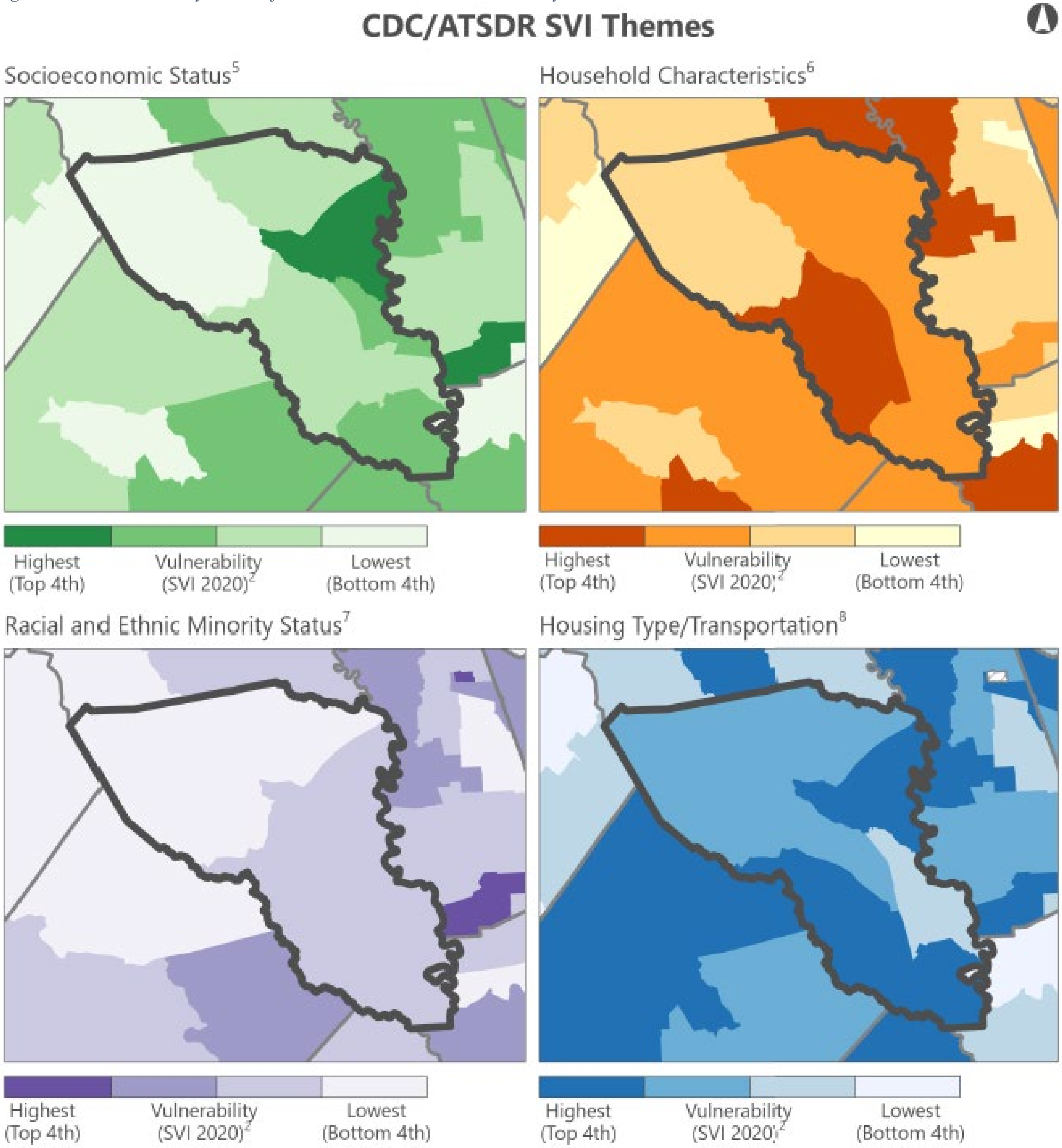


Figure 3.11: Austin County Themes for CDC/ASTDR Social Vulnerability



Housing and Living Arrangements

As of July 1, 2022, there were 14,198 housing units in Austin County, with 11,913 households. A household is defined by the U.S. Census Bureau as all the persons who occupy a housing unit and a housing unit as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. The median price of a single-family home in Austin County was listed at $240,000 from 2018-2021.[6]

Hazus Analysis- Loss Estimations

A Hazus analysis was conducted for 4 scenarios within Austin County: a 100-year flood scenario, a 500-year flood scenario, a 100-year hurricane scenario, and a 500-year hurricane scenario. Hazus is a regional multi-hazard loss estimation model that was developed by FEMA and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state, and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.[22] For this section, the 100-year flood scenario will be highlighted regarding potential losses of building stock, debris generation, and shelter requirements. The full Hazus analysis for all scenarios can be found in Appendix A.

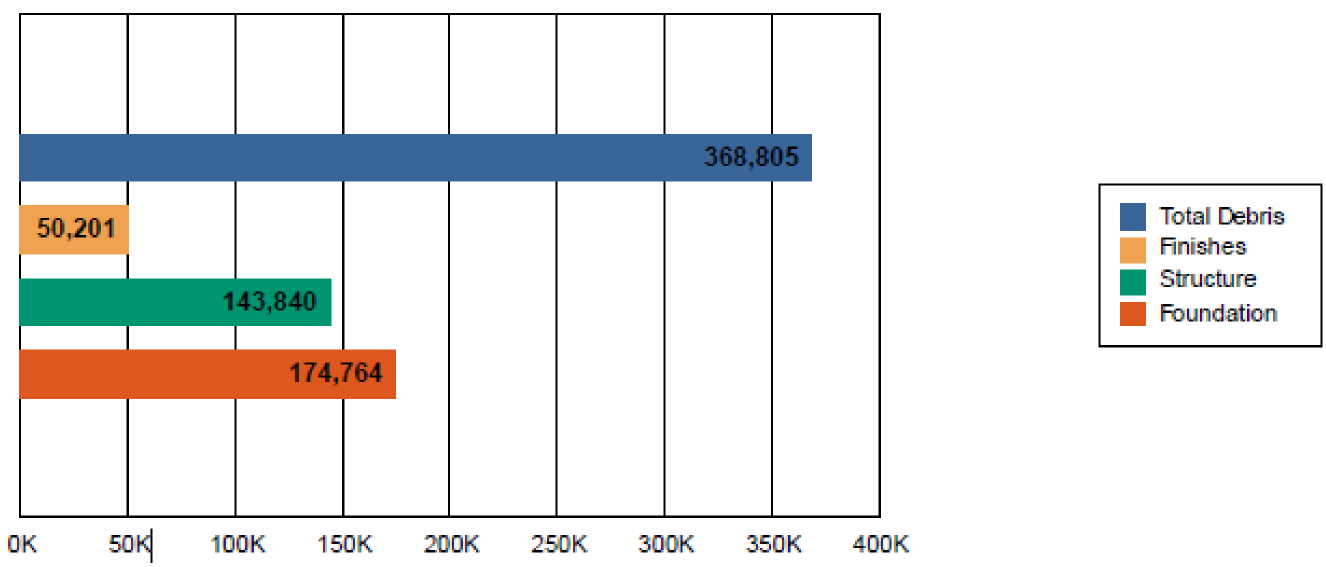
Table 3.3: Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	$3,230,826	45.4%
Commercial	$1,391,083	19.5%
Industrial	$573,273	8.1%
Agricultural	$1,591,429	22.4%
Religion	$67,882	1.0%
Government	$44,675	0.6%
Education	$218,254	3.1%
Total	**$7,117,422**	**100%**

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (drywall, insulation, etc.), 2) Structural (wood, brick, etc.), and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris. The model estimates that a total of 368,805 tons of debris will be generated. Of the total amount, Finishes comprises 14% of the total, Structure comprises 39% of the total, and Foundation comprises 47%. If the debris tonnage is converted into an estimated number of truckloads, it will require 14,753 truckloads (estimating 25 tons/truck) to remove the debris generated by the flood.

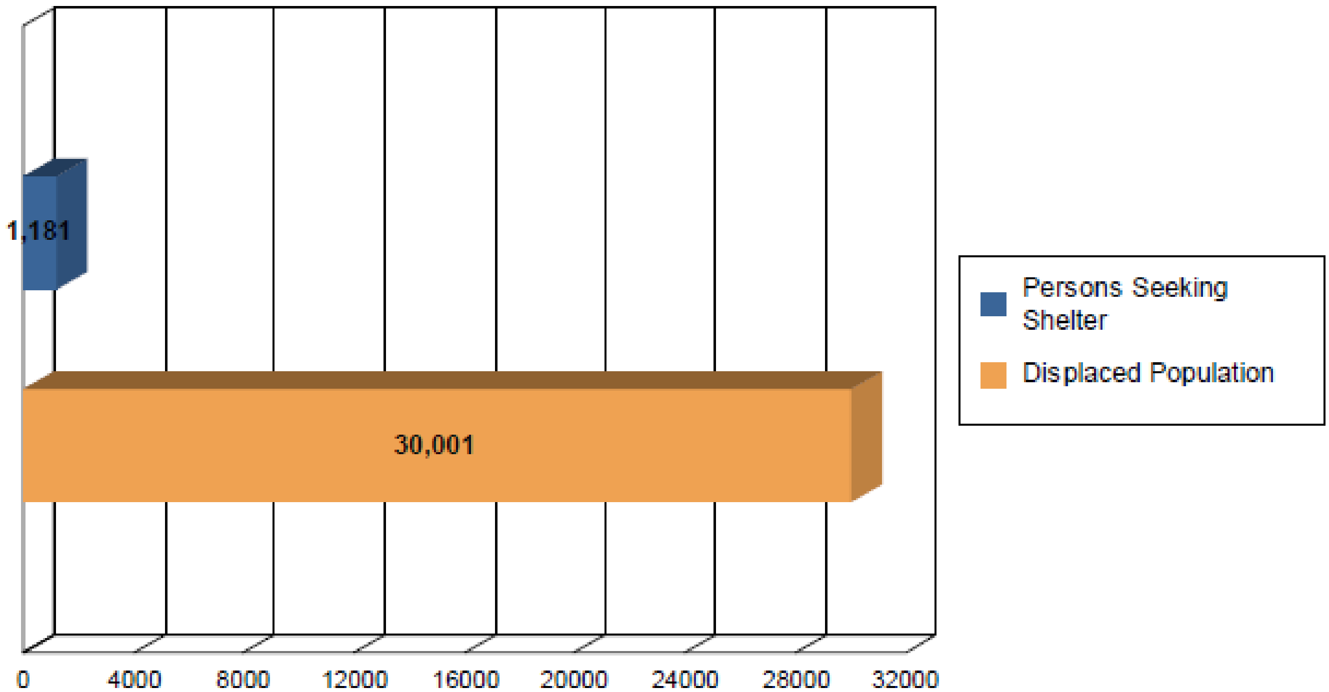
Figure 3.12: Debris Breakdown in Tons



Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 10,000 households (or 30,001 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,181 people (out of a total estimated population of 30,013) will seek temporary shelter in public shelters.

Figure 3.13: Displaced Population/Persons Seeking Short-Term Public Shelter



Critical Facilities and Lifelines

H-GAC maintains a database of critical facilities that was greatly expanded for this plan update to include more community lifelines and additional critical facilities that were not considered in the 2017 HMP. The HMC provided additional critical facility data when available at meetings hosted by H-GAC. The PT also collected critical facility information from stakeholders at the public hearings hosted in July. It was determined that there are 232 facilities are considered critical or valuable assets, a summary of these facilities is provided below in Table 3.4.[7,23] A full list of critical facilities can be found in Appendix C.

Table 3.4: Critical Facilities & Community Lifelines

Asset Description	Quantity	Amount within a Floodplain
AM Transmission Tower	2	0
Cellular Tower	12	0
Childcare Facility	11	0
College	1	0
Correctional Facility	1	0
Courthouse	1	0
Dam	21	4
Dialysis Center	1	0
Distribution Center	1	0
Elder Care Facility	8	0
Electric Substation	9	0
EMS	6	0
Fire Station	8	1
FM Transmission Tower	3	0
Hospitals/Urgent Care	1	0
Local Emergency Operation Center	2	0
Petroleum Storage Tank	35	4
Pharmacy	6	0
Place of Worship	22	0
Police Station	7	1
Potable Water Well	323	44
Power Plant	2	0
Private Schools	2	0
Public Schools	14	0
Railroad Bridge	28	17
Roadway Bridge	204	152
Shelters	13	0
Solid Waste Landfill	2	0
Toxic Release Inventory Facility	7	0
Urgent Care	2	0
Wastewater Outfall	16	4
Wastewater Treatment Plant	6	3
Residential Units	14,198	
Commercial Units	677	

National Flood Insurance Program (NFIP) Participation

The NFIP is a federal program administered through FEMA that enables property owners in participating communities to purchase insurance as a protection against flood losses. Communities must maintain eligibility in the NFIP by adopting and enforcing floodplain management regulations intended to prevent unsafe development in the floodplain, thus reducing future flood damage. FEMA creates flood maps, or Flood Insurance Rate Maps (FIRMs) to support the NFIP.[24,25] These flood maps are periodically updated and outline special flood hazard areas (SFHA). The SFHA is the area where the NFIP floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.[26] The cities of Industry and South Frydek are not currently participants in the NFIP.

The Community Rating System (CRS)

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Participation in the CRS program is voluntary and includes many benefits for a community, such as discounted flood insurance premiums that relate to the community's level of efforts that reduce risk from flooding and strengthen floodplain management. Currently, there are no communities within Austin County, including the County itself, that participate in the CRS Program.[27]

Table 3.5: Community Participation in the NFIP and CRS Program[28]

Jurisdiction	Participating	Date Joined	Current Effective FIRM Date	CRS Participation
Austin County	Y	02/25/77	10/18/19	N
Bellville	Y	11/19/76	10/18/19	N
Brazos Country	Y	02/25/77	10/18/19	N
Industry	N			N
San Felipe	Y	01/03/86	10/18/19	N
Sealy	Y	12/17/73	10/18/19	N
South Frydek	N			N
Wallis	Y	05/24/74	10/18/19	N

Repetitive Loss and Severe Repetitive Loss Properties

FEMA defines a repetitive loss (RL) structure as "a structure covered under an NFIP flood insurance policy that:

(1) Has incurred flood-related damage on 2 occasions, in which the cost of repair, on average, equaled or exceeded 25% of the value of the structure at the time of each such flood event; and
(2) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage."[29]

A severe repetitive loss (SRL) property is defined as "a structure that is covered under an NFIP flood insurance policy and has incurred flood-related damage:

(1) For which 4 or more separate claims payments have been made under flood insurance coverage under subchapter B of this chapter, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
(2) For which at least 2 separate flood insurance claims payments (building payments only) have been made, with a cumulative amount of such claims exceeding the value of the insured structure.[30]

According to available data from 2023, Austin County has a total of 54 RL properties, of which 8 are designated as SRL properties.[31] This does not include RL or SRL properties that have already been mitigated. Table 3.6 outlines the jurisdiction, structure type (residential, commercial, institutional, etc.), and number of records for RL and SRL properties within the county, including the number of those properties that were insured under the NFIP.

Table 3.6: RL and SRL Properties, Austin County (FEMA Region 6, Floodplain Management and Insurance Branch, Personal Communication, January 12, 2023)

Jurisdiction Name	Residential RLPs	Non-Residential RLPs	Total RLPs	SRL Properties	Number of NFIP Insured Properties
Austin County	37	1	38	7	25
Bellville	0	0	0	0	0
Brazos Country	2	0	2	0	2
Industry	0	0	0	0	0
San Felipe	1	1	2	0	0
Sealy	9	0	9	0	6
South Frydek	0	0	0	1	0
Wallis	2	1	3	0	2
TOTALS:	51	3	54	8	35

NFIP Policies In-Force

Table 3.7 summarizes the NFIP policies in force for Austin County by jurisdiction. An "In-force" policy means that the contract between the insurer and the policyholder is active, and the insurance company is liable to pay the benefits as defined in the policy agreement if the insured event occurs. In total, there are 582 NFIP insured properties within the county.

Table 3.7: NFIP Insured Properties by Community, Austin County[32]

Community Name (Number)	Policies In-Force	Total Coverage	Total Written Premium + FPF
AUSTIN COUNTY (480704)	331	$94,643,000	$244,722
BELLVILLE (481095)	27	$8,537,000	$17,681
BRAZOS COUNTRY (481693)	40	$12,905,000	$24,406
INDUSTRY			
SAN FELIPE (480705)	23	$7,843,000	$21,966
SEALY (480017)	126	$38,027,000	$103,851
SOUTH FRYDEK			
WALLIS (480018)	35	$10,360,000	$25,033

Community Name- The official NFIP name of the community in which the policy resides.
Community Number- The 6-character community ID in which the policy resides.
Total Coverage- The total building and contents coverage for the policies in force.
Total Written Premium + FPF (Federal Policy Fee)- This represents the sum of the premium and FPF for the policies in force.

NFIP Claims

FEMA Guidance specifies that NFIP flood insurance claim information is subject to The Privacy Act of 1974, as amended. The Act prohibits public release of policyholder names, or names of financial assistance recipients and the amount of the claim payment or assistance. After flooding events, local officials are responsible for inspecting flood-damaged structures in the SFHA to determine if they are substantially damaged (50% or more damaged). If so, the property owner is required to bring a non-conforming structure into compliance with the local floodplain ordinance. In Austin County, the County Judge and individual jurisdictions' Floodplain Administrators are responsible for handling these NFIP claims. Over 314 NFIP claims have been submitted, with nearly $13,911,588 in payments for Austin County. Compared to NFIP Claims within the entire State of Texas, Austin County made up 13.32% of total NFIP claim records.[32] Table 3.8 shows NFIP claim records and estimated payment totals for the State of Texas as compared to Austin County.

Table 3.8: NFIP Claims, State of Texas[32,33]

State	Number of Records	Total Payments
TEXAS	2,357	$75,598,418
AUSTIN COUNTY	314	$13,911,588

Total Payments- The total amount of payments for all claims, including building, contents, and Increased Cost of Compliance (ICC) coverage payments.

Section 4: Risk Assessment

This section outlines the risk assessment procedures, identifies hazards ranked by risk, and summarizes the hazards that affect Austin County and the history of hazard events for those identified risks within the county.

Section 4: RISK ASSESSMENT

The 2023 Texas State HMP identified 11 major natural hazards that affect the region. These include hurricanes, floods, wildfires, drought, and tornados. The local PT identified 15 natural hazards which could affect the county and local jurisdictions.

Risk Assessment

The HMC was provided with a Risk Assessment worksheet prepared by H-GAC staff. The worksheet outlined the purpose of the Risk Assessment, important items to keep in mind while completing the worksheet, probability, and severity scores, including characteristics for those scores that were relatable, and a guide for how to calculate hazard rankings determined by the probability and severity scores. The Risk Assessment ranked the hazards identified by scoring the probability and severity of each hazard. A risk score was then determined by multiplying the probability (P) by the severity (S). Tables including scores and associated characteristics can be found below. Appendix D includes completed worksheets and a summary of hazard ranking scores from participating jurisdictions.

Probability	Characteristics
4 – Highly Likely	Event is probable within the next calendar year These events have occurred, on average, once every 1-2 years in the past
3 – Likely	Event is probable within the next 10 years Event has a 10-50% chance of occurring in any given year These events have occurred, on average, once every 3-10 years in the past
2 – Possible	Event is probable within the next 50 years Event has a 2-10% chance of occurring in any given year These events have occurred, on average, once every 10-50 years in the past
1 – Unlikely	Event is probable within the next 200 years Event has a 0.5-2% chance of occurring in any given year These events have occurred, on average, once every 50-200 years in the past

Severity	Characteristics
8 – Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50% of property is severely damaged
4 – Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least 14 days More than 25% of property is severely damaged
2 – Limited	Injuries and/or illnesses do not result in permanent disability Complete shutdown of critical facilities for more than seven days More than 10% of property is severely damaged.
1 – Negligible	Injuries and/or illnesses are treatable with first aid Minor quality of life lost Shutdown of critical facilities and services for 24 hours or less Less than 10% of property is severely damaged

Hazards Ranked by Risk

Each identified hazard in the table below poses a risk to Austin County. Ranking the hazards from greatest to lowest risk allows the communities to prioritize their resources and focus efforts where they are most needed. Identified hazards were given a risk score as determined by participating jurisdictions and the HMC, those hazards were then categorized with a risk rating of High, Moderate, or Low.

Risk Rating	Ranking	Hazards
High	1	Flooding
	2	Wildfire
Moderate	3	Severe Thunderstorms & Lightning
	4	Tornado/Microburst
	5	Erosion
	6	Winter Weather
	7	Drought & Expansive Soils
	8	Windstorm
Low	9	Hail
	10	Hurricanes, Tropical Storms, & Depressions
	11	Extreme Heat
	12	Dam/Levee Failure
	13	Emerging Infectious Diseases
	14	Cybersecurity

Section 5: Capability Assessment

This section includes the capability assessment, which includes a summary and description of the existing plans, programs, and regulatory mechanisms that support hazard mitigation within the planning area.

Section 5: CAPABILITY ASSESSMENT

Capability Assessment

A Capability Assessment is a process of evaluating the existing capabilities, including resources such as staff time, funding, and infrastructure, that the county currently has at its disposal to utilize for hazard risk reduction. The participating jurisdictions completed local capability and risk assessment surveys to collect data on hazards that affect communities, the communities' ability to mitigate damages from these hazards, and current plans or programs in place to help mitigate natural hazards. The jurisdictions also identified factors impacting their capabilities to address hazards in their communities. The PT used the information to assess the overall risk within each community and to determine a strategy to integrate the HMP into their current planning mechanisms. A condensed version of the information is provided below. The full capability assessment worksheets and responses can be found in Appendix D.

List of Existing Plans & Regulations

CIP: Capital Improvements Plan
COMP: Comprehensive Land Use Plan
COOP: Continuity of Operations Plan
DRP: Disaster Recovery Plan
EDP: Economic Development Plan
EOP: Emergency Operations Plan
FMP: Floodplain Management Plan
FDPO: Flood Damage Prevention Ordinance
FPO: Floodplain Ordinance
HMP: Hazard Mitigation Plan
NHSO: Natural Hazard Specific Ordinance
REP: Radiological Emergency Plan
SMP: Stormwater Management Plan
SO: Subdivision Regulation
TP: Transportation Plan
ZO: Zoning Ordinance

Table 5.1: Existing Plans and Regulations by Participating Jurisdictions

Jurisdiction	CIP	COMP	COOP	DRP	EDP	EOP	FMP	FDPO	FPO	HMP	NHSO	REP	SMP	SO	TP	ZO
Austin County				X		X	X	X		X				X		
Bellville	X					X		X		X				X		X
Brazos Country							X	X	X	X				X		
Industry										X						
San Felipe			X	X		X	X			X						
Sealy	X	X						X		X				X		
South Frydek										X				X		
Wallis								X		X				X		
Bellville ISD	X	X	X	X		X				X					X	
Brazos ISD	X	X	X	X		X				X					X	
Sealy ISD	X	X	X	X		X	X			X					X	

Capability Limitations and Expansion Opportunities

Participating jurisdictions examined their existing authorities, policies, programs, and resources. Participating jurisdictions then identified ways to improve upon and expand their existing authorities to support the mitigation strategy.

Table 5.2: Capability Limitations and Expansion Opportunities by Participating Jurisdictions

Jurisdiction	Capability Limitations and Expansion Opportunities
Austin County	Identified the local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. Austin County will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Limited
Bellville	Identified a need for technical staff and larger budget as factors that decreases their capability to implement mitigation actions and reduce future damages. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Moderate
Brazos Country	Identified a need for technical staff and larger budget as factors that decreases their capability to implement mitigation actions and reduce future damages. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Limited
Industry	Identified a low local budget and lack of technical staff as factors that decreases their capability to implement mitigation actions and reduce future damages. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Limited
San Felipe	Identified a low local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Limited
Sealy	Identified low local funding as a barrier for implementing projects within the mitigation action plan. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Moderate
South Frydek	Identified a low local budget and technical staff as a factor that decreases their capability to implement mitigation actions and reduce future damages. Overall capability assessment score is: Limited
Wallis	Identified low local budget as a barrier for implementing projects within the mitigation action plan. The city will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. Overall capability assessment score is: Moderate
Bellville ISD	Identified a low local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. The district will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards, when applicable. Overall capability assessment score is: Limited
Brazos ISD	Identified a low local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. The district will apply for state and federal funding to help fund mitigation actions that reduce the

	impact of natural hazards, when applicable. Overall capability assessment score is: Limited
Sealy ISD	Identified a low local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. The district will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards, when applicable. Overall capability assessment score is: Limited

Section 6: Hazard Identification & Risk Analysis

This section is broken down into subsections for each hazard of concern to the county and participating jurisdictions identified during the risk assessment. It contains descriptions of identified hazards, hazard location, extent, history of events, probability of future events, and climate change impacts. Additionally, vulnerability is addressed for all hazards and includes a probable risk level, an estimate of property and crop damages, hazard ranking, number of events, fatalities and injuries, average annual events, changes in frequency, and estimated annualized losses where applicable.

Section 6: HAZARD IDENTIFICATION & RISK ANALYSIS

6.1 Flooding
6.2 Wildfire
6.3 Severe Thunderstorms & Lightning
6.4 Tornado/Microbursts
6.5 Erosion
6.6 Winter Weather
6.7 Drought & Expansive Soils
6.8 Windstorm
6.9 Hail
6.10 Hurricanes, Tropical Storms, & Depressions
6.11 Extreme Heat
6.12 Dam/Levee Failure
6.13 Emerging Infectious Diseases
6.14 Cybersecurity

Section 6.1: Flooding

6.1 Flooding

Floodplains are the primary tool used by FEMA to determine areas at risk of flooding. The periodic flooding of lands adjacent to rivers, streams, and shorelines is a natural and inevitable occurrence that can be expected based on established recurrence intervals. The recurrence interval of a flood is the average time interval, in years, that can be anticipated between flood events of a certain magnitude. Using the recurrence interval with land and precipitation modeling, forecasters can estimate the probability and likely location of flooding. These are expressed as floodplains. The most used floodplain measurements are the 100-year floodplain and the 500-year floodplain. The 100-year floodplain is a SFHA 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 (1 in 100) annual chance flood is also referred to as the base flood.[34] The 500-year floodplain, or the 0.2% annual chance flood, is a flooding event that has a 0.2 percent (1 in 500) chance of occurring in any given year at any given location.

Four different types of flooding can affect an area: coastal, riverine, flash flooding, and groundwater flooding. For this HMP update the flooding section focuses on riverine and flash flooding as those are historically the types of floods that have occurred within the county. Riverine Flooding is when streams and rivers exceed the capacity of their natural or constructed channels to accommodate water flow and water overflows the banks, spilling out into adjacent low-lying, dry land.[35] Riverine flooding can occur during heavy periods of rain that cause rivers and streams to crest their banks and can take days, weeks, to months to subside back to normal levels. Flash Flooding is defined by the National Weather Service (NWS) as "A rapid and extreme flow of high water into a normally dry area or a rapid water level rise in a stream or creek above a predetermined flood level. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Commonly it occurs within six hours of a heavy rain event. However, flash floods can also occur within hours or even minutes if a dam or levee fails or rapid ponding of water caused by torrential rainfall."[36]

Location

Figure 6.1.1 below shows the location of floodplains within Austin County and participating jurisdictions. Figures 6.1.2 through 6.1.8 show the floodplains within each participating jurisdiction of this plan. Areas depicted by differentiating colors on the map are showing the locations of the 100-year and 500-year floodplains.

Figure 6.1.1: Floodplain Location, Austin County

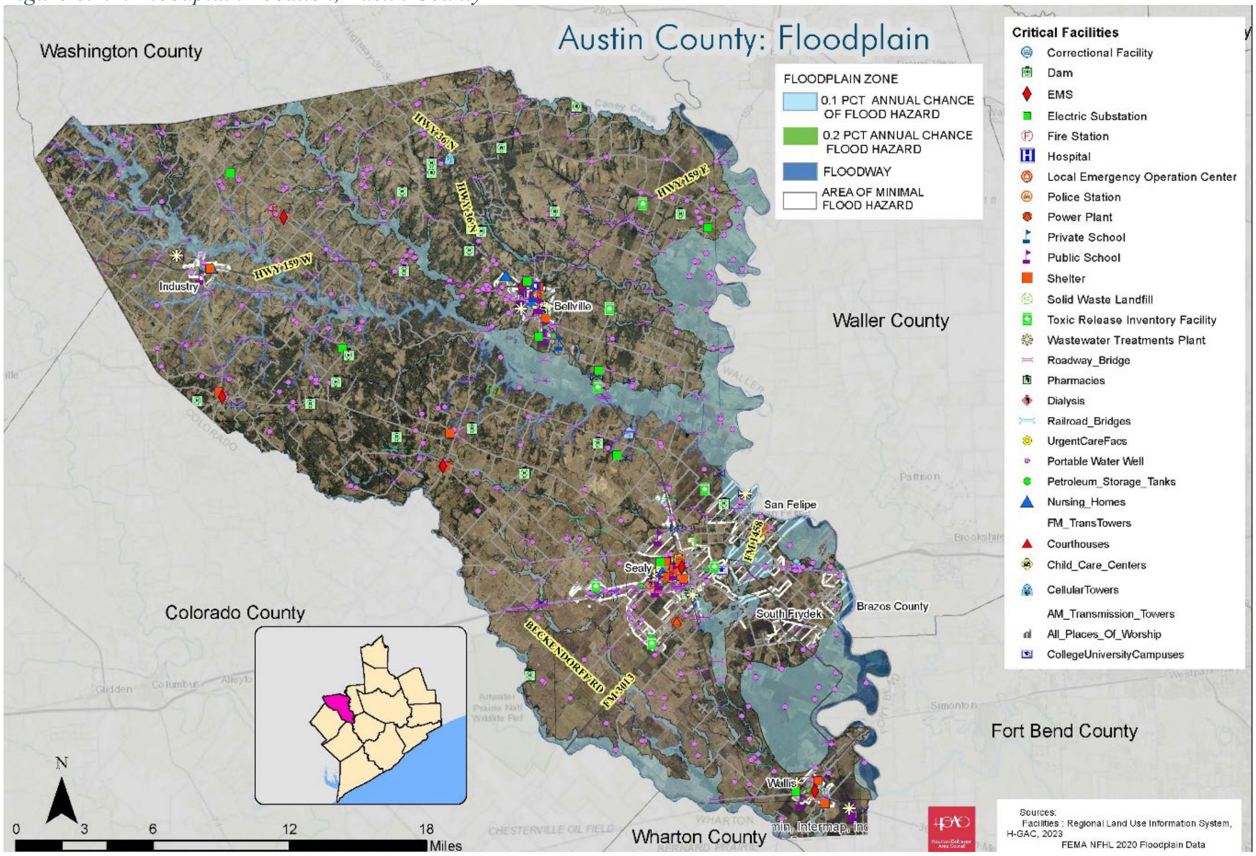


Figure 6.1.2: Floodplain Location, City of Bellville

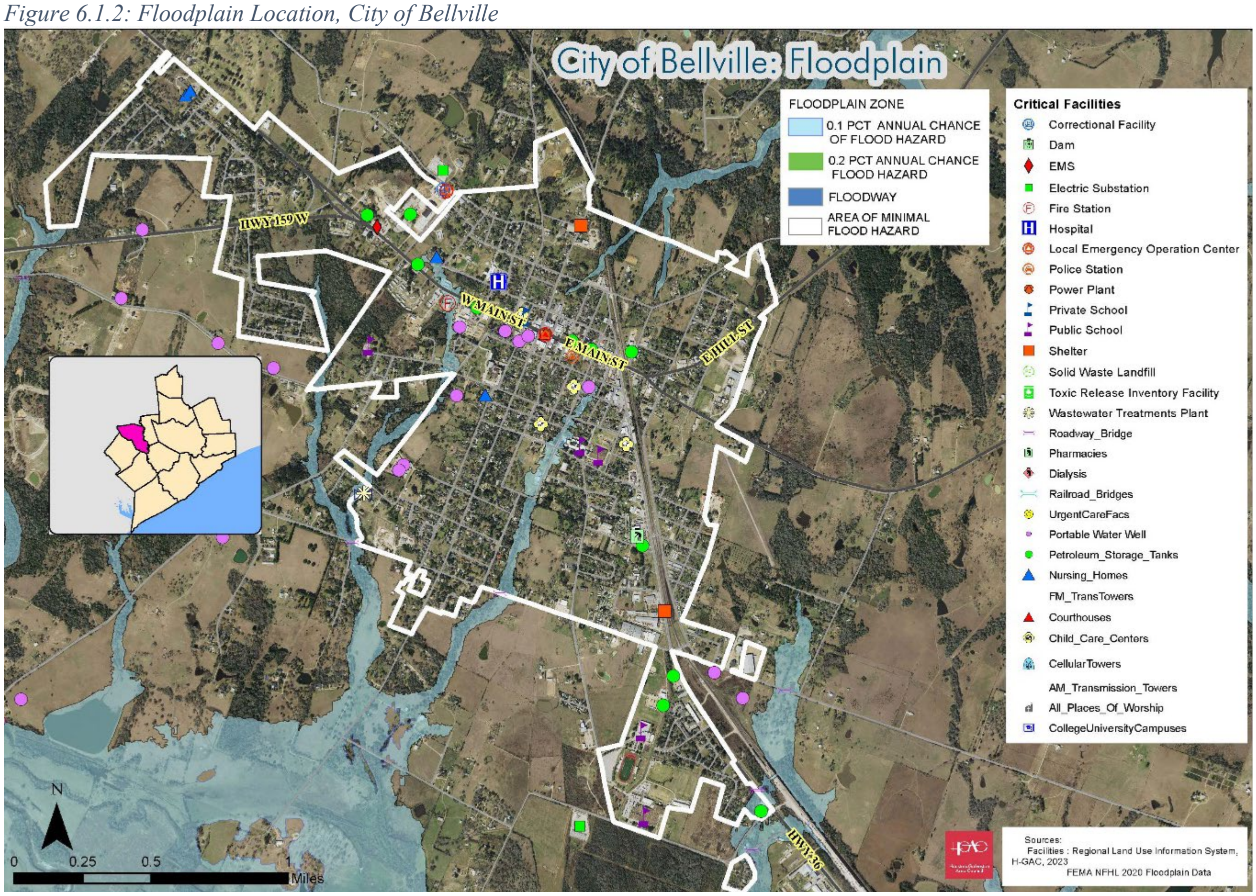


Figure 6.1.3: Floodplain Location, City of Brazos Country

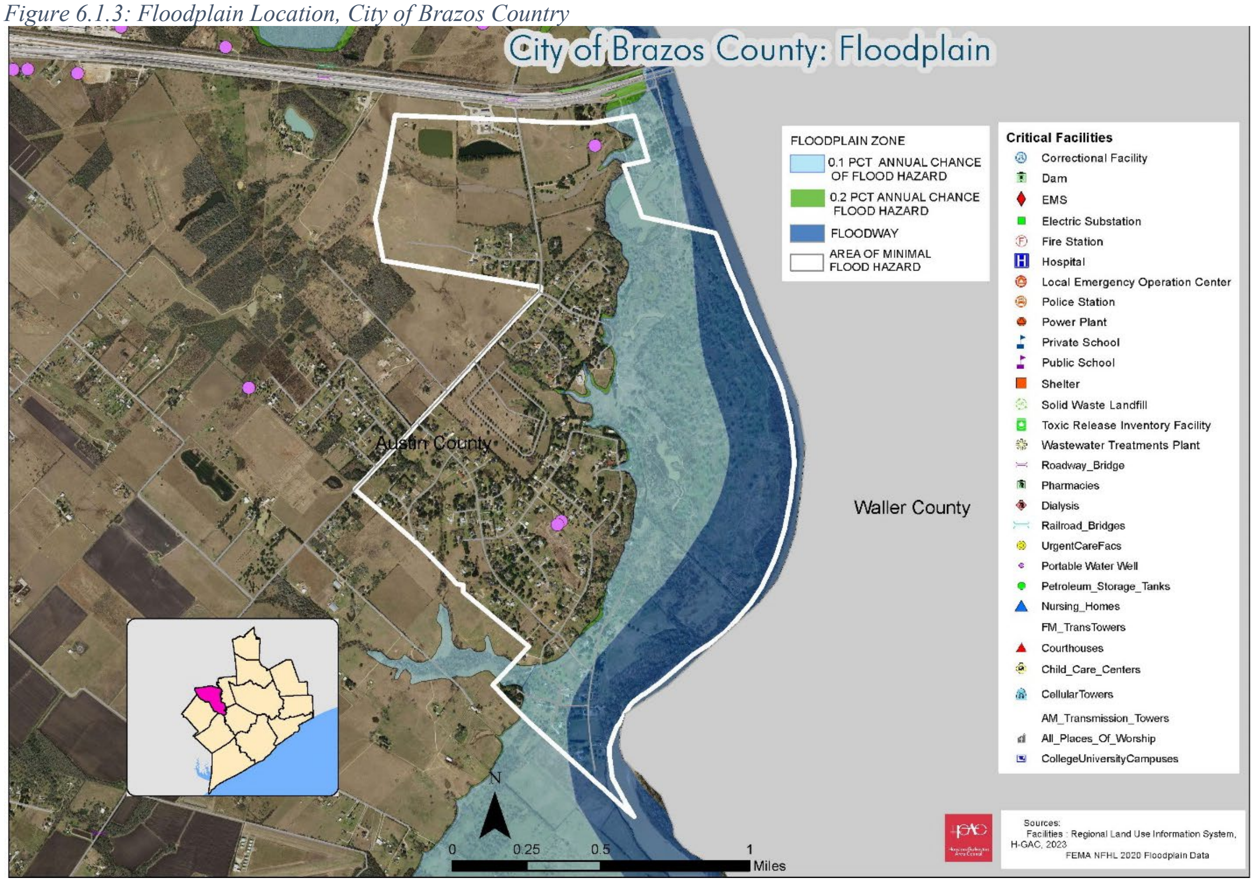


Figure 6.1.4: Floodplain Location, City of Industry

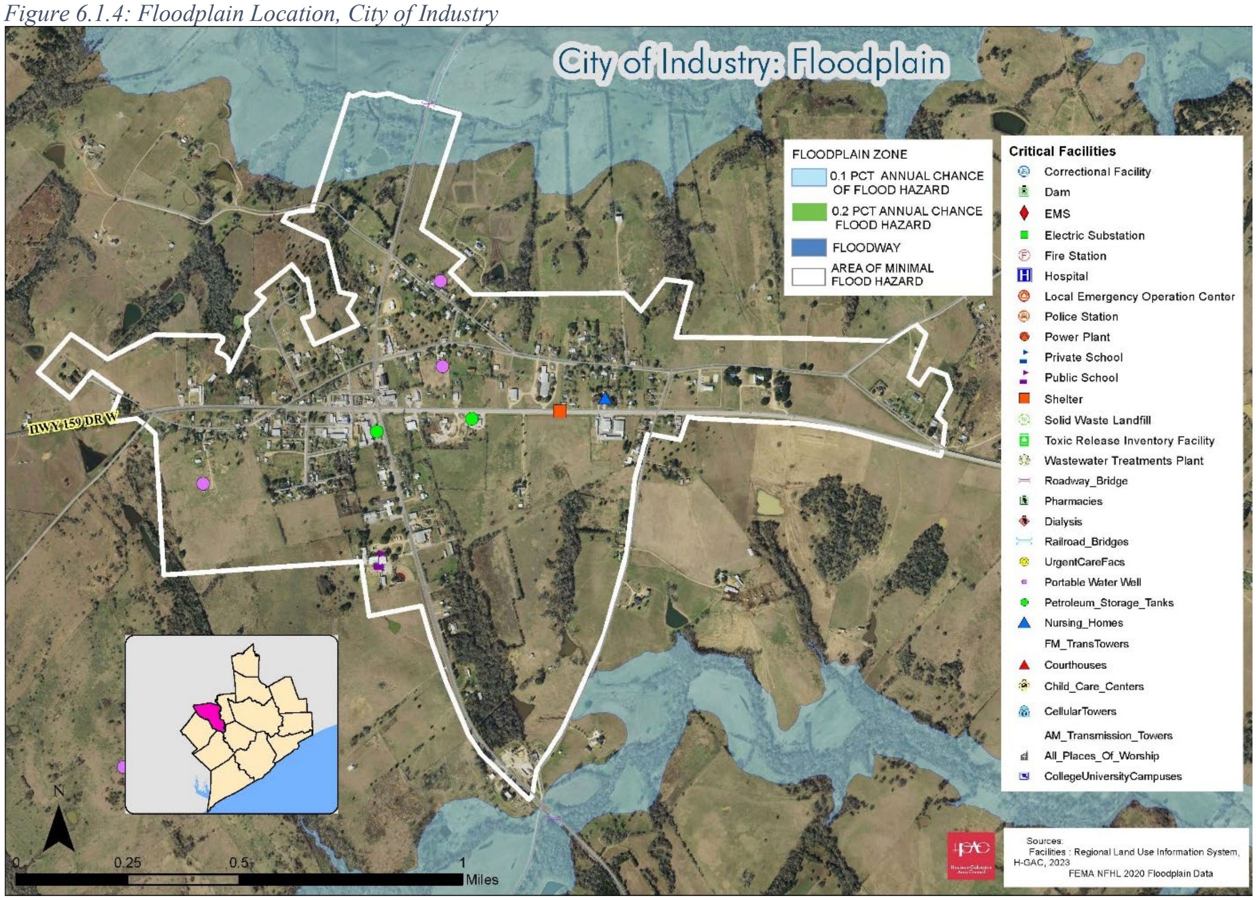


Figure 6.1.5: Floodplain Location, City of San Felipe

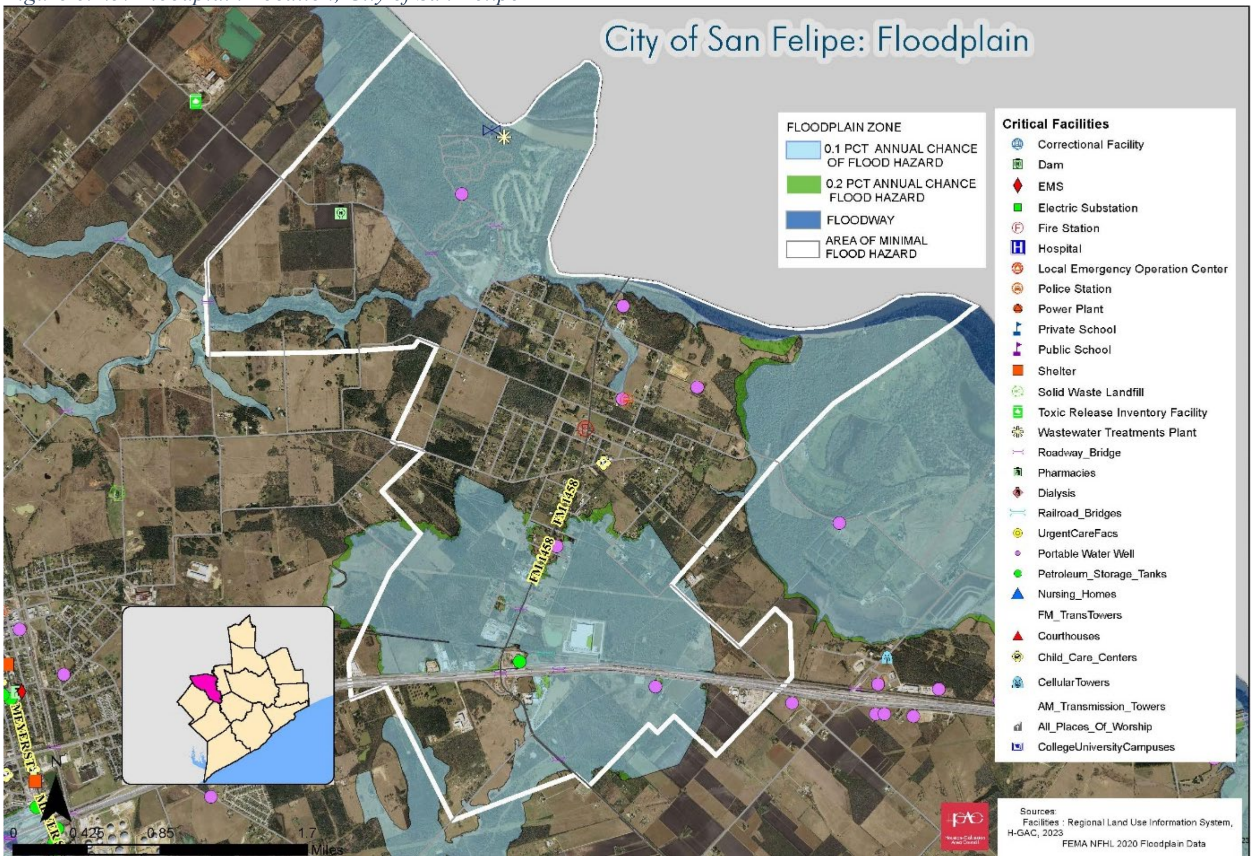


Figure 6.1.6: Floodplain Location, City of Sealy

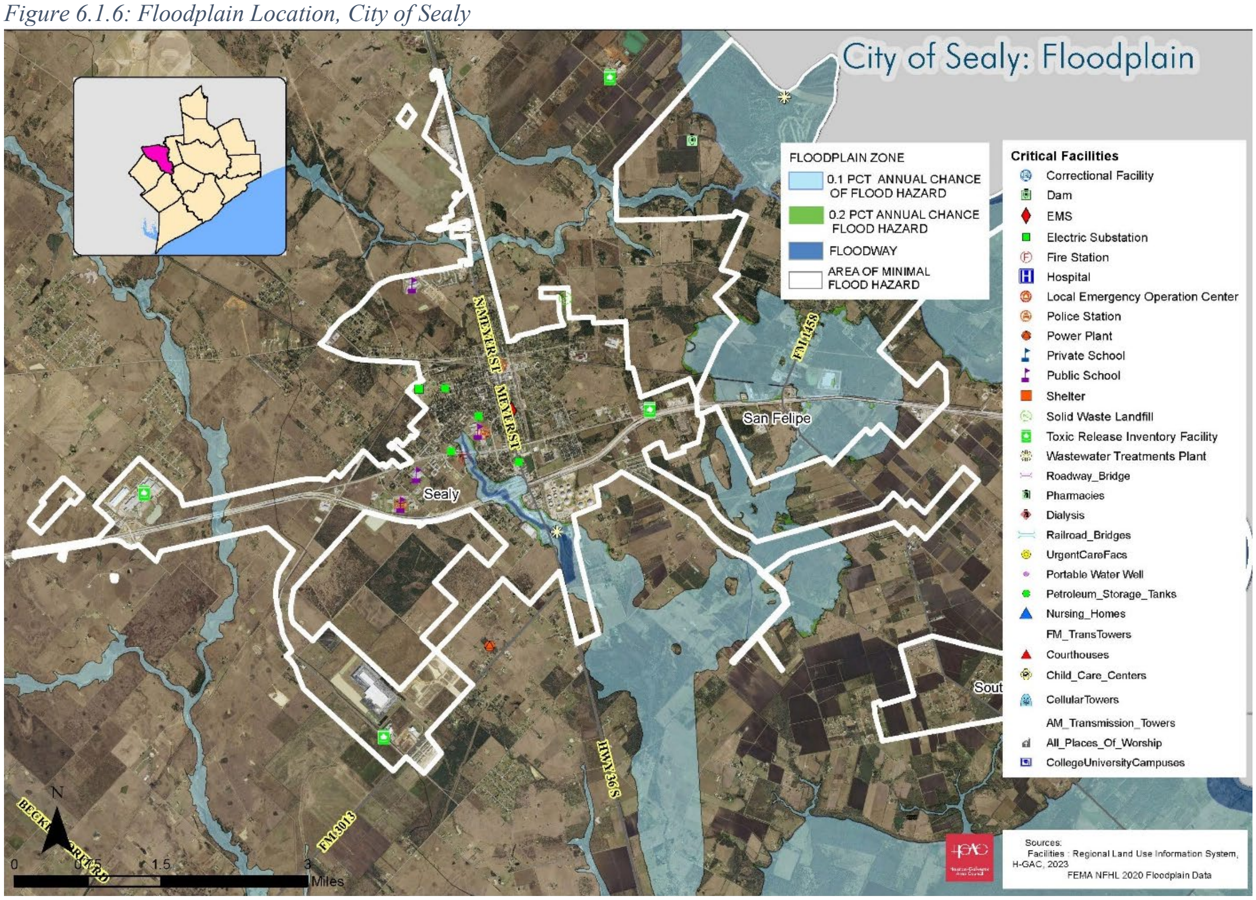


Figure 6.1.7: Floodplain Location, City of South Frydek

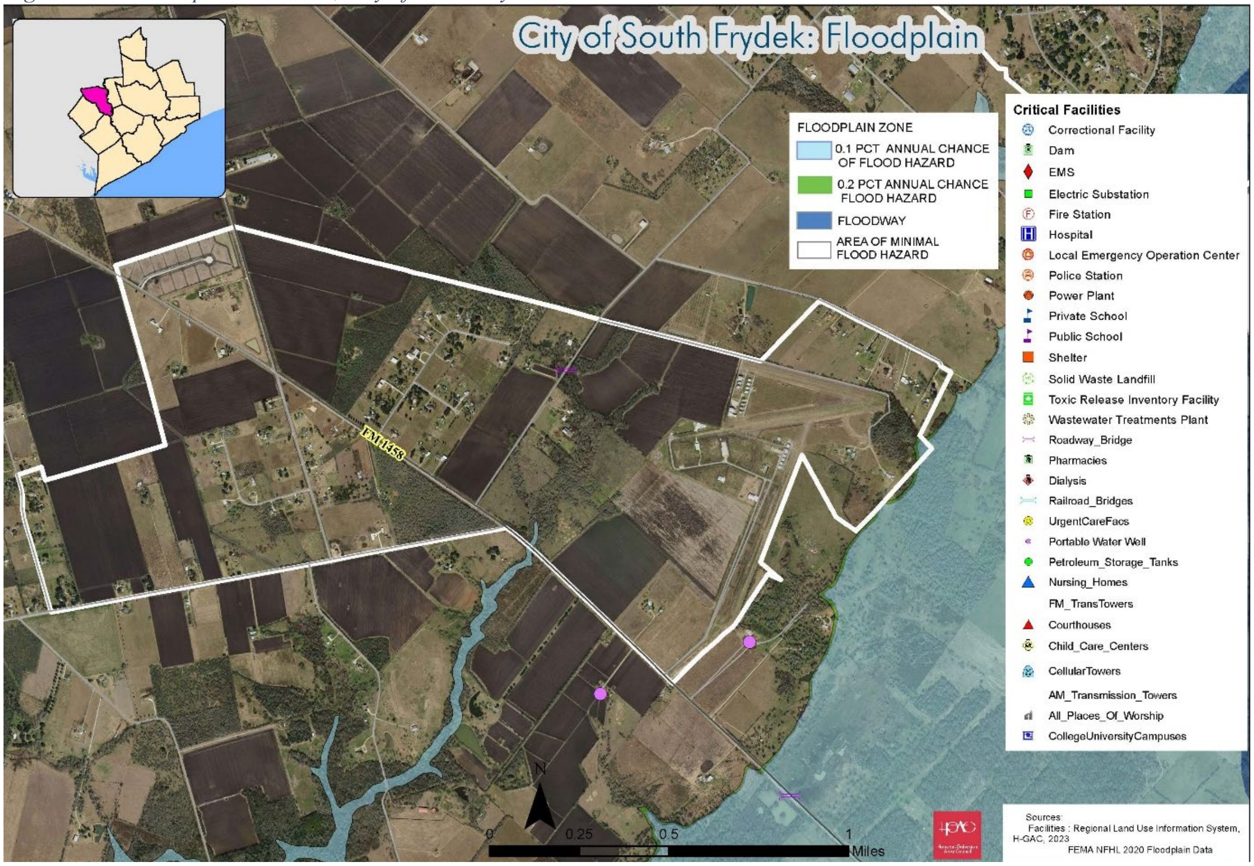
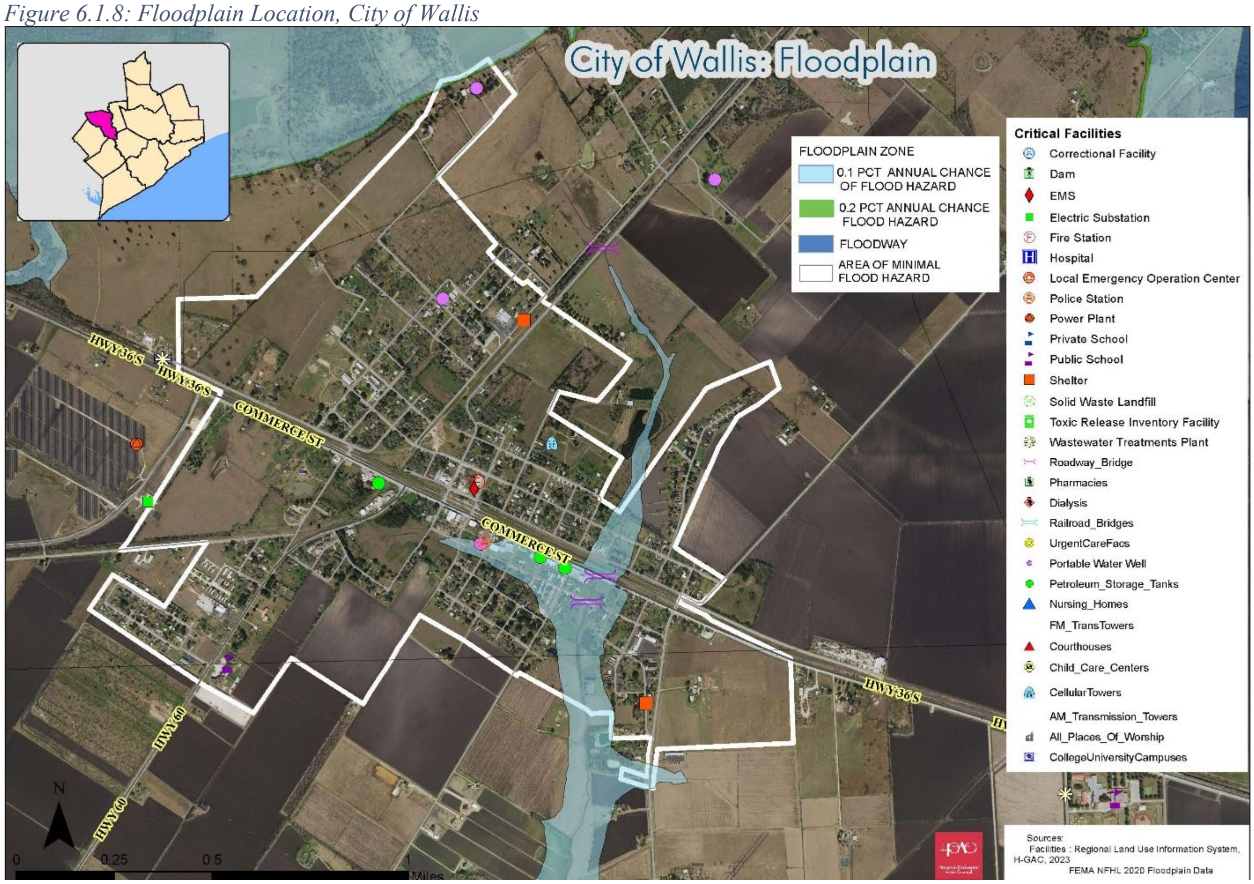


Figure 6.1.8: Floodplain Location, City of Wallis



Extent

The NWS categorizes riverine flooding levels into four categories, minor, moderate, major, and record flooding. Table 6.1.1 below outlines these categories and their descriptions. Once a river reaches flood stage, an established gage height for a given location in which a rise in surface water begins to create a hazard to lives, property, or businesses, the NWS utilizes these categories to describe flood severity.

Table 6.1.1: NWS Flood Categories

Flood Category	Description
Minor Flooding	Minimal or no property damage is expected, but the flooding could possibly cause some public threat or inconvenience.
Moderate Flooding	Some inundation of structures and roads near streams is expected. Some evacuations of people and or a transfer of property to higher elevations are necessary.
Major Flooding	Extensive inundation of structures and roads in addition to the possible significant evacuations of people and/or transfer of property to higher elevations.
Record Flooding	Flooding which equals or exceeds the highest stage or discharge observed at a given site during the period of record.

Flash Floods can be caused by several things, but they are most often caused due to extremely heavy rainfall from thunderstorms. The intensity of the rainfall, the location and distribution of the rainfall, the land use and topography, vegetation types and growth/density, soil type, and soil water content all determine how quickly flooding may occur, and influence where it may occur.[37] Flooding causes widespread and varying degrees of damage. The magnitude or extent of flood damage is expressed by using the maximum depth of flood water during a specific flood event. Structures inundated by 4 feet or more of flood water are considered an absolute loss. Other forms of loss include damage to roads and bridges, agriculture damages, loss of services, injury, or death. "In addition to property damage, flooding can also cut off access to utilities, emergency services, and transportation, and may impact the overall economic well-being of an area. Overall, Austin County has a moderate risk of flooding over the next 30 years, which means flooding is likely to impact day-to-day life within the community. This is based on the level of risk the properties face rather than the proportion of properties with risk."[38]

Historic Occurrences

The National Oceanic and Atmospheric Administration (NOAA) collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the National Climatic Data Center (NCDC) storm events database. A condensed version of the Austin County flood events data from 1950-2023 is provided in the table below.[39]

Table 6.1.2: Austin County Flood Events (1950-2023)

Event Date	Fatalities	Property Damage Estimate	Crop Damage Estimate
9/20/1996	0	$15,000.00	$-
2/20/1997	0	$5,000.00	$-
5/21/1997	0	$10,000.00	$-
6/7/1997	0	$5,000.00	$-
10/13/1997	0	$5,000.00	$-
2/26/1998	0	$1,000.00	$-
10/17/1998	0	$50,000.00	$-
10/18/1998	0	$15,000.00	$-
10/18/1998	0	$-	$-
11/12/1998	0	$-	$-
11/12/1998	0	$10,000.00	$-
11/12/1998	0	$5,000.00	$-
11/12/1998	0	$10,000.00	$-
11/12/1998	0	$20,000.00	$-
11/13/1998	0	$10,000.00	$-

11/14/1998	0	$5,000.00	$-
11/4/2002	0	$20,000.00	$-
4/25/2004	0	$5,000.00	$-
6/24/2004	0	$25,000.00	$-
11/22/2004	0	$-	$-
11/22/2004	0	$-	$-
1/13/2007	2	$8,000.00	$-
1/13/2007	0	$-	$-
4/30/2007	0	$-	$-
5/27/2007	0	$-	$-
11/17/2007	0	$60,000.00	$-
10/13/2013	0	$20,000.00	$-
5/18/2015	0	$-	$-
5/26/2015	0	$-	$-
5/27/2015	0	$-	$-
4/18/2016	1	$2,300,000.00	$-
8/27/2017	0	$100,000.00	$50,000.00
8/28/2017	0	$-	$-
5/24/2021	0	$-	$-
5/24/2021	0	$-	$-
5/24/2021	0	$-	$-
5/24/2021	0	$-	$-
4/7/2023	0	$-	$-
9/15/2023	0	$-	$-
TOTALS:	3	$2,704,000.00	$50,000.00

Presidential Disaster Declarations

There have been six federally declared flood disasters in Austin County since 1950. These events are considered the most significant flood events in Austin County's recent history.[1]

Table 6.1.3: Federally Declared Disasters, Flood

Declaration Year	Title	Disaster Number
1991	SEVERE THUNDERSTORMS AND FLOODING	930
1994	SEVERE THUNDERSTORMS AND FLOODING	1041
1998	TX-FLOODING 10/18/98	1257
2016	SEVERE STORMS AND FLOODING	4269
2016	SEVERE STORMS AND FLOODING	4272
2017	TX-HURRICANE HARVEY	4332

USDA Disaster Declarations

The United States Department of Agriculture (USDA) authorizes the Secretary of Agriculture to designate counties as disaster areas to make emergency (EM) loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader or by an FSA State Executive Director (SED). The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.1.4: USDA Declared Disasters (2018-2023), Flood

Crop Disaster Year	Disaster Description	Designation Number
2018	Excessive moisture and flooding	S4476
2021	Excessive moisture and excessive rainfall	S5053
2021	Excessive Moisture	S5088
2021	Excessive Moisture	S5089
2021	Excessive Moisture	S5105

National Flood Insurance Program Participation

The NFIP is a federal program administered through FEMA that enables property owners in participating communities to purchase insurance as a protection against flood losses. Communities must maintain eligibility in the NFIP by adopting and enforcing floodplain management regulations intended to prevent unsafe development in the floodplain, thus reducing future flood damage. FEMA creates flood maps, or FIRMs to support the NFIP.[24,25] These flood maps are periodically updated and outline SFHA. The SFHA is the area where the NFIP floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.[26]

The Community Rating System

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Participation in the CRS program is voluntary and includes many benefits for a community, such as discounted flood insurance premiums that relate to the community's level of efforts that reduce risk from flooding and strengthen floodplain management. Currently, there are no communities within Austin County, including the County itself, that participate in the CRS Program.[27]

As seen in Section 3- Table 3.9: Community Participation in the NFIP and CRS Program[28]

Jurisdiction	Participating	Date Joined	Current Effective FIRM Date	CRS Participation
Austin County	Y	02/25/77	10/18/19	N
Bellville	Y	11/19/76	10/18/19	N
Brazos Country	Y	02/25/77	10/18/19	N
Industry	N			N
San Felipe	Y	01/03/86	10/18/19	N
Sealy	Y	12/17/73	10/18/19	N
South Frydek	N			N
Wallis	Y	05/24/74	10/18/19	N

Repetitive Loss and Severe Repetitive Loss Properties

FEMA defines a RL structure as "a structure covered under an NFIP flood insurance policy that:

(3) Has incurred flood-related damage on 2 occasions, in which the cost of repair, on average, equaled or exceeded 25% of the value of the structure at the time of each such flood event; and

(4) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage."[29]

A SRL property is defined as "a structure that is covered under an NFIP flood insurance policy and has incurred flood-related damage:

(3) For which 4 or more separate claims payments have been made under flood insurance coverage under subchapter B of this chapter, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
(4) For which at least 2 separate flood insurance claims payments (building payments only) have been made, with a cumulative amount of such claims exceeding the value of the insured structure.[30]

According to available data from 2023, Austin County has a total of 54 RL properties, of which 8 are designated as SRL properties.[31] This does not include RL or SRL properties that have already been mitigated. Over 314 NFIP claims have been submitted, with nearly $13,911,588 in paid RL claims. Compared to NFIP Claims within the entire State of Texas, Austin County made up 13.32% of total NFIP claim records.[31,32] Tables 3.5 outlines the jurisdiction, structure type (residential, commercial, institutional, etc.), and number of records for RL and SRL properties within the county, including the number of those structures that were insured under the NFIP. Table 3.6 depicts NFIP claim records and estimated payment totals for the State of Texas and Austin County.

As seen in Section 3- Table 3.10: RL and SRL Properties, Austin County
(Source: FEMA, Correspondence with the Floodplain Management and Insurance Branch)[33]

Jurisdiction Name	Residential RLPs	Non-Residential RLPs	Total RLPs	SRL Properties	Number of NFIP Insured Properties
Austin County	37	1	38	7	25
Bellville	0	0	0	0	0
Brazos Country	2	0	2	0	2
Industry	0	0	0	0	0
San Felipe	1	1	2	0	0
Sealy	9	0	9	0	6
South Frydek	0	0	0	1	0
Wallis	2	1	3	0	2
TOTALS:	51	3	54	8	35

Flood Mitigation Assistance Repetitive Loss and Severe Repetitive Loss Properties

FEMA supports a handful of Hazard Mitigation Assistance (HMA) programs that support mitigation activities by providing funding that helps support mitigation projects. One such program is Flood Mitigation Assistance (FMA), this competitive program provides funding to states, local communities, federally recognized tribes, and territories that can be used for projects that reduce or eliminate the risk of repetitive flood damage to structures insured by the NFIP. While individual homeowners are not eligible to apply for FMA grant funds, a community in good standing (those that have a FEMA-approved HMP and are in good standing with the NFIP) can apply on their behalf. Homeowners who do receive FMA grant funds are required to have active NFIP flood insurance policies, and the NFIP flood insurance policy must be maintained for the life of the structure.[41] Table 3.6 outlines the jurisdiction, structure type (residential, commercial, institutional, etc.), and number of records for RL and SRL properties under the FMA program within the county.

Table 6.1.5: FMA RL and SRL Properties, Austin County (Source: FEMA, Floodplain Management and Insurance Branch) [33]

Jurisdiction Name	Residential FMA RLPs	Non-Residential FMA RLPs	Total FMA RLPs	FMA SRL Properties
Austin County	10	0	10	7
Bellville	0	0	0	0
Brazos Country	0	0	0	0
Industry	0	0	0	0
San Felipe	0	0	0	0
Sealy	2	0	2	1
South Frydek	0	0	0	0
Wallis	0	0	0	0
TOTALS:	12	0	12	8

NFIP Policies in Force

Table 3.7 summarizes the NFIP policies in force for Austin County by jurisdiction. An "In-force" policy means that the contract between the insurer and the policyholder is active, and the insurance company is liable to pay the benefits as defined in the policy agreement if the insured event occurs. In total, there are 2,205 NFIP insured properties within the county.[32]

As seen in Section 3- Table 3.11: NFIP Insured Properties by Community, Austin County

Community Name (Number)	Policies in Force	Total Coverage	Total Written Premium + FPF
AUSTIN COUNTY (480704)	331	$94,643,000	$244,722
BELLVILLE (481095)	27	$8,537,000	$17,681
BRAZOS COUNTRY (481693)	40	$12,905,000	$24,406
INDUSTRY			
SAN FELIPE (480705)	23	$7,843,000	$21,966
SEALY (480017)	126	$38,027,000	$103,851
SOUTH FRYDEK			
WALLIS (480018)	35	$10,360,000	$25,033

Community Name- The official NFIP name of the community in which the policy resides.
Community Number- The 6-character community ID in which the policy resides.
Total Coverage- The total building and contents coverage for the policies in force.
Total Written Premium + FPF - This represents the sum of the premium and FPF for the policies in force.

NFIP Claims

FEMA Guidance specifies that NFIP flood insurance claim information is subject to The Privacy Act of 1974, as amended. The Act prohibits public release of policyholder names, or names of financial assistance recipients and the amount of the claim payment or assistance. After flooding events, local officials are responsible for inspecting flood-damaged structures in the SFHA to determine if they are substantially damaged (50% or more damaged). If so, the property owner is required to bring a non-conforming structure into compliance with the local floodplain ordinance. In Austin County, the County Judge and individual jurisdictions' Floodplain Administrators are responsible for handling these NFIP claims. There have been 314 NFIP claims submitted, with over $13 million in payments for Austin County, as seen in Table 3.8.

As seen in Section 3- Table 3.12: NFIP Claims, Austin County
(Source: FEMA Region 6, Floodplain Management and Insurance Branch, Personal Communication, January 12, 2023)

State	Number of Records	Total Payments
AUSTIN COUNTY	314	$13,911,588

Total Payments- The total amount of payments for all claims, including building, contents, and ICC payments.

Probability of Future Occurrences

Flooding and flash floods will continue to occur within Austin County. For this HMP update, the most recent available data was collected to determine the probability of future flood occurrences. These probabilities are based on the 39 flooding events (Table 6.1.2) over a 73-year timeframe (1950-2023) reported in the NCDC Storm Events Database. It is important to note not all flood events that occurred between 1954 and 1996 are accounted for within federally declared disasters due to limitations in data availability at the time. The HMC rated flooding as having a high probability of occurrence and a high level of severity.

Table 6.1.6 Probability of Future Occurrence, Flooding

Hazard Type	Number of Occurrences (1996-2023)	% Chance of Occurring Per Year
Flood	1	53.4%
Flash Flood	38	
Total	39	

The FEMA National Risk Index (NRI) utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

Populations at Risk

All populations within or near a 100-year or 500-year floodplain are at risk of a flood event. Socially vulnerable populations and those in underserved communities are at risk of disproportionate impacts from an event. People with access and functional needs may be unable to get to safety due to a lack of transportation, may be dependent on power for medical devices, may not get emergency communication notifications due to language or technology barriers, and may need accommodations to evacuate or shelter in place.

2,814 properties in Austin County have greater than a 26% chance of being severely affected by flooding over the next 30 years. This represents 22% of all properties in Austin County. Residential homes face a moderate flood risk with 1,966 out of 10,592 homes at risk. Commercial properties and roads face a major risk of flooding, and social facilities have a minor risk. Table 6.1.7 below summarizes these risk levels and estimated affected buildings or infrastructure.[5]

Table 6.1.7: Austin County Property Risk Levels

Property Type	Risk Level	Properties Affected
Residential	Moderate	1,966 out of 10,592
Commercial	Major	131 out of 680
Critical Infrastructure	Moderate	11 out of 243 facilities
Roads	Major	644 out of 2,049 miles
Social Facilities	Minor	8 out of 109

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. Expected annual loss (EAL) represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor the incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts from natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.

EAL for Austin County each year for riverine flooding is listed as relatively low. EAL for various factors can be found in Table 6.1.8 below.[42]

Table 6.1.8: Expected Annual Loss

Expected Annual Loss Type	Expected Annual Loss ($)	Expected Annual Loss Rate
Building	$3,806,245.40	$1 per $1.87K of building value
Agriculture	$154,772.59	$1 per $245.43 of agriculture value
Population	0.26 fatalities ($3,002,983.02)	1 per 115.93K people
TOTALS:	**$6,964,001.01**	**52.2%**

The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score.

Figure 6.1.9: Risk Index by Census Tract, Riverine Flooding

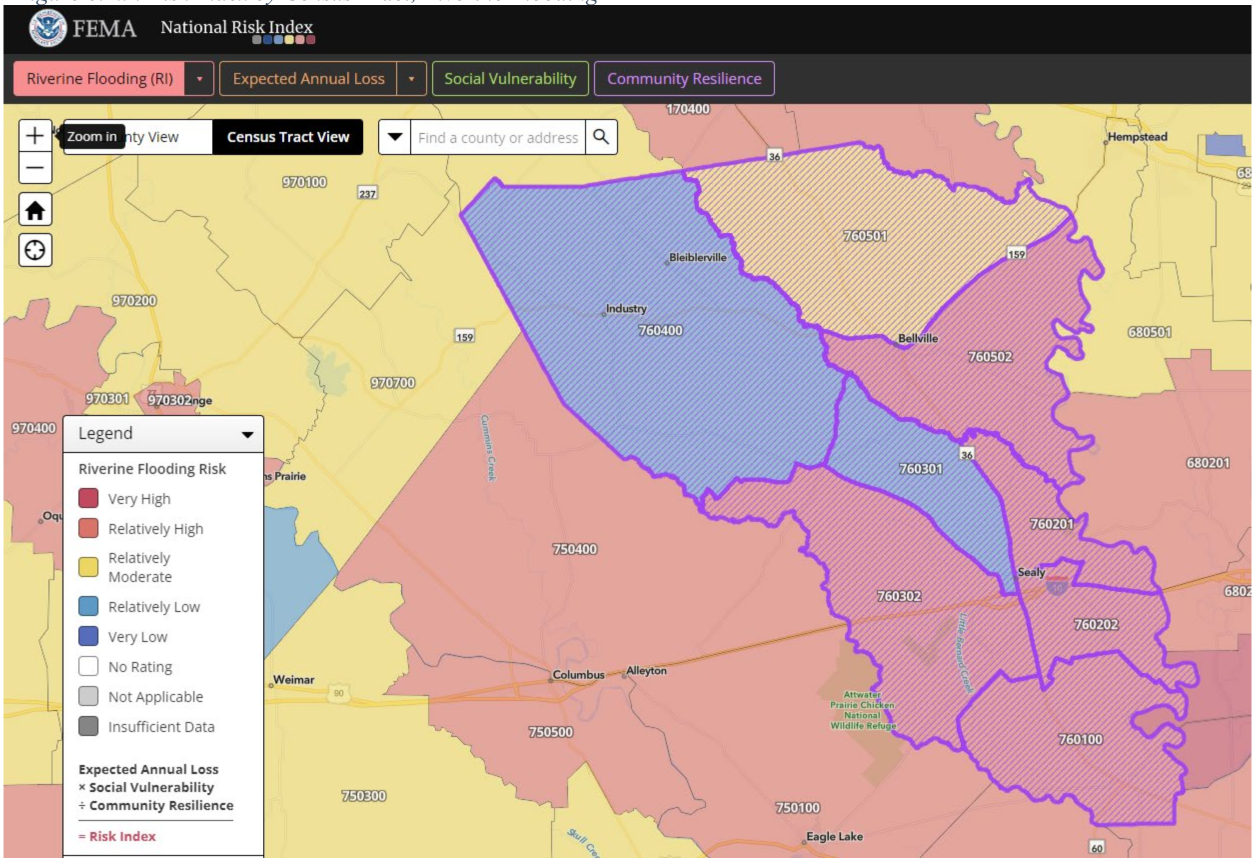


Figure 6.1.10: Social Vulnerability by Census Tract, Austin County

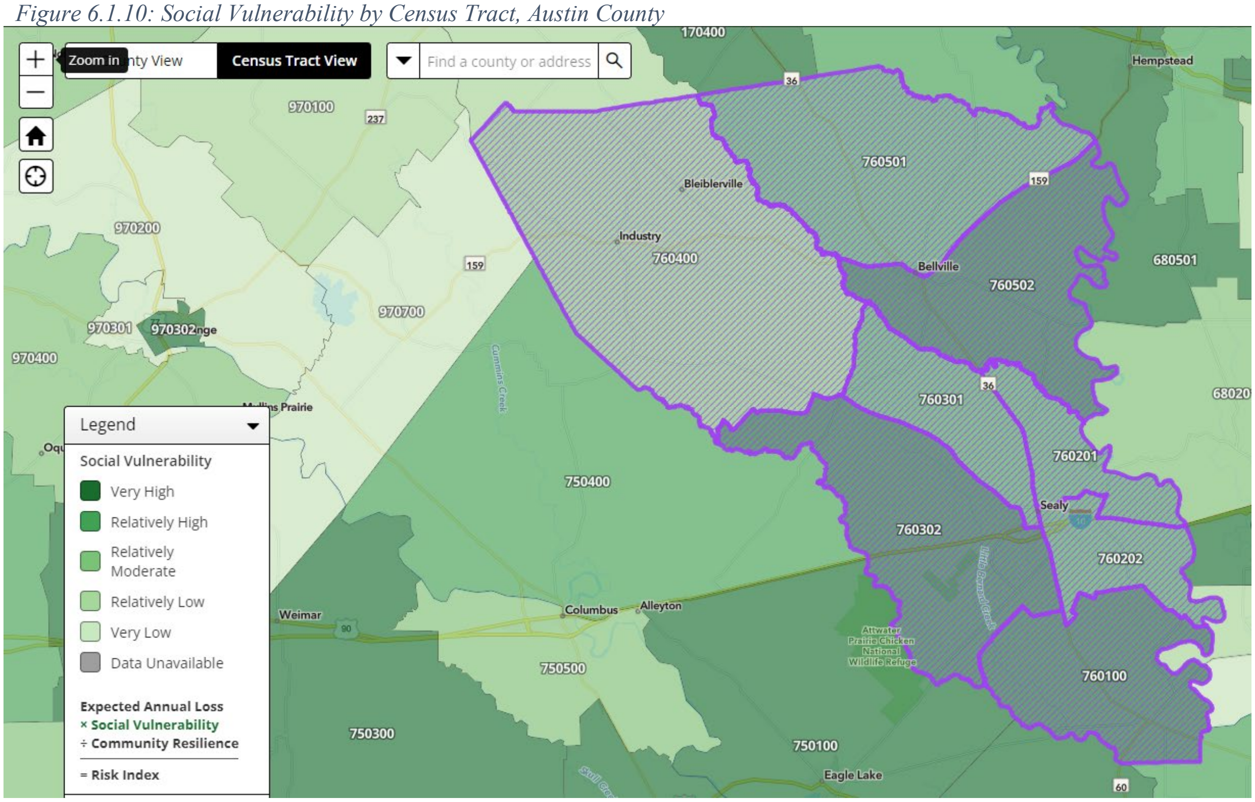


Figure 6.1.11: Community Resilience by Census Tract, Austin County

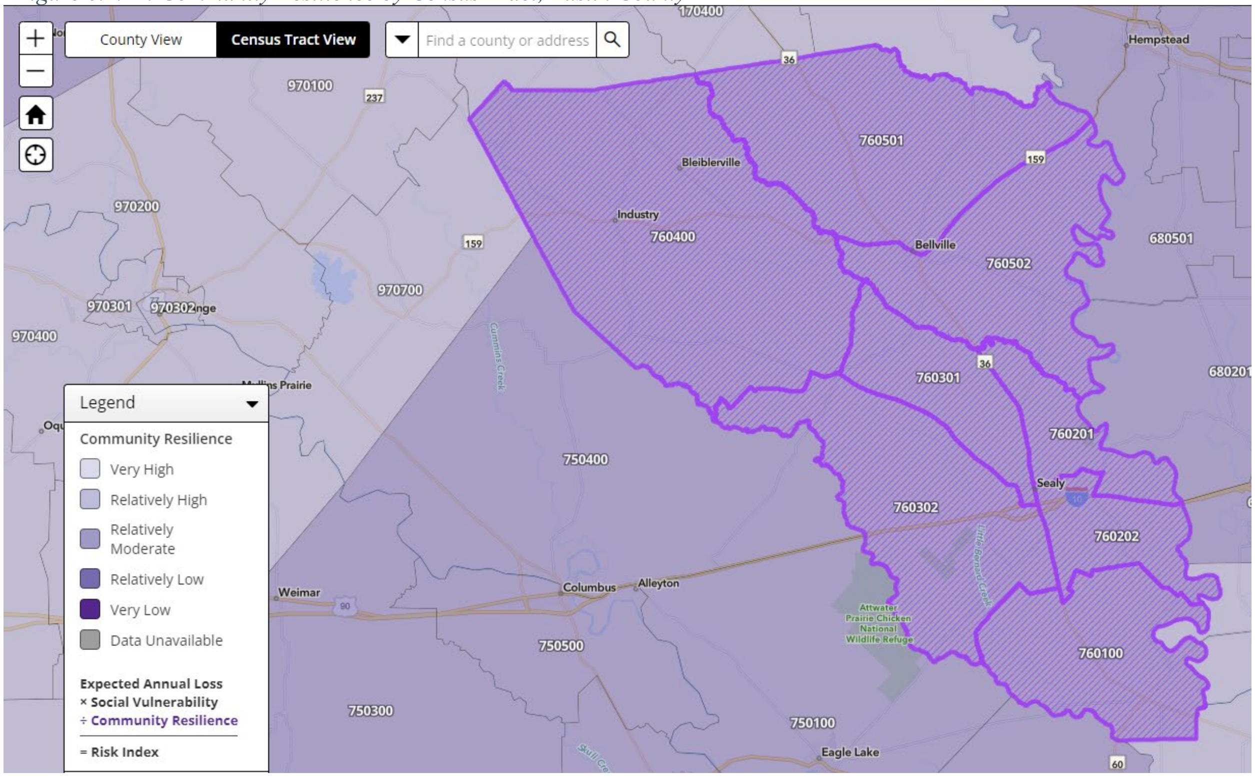


Figure 6.1.12: FEMA NRI Summary, Riverine Flooding

Rank	Community	Social Vulnerability	Community Resilience	Hazard Type: Riverine Flooding Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively High	95.47	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively High	94.33	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively High	94.28	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively High	93.36	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively High	92.96	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Moderate	76.12	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Low	65.98	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Low	61.3	0 100

Climate Change Impacts

Other factors, such as climate-driven changes like increasing precipitation and warmer sea surface temperatures may also affect the probability of future floods within Austin County. Precipitation changes within the next 15 to 30 years are expected to be 10%-15% heavier due to increased surface temperatures. These increased temperatures cause more evaporation, making more water available in the atmosphere for rain events. Increased sea surface temperatures can cause a greater intensity of hurricanes and precipitation. Storms are also likely to be more severe.[5] Riverine flooding in Texas is projected to have no substantial change through 2036. This is due to the construction of dams and reservoirs for flood management that occurred and continues to occur within the 20th century. There is a mixture of historical trends categorized by season, but there is no one clear trend to project future flood probabilities. In addition, meteorological drivers of riverine flooding (increased rainfall intensity and decreased soil moisture) are projected to have competing influences. If there is an increasing trend present in riverine flooding, it will be at the most extreme flood events or in the wettest parts of the state where there is so much rainfall that a decrease in soil moisture would have little mitigating impact.[43] Table 6.1.9 below summarizes the expected climate change impacts of flooding.

Table 6.1.9: Climate Change Impacts, Flooding

Location	The location of floods is not expected to change
Extent/Intensity	The extent and intensity of flooding within the County may change due to increased precipitation, stronger storms, and rising surface temperatures.
Frequency	There are no clear trends in flood frequency due to considerable variability, flood management measures, and competing meteorological drivers.
Duration	The duration of flood events is not likely to change.

Section 6.2: Wildfire

6.2 Wildfire

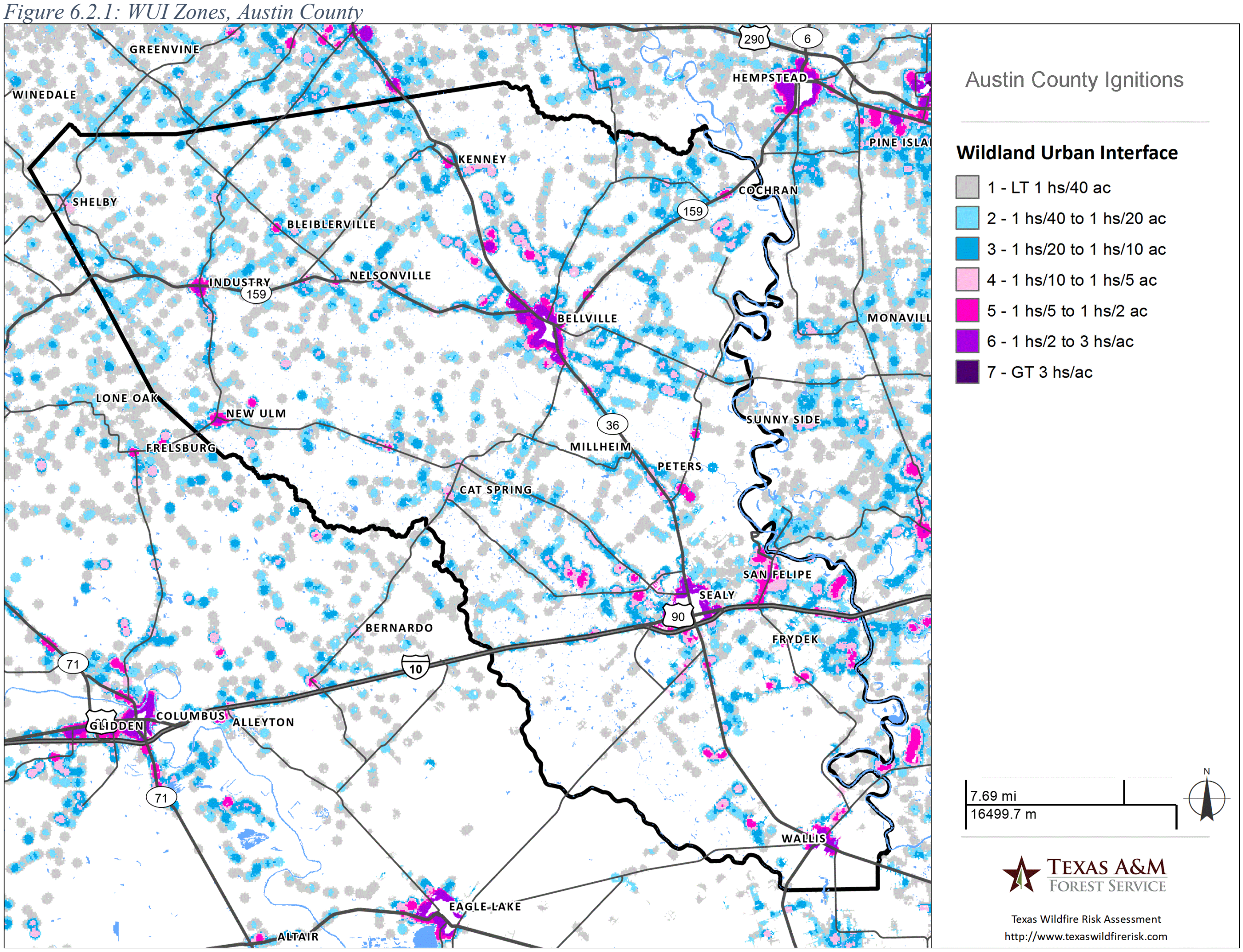
Wildfire refers to any non-structure fire that occurs in the wildland, an area in which development is essentially nonexistent except for roads, railroads, power lines, and similar transportation or utility structures. This definition does not refer to fires that are conducted via prescribed burns.[44] Wildfires typically occur more often in the summer during dry months and can be exacerbated by droughts or drought-like conditions when plants and other brush contain less moisture and easily ignite. In Texas nearly 85 percent of wildfires occur within two miles of a community. Wildfires can be ignited by a variety of causes from lightning strikes, downed powerlines, smoking (or improper disposal of cigarettes), debris burning, and fireworks.

Location

This is a reoccurring natural hazard in every Texas county and has no geographic boundary. The Texas Wildfire Risk Assessment (TWRA) Explorer is the primary mechanism for Texas A&M Forest Service to deploy wildfire risk information and create awareness about wildfire issues across the state.[45] The Texas Wildfire Risk Assessment Portal, or TxWRAP, allows users to easily view their wildfire risk online. TxWRAP uses a variety of factors such as wildfire threat, wildland urban interface, surface fuels, historic wildfire ignitions, fire behavior, and much more to determine the fire potential of a specific land areas and depicts through a set of ratings areas that are most prone to wildfires.[46] Particularly vulnerable are the Wildland Urban Interface (WUI) areas.

The WUI is the area where development, people, and homes, mix with areas of wildland or other vegetation. It is within these areas that wildfire risks substantially increase. With continued population growth throughout the county, the WUI zones will become more abundant. Since most wildfires are caused by human activities, the intersection of WUI and drought are particularly dangerous. Wildfires and their size can vary greatly depending on a variety of factors such as location, fire intensity, and duration. It is estimated that 23,146 people or 84.9 % percent of the Austin County population (27,248) live within the WUI. Figure 6.2.1 depicts WUI zones within Austin County, which closely follow housing density.

Figure 6.2.1: WUI Zones, Austin County



Extent

Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on weighted average of four percentile weather categories. This is similar to the Richter scale for earthquakes. FIS provides a standard scale to measure potential wildfire intensity. FIS consist of 5 classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities. The Characteristic FIS is described in Table 6.2.1.

Table 6.2.1: Characteristic FIS Descriptions

	Wildfire Intensity Class	Description
	1- Very Low	Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
	2- Low	Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
	3- Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.

	4- High	Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
	5- Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Figure 6.2.2 shows wildfire intensity from the Texas Forest Service (TFS) Wildfire Risk Explorer in relation to participating jurisdiction city boundaries and critical facilities. Figures 6.2.3 through 6.2.9 show a closer picture of the wildfire intensity within each participating jurisdiction of this plan.

Figure 6.2.2: Wildfire Risk, Austin County

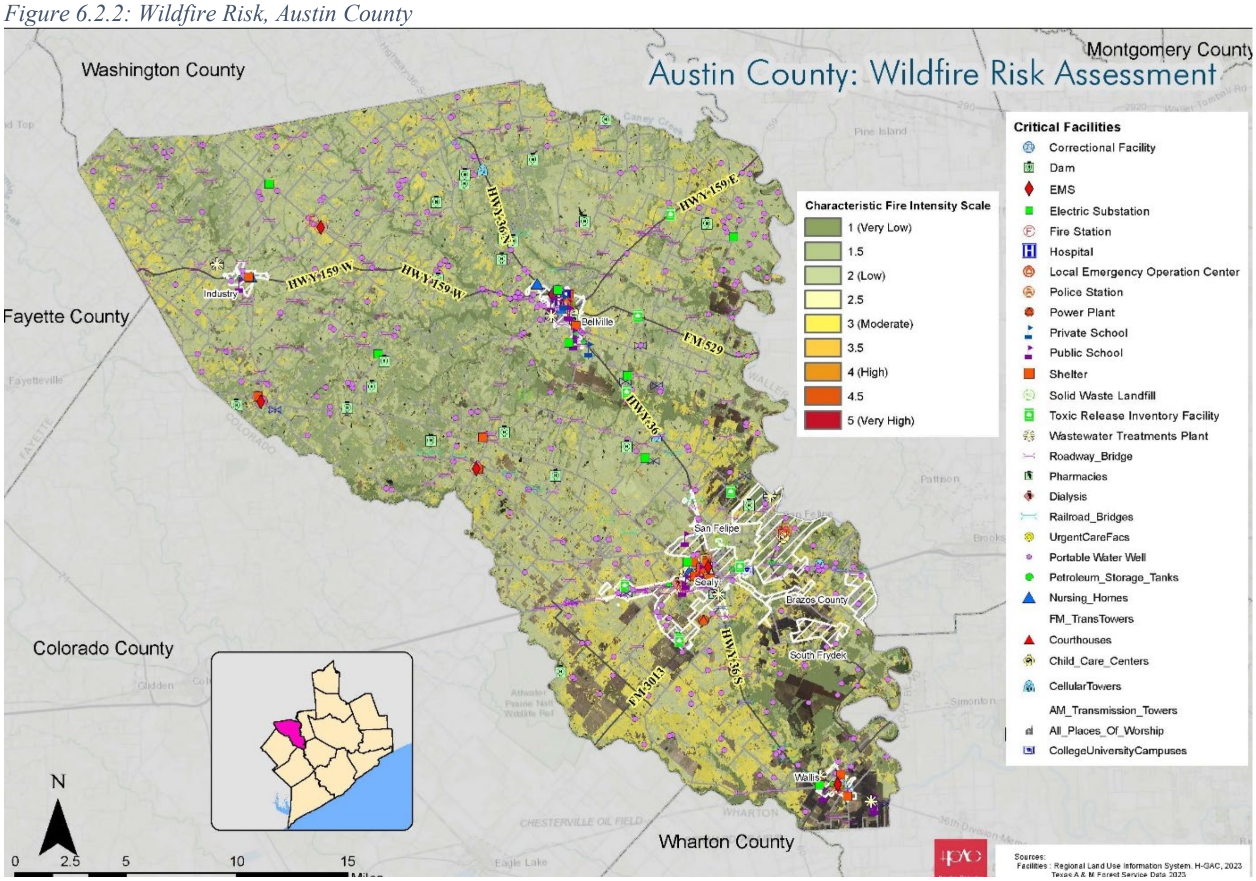


Figure 6.2.3: Wildfire Risk, City of Bellville

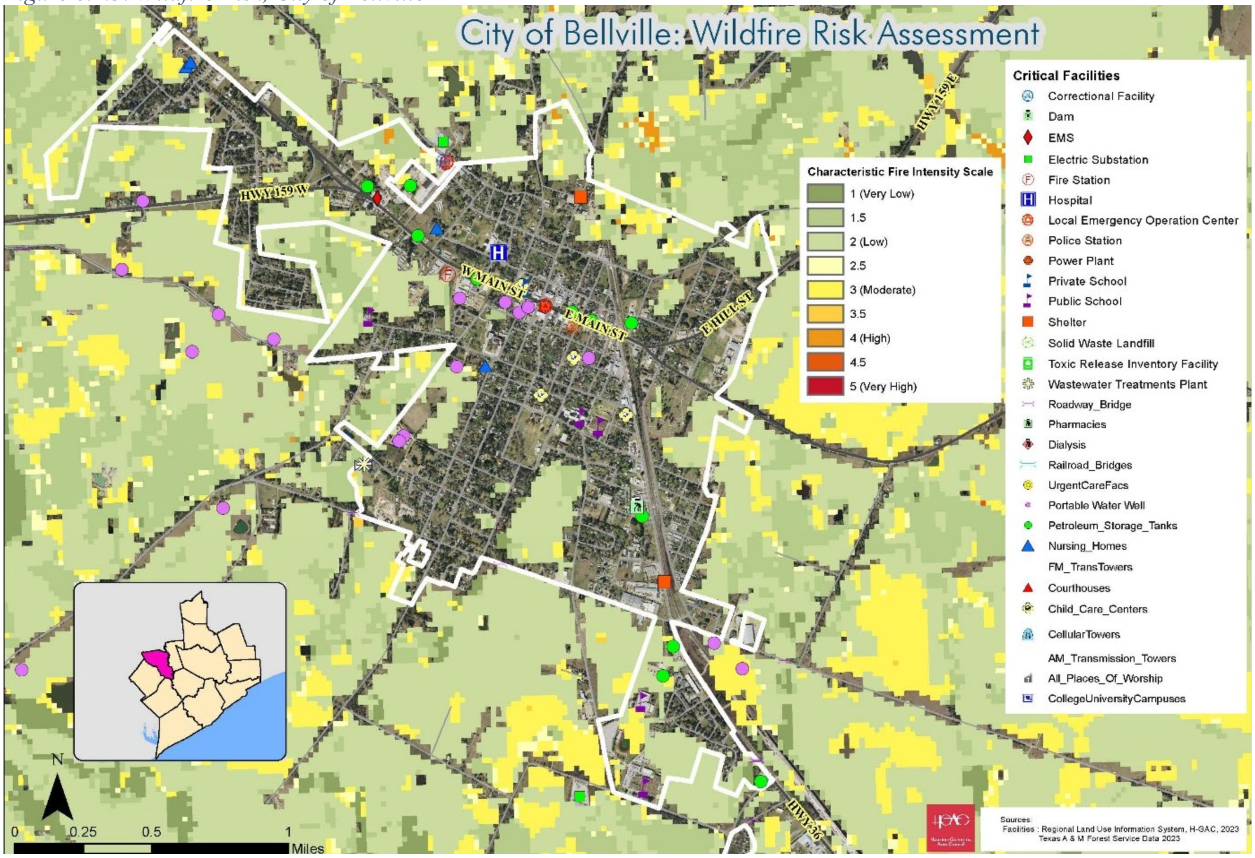


Figure 6.2.4: Wildfire Risk, City of Brazos Country

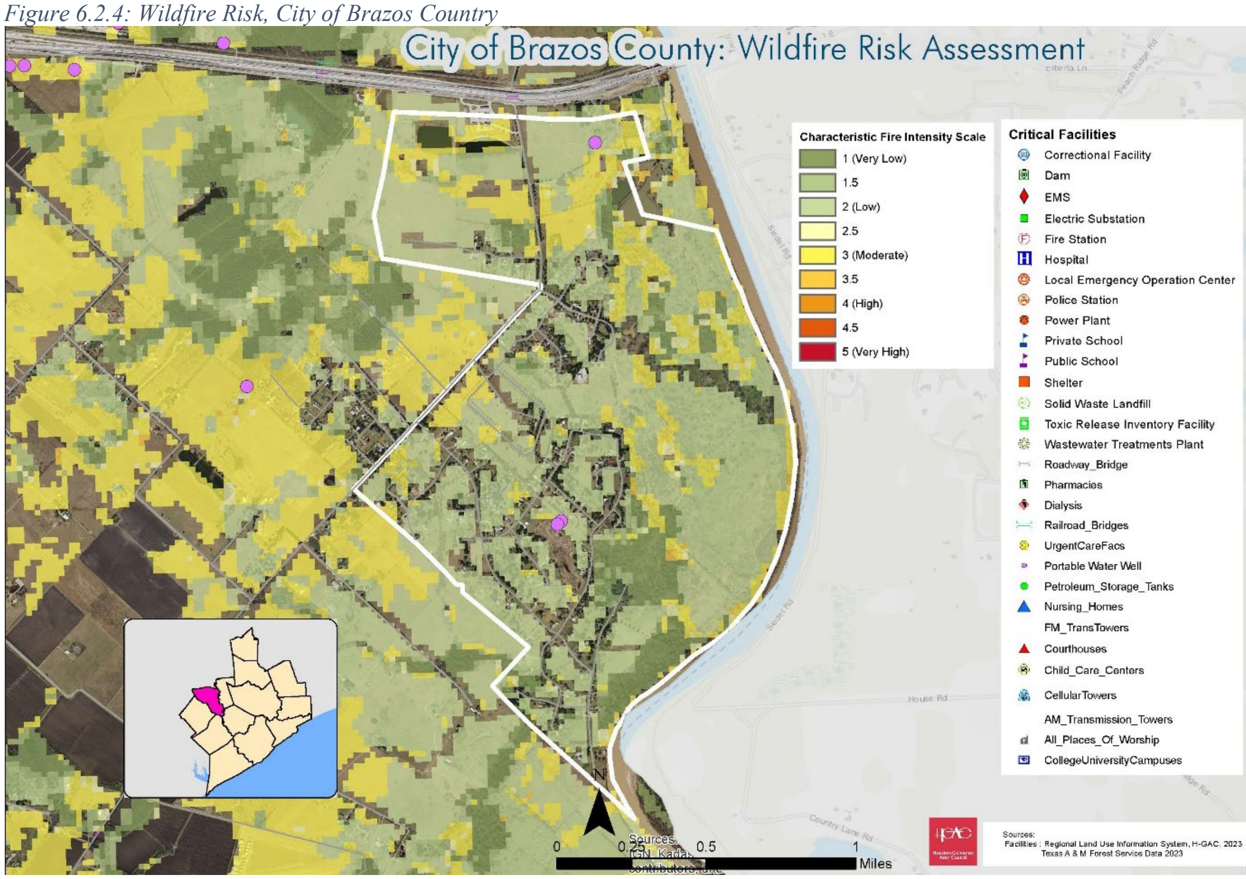


Figure 6.2.5: Wildfire Risk, City of Industry

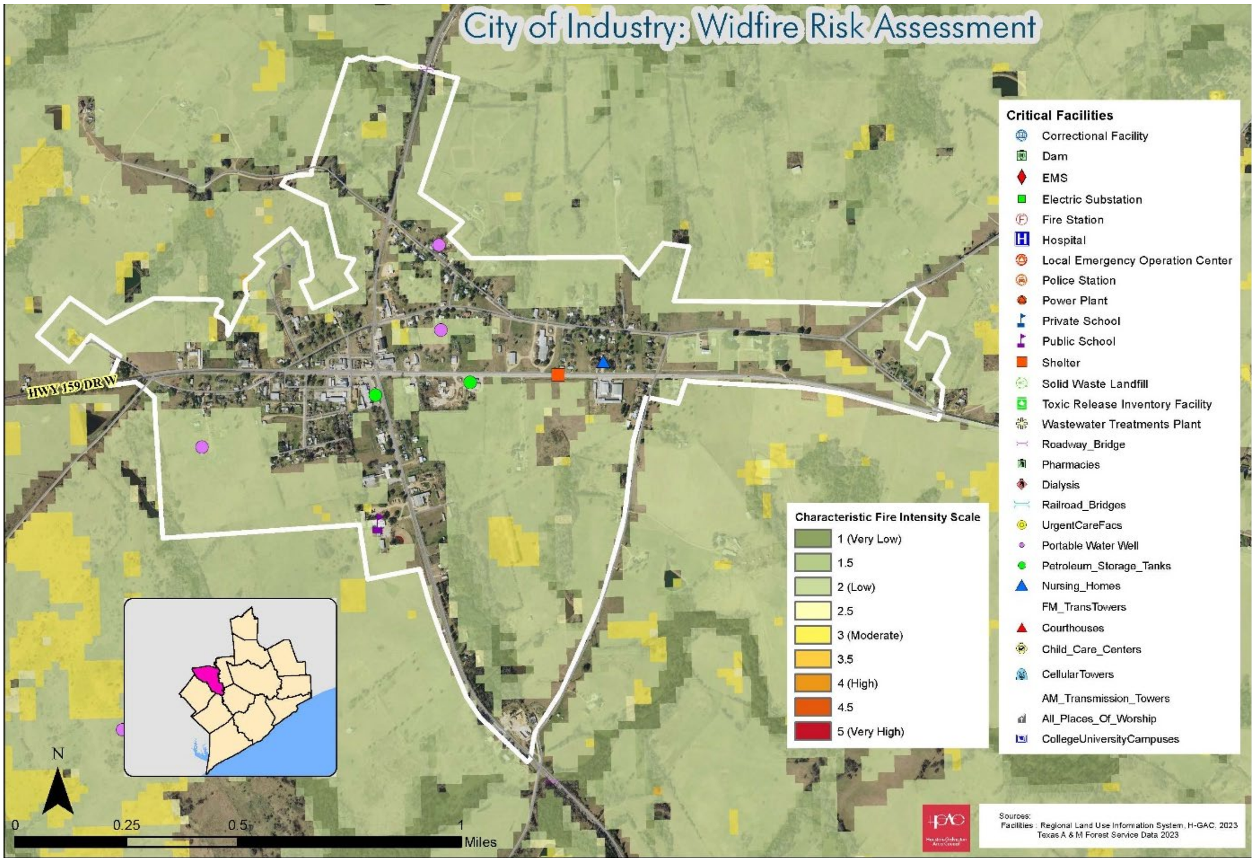


Figure 6.2.6: Wildfire Risk, City of San Felipe

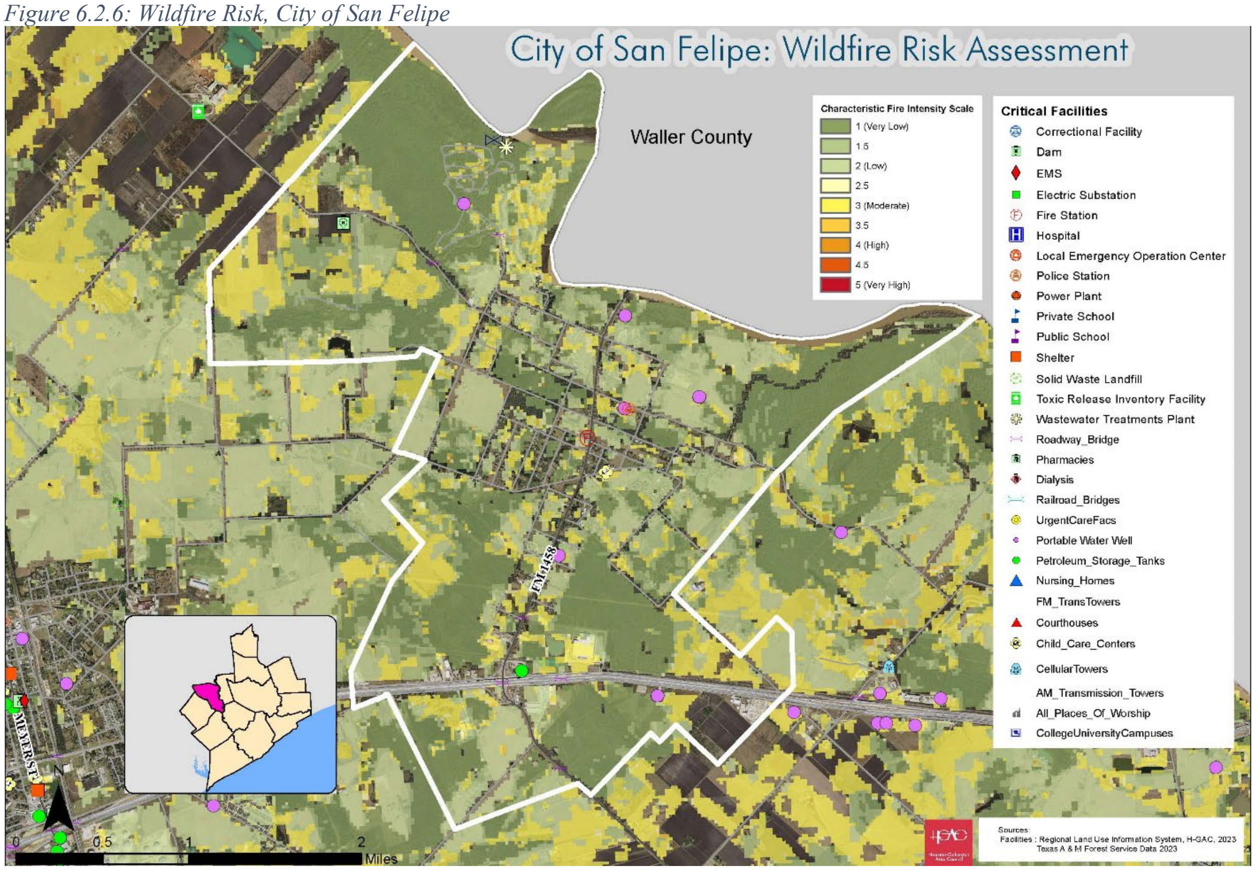


Figure 6.2.7: Wildfire Risk, City of Sealy

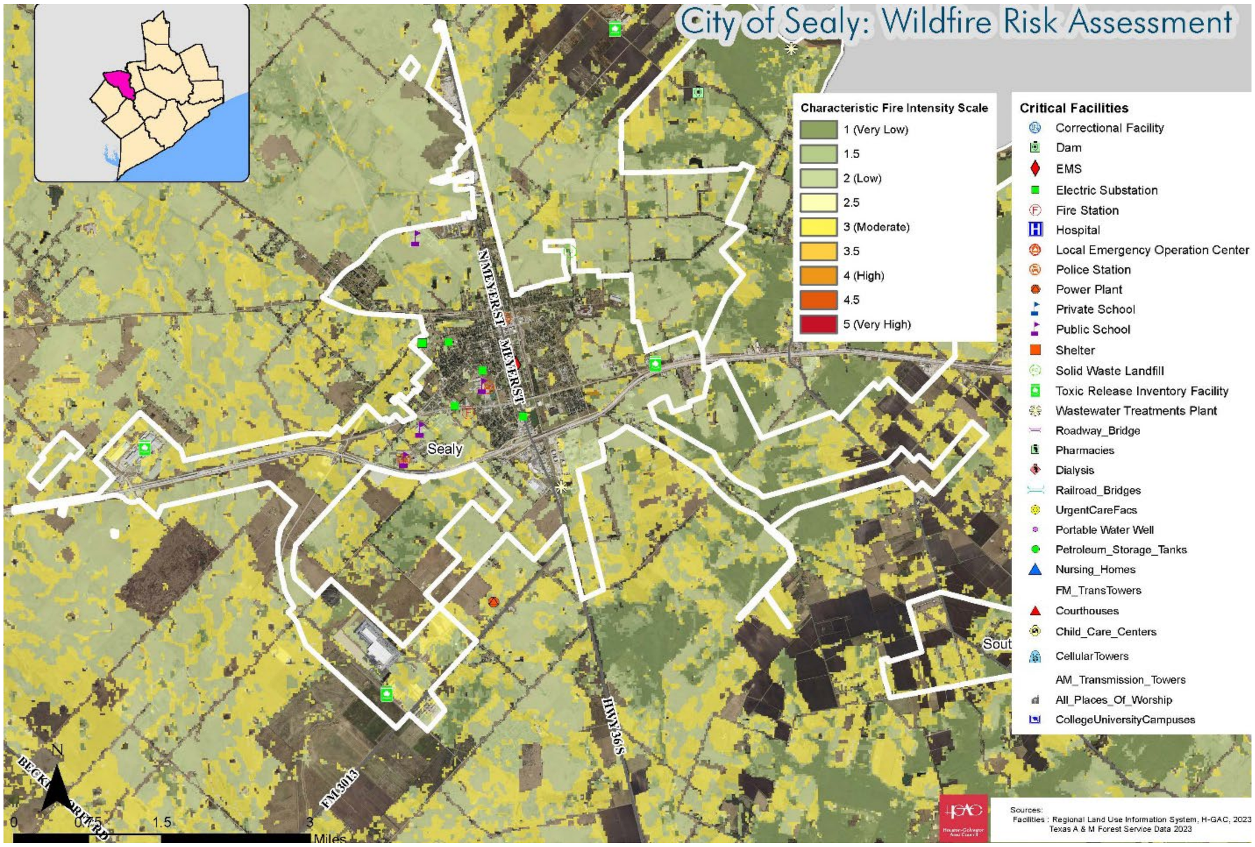


Figure 6.2.8: Wildfire Risk, City of South Frydek

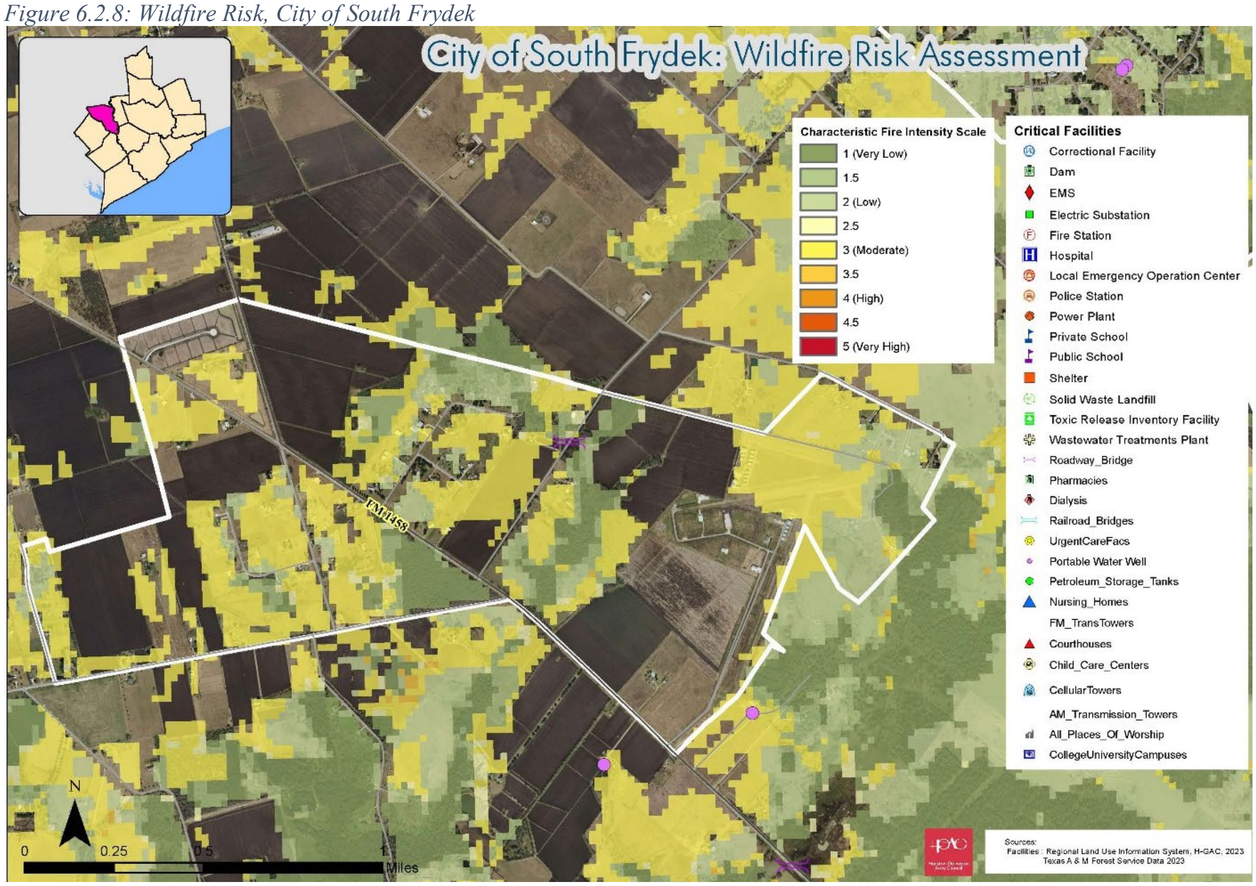
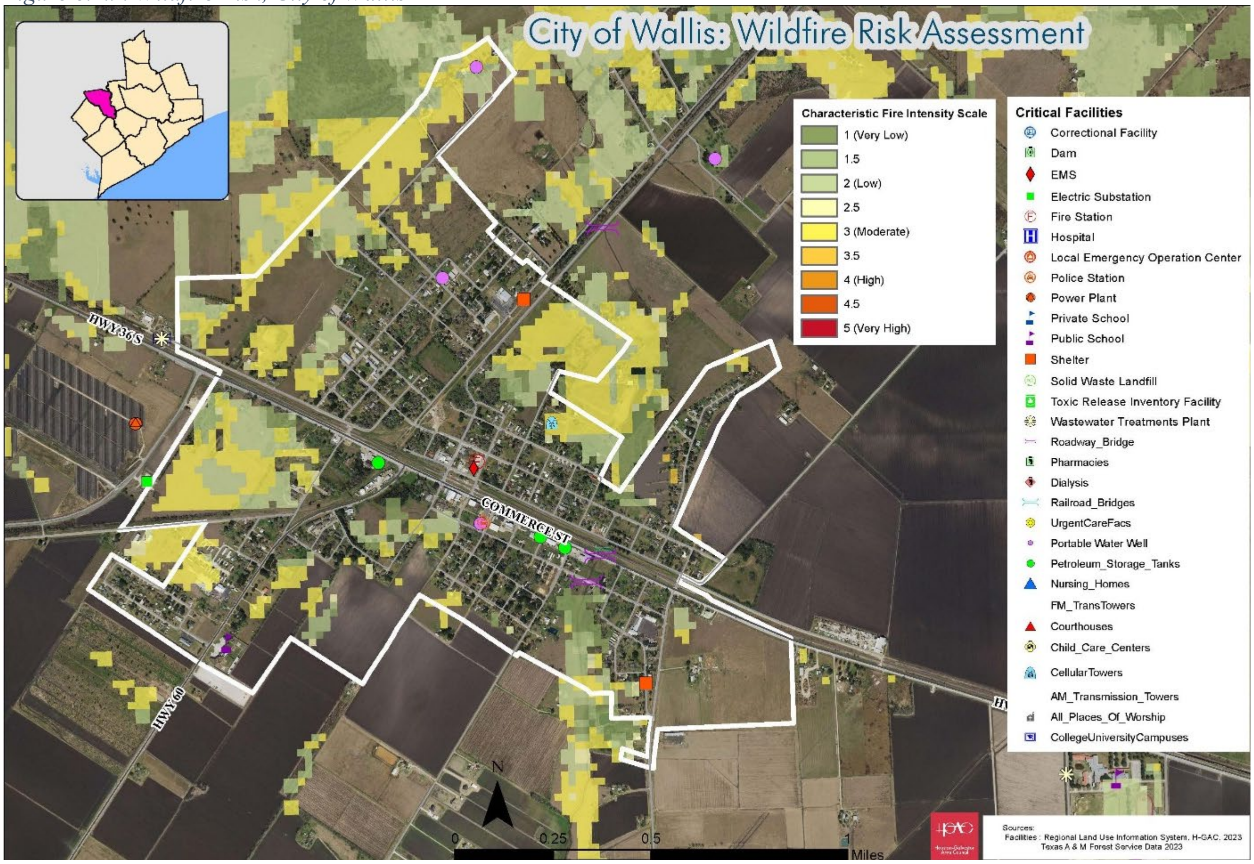


Figure 6.2.9: Wildfire Risk, City of Wallis



Historic Occurrences

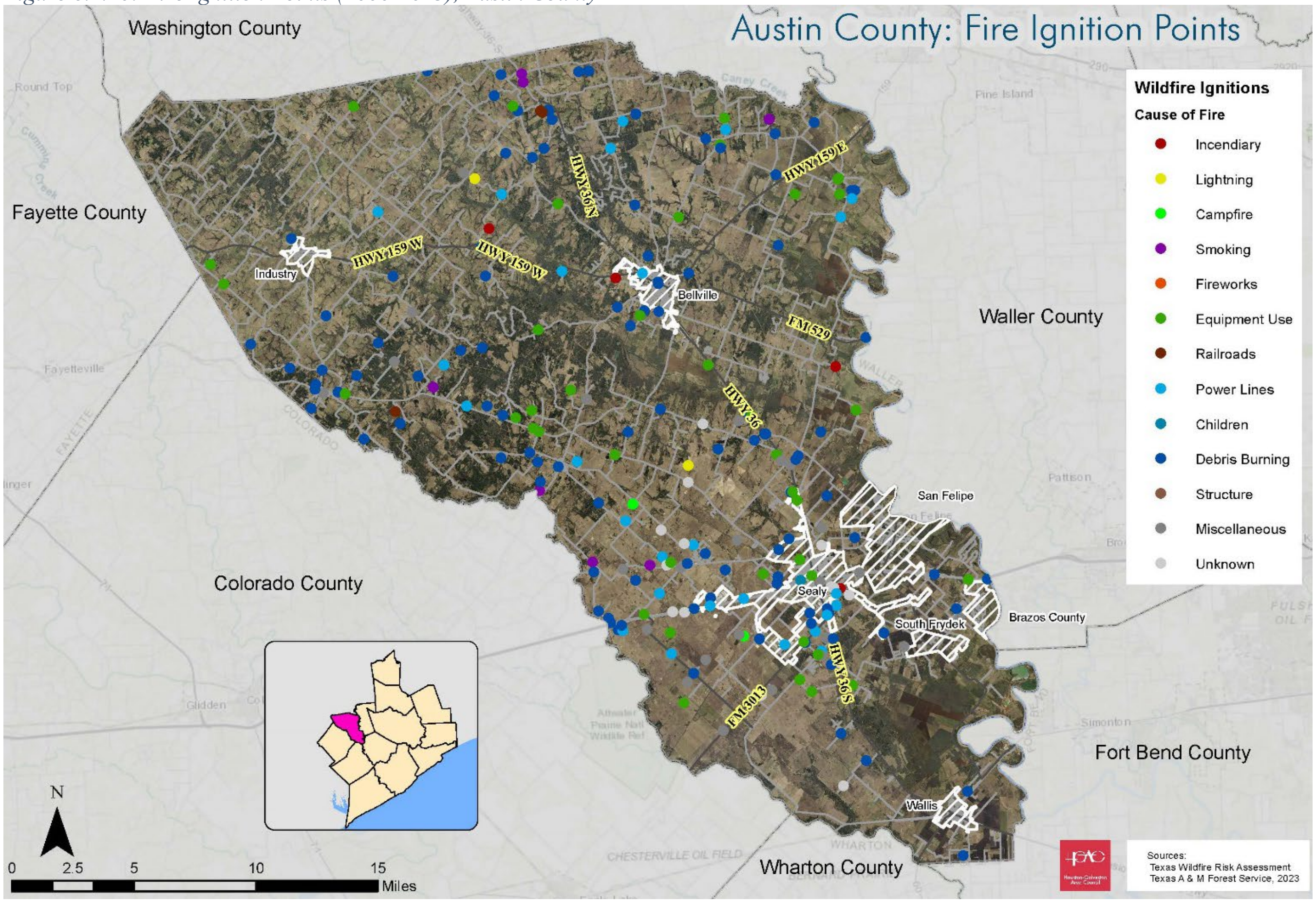
The Texas A&M Forest Service tracks wildfire events, acres destroyed, and the initial ignition cause of the fire. Table 6.2.2 shows the historical data associated with burns that caused recorded damage since the last plan update, 2018 to 2021. Figure 6.2.10 shows the point location of all fire ignitions from 2005-2024, symbolized by color to depict the cause of the fire.

Table 6.2.2: Fire Ignition Point Causes (2018-2021)

Cause Name	Damaged Acres	Start Date
Debris Burning	8	1/25/2018
Debris Burning	2	1/30/2018
Debris Burning	10	2/1/2018
Debris Burning	20	3/10/2018
Miscellaneous	30	3/17/2018
Debris Burning	10	3/19/2018
Miscellaneous	50	3/20/2018
Debris Burning	10	3/27/2018
Unknown	1	8/17/2018
Debris Burning	5	9/2/2018
Debris Burning	1	9/6/2018
Power Lines	1	3/15/2019
Debris Burning	1	6/14/2019
Power Lines	1	6/21/2019

Debris Burning	25	7/25/2019
Equipment Use	5	8/11/2019
Unknown	1	1/4/2020
Unknown	1	1/15/2020
Debris Burning	1	2/1/2020
Debris Burning	1	2/2/2020
Children	1	2/3/2020
Debris Burning	5	2/7/2020
Equipment Use	1	2/15/2020
Equipment Use	1	5/9/2020
Debris Burning	2	7/14/2020
Unknown	2	7/23/2020
Equipment Use	1	8/7/2020
Debris Burning	1	8/9/2020
Debris Burning	1	8/12/2020
Unknown	1	8/17/2020
Lightning	2	8/18/2020
Unknown	1	8/23/2020
Unknown	20	9/1/2020
Debris Burning	2	9/30/2020
Equipment Use	1	10/3/2020
Debris Burning	1	10/4/2020
Unknown	1	10/12/2020
Power Lines	3	10/13/2020
Debris Burning	1	11/3/2020
Unknown	1	11/25/2020
Unknown	1	12/1/2020
Unknown	1	12/3/2020
Unknown	175	12/7/2020
Unknown	1	12/8/2020
Miscellaneous	2	1/16/2021
Equipment Use	85	1/17/2021
Miscellaneous	5	1/17/2021
Miscellaneous	90	3/6/2021
Miscellaneous	2	3/18/2021
Equipment Use	0.3	3/26/2021
Equipment Use	1	3/28/2021
Lightning	2.5	6/27/2021
Debris Burning	2	9/2/2021
Miscellaneous	1	9/10/2021
Equipment Use	30	10/5/2021
Debris Burning	0.25	10/28/2021

Figure 6.2.10: Fire Ignition Points (2000-2023), Austin County



The measure of wildfire occurrence used in the TWRA is called the Wildfire Ignition Density. Wildfire Ignition Density is the likelihood of a wildfire starting based on historical ignition patterns. Occurrence is derived by modeling historic wildfire ignition locations to create an average ignition rate map. The ignition rate is measured in the number of fires per year per 1000 acres. Five years of historic fire report data was used to create the ignition points for all Texas fires. Data was obtained from federal, state and local fire department report data sources for the years 2005 to 2009. The compiled wildfire occurrence database was cleaned to remove duplicate records and to correct inaccurate locations. The database was then modeled to create a density map reflecting historical fire ignition rates. The Ignition Density map, below, is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county, or local planning efforts.[47]

Figure 6.2.11: Wildfire Ignition Density, Austin County

Presidential Disaster Declarations

There have been 3 disaster declarations for fire/wildfire within Austin County since 1953, as depicted in Table 6.2.3 below.[1]

Table 6.2.3: Disaster Declarations, Wildfire

Declaration Date	Title	Disaster Number
9/1/1999	Extreme Fire Hazards	3142
1/11/2006	Extreme Wildfire Threat	1624
3/13/2008	Wildfires	3284

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a

Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.2.4: USDA Declared Disasters (2018-2023), Wildfire

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

As jurisdictions across the state move into wildland and increase the WUI areas, the potential for wildfires substantially increases. Wildfire probability depends on a variety of factors such as local weather conditions, topographic factors, and existing fuels within a given area (natural vegetation or wildlands). A variety of activities can spark wildfires, most of which are human induces such as camping, debris burning, and smoking can affect the number and the extent of wildfires within a given year. Wildfires can occur at any time of the year under the right conditions. Wildfires can be exacerbated by droughts, which are more likely to occur in summer months when temperatures are higher, and precipitation is less frequent. according to the FEMA NRI for drought Annualized frequency values for drought are 27.9 events per year over a 22-year period of record for Austin County (2000-2021), while annualized frequency values for wildfires is 0.055% chance per year based on the 2021 dataset. The probability of future occurrences of wildfires for the county, per FEMA's NRI, is relatively low. [42]

Populations at Risk

Populations at risk from wildfire within Austin County are those that live within WUI zones, especially vulnerable population areas (as outlined in the County Profile). It is estimated that 23,146 people or 84.9 % percent of the Austin County population live within the WUI. Residential and commercial property loss throughout the county may lead to a financial loss for residents and jurisdictions. Wildfires also have the potential to negatively impact human health due to decreased air quality from smoke and air pollution. This can lead to significant injury or loss of life particularly for children or older individuals. Loss of agriculture land throughout the county may lead to an economic loss for the county, local farmers, businesses, and residents that rely on agriculture. The FEMA NRI social vulnerability score for this hazard is relatively low. [48]

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor the incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts from natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.

EAL for Austin County each year according to the FEMA NRI for wildfire is listed as relatively low. EAL for various factors can be found in Table 6.2.5 below.[48]

Table 6.2.5: Expected Annual Loss, Wildfire

Expected Annual Loss Type	Expected Annual Loss ($)	Expected Annual Loss Rate
Building	$91,923	$1 per $77.44K of building value
Agriculture	$3	$1 per $13.37 million of agriculture value
Population	0.00 fatalities ($5,537)	1 per 62.88 million people
TOTALS:	**$97,463**	**EAL Score- Wildfire: 63.8**

The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score.

Figure 6.2.12: Risk Index by Census Tract, Wildfire

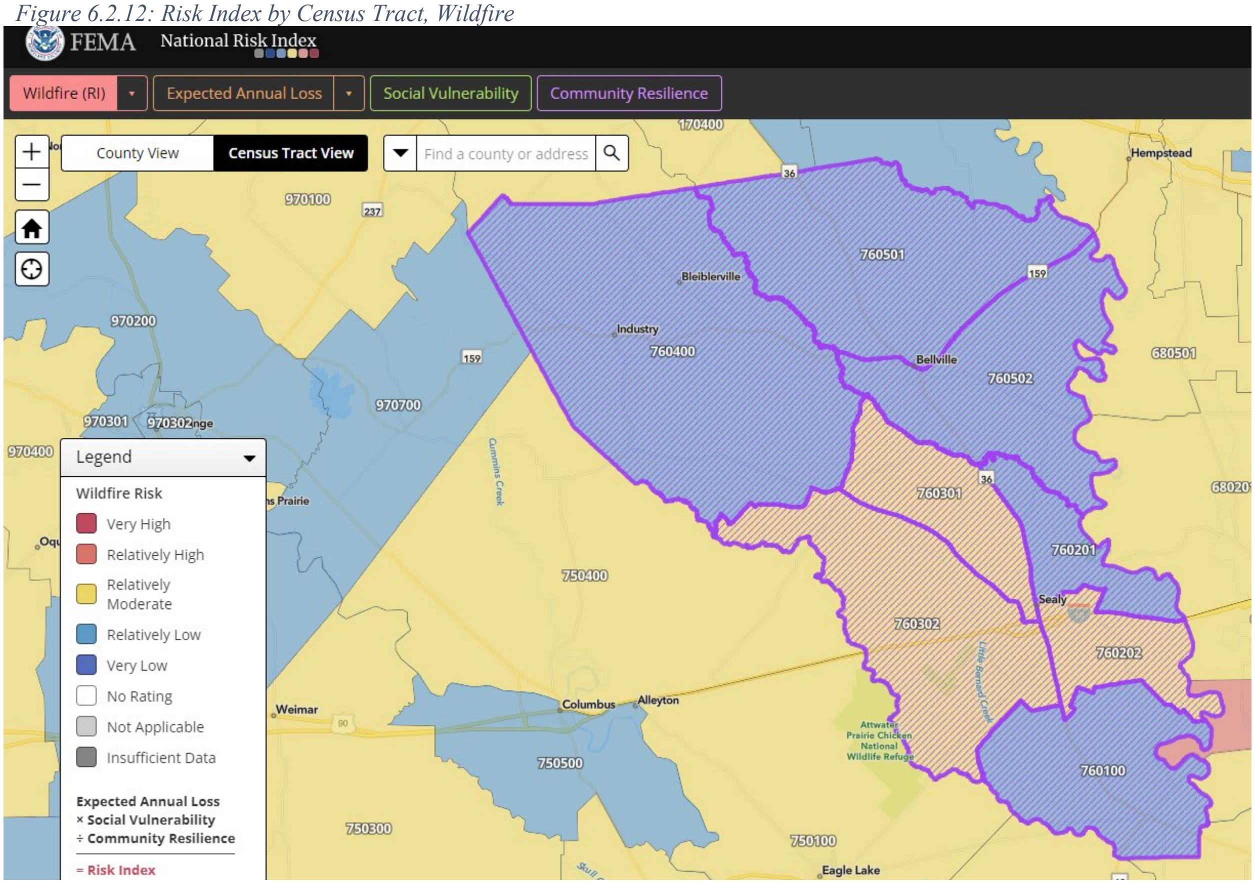


Figure 6.2.13: Social Vulnerability by Census Tract, Austin County

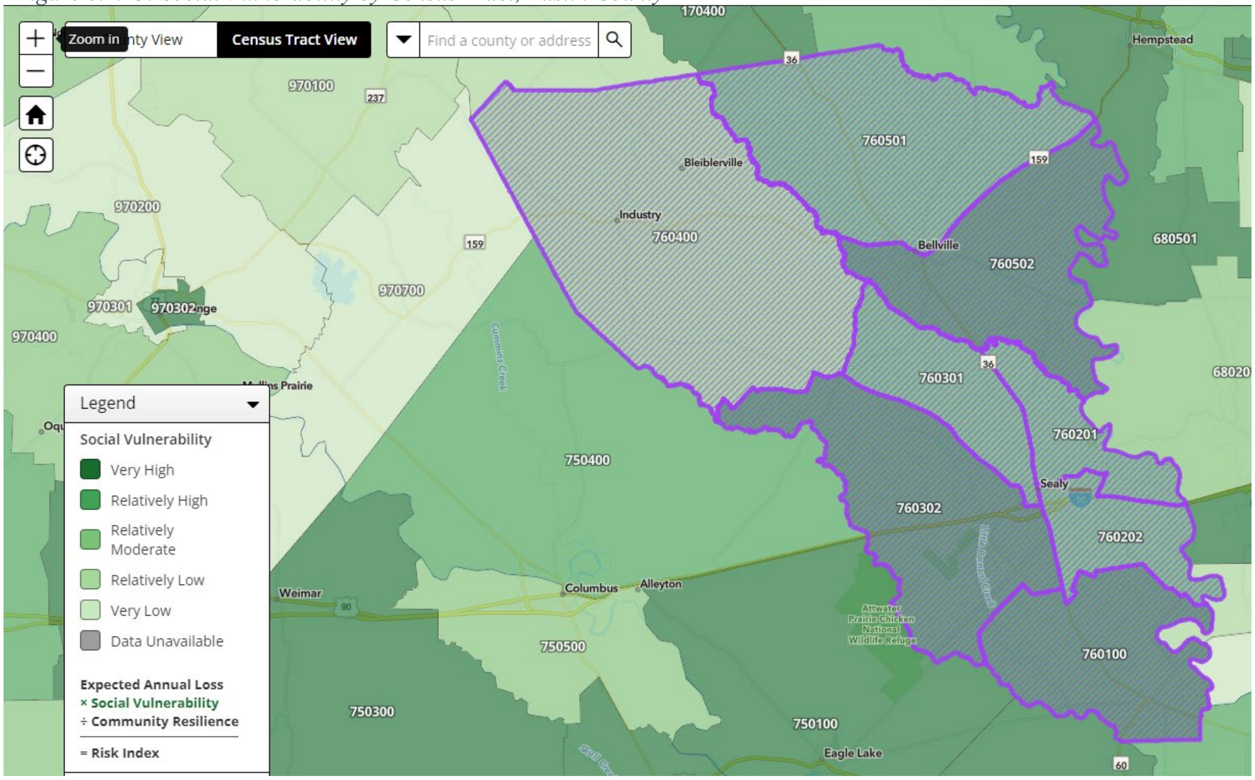


Figure 6.2.14: Community Resilience by Census Tract, Austin County

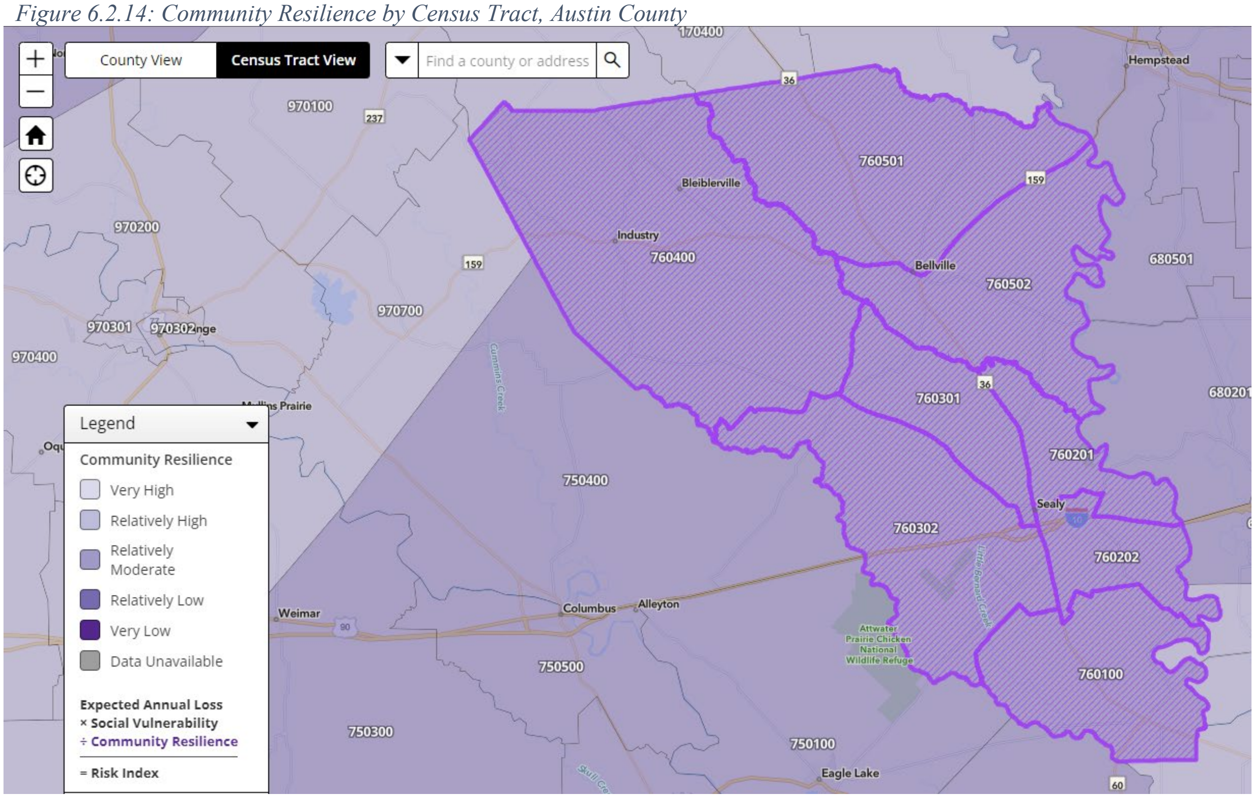


Figure 6.2.15: FEMA NRI Summary, Wildfire

Rank	Community	Social Vulnerability	Community Resilience	Hazard Type: Wildfire Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively Moderate	91.67	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	87.21	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Moderate	86.75	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Low	84.73	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Low	83.44	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Low	83.15	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Low	82.55	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Low	81.78	0 100

Climate Change Impacts

Wildfires are often a natural phenomenon and part of the normal cycle of the natural environment that help keep ecosystems healthy. Weather conditions often affect the duration of a wildfire and how it will gro. These factors are lower precipitation, high temperatures, wind, and more.[49] Wildfires are more likely to occur during summer months and during periods of drought. According to the Office of the Texas State Climatologist, drivers of wildfire risk are projected to increase the risk of wildfires throughout the state, primarily due to increased rates of drying and increased fuel load.[43]

Table 6.2.6: Climate Change Impacts, Wildfire

Location	The location of wildfires is not expected to change. Areas within or near the WUI are at the greatest risk.
Extent/Intensity	The extent and intensity of wildfires within the county may change (increase) due to rising surface temperatures, heat events, and increases in drought severity.
Frequency	Weather and other factors that lead to wildfires are expected to increase throughout the state, thus the frequency of wildfires is expected to increase.
Duration	There is no clear trend regarding the duration of wildfire events.

Section 6.3: Severe Thunderstorms & Lightning

6.3 Severe Thunderstorm & Lightning

The NWS defines a thunderstorm as "A local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder." A severe thunderstorm is defined as "A thunderstorm that produces a tornado, winds of at least 58 mph (50knots), and/or hail at least 1" in diameter. Structural wind damage may imply the occurrence of a severe thunderstorm. A thunderstorm wind equal to or greater than 40 mph (35 knots) and/or hail of at least 1" is defined as approaching severe."[50] Thunderstorms form when certain factors are present. These are moisture, instability, lifting, and in the case of severe thunderstorms wind shear. The difference between thunderstorms and severe thunderstorm formation resides in the wind field or wind sheer.[51] There are different types of thunderstorms with varying characteristics and degrees of severity.[52] Descriptions of these can be found in Table 6.3.1.

Table 6.3.1: Types of Thunderstorms

Type of Thunderstorm	Description
Ordinary Cell (Pulse Thunderstorm)	A one-time updraft and one-time downdraft. The rising updraft will suspend growing raindrops until the point where the weight of the water is greater than what can be supported. Drag between the air and the falling drops begins to diminish the updraft, which allows more raindrops to fall. While hail and gusty wind can develop, these occurrences are typically not severe. However, if atmospheric conditions are right and the ordinary cell is strong enough, more than one cell can potentially form and can include microburst winds (usually less than 70 mph/112 km/h) and weak tornadoes.
Multi-Cell Cluster	A thunderstorm with numerous cells in various stages of development merging together. While each individual thunderstorm cell in a multi-cell cluster behaves as a single cell, the prevailing atmospheric conditions are such that as the first cell matures, it is carried downstream by the upper-level winds, with a new cell forming upwind of the previous cell to take its place. Sometimes the atmospheric conditions encourage vigorous new cell growth – they form so fast that each new cell develops further and further upstream. Tremendous rainfall amounts can be produced over very small areas by back-building thunderstorms.
Multi-cell Line (Squall Line)	Thunderstorms that form in a line and can extend laterally for hundreds of miles. These "squall lines" can persist for many hours and produce damaging winds and hail. Updrafts, and therefore new cells, continually re-form at the leading edge of the system, with rain and hail following behind. Individual thunderstorm updrafts and downdrafts along the line can become quite strong, resulting in episodes of large hail and strong outflow winds that move rapidly ahead of the system. While the leading edge of squall lines occasionally form tornadoes, they primarily produce "straight-line" wind damage, a result of the force of the downdraft spreading horizontally as it reaches the Earth's surface.
Supercell Thunderstorms	Supercell thunderstorms are a special kind of single cell thunderstorm that can persist for many hours. They are responsible for nearly all of the significant tornadoes produced in the U.S. and for most of the hailstones larger than golf ball size. Supercells are also known to produce extreme winds and flash flooding.

Lightning is defined by NWS as "A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground, or between the ground and a cloud."[53] Lightning accompanies all thunderstorms and poses a threat to lives and property. While the odds of being struck by lightning are relatively low (1/1,222,000)[54], lightning kills about 20 people per year while hundreds more are injured or suffer lifelong neurological damage.[55] There are different types of lightning with varying characteristics. Most lighting starts within a thunderstorm and travels through the cloud.[56] Descriptions of these can be found in Table 6.3.2.

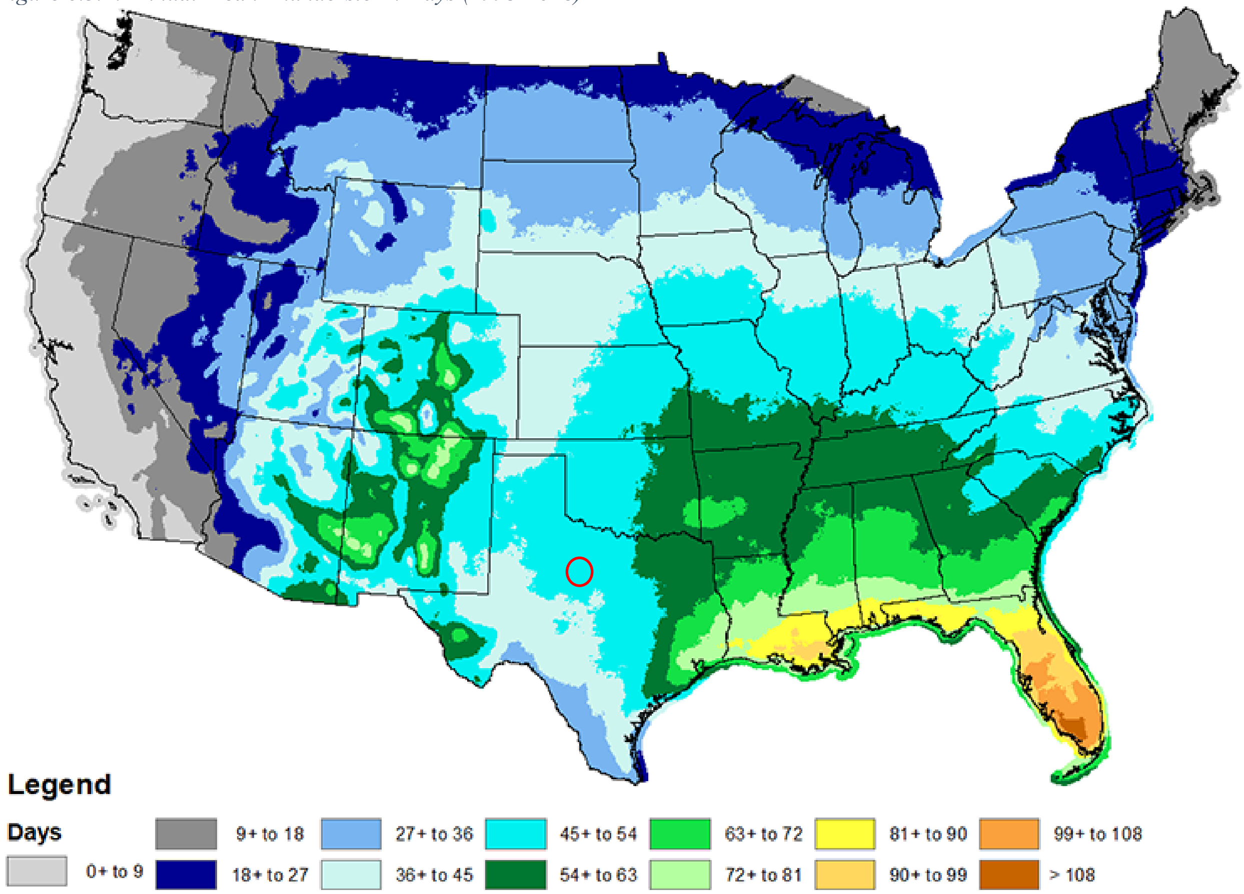
Table 6.3.2 Types of Lightning

Type of Lightning	Description
Cloud-to-Ground Flashes (Cloud-to-Ground Lightning)	A channel of negative charge, called a stepped leader, will zigzag downward in roughly 50-yard segments in a forked pattern. This stepped leader is invisible to the human eye, and shoots to the ground in less time than it takes to blink. As it nears the ground, the negatively charged stepped leader causes streamer channels of positive charge to reach upward, normally from taller objects in the area, such as a tree, house, or telephone pole. When the oppositely charged leader and streamer connect, a powerful electrical current begins flowing. This return stroke current of bright luminosity travels about 60,000 miles per second back towards the cloud.
	A "**bolt from the blue**" is Cloud-to-Ground lightning which starts inside a cloud, goes out the side of the storm, then travels horizontally away from the cloud before going to ground. A bolt from the blue can strike ground at a spot with "blue sky" above it. *Even a storm that is 6 miles away can be dangerous.*
Cloud Flashes (Intra-Cloud Lightning)	Many flashes of lightning within a cloud that do not reach the ground. Cloud flashes sometimes have visible channels that extend out into the air around the storm

Location

Thunderstorms, and the accompanying lightning, are not confined to any geographic boundaries. These hazards can happen anywhere, during any time of the year. However, typically thunderstorms will occur in warmer months such as Summer and Spring, and during the warmest parts of the day. Figure 6.3.1 shows the average number of thunderstorm days each year throughout the U.S. (defined as two lightning flashes within 10 nautical miles (nmi) radius). The most frequent occurrence is in the southeastern states due to warm, moist air from the Gulf of Mexico and Atlantic Ocean are readily available to fuel atmospheric conditions that produce thunderstorms. [57] Austin County is in an area that can see anywhere from 54-81 thunderstorm days per year.

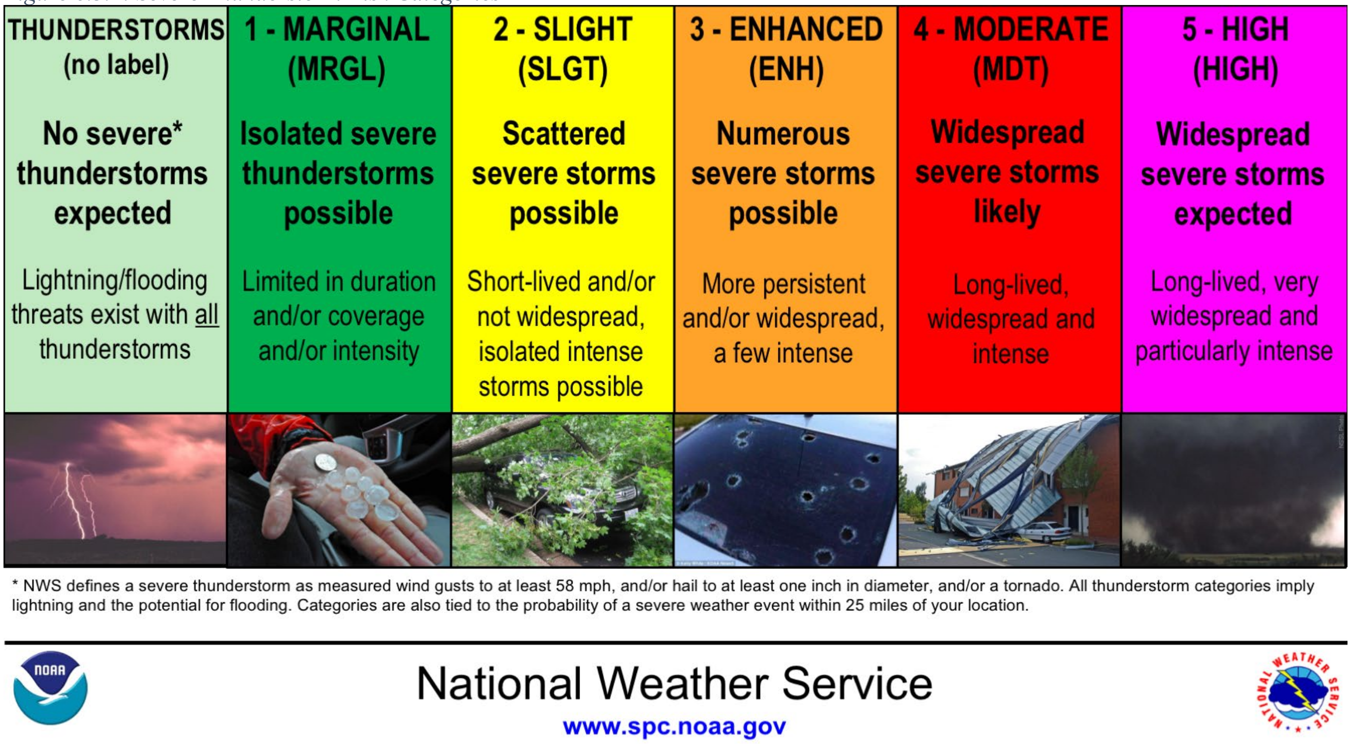
Figure 6.3.1: Annual Mean Thunderstorm Days (1993-2018)



Extent

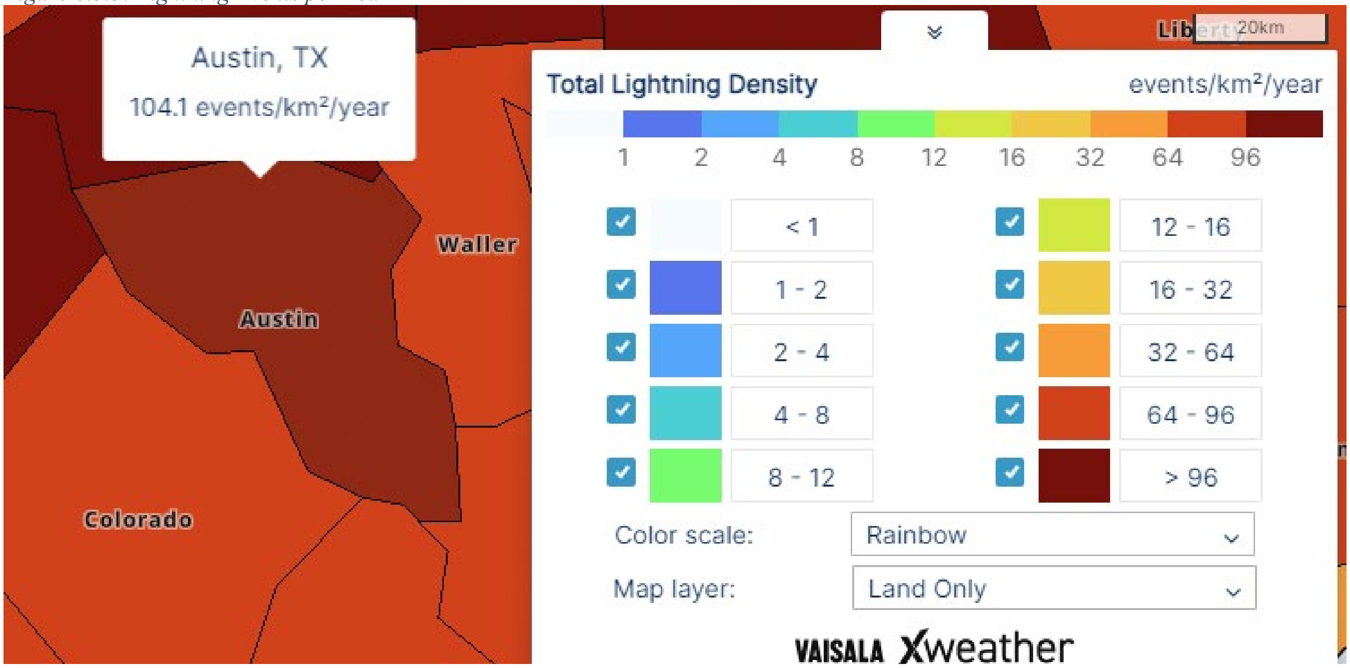
Thunderstorm intensity can be measured by NWS and the Storm Prediction Center (SPC) of the NWS risk categories. The SPC issues Convective Outlooks that depict non-severe thunderstorm areas and severe thunderstorm threats across the contiguous United States, along with a text narrative. The categorical forecast specifies the level of the overall severe weather threat via numbers, descriptive labeling, and colors, as seen in Figure 6.3.2. The probabilistic forecast directly expresses the best estimate of a severe weather event occurring within 25 miles of a point.[58]

Figure 6.3.2: Severe Thunderstorm Risk Categories



The National Lightning Detection Network (NLDN) consists of over 100 remote, ground-based sensing stations located across the United States that instantaneously detect the electromagnetic signals given off when lightning strikes the earth's surface. These remote sensors send the raw data via a satellite-based communications network to the Network Control Center (NCC) operated by Vaisala Inc. in Tucson, Arizona. Within seconds of a lightning strike, the NCC's central analyzers process information on the location, time, polarity, and communicated to users across the country. Through a partnership with Vaisala and cooperative effort with the U.S. Air Force 14th Weather Squadron, summarized daily files from 1986 to present are archived to be at the NOAA National Center for Environmental Information (NCEI). Through a contract with Vaisala, the raw data from NCEI is available only to government and military users. [59] Through use of Vaisala's Interactive Global Lightning Density Map, Figure 6.3.3 shows the average number of lightning events per km2 per year for Austin County. This interactive map utilizes data from 2016 to 2022.[60]

Figure 6.3.3: Lightning Events per Year



Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County severe thunderstorm & lightning events data from 1950-2023 is provided in the table below. Austin County has no reported lightning events or losses per the NCEI.[39]

Table 6.3.3: Austin County Severe Thunderstorm and Lightning Events (1950-2023)

Date	Jurisdiction	Event Type	Injuries/ Deaths	Property Damage	Crop Damage	Wind Speed (mph)
4/21/1958	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
4/29/1960	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
8/13/1977	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/21/1979	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/15/1980	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
4/23/1981	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/20/1983	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/8/1985	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	52
11/11/1985	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
12/19/1987	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
3/29/1990	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
1/18/1991	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/20/1992	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/9/1993	Wallis	Thunderstorm Wind	0/0	$5,000	$0	ND
4/5/1994	Halletsville	Thunderstorm Wind	0/0	$500,000	$50,000	ND
5/29/1994	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
10/8/1994	Industry	Thunderstorm Wind	0/0	$5,000	$0	ND
3/7/1995	N/A, Austin County	Thunderstorm Wind	0/0	$3,000	$0	ND
3/13/1995	Bellville	Thunderstorm Wind	0/0	$0	$0	ND

4/29/1996	SEALY	Thunderstorm Wind	0/0	$5,000	$0	ND
9/20/1996	BELLVILLE	Thunderstorm Wind	0/0	$5,000	$0	ND
9/20/1996	CAT SPG	Thunderstorm Wind	0/0	$10,000	$0	55
5/21/1997	SEALY	Thunderstorm Wind	0/0	$5,000	$0	ND
5/30/1997	BELLVILLE	Thunderstorm Wind	0/0	$5,000	$0	ND
6/17/1997	KENNEY	Thunderstorm Wind	0/0	$5,000	$0	ND
12/23/1997	NEW ULM	Thunderstorm Wind	0/0	$3,000	$0	ND
2/10/1998	CAT SPG	Thunderstorm Wind	0/0	$25,000	$0	ND
2/10/1998	SEALY	Thunderstorm Wind	0/0	$5,000	$0	ND
2/10/1998	WALLIS	Thunderstorm Wind	0/0	$10,000	$0	ND
2/10/1998	BELLVILLE	Thunderstorm Wind	0/0	$10,000	$0	ND
6/5/1998	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	ND
5/2/2000	WALLIS	Thunderstorm Wind	0/0	$0	$200,000	ND
7/23/2000	INDUSTRY	Thunderstorm Wind	0/0	$15,000	$0	ND
7/23/2000	SHELBY	Thunderstorm Wind	0/0	$15,000	$0	ND
9/2/2000	INDUSTRY	Thunderstorm Wind	0/0	$25,000	$0	ND
9/2/2000	BELLVILLE	Thunderstorm Wind	0/0	$15,000	$0	ND
9/2/2000	BURLEIGH	Thunderstorm Wind	0/0	$15,000	$0	ND
11/5/2000	COUNTYWIDE	Thunderstorm Wind	0/0	$100,000	$0	ND
11/12/2000	BELLVILLE	Thunderstorm Wind	0/0	$10,000	$0	ND
11/12/2000	SEALY	Thunderstorm Wind	0/0	$80,000	$0	ND
11/12/2000	BELLVILLE	Thunderstorm Wind	0/0	$15,000	$0	ND
8/6/2001	SEALY	Thunderstorm Wind	0/0	$10,000	$0	ND
9/21/2001	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	ND
10/13/2001	BELLVILLE	Thunderstorm Wind	0/0	$0	$0	52
3/30/2002	SEALY	Thunderstorm Wind	0/0	$8,000	$0	60
12/12/2002	CAT SPG	Thunderstorm Wind	0/0	$5,000	$0	ND
12/23/2002	WALLIS	Thunderstorm Wind	0/0	$45,000	$0	52
6/13/2003	INDUSTRY	Thunderstorm Wind	0/0	$8,000	$0	58
8/11/2004	BELLVILLE	Thunderstorm Wind	0/0	$50,000	$0	65
8/11/2004	KENNEY	Thunderstorm Wind	0/0	$10,000	$0	50
11/23/2004	CAT SPG	Thunderstorm Wind	0/0	$5,000	$0	50
10/31/2005	BELLVILLE	Thunderstorm Wind	0/0	$13,000	$0	53
4/21/2006	NEW ULM	Thunderstorm Wind	0/0	$5,000	$0	50
3/12/2007	BUCKHORN	Thunderstorm Wind	0/0	$1,000	$0	48
3/14/2007	WALLIS	Thunderstorm Wind	0/0	$25,000	$0	58
4/25/2007	BELLVILLE	Thunderstorm Wind	0/0	$0	$0	52
5/14/2008	COCHRAN	Thunderstorm Wind	0/0	$2,000	$0	57
12/24/2009	MILLHEIM	Thunderstorm Wind	0/0	$10,000	$0	52
5/29/2010	WALLIS	Thunderstorm Wind	0/0	$10,000	$0	52
8/23/2010	NEW ULM	Thunderstorm Wind	0/0	$0	$0	52
8/24/2011	BELLVILLE	Thunderstorm Wind	0/0	$3,000	$0	55
8/24/2011	SEALY	Thunderstorm Wind	0/0	$2,000	$0	55
9/29/2011	WALLIS	Thunderstorm Wind	0/0	$3,000	$0	50
2/18/2012	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	56
2/18/2012	WALLIS	Thunderstorm Wind	0/0	$2,000	$0	56
8/10/2012	BELLVILLE ARPT	Thunderstorm Wind	0/0	$0	$0	55
4/16/2015	NELSONVILLE	Thunderstorm Wind	0/0	$0	$0	52

4/25/2015	SAN FELIPE	Thunderstorm Wind	0/0	$3,000	$0	50
4/25/2015	SAN FELIPE	Thunderstorm Wind	0/1	$2,000	$0	55
4/27/2015	INDUSTRY	Thunderstorm Wind	0/0	$12,000	$0	55
5/25/2015	NEW ULM	Thunderstorm Wind	0/0	$0	$0	60
5/25/2015	SEALY	Thunderstorm Wind	0/0	$0	$0	60
5/25/2015	SEALY	Thunderstorm Wind	0/0	$0	$0	56
5/27/2015	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	54
5/23/2017	SEALY	Thunderstorm Wind	0/0	$1,000,000	$0	87
5/22/2018	BURLEIGH	Thunderstorm Wind	0/0	$2,000	$0	53
5/22/2018	SAN FELIPE	Thunderstorm Wind	0/0	$2,000	$0	53
1/10/2020	WEHDEM	Thunderstorm Wind	0/0	$3,000	$0	65
		TOTALS:	**0/1**	**$2,140,000**	**$250,000**	N/A

ND- No Data

Presidential Disaster Declarations

There have been 2 disaster declarations for severe thunderstorms within Austin County since 1954, as depicted in Table 6.3.4 below. There were 0 disaster declarations for lightning.[1]

Table 6.3.4: Federal Disaster Declarations, Severe Thunderstorm

Declaration Date	Title	Disaster Number
9/1/1999	Tropical Storm Charley	1239
1/11/2006	Severe storms, tornadoes, straight-line winds, and flooding	4223

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.3.5: USDA Declared Disasters (2018-2023), Severe Thunderstorm and Lightning

Crop Disaster Year	Disaster Description	Designation Number
2018	Excessive moisture and flooding	S4476
2021	Excessive moisture and excessive rainfall	S5053
2021	Excessive Moisture	S5088
2021	Excessive Moisture	S5089
2021	Excessive Moisture	S5105

Probability of Future Occurrences

Severe thunderstorms and lightning are more likely to occur in summer months when temperatures are higher and moisture from the gulf helps to fuel thunderstorm development. According to the FEMA NRI for lightning, annualized frequency values for lightning are 74.4 events per year over a 22-year period of record (1991-2012), with 1,638 events on record for this timeframe.[42]

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor the incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts from natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

EAL for Austin County each year according to the FEMA NRI for lightning is listed as relatively low. EAL Exposure and EAL Values for various factors can be found in Table 6.3.6 and 6.3.7 below. [48]

As stated above, the risk of severe thunderstorms and lightning occurring applies the same to the entire county. There are no known factors that make one area or community more prone these events than another. However, severe thunderstorms and lightning can adversely impact unhoused individuals over those who have places to seek shelter. While no place is 100% safe from lightning, some places are much safer than others, the safest place to go when you hear thunder is indoors. Studies have shown most people struck by lightning are struck not at the height of a thunderstorm, but before and after the storm has peaked. This is because lightning can strike as far as 10 miles from the area where it is raining, and many people are unaware of how far lightning can strike from its parent thunderstorm. Lightning is the first thunderstorm hazard to arrive and the last to leave.[61] Additionally, People living in mobile homes are especially at risk from injury and death. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph. Winds from thunderstorms can cause EF 2 damage.

Table 6.3.6: Expected Annual Loss Exposure Values, Severe Thunderstorms and Lightning

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Severe Thunderstorm	ND	ND	ND	ND	ND
Lightning	$7,118,991,434	$348,150,800,000/ 30,013	N/A	$355,269,791,434	Relatively Low

ND- No Data, N/A- Not Applicable

Table 6.3.7: Expected Annual Loss Values, Severe Thunderstorms and Lightning

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Severe Thunderstorm	ND	ND	ND
Lightning	$5,352	$115,863/0.01	N/A

ND- No Data, N/A- Not Applicable

The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score. Severe thunderstorm is not listed as a severe hazard type, lightning is accounted for.

Figure 6.3.4: Risk Index by Census Tract, Lightning

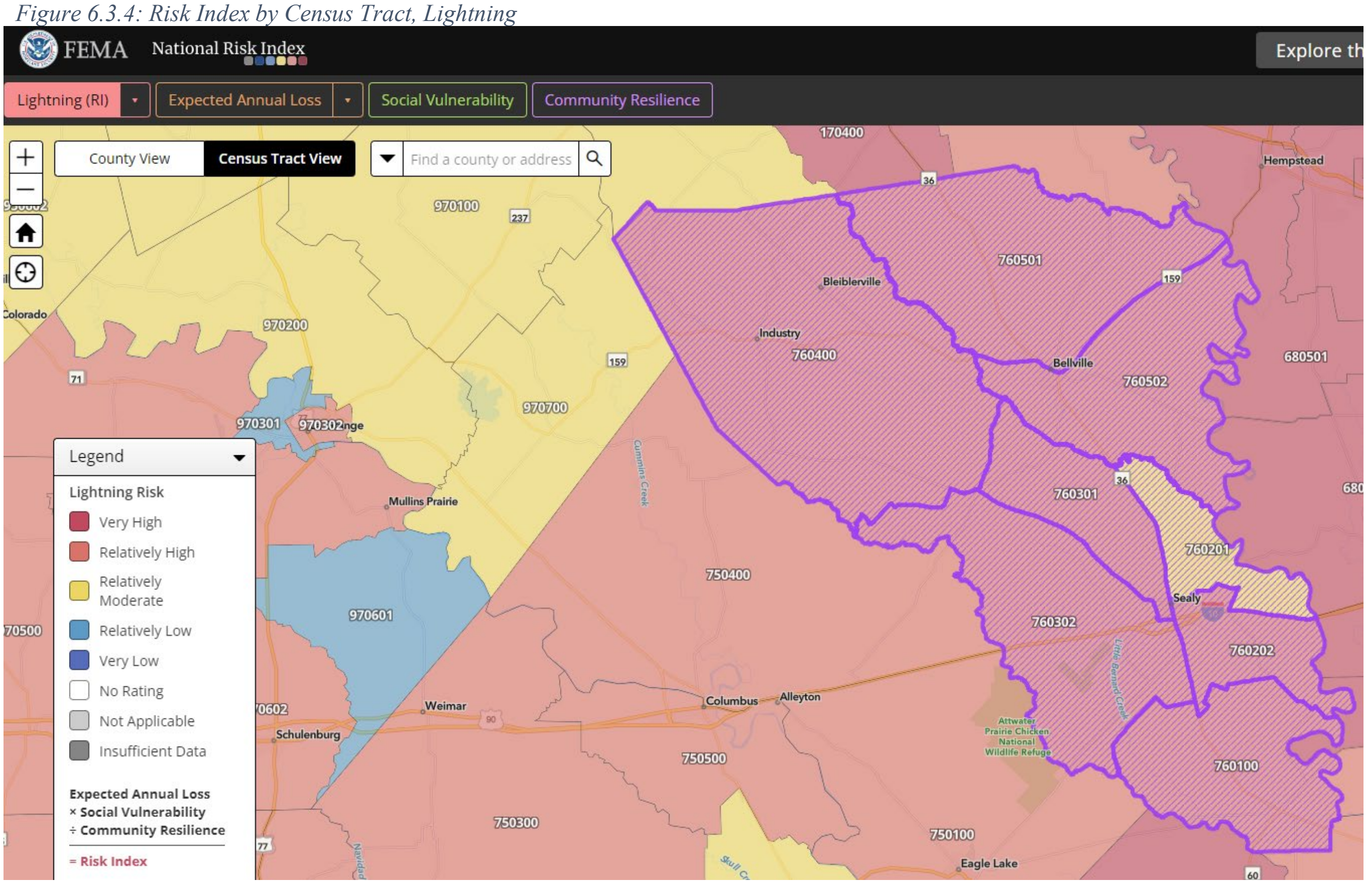


Figure 6.3.5: Social Vulnerability by Census Tract, Austin County

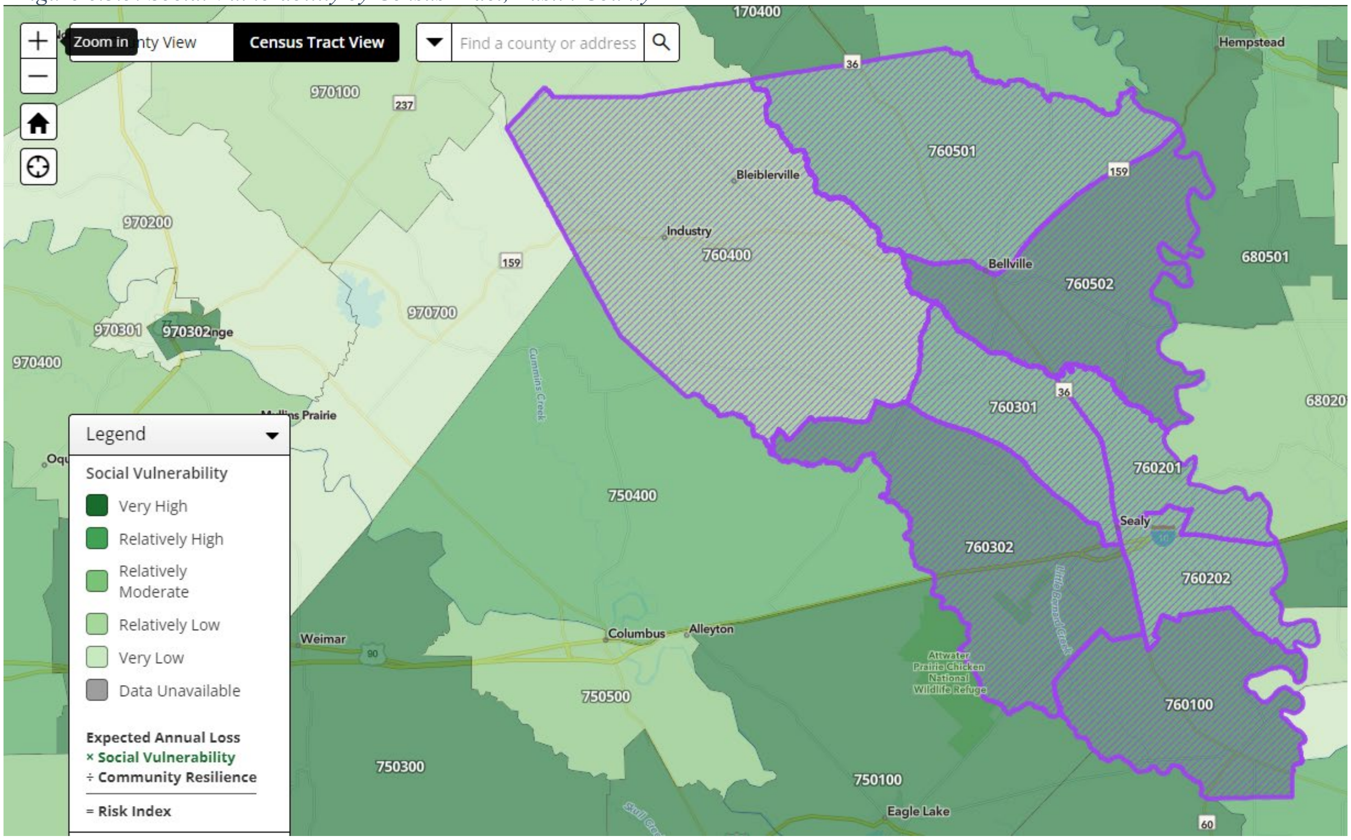


Figure 6.3.6:: Community Resilience by Census Tract, Austin County

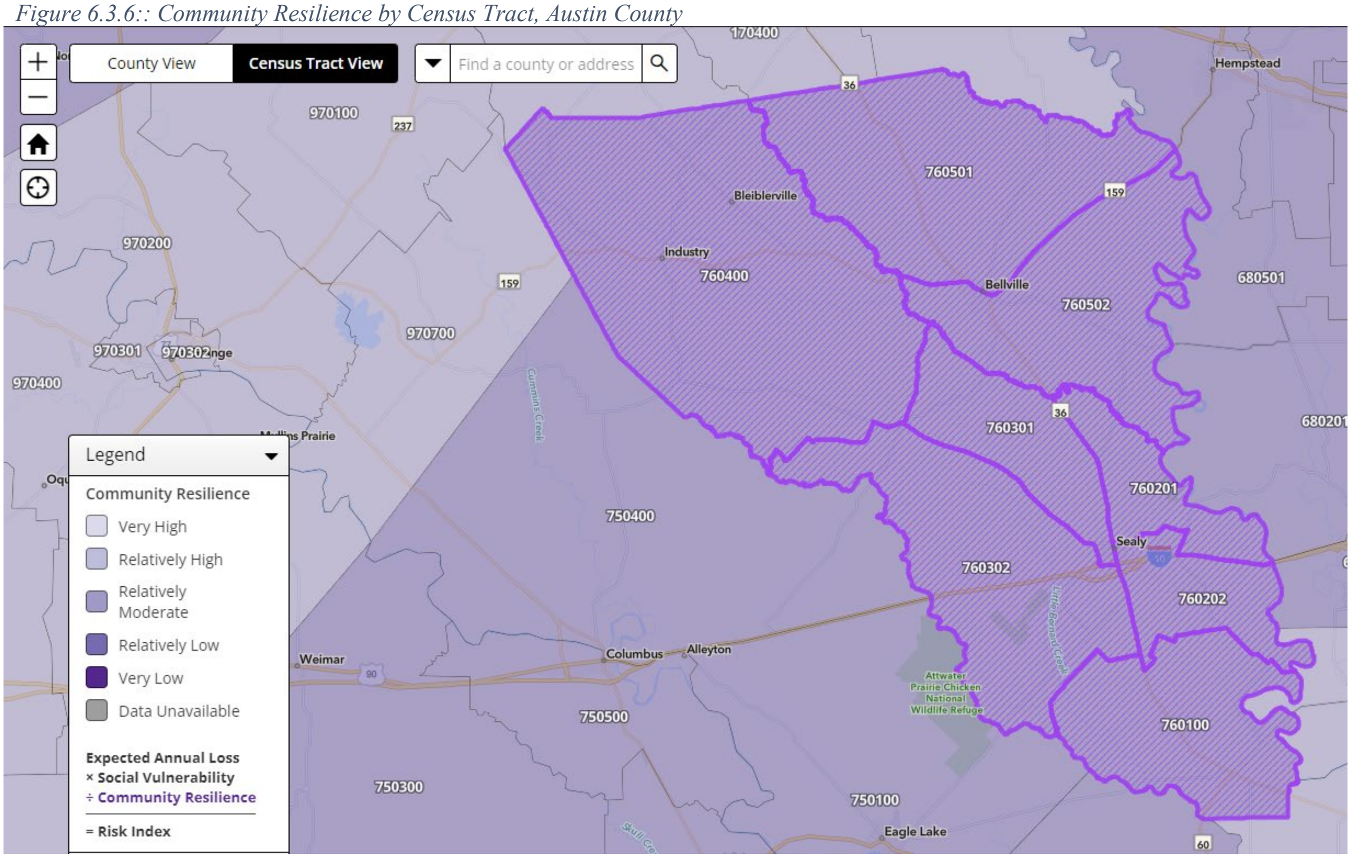


Figure 6.3.7: FEMA NRI Summary, Lightning

NRI Hazard: Wildfire

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively Moderate	91.67	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	87.21	0 100
3	Census tract 48015760202	Relatively High	Relatively Low	Relatively Moderate	86.75	0 100
4	Census tract 48015760501	Relatively High	Relatively Low	Relatively Low	84.73	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Low	83.44	0 100
6	Census tract 48015760100	Very High	Relatively Low	Relatively Low	83.15	0 100
7	Census tract 48015760301	Relatively High	Relatively Low	Relatively Low	82.55	0 100

Climate Change Impacts

According to the Office of the Texas State Climatologist, the climate data record for severe thunderstorms is poor, and severe thunderstorms are too small to be simulated directly by present-day climate models. Over the past few decades, the severe storm environment over Texas has changed in complex and opposing ways. The amount of energy available for convection has decreased, and the amount of energy needed to initiate convection has increased at the same time. This suggests that environmental conditions have become less favorable for the occurrence of thunderstorms. However, the amount of low-level shear has increased, which would be expected to make thunderstorms more likely to become severe once they develop.

Changes in severe storm environments have not been uniform throughout the year, with environments becoming more favorable for severe thunderstorms and significant hail in Texas early in the spring and less favorable later in the spring. Lightning occurs most often during the months of May and June. Climate model simulations imply different prospects going forward. As temperatures increase, the amount of energy available to fuel these storms is simulated to increase as temperature and low-level moisture increase. This results in an overall increase in the number of days capable of producing severe thunderstorms. With these complex trends and partially contradictory information between models and observations, there is low confidence in any ongoing trend in the overall frequency and severity of severe thunderstorms.[43]

Table 6.3.8: Climate Change Impacts, Severe Thunderstorm and Lightning

Location	The location of severe thunderstorms and lightning is not expected to change.
Extent/Intensity	The extent and intensity of severe thunderstorms and lightning within the county may change (increase) due to increased temperatures and energy available to fuel severe thunderstorms and the accompanying lightning.
Frequency	There are no clear trends in severe thunderstorms and lightning frequency due to considerable variability in conditions that lead to them occurring. However, these hazards occur most frequently in warmer months, around May and June.
Duration	The duration of severe thunderstorms and lightning events is not likely to change, however the intensity of them is expected to increase due to rising temperatures and the proximity of the County to the Gulf of Mexico.

Section 6.4: Tornado/Microburst

6.4 Tornado/ Microburst

A Tornado is defined by the NWS as a "A violently rotating column of air touching the ground, usually attached to the base of a thunderstorm." [62] Tornados are one of the most violent storms, with the strongest tornados being capable of massive destruction. In extreme cases, winds from a tornado may approach 300 miles per hour, with damage paths that can be more than one mile wide and 50 miles long. These catastrophic tornados are often produced by supercell thunderstorms.[63]

A microburst is a localized column of sinking air (downdraft) within a thunderstorm and is usually less than or equal to 2.5 miles in diameter. Microbursts can cause extensive damage at the surface, and in some instances, can be life-threatening. There are two primary types of microbursts: 1) wet microbursts and 2) dry microbursts. Wet microbursts are accompanied by significant precipitation and are common in the Southeast during the summer months. Microbursts start with the development of a thunderstorm and the water droplets/hailstones being suspended within the updraft. Sometimes an updraft is so strong it suspends large amounts of these droplets and hailstones in the upper portions of the thunderstorm. When the updraft weakens due to evaporational cooling, it is no longer capable of holding the large core of rain/hail up in the thunderstorm. As a result, the core plummets to the ground creating a microburst. As it hits the ground it spreads out in all directions. The location in which the microburst first hits the ground experiences the highest winds and greatest damage. Wind speeds in microbursts can reach up to 100 mph, or even higher, which is equivalent to an EF-1 tornado.[64]

Location

Similar to that of thunderstorms (Section 6.3), tornadoes and microbursts do not have any specific geographic boundary and can occur anywhere if the right conditions are present. From 1951-2011, nearly 62.7 percent of all Texas tornadoes occurred within the three-month period of April, May, and June, with almost one-third of the total tornadoes occurring in May.[65] The State of Texas has the highest average annual number of tornadoes per state, with an average of 136 tornadoes per year over a 30-year period, as seen in Figure 6.4.1. [66] Figure 6.4.2 depicts Austin County's total number of tornadoes per year between 21-40 instances.[67]

Figure 6.4.1: Annual Tornadoes per State, 1993-2022

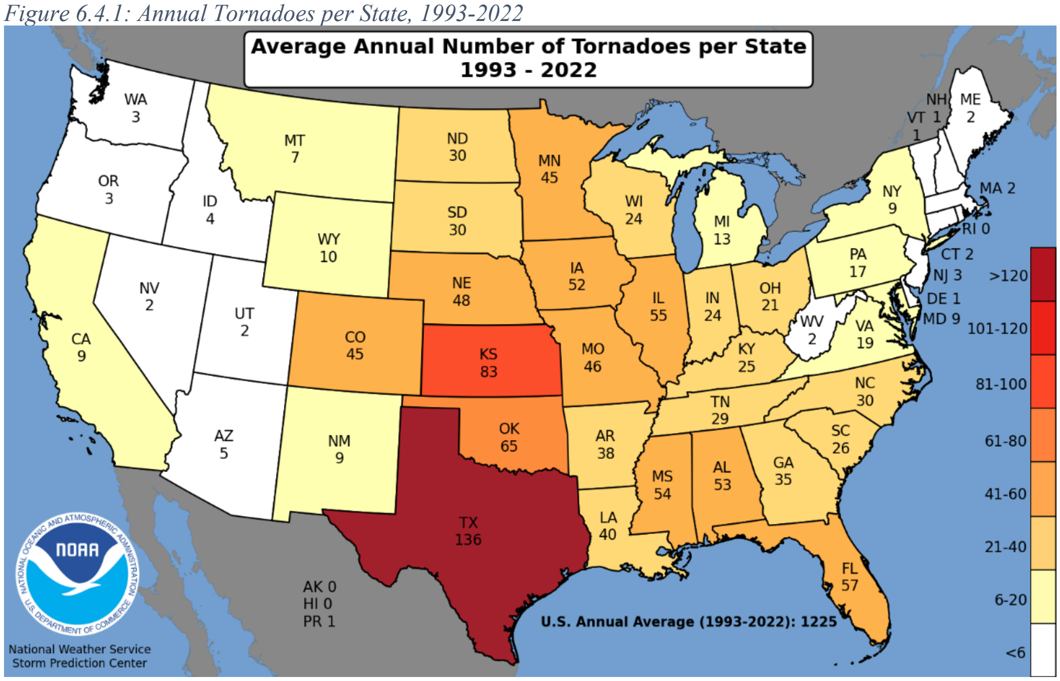
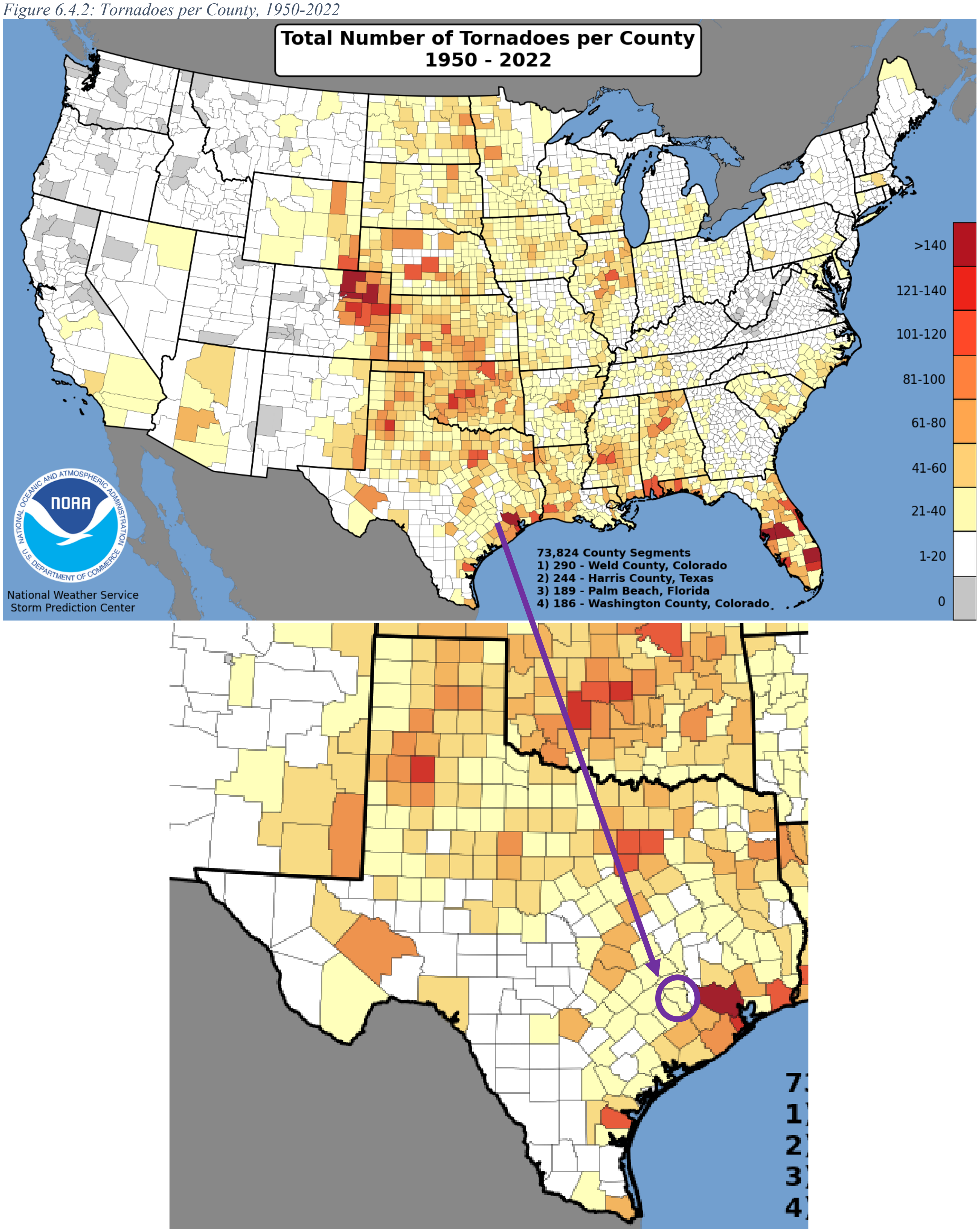


Figure 6.4.2: Tornadoes per County, 1950-2022



Extent

Tornado intensity is ranked using the Enhanced Fujita Scale (EF- Scale), a rating of how strong a tornado was. It is calculated by surveying the damage and comparing it with damage to similar objects at certain wind speeds. The EF-Scale is not meant to be used as a measure of how strong a tornado currently on the ground is. The EF-Scale incorporates 28 damage indicators such as building type, structures, and trees. For each damage indicator, there are 8 degrees of damage ranging from the beginning of visible damage to complete destruction of the damage indicator.[68]

Table 6.4.1: Enhanced Fujita Scale Descriptions

EF Rating	Wind Speed	Typical Damage
0	65-85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
1	86-110	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
2	111-135	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
4	166-200	Devastating damage. Whole frame houses Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
5	>200	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly more than 109 yards; high-rise buildings have significant structural deformation; incredible phenomena will occur.

Table 6.4.2: EF-Scale Damage Indicators

Number (Details Linked)	Damage indicator	Abbreviation
1	Small barns, farm outbuildings	SBO
2	One- or two-family residences	FR12
3	Single-wide mobile home (MHSW)	MHSW
4	Double-wide mobile home	MHDW
5	Apt, condo, townhouse (3 stories or less)	ACT
6	Motel	M
7	Masonry apt. or motel	MAM
8	Small retail bldg. (fast food)	SRB
9	Small professional (doctor office, branch bank)	SPB
10	Strip mall	SM
11	Large shopping mall	LSM
12	Large, isolated ("big box") retail bldg.	LIRB
13	Automobile showroom	ASR
14	Automotive service building	ASB
15	School - 1-story elementary (interior or exterior halls)	ES
16	School - jr. or sr. high school	JHSH
17	Low-rise (1-4 story) bldg.	LRB
18	Mid-rise (5-20 story) bldg.	MRB
19	High-rise (over 20 stories)	HRB
20	Institutional bldg. (hospital, govt. or university)	IB
21	Metal building system	MBS
22	Service station canopy	SSC
23	Warehouse (tilt-up walls or heavy timber)	WHB

24	Transmission line tower	TLT
25	Free-standing tower	FST
26	Free standing pole (light, flag, luminary)	FSP
27	Tree - hardwood	TH
28	Tree - softwood	TS

Historic Occurrences

Austin County has experienced seven tornados and one microburst since 1990. There have been no new tornado occurrences since the last plan update, however, there have been recent instances of funnel cloud formation as reported by NCEI. Figure 6.4.3 below depicts previous tornado occurrences and their tracks within Austin County, while Table 6.4.3 lists tornado and funnel cloud occurrences within the county.

Figure 6.4.3: Tornado Paths, Austin County

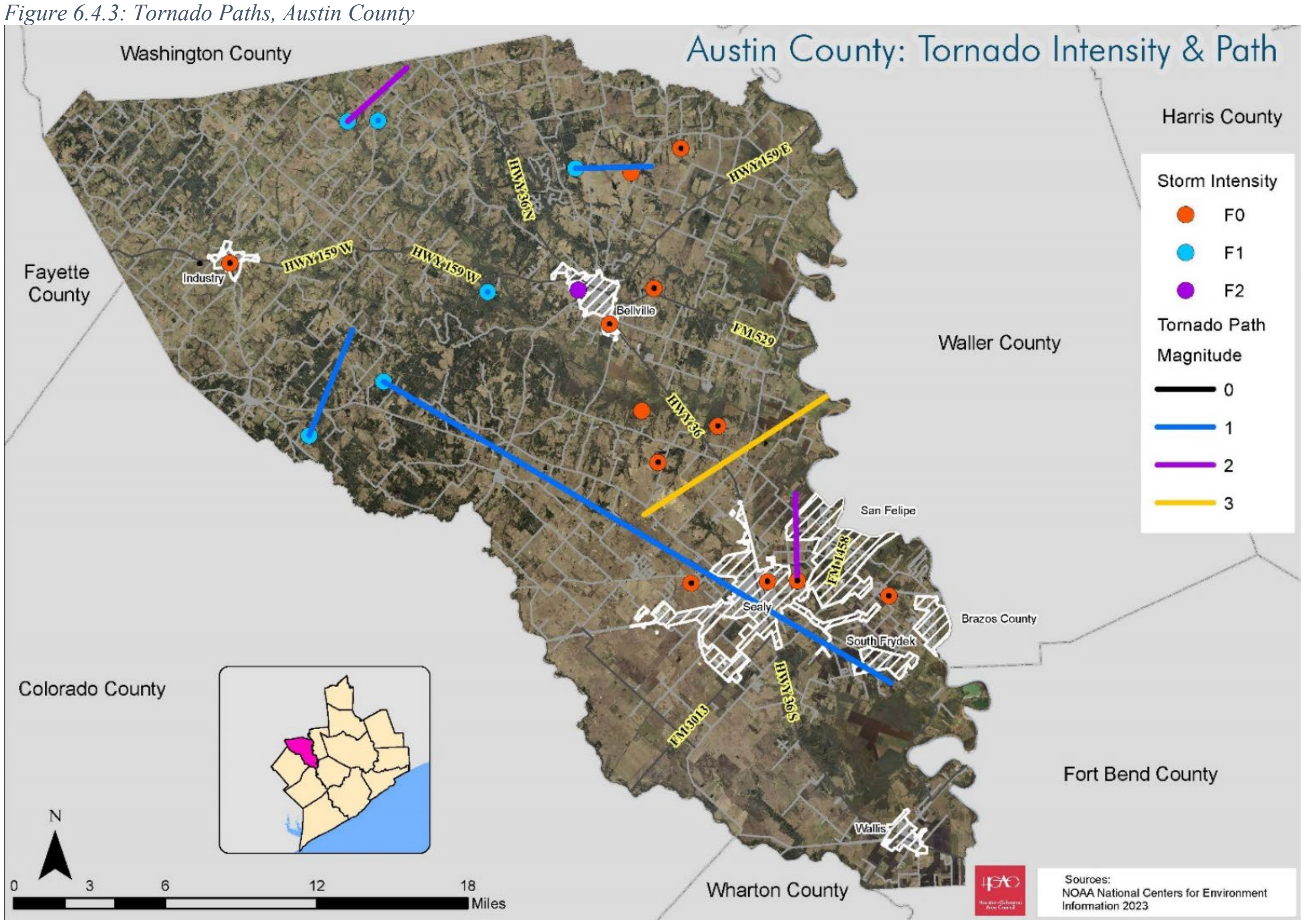


Table 6.4.3:Tornado Occurrences, Austin County

Date	Rating	Location	Property Damage ($)	Crop Damage ($)	Deaths	Injuries
7/31/1992	F0	Austin County	$25,000.00	$0	0	0
5/13/1994	F1	Austin County	$50,000.00	$0	0	0
5/13/1994	F0	Austin County	$0.00	$0	0	0

5/13/1994	F0	Austin County	$5,000.00	$0	0	1
1/12/1995	F0	Sealy	$50,000.00	$0	0	0
10/23/1997	F0	Bellville	$5,000.00	$0	0	0
11/12/2000	F0	Bellville	$15,000.00	$0	0	0
9/4/2001	Funnel Cloud	Sealy	$0.00	$0	0	0
4/10/2004	Funnel Cloud	Bellville	$0.00	$0	0	0
10/7/2004	Funnel Cloud	Bellville	$0.00	$0	0	0
3/29/2006	Funnel Cloud	Bellville	$0.00	$0	0	0
4/27/2009	Funnel Cloud	Shelby	$0.00	$0	0	0
7/20/2011	Funnel Cloud	San Felipe	$0.00	$0	0	0
9/18/2014	Funnel Cloud	Sealy	$0.00	$0	0	0
5/23/2017	Microburst	Sealy	$1,000,000.00	$0	0	0
5/3/2019	Funnel Cloud	Cochran	$0.00	$0	0	0
8/3/2021	Funnel Cloud	Wallis	$0.00	$0	0	0

Presidential Disaster Declarations

There has been 1 disaster declaration in which tornado was included in the declaration title for Austin County, however the declaration itself is listed as a "severe storm" for the incident type. There were 0 disaster declarations for microbursts.[1]

Table 6.4.4: Federal Disaster Declarations, Tornado/ Microburst

Declaration Date	Title	Disaster Number
1/11/2006	Severe storms, tornadoes, straight-line winds, and flooding	4223

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.4.5: USDA Declared Disasters (2018-2023), Tornado/ Microburst

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

Tornado season usually refers to the time of year the U.S. sees the most tornadoes. The peak "tornado season" for the southern Plains (e.g., Texas, Oklahoma, and Kansas) is from May into early June. On the Gulf coast, it is earlier in the spring.[66] According to the FEMA NRI for tornadoes, annualized frequency values are 0.5 events per year over a 72-year period of record (1950-2021), with 12 events on record for this timeframe.[42]

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor the incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts from natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

All residents within the county are exposed to these hazards. Impacts of a tornado/ microburst on life, health, and safety of Austin County residents depends on several factors, including severity of the event and whether adequate warning time was provided to residents to take shelter. Tornadoes/ microbursts can lead to a disruption in emergency response services, shelters, and loss of secure inmate housing while repairs are made to critical facilities within the county. Residents impacted may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings, and debris carried by winds associated with tornadoes/ microbursts can lead to further injury or loss of life. Socially vulnerable populations are most susceptible based on several factors, including their physical and financial ability to react or respond during or directly following a hazard event. Those at a greater risk for adverse impacts due to tornadoes/ microbursts are older populations as they require extra time or outside assistance during evacuations. Older residents are also more likely to seek or need medical attention that may not be available during a storm event. Those that are economically disadvantaged are also more vulnerable because they may not have the funds to recover from such an event as quickly as households that are in a better spot economically. People living in mobile homes are especially at risk from injury and death. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph (Tornadoes of EF 1 and above).

EAL for Austin County each year according to the FEMA NRI for tornadoes is listed as relatively moderate. EAL Exposure and EAL Values for various factors can be found in Table 6.4.6 and 6.4.7 below.[41]

Table 6.4.6: Expected Annual Loss Exposure Values, Tornado/ Microburst

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Tornado	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	Relatively Moderate
Microburst	ND	ND	ND	ND	ND

ND- No Data, N/A- Not Applicable

Table 6.4.7: Expected Annual Loss Values, Tornado/ Microburst

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Tornado	$887,196	$1,604,908/ 0.14	$782
Microburst	ND	ND	ND

The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score. Microburst is not listed as a severe hazard type; Tornado is accounted for.

Figure 6.4.4: Risk Index by Census Tract, Tornado

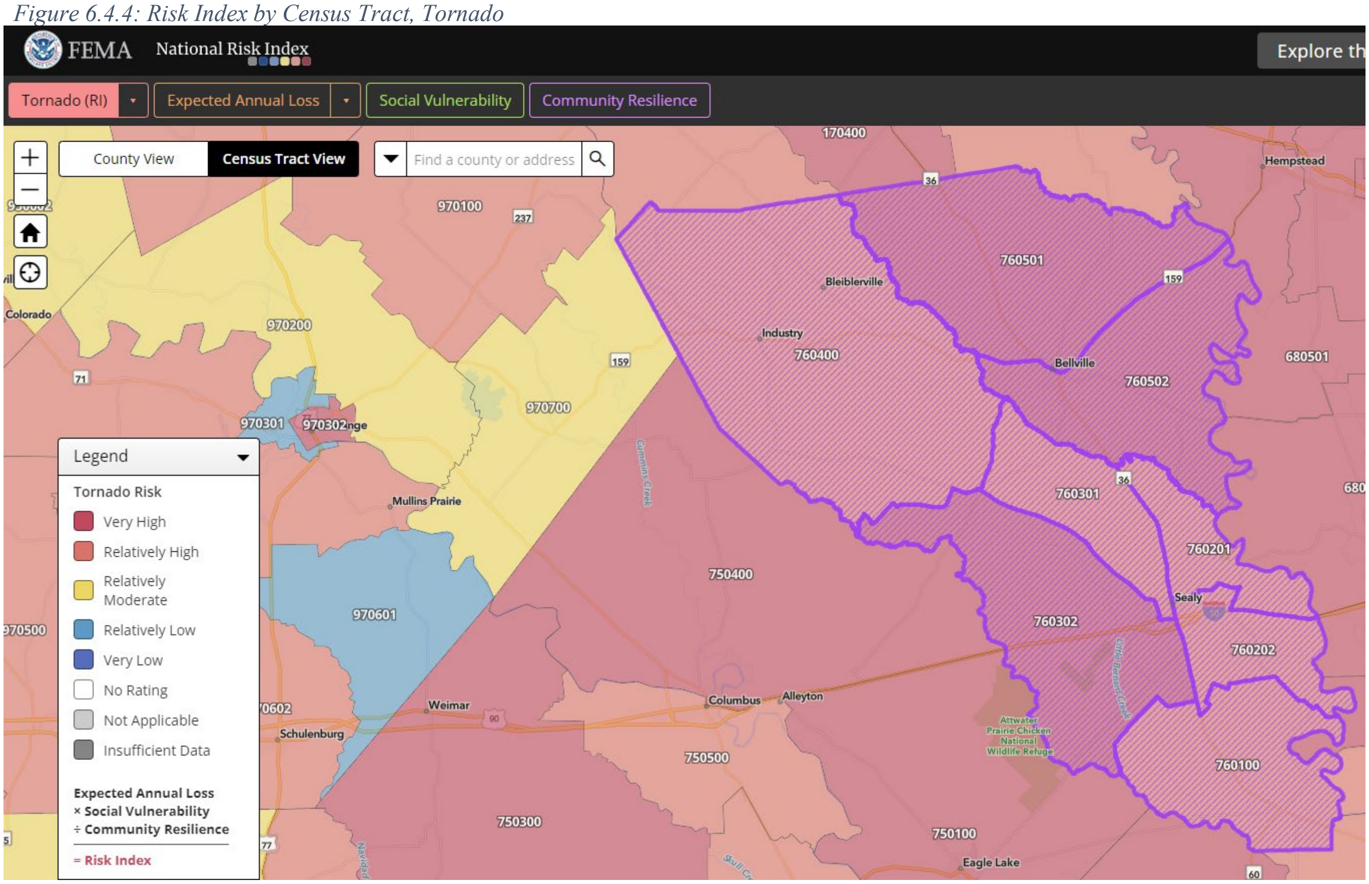


Figure 6.4.5: Social Vulnerability by Census Tract, Austin County

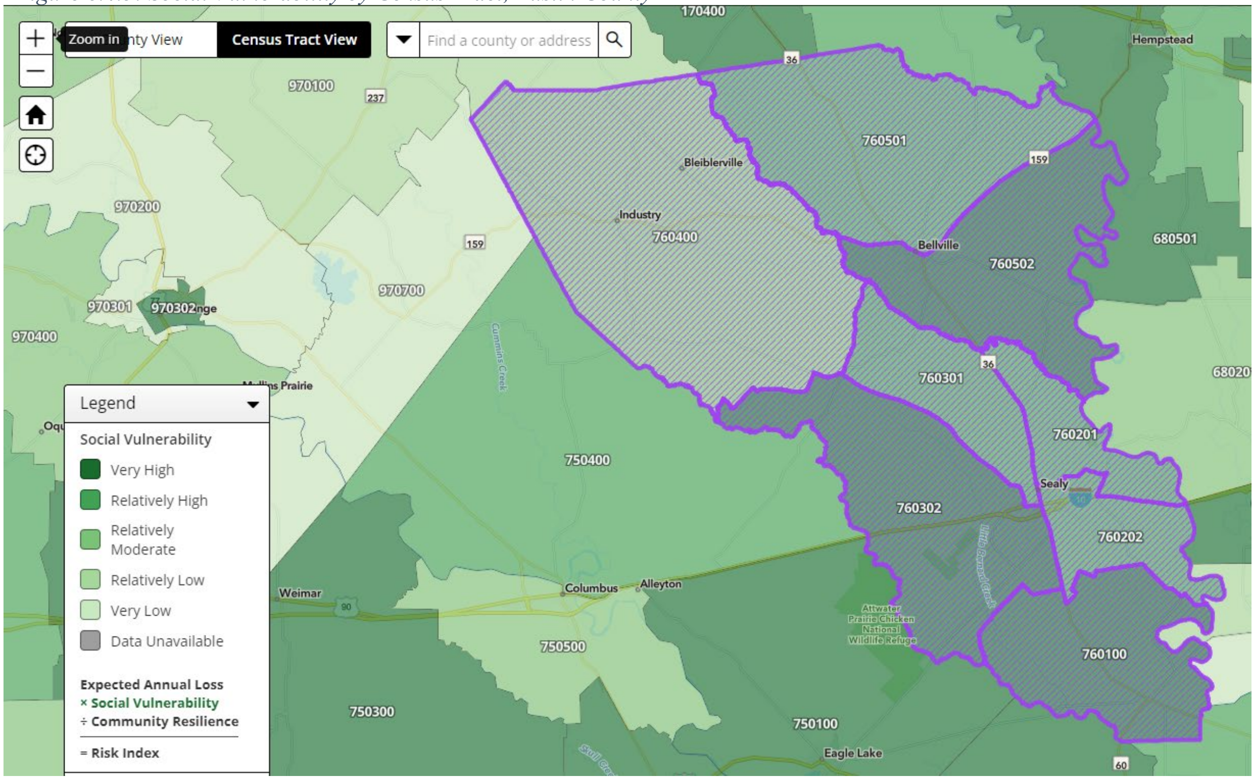


Figure 6.4.6: Community Resilience by Census Tract, Austin County

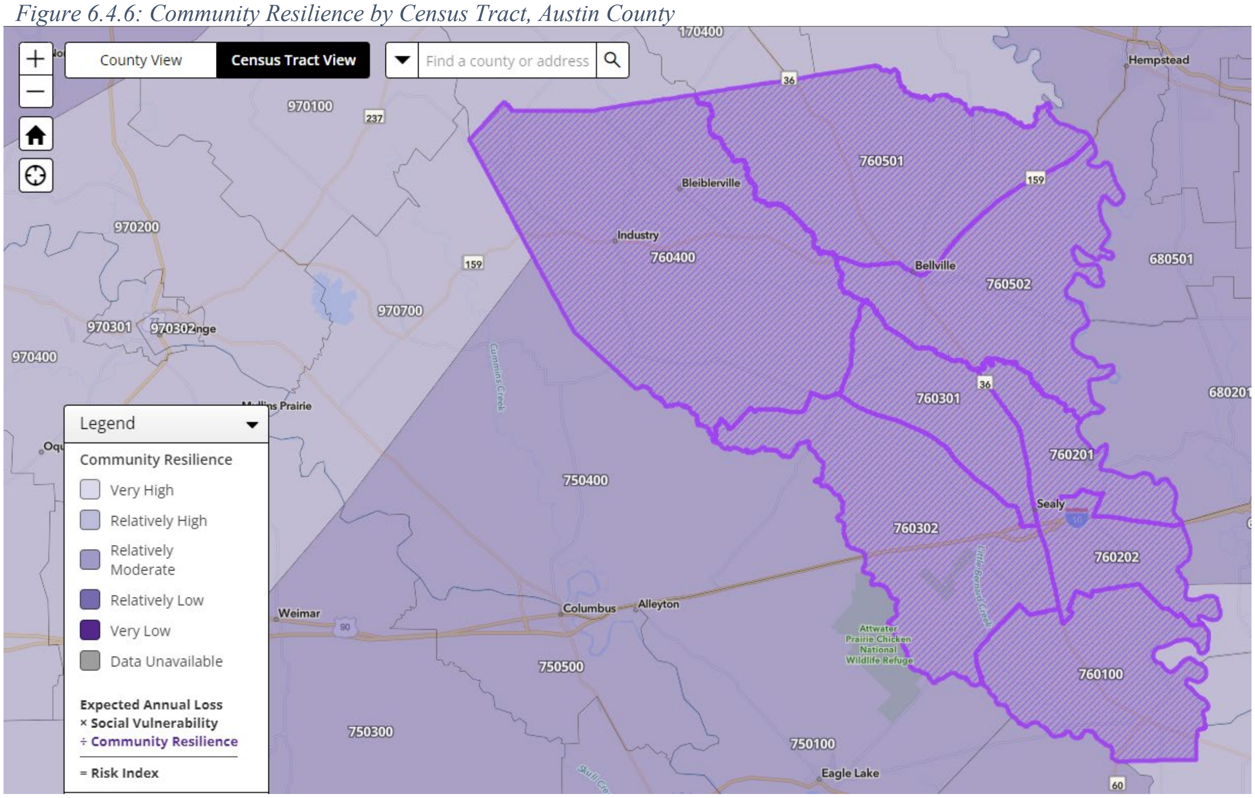


Figure 6.4.7: FEMA NRI Summary, Tornado

Hazard Type: Tornado

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Very High	98.38	0 100
2	Census tract 48015760302	Very High	Relatively Low	Very High	97.79	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Very High	95.03	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively High	92.88	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively High	92.12	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively High	87.04	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively High	80.7	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively High	77.07	0 100

Climate Change Impacts

According to the Office of the Texas State Climatologist, "The most robust trend in tornado activity is a tendency of more tornadoes in large outbreaks, but the factors apparently driving that trend are not projected to continue."[43] Severe thunderstorms and lightning are more likely to occur in summer months when temperatures are higher and moisture from the gulf helps to fuel thunderstorm development, which could lead to the development of tornadoes along the front of the storm if the right conditions exist.

Table 6.4.8: Climate Change Impacts, Tornado/ Microburst

Location	The location of tornadoes and microbursts is not expected to change.
Extent/Intensity	The extent and intensity of tornadoes and microbursts within the county may change (increase) due to increased temperatures and energy available to fuel severe thunderstorms from the warm air within the Gulf of Mexico.
Frequency	Tornadoes and microburst frequency is not expected to change. 62.7 percent of all Texas tornadoes occurred within the three-month period of April, May, and June, with almost one-third of the total tornadoes occurring in May
Duration	The duration of tornadoes and microbursts events is not likely to change, however the intensity of them, or outbreaks is expected to increase.

Section 6.5: Erosion

6.5 Erosion

Soil erosion consists of a series of natural processes that move earth and rock material. The land surface is worn away through the detachment and transport of soil and rock by moving water, wind, and other geologic agents.[69] Erosion removes topsoil (areas with the highest levels of organic matter and nutrients), reduces levels of organic matter within the soil, and creates a less favorable environment for plants due to breakdown within the soil structure. The different types of erosion are described in table 6.5.1 below.

FEMA defines erosion as "The process of the gradual wearing away of land masses. Erosion can occur along coasts and rivers and streams." Although flood-related erosion is covered by flood insurance, this hazard is not covered under the NFIP. The mapping and regulatory standards of the NFIP do not currently address erosion, however, CRS credit is given to communities that include this hazard in their regulations, planning, public information, hazard disclosure, and flood warning programs. For example: communities that have established setbacks and other requirements in areas subject to erosion.

Table 6.5.1: Types of Erosion[70]

Type of Erosion	Description
Wind Erosion	Wind erosion is a natural process that moves loose soil from one location to another. Wind erosion can harm the fields where it picks up soil, as well as the areas where the dirt—and whatever minerals and contaminants it includes—are deposited. It can also have health impacts: worsening air quality, obscuring visibility, and causing people to experience breathing difficulties.
Water Erosion, Rainfall	Occurs when the rainfall intensity that hits the ground exceeds the absorbing capacities or the infiltration rate of soil affected. This leads to soil in water runoff and sediment transport to waterways resulting in deterioration in soil and water quality.
Water Erosion, Sheet	Sheet erosion is the removal of soil in thin, uniform layers (sheets) by raindrop impact and shallow surface water flow. Sheet erosion can sometimes be difficult to detect unless the soil is deposited nearby or if the damage is already severe. This erosion process removes the fine soil particles that contain most of the important nutrients and organic matter.
Water Erosion, Rill	Occurs when runoff becomes concentrated enough to cut small rivulets in the soil that carry sediment down hillsides.
Water Erosion, Gully	Gully Erosion is the washing away of soil through deep grooves or channels across unprotected land. Gully erosion can refer to soil being washed away through human-made drainage lines or describe the process of soil traveling through grooves created by hard rains. Farmers will typically fill these grooves back in with fresh soil as a temporary solution. Gully erosion can hinder the ability to plow fields and grow crops.
Water Erosion, Bank	The progressive undercutting, scouring, and slumping of natural rivers and streams as well as man-made drainage channels by the intense movement of water. When land managers remove vegetation or ranchers allow their livestock to overgraze the land near streams and riverbanks, it can exacerbate the problem.

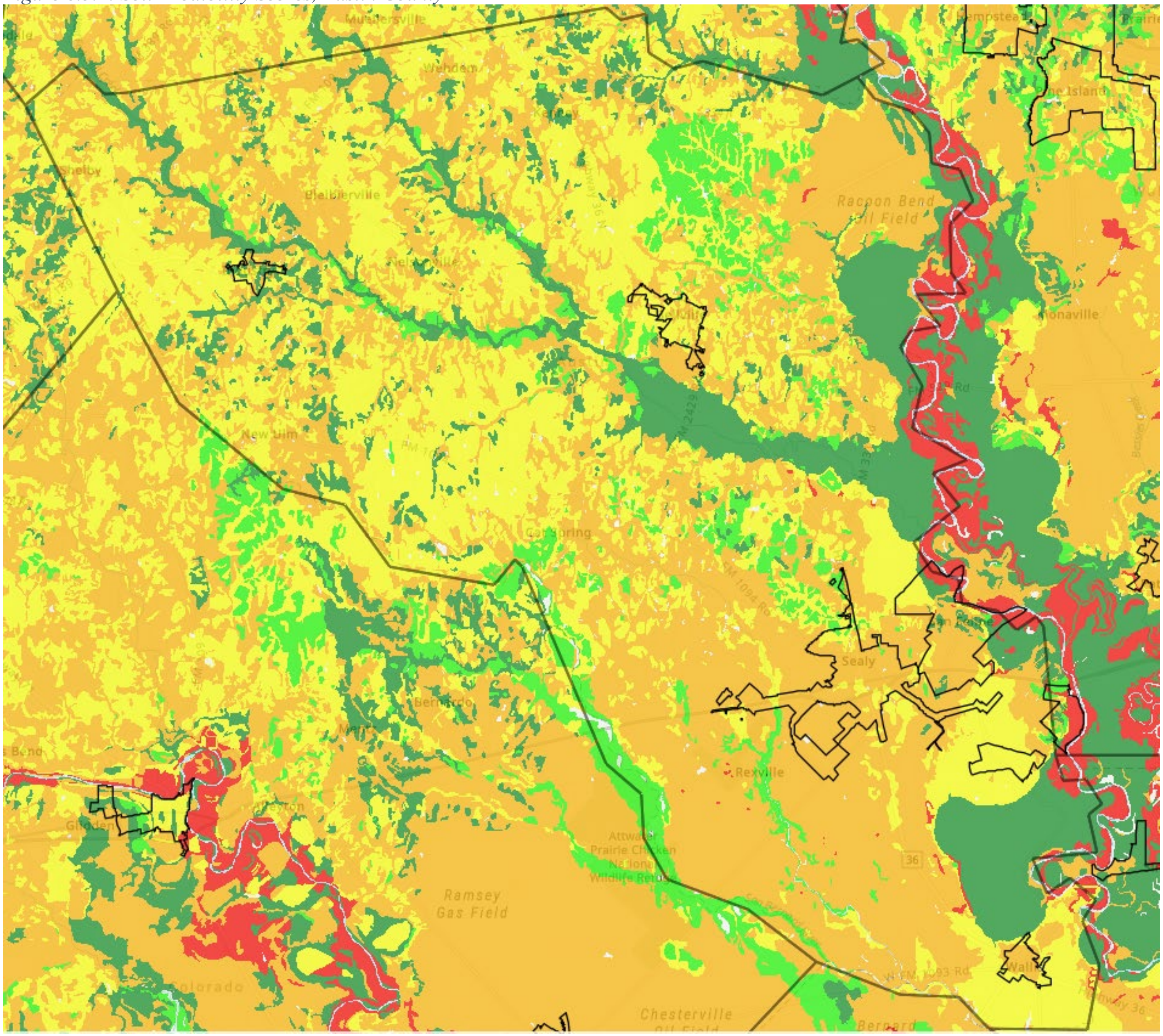
Location

Soil erosion is typically measured in a variety of ways, both qualitative and quantitative. Within the county, inland erosion due to water is the main hazard of concern. One method is the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE). Potential erodibility for sheet and rill erosion is estimated by multiplying the following factors of the Universal Soil Loss Equation USLE: Rainfall and runoff factor (R), Susceptibility of the soil to water erosion (K), and Combined effects of slope length and steepness (LS). The K factor represents the susceptibility of soil to water erosion.[71] Past management or misuse of a soil by intensive cropping can increase a soil's erodibility. The K factor may need to be increased if the subsoil is exposed or where the organic matter has been depleted, the soil's structure destroyed, or soil compaction has reduced permeability.[72] Table 6.5.2 below shows K factor scores, soil descriptions, and their associated soil erodibility. Figure 6.5.1 depicts these k-factors within Austin County. K-factors with high erodibility of 0.4 or greater are depicted in red. The legend breaks down the soil erodibility factor and how they were colored on the map. Areas within the county most susceptible to this hazard are located mainly along the Brazos River, such as the City of San Felipe and City of Brazos Country.

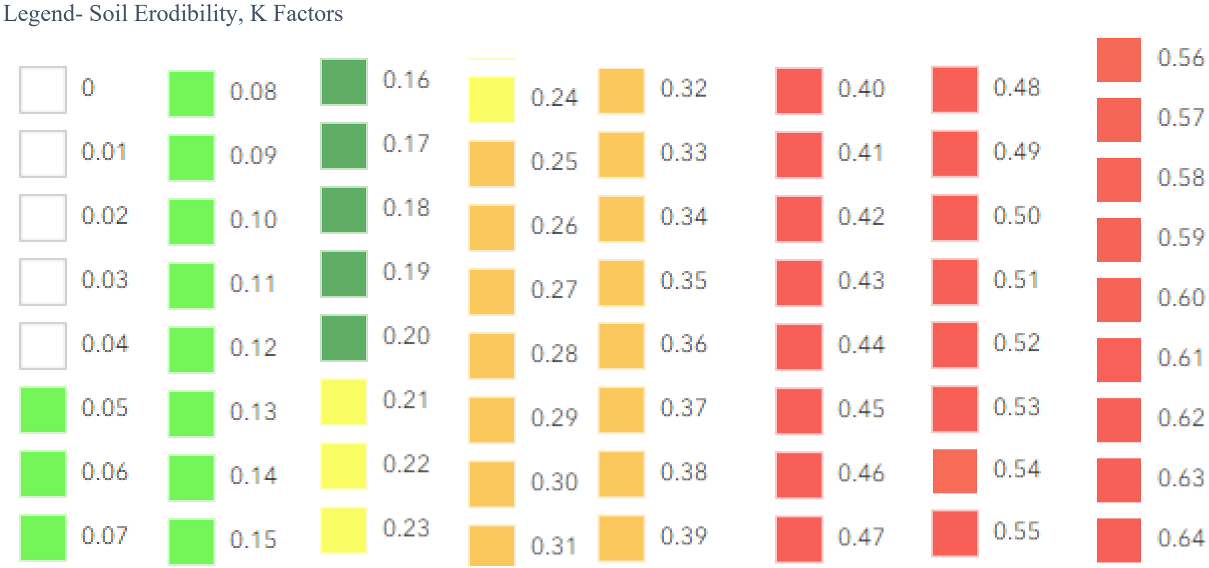
Table 6.5.2: K Factor, Soil Erodibility Scores

K-Factor	Soil Description	Erodibility
0.05 to 0.15	High in clay	Resistant to detachment
0.05 to 0.2	Coarse textured soils, such as sandy soils	Low runoff, easily detached
0.25 to 0.4	Medium textured soils, such as the silt loam soils	Moderately susceptible to detachment and they produce moderate runoff
>0.4	Soils with a high silt content	Most erodible of all soils, easily detached; tend to crust and produce high rates of runoff

Figure 6.5.1: Soil Erodibility Scores, Austin County



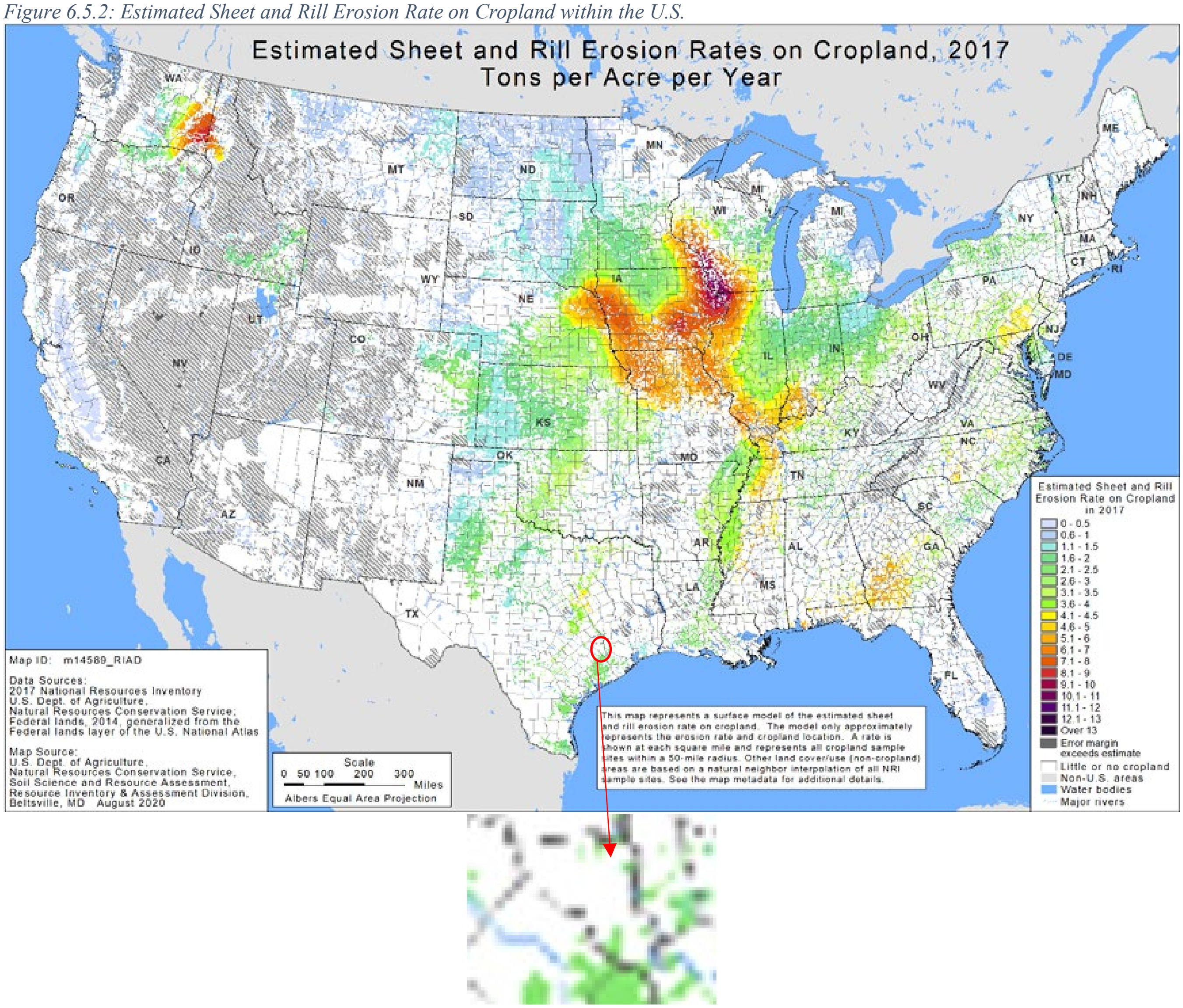
Legend- Soil Erodibility, K Factors



Extent

Soil erosion and its risk of occurring is difficult to measure without proper documentation techniques in place. Measuring certain properties in specific locations in the field, such as the surface and aggregate stability of the soil, infiltration rates, organic matter content, and sediment delivery ratios are all necessary components to quantify the rate of erosion in a given area Furthermore, using these quantitative measurements with photographs or visual observations of the soil or landmarks at specific locations would help to paint a clearer picture if erosion is occurring or likely to occur.[67] Soil erosion rates on cropland within the U.S. decreased 35 percent between 1982 and 2017. The water (sheet and rill) erosion rate declined from 3.89 tons per acre per year to 2.67 tons per acre per year, and the erosion rate due to wind decreased from 3.24 tons per acre per year to 1.96 tons per acre per year.[73] Figure 6.5.2 shows the estimated sheet and rill erosion rates on cropland in tons per acre per year within the U.S. The rate of erosion due to sheet and rill within Austin County ranged from 2.1 to 2.5 tons per acre per year. This map is derived from the 2017 summary resource report developed by the U.S. Department of Agriculture Natural Resources Conservation Service. It is the most recent report available and was published in 2020.

Figure 6.5.2: Estimated Sheet and Rill Erosion Rate on Cropland within the U.S.



Historic Occurrences

During the last HMP update for Austin County in 2017, there were two notable occurrences of erosion. The most notable occurrence in the county took place in San Felipe where the Stephen F. Austin State Park reported building damage due to erosion. Another instance occurred within the City of Brazos Country where the golf course had also experienced erosion, however no damage was reported. San Felipe, Brazos Country, and portions of unincorporated Austin County are located directly along the Brazos River and are susceptible to the effects of erosion.

Presidential Disaster Declarations

There have been no disaster declarations for erosion within Austin County since 1950.[1]

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.5.3: USDA Declared Disasters (2018-2023), Erosion

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

As mentioned above, the rate of erosion on croplands has been decreasing across the U.S. over time. However, the county and jurisdictions at risk for this hazard sit along the Brazos River where erosion could potentially increase if the river crests due to heavy rainfall from other hazards.

Populations at Risk

Populations at risk from erosion include those who work in agricultural fields. Erosion can greatly affect agriculture production through lost revenue and agricultural production. Those who own private property particularly along the Brazos River may be more susceptible to this hazard as damage could require costly repairs and infrastructure reinforcement. The FEMA NRI does not account for erosion within its various analysis of natural hazards. EAL Exposure Values for various factors can be found in Table 6.5.4 below.[42]

Table 6.5.4: Expected Annual Loss Exposure Values, Erosion

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Erosion	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	ND

ND- No Data, N/A- Not Applicable

Climate Change Impacts

Climate change can increase the impacts felt from water erosion from more frequent and intense rainfall, longer periods of extreme heat and drought can lead to an increase in wind erosion, and as wildfires destroy areas- the loss of vegetation and groundcover are more prone to erosion by both wind and water. In addition, soil erosion can drive climate change. Soil is a vast storage center for carbon dioxide, organic matter, and microbes. When soil becomes degraded it can release carbon back into the atmosphere.[68]

Table 6.5.5: Climate Change Impacts, Erosion

Location	The location of erosion is not expected to change.
Extent/Intensity	The extent of erosion is not expected to change.
Frequency	The frequency of erosion is not expected to change. The rate of erosion on croplands have been decreasing across the U.S. over time, however the county and jurisdictions at risk for this hazard sit along the Brazos River where erosion could increase if the river crests due to heavy rainfall from other hazards. Frequency of this hazard is difficult to estimate.
Duration	The duration of erosion is not expected to change.

Section 6.6: Winter Weather

6.6 Winter Weather

Winter weather is defined by NWS as "a winter weather phenomenon (such as snow, sleet, ice, wind chill) that impacts public safety, transportation, and/or commerce. It typically occurs during the climatological winter season between October 15 and April 15."[74]

Location

Winter weather occurs on a regional scale and can happen anywhere within the state or the county.

Extent

The Winter Storm Severity Index (WSSI) is a new product (released in 2022) of the NWS that forecasts the potential impacts of winter storms. NWS has implemented the WSSI to provide the public with a tool that attempts to convey the complexities and hazards associated with winter storms as they relate to potential societal impacts. The WSSI is created using Geographic Information Systems (GIS) by screening the official NWS gridded forecasts from the National Digital Forecast Database (NDFD) for winter weather elements and combining those data with non-meteorological or static information datasets such as land use, climatology, urban areas, etc. The outcome is a graphical depiction of anticipated overall impacts on society due to winter weather. There are numerous datasets used or derived as part of calculating the WSSI.

Table 6.6.1: Winter Storm Severity Index Datasets

Data Source	Dataset
Official NWS Forecast datasets from NDFD	• 6-hour snow accumulation • 6-hour ice accumulation • 6-hour precipitation accumulation (Quantitative Precipitation Forecasts) • Wind speed (hourly time steps) • Temperature (hourly time steps)
Additional derived forecast parameters from other official NWS NDFD	• Total snowfall • Total ice accumulation • Maximum wind speed within each 6-hour period • 6-hourly snowfall accumulation rate • 6-hourly snow-liquid ratio • Average snow-liquid ratio
Daily National Snow Analyses are obtained from the NWS National Operational Hydrologic Remote Sensing Center (NOHRSC)	• Snow depth • Snowpack temperature • Snow water equivalent
Non-forecast datasets	• Urban area designation • Land-use designations • NOAA/NCEI gridded annual snowfall climatology

The WSSI consists of a series of component algorithms, each of which uses meteorological and non-meteorological data to model the predicted severity of specific characteristics of winter weather. Each of the components produces a 0 to 5 output scale value that equates to the potential severity based on the winter weather hazards. The final WSSI value is the maximum value from all the sub-components. The 4 impact levels are given the following descriptors: Minor, Moderate, Major, and Extreme. In addition to the impact levels, a Winter Weather Area is also shown to depict the extent of the winter weather conditions. The WSSI output provides colors, impact classifications, and definitions of the overall expected severity of winter weather, as depicted in Table 6.6.2 below.

Table 6.6.2: Winter Storm Severity Index Impact Classifications and Definitions

Map Color	Associated Impacts	WSSI Definition
	No Impacts	N/A
	Limited Impacts, Winter Weather Area	**Expect winter weather.** Winter driving conditions: **Drive carefully.**
	Minor Impacts	**Expect a few inconveniences to daily life.** Winter driving conditions: **Use caution while driving.**
	Moderate Impacts	**Expect disruptions to daily life.** Winter driving conditions: Hazardous driving conditions. **Use extra caution while driving**. Closures and disruptions to infrastructure may occur.
	Major Impacts	**Expect considerable disruptions to daily life.** Winter driving conditions: Dangerous or impossible driving conditions. **Avoid travel if possible.** Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts	**Expect substantial disruptions to daily life.** Winter driving conditions: Extremely dangerous or impossible driving conditions. **Travel is not advised.** Extensive and widespread closures and disruptions to infrastructure may occur. Life-saving actions may be needed.

The specific sub-components of the WSSI are:

- Snow Load Index- Indicates potential infrastructure impacts due to the weight of the snow. This index accounts for the land cover type. For example, more forested and urban areas will show increased severity versus the same snow conditions in grasslands.
- Snow Amount Index- Indicates potential impacts due to the total amount of snow or the snow accumulation rate. This index also normalizes for climatology, such that regions of the country that experience, on average, less snowfall will show a higher level of severity for the same amount of snow that is forecast across a region that experiences more snowfall on average. Designated urban areas are also weighted a little more than non-urban areas.
- Ice Accumulation- Indicates potential infrastructure impacts (e.g., roads/bridges) due to combined effects and severity of ice and wind. Designated urban areas are also weighted a little more than non-urban areas. Please note that not all NWS offices provide ice accumulation information in the NDFD. In those areas, the ice accumulation is not calculated.
- Blowing Snow Index- Indicates the potential disruption due to blowing and drifting snow. This index accounts for land use type. For example, more densely forested areas will show less blowing snow than open grassland areas.
- Flash Freeze Index- Indicates the potential impacts of flash freezing (temperatures starting above freezing and quickly dropping below freezing) during or after precipitation events.
- Ground Blizzard- Indicates the potential travel-related impacts of strong winds interacting with pre-existing snow cover. This is the only sub-component that does not require snow to be forecast for calculations to be made. The NOHRSC snow cover data along with forecast winds are used to model the ground blizzard. Adjustments are made based on the land cover type. For example, heavily forested areas will have a lower ground blizzard severity than the same conditions occurring across open areas.[75]

NOAA and the NWS also have a variety of watches, warnings, and advisories for freeze, frost, wind, and ice events. A watch is generally issued in the 24 to 72-hour forecast time frame when the risk of a hazardous winter weather event has increased (50 to 80% certainty that warning thresholds will be met). It is intended to provide enough lead time so those who need to set their plans in motion can do so. Warnings are issued when a hazardous winter weather event is occurring, is imminent, or has a very high probability of occurrence (generally greater than 80%). A warning is used for conditions posing a threat to life or property. Advisories are issued when a hazardous winter weather event is occurring, is imminent, or has a very high probability of occurrence (generally greater than 80%). An advisory is for less serious conditions that cause significant inconvenience and, if caution is not exercised, could lead to situations that may threaten life and/or property. Table 6.6.3 describes the various winter weather warnings, watches, and advisories below.[76]

Table 6.6.3: Winter Weather-Related Warnings, Watches, and Advisories

Watch/ Warning/ Advisory	Description
Winter Storm Watch	Issued when conditions are favorable for a significant winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow, or a combination of events.)
Wind Chill Watch	Issued when there is the potential for a combination of extremely cold air and strong winds to create dangerously low wind chill values.
Freeze Watch	Issued when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours.
Winter Storm Warning	Issued for a significant winter weather event including snow, ice, sleet, blowing snow, or a combination of these hazards. Travel will become difficult or impossible in some situations. Delay your travel plans until conditions improve.
Wind Chill Warning	Issued for a combination of very cold air and strong winds that will create dangerously low wind chill values. This level of wind chill will result in frostbite and lead to hypothermia if precautions are not taken. Avoid going outdoors and wear warm protective clothing if you must venture outside.
Freeze Warning	Issued when significant, widespread freezing temperatures are expected.
Ice Storm Warning	Are usually issued for ice accumulation of around 1/4 inch or more. This amount of ice accumulation will make travel dangerous or impossible and likely lead to snapped power lines and falling tree branches. Travel is strongly discouraged.
Blizzard Warning	Issued for frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. A Blizzard Warning means severe winter weather conditions are expected or occurring. Falling and blowing snow with strong winds and poor visibilities are likely, leading to whiteout conditions making travel extremely difficult. Do not travel. If you must travel, have a winter survival kit with you. If you get stranded, stay with your vehicle, and wait for help to arrive.
Winter Weather Advisory	Issued for any amount of freezing rain, or when 2 to 4 inches of snow (alone or in combination with sleet and freezing rain) is expected to cause a significant inconvenience, but not serious enough to warrant a warning.
Wind Chill Advisory	Issued when wind chills of -5F to -19F are expected east of the Blue Ridge Mountains and when wind chills of -10 to -24F are expected along and west of the Blue Ridge Mountains and in Frederick and Carroll Counties in Maryland.
Frost Advisory	Issued when the minimum temperature is forecast to be 33 to 36 degrees on clear and calm nights during the growing season.

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County winter weather-related events data from 1950-2023 is provided in the table below.[39]

Table 6.6.4: Historic Occurrences, Winter Weather

Date	Description	Death/Injury	Property Damage	Crop Damage
1/12/1997	Ice Storm	0/ 0	$0	$0
1/16/2007	Ice Storm	0/ 0	$1,000	$0
2/3/2011	Ice Storm	0/ 0	$0	$0
2/3/2011	Ice Storm	0/ 0	$0	$0
12/7/2013	Winter Weather	0/ 0	$0	$0
2/15/2021	Extreme Cold/ Wind Chill	0/ 0	$25,000	$0
2/3/2022	Winter Weather	0/ 0	$0	$0

Presidential Disaster Declarations

There have been 2 disaster declarations for winter weather within Austin County since 1953.[1]

Table 6.6.5: Federal Disaster Declarations, Winter Weather

Declaration Date	Title	Disaster Number
2/14/2021	Severe Winter Storm	3554
2/19/2021	Severe Winer Storms	4586

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.6.6: USDA Disaster Declarations (2018-2023), Winter Weather

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

The table below shows FEMA NRI annualized frequency values for winter weather and related hazards.

Table 6.6.7: Annualized Frequency Values, Cold Wave, Ice Storm, and Winter Weather

Hazard Type	Annualized Frequency	Events on Record	Period of Record
Cold Wave	0.1 events per year	2	2005-2021 (16 years)
Ice Storm	0.7 events per year	48	1946-2014 (67 years)
Winter Weather	0.5 events per year	8	2005-2021 (16 years)

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor the incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts from natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

The Gulf Coast and Southeast Texas region are generally not used to snow, ice, and freezing temperatures. When cold air penetrates south across Texas and Florida, into the Gulf of Mexico, temperatures fall below freezing. This can kill vulnerable vegetation, such as flowering plants and the citrus fruit crop. Wet snow and ice rapidly accumulate on trees with leaves, causing the branches to snap under the load. Motorists are generally unaccustomed to driving on slick roads and traffic accidents increase. Some buildings are poorly insulated or lack heat altogether. Local towns may not have available snow removal equipment or treatments, such as sand or salt for icy roads.[77] Populations at risk include adults over 65 years of age and children, who according to the CDC are the most vulnerable populations to winter weather-related illnesses. Additionally, Austin County experiences significant financial annual losses to winter weather. Most of these losses are attributed ice storms that cause dangerous driving conditions, falling trees, and power outages in homes. The most notable vulnerabilities throughout the county to this hazard are the dangerous driving conditions and power outages.

The FEMA NRI accounts for winter weather in various formats, these are cold waves, ice storms, and winter weather. EAL Exposure Values for Austin County each year according to the FEMA NRI for these hazards are listed as relatively low.[42] EAL Exposure Values and EAL Values can be found in Tables 6.6.8 and 6.6.9 below.

Table 6.6.8: Expected Annual Loss Exposure Values, Cold Wave, Ice Storm, and Winter Weather

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Cold Wave, Ice Storm, and Winter Weather	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	Relatively Low

Table 6.6.9: Expected Annual Loss Values, Cold Wave, Ice Storm, and Winter Weather

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Cold Wave	$1,235	$82,576/ 0.01	$15,923
Ice Storm	$5,763	$39,920/ 0.00	N/A
Winter Weather	$2,031	$41,531/ 0.00	$296

N/A- Not Applicable

Historic loss ratios, according to the FEMA NRI, for cold waves and ice storms within Austin County are very low. Winter weather historic loss ratio is listed as relatively moderate.

The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score.

Figure 6.6.1: Risk Index by Census Tract, Cold Wave

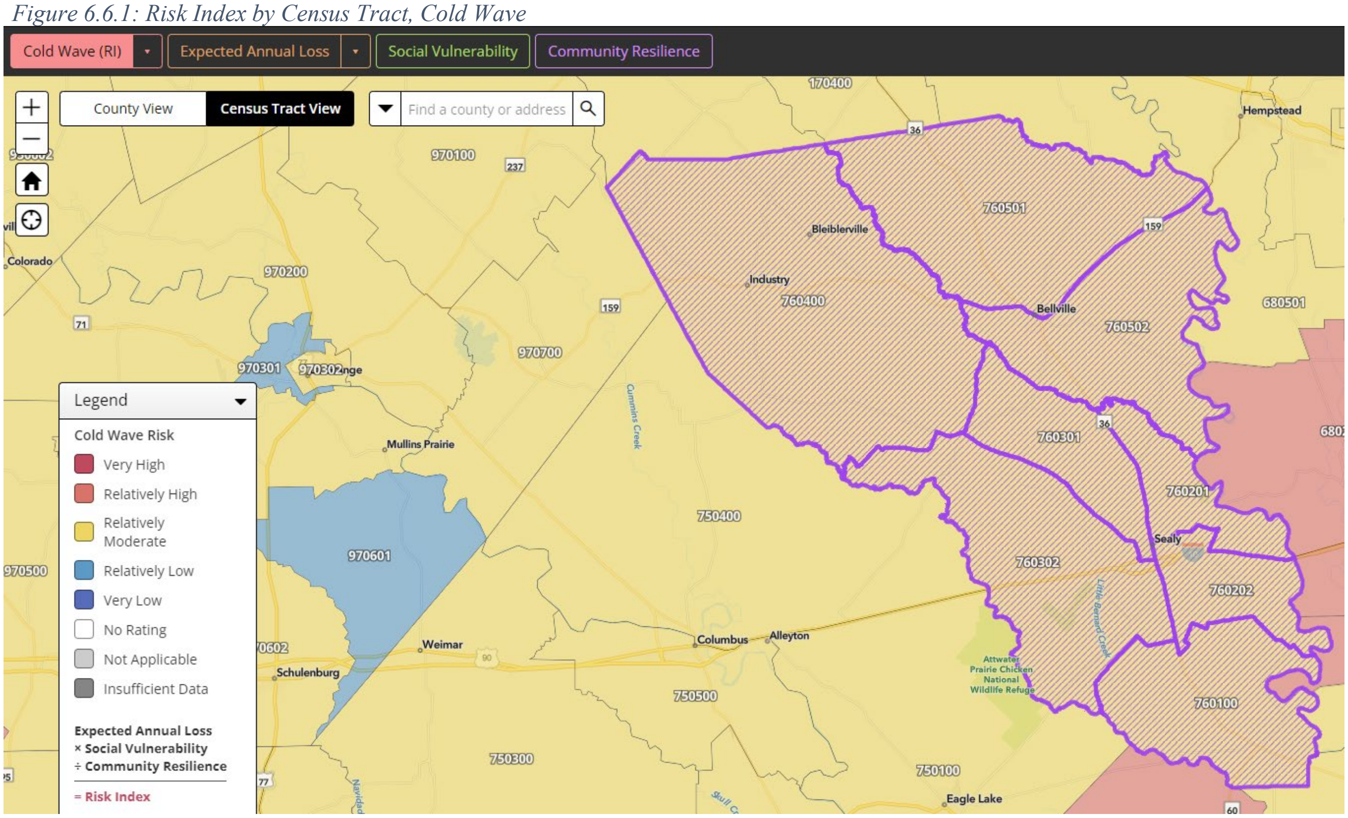


Figure 6.6.2: Risk Index by Census Tract, Ice Storm

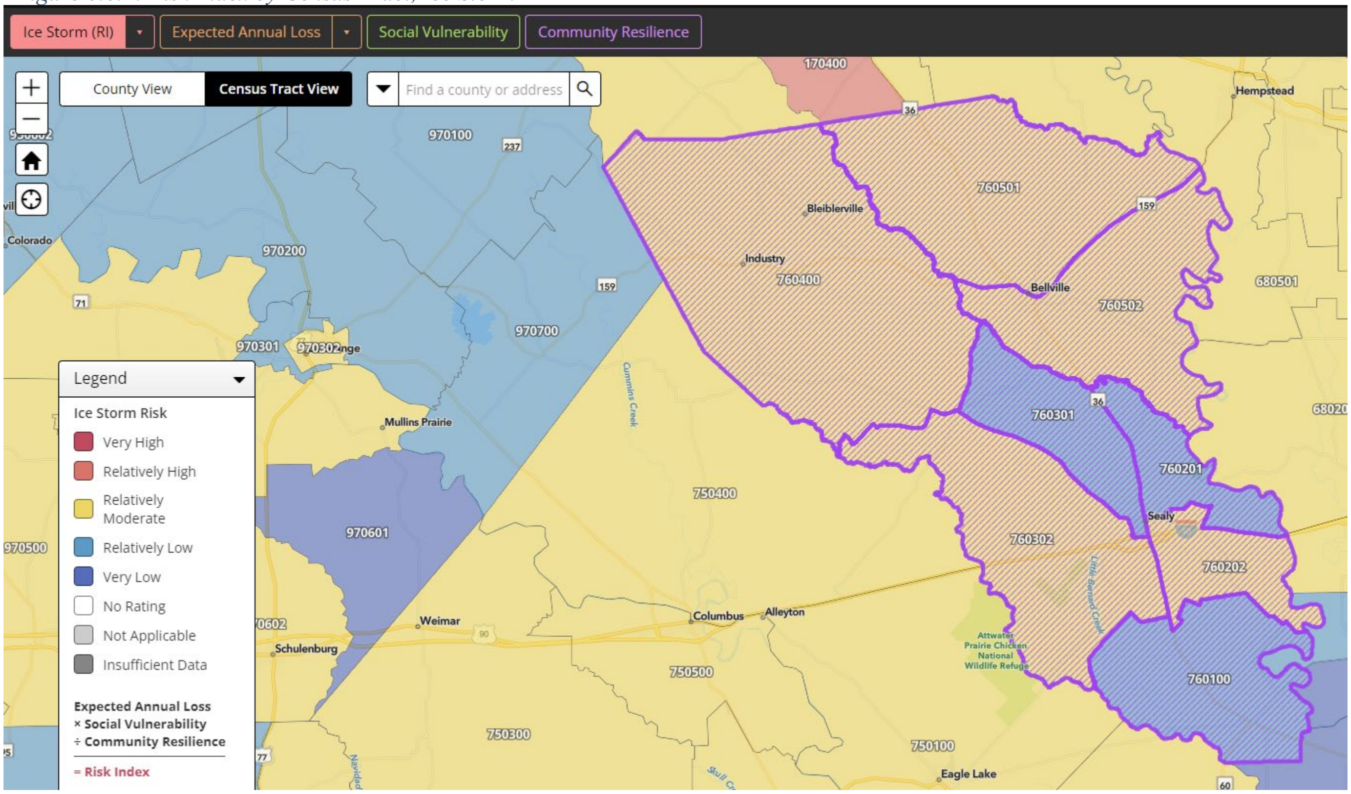


Figure 6.6.3: Risk Index by Census Tract, Winter Weather

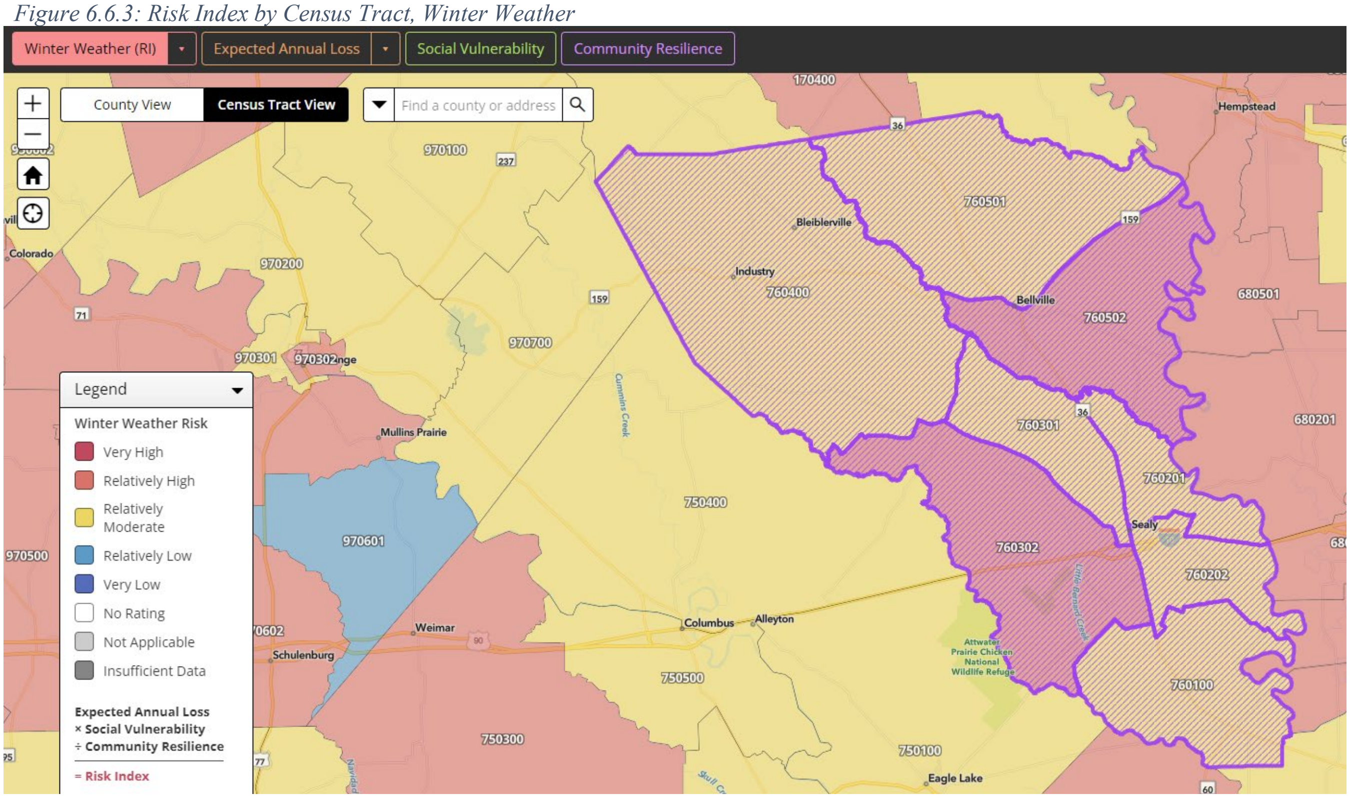


Figure 6.6.4: Social Vulnerability by Census Tract, Austin County

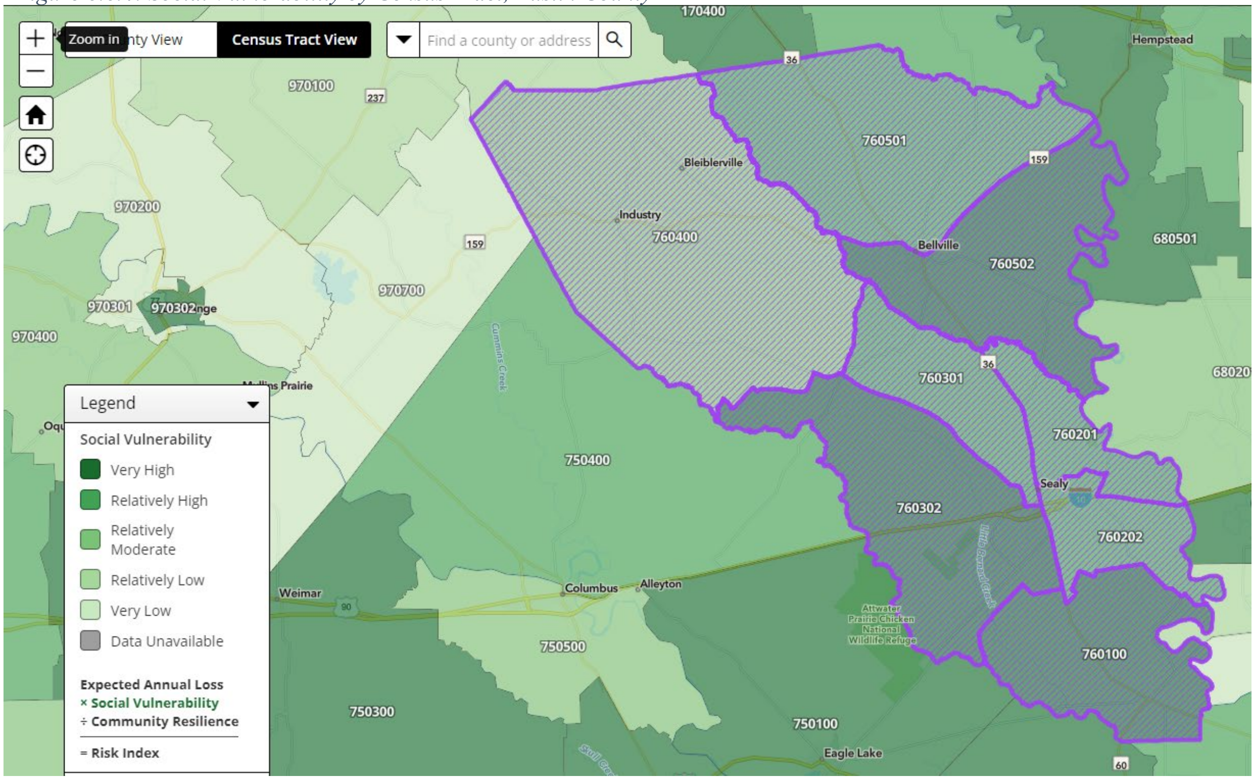


Figure 6.6.5: Community Resilience by Census Tract, Austin County

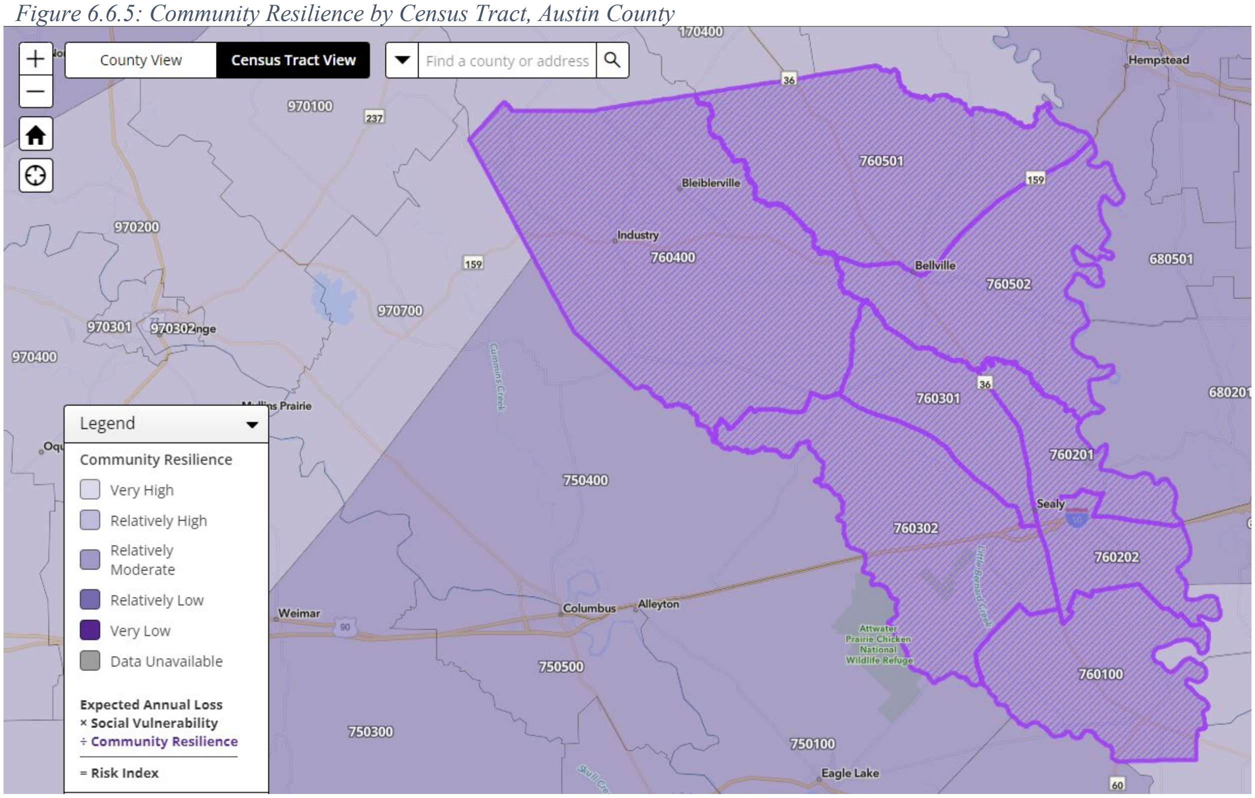


Figure 6.6.6: FEMA NRI Summary, Cold Wave

Hazard Type: Cold Wave

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively Moderate	89.23	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	88.72	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Moderate	84.91	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Moderate	83.5	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Moderate	82.02	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Moderate	81.78	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Moderate	78.9	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Moderate	75.13	0 100

Figure 6.6.7: FEMA NRI Summary, Ice Storm

Hazard Type: Ice Storm

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively Moderate	80.53	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	79.08	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Moderate	74.6	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Moderate	73.41	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Moderate	70.66	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Low	68.68	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Low	67.42	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Low	60.13	0 100

Figure 6.6.8: FEMA NRI Summary, Winter Weather

Hazard Type: Winter Weather

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively High	88.35	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively High	87.28	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Moderate	83.17	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Moderate	82.32	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Moderate	77.64	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Moderate	76.31	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Moderate	75.15	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Moderate	69.83	0 100

Climate Change Impacts

As stated above, the Gulf Coast and Southeast Texas region are generally not used to snow, ice, and freezing temperatures. According to the Office of the Texas State Climatologist, in the southern part of the state and in coastal regions, snow is rare, but nonetheless, large accumulations of snow are possible. Climate model projections have shown the risk of snowfall consistently decreases in climates like that of Texas.[43]

Table 6.6.10: Climate Change Impacts, Winter Weather

Location	The location of winter weather is not expected to change.
Extent/Intensity	The extent of winter weather is not expected to change.
Frequency	The frequency of winter weather is expected to decrease.
Duration	The duration of winter weather is expected to decrease.

Section 6.7: Drought & Expansive Soils

6.7 Drought & Expansive Soils

The NWS defines drought as "A deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area." The American Meteorological Survey defines drought as "A period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance."[78] Drought can have several different classifications for monitoring purposes. Table 6.7.1 below outlines these classifications and their definitions.

Table 6.7.1: Drought Classifications

Drought Classification	Definition
Meteorological	When dry weather patterns dominate an area.
Hydrological	When low water supply becomes evident in the water system.
Agricultural	When crops become affected by drought.
Socioeconomic	When the supply and demand of various commodities is affected by drought.
Ecological	When natural ecosystems are affected by drought.

Expansive or swelling soils are soils intertwined with layers of various clay particles that can absorb large quantities of water. Changes in precipitation or other moisture conditions cause these soils to shrink and swell. They can expand up to 20% by volume when exposed to water and exert a force of up to 30,000 pounds per square foot, enough to break up any structure they encounter. Expansive soils are one of the nation's most prevalent causes of damage to buildings and construction. Annual losses are estimated in the billions of dollars. Losses include severe structural damage, cracked driveways, cracked or upheaval in sidewalks, slab on grade foundations, roads, and highway structures, which can lead to the condemnation of buildings and disruption of pipelines and sewer lines. The destructive forces of these soils may be upward, horizontal, or both, and can be exacerbated by drought conditions.[79] For this plan update, drought & expansive soils are included in the same hazard profile as they directly correlate to greater losses and risk for the county.

Location

Drought can lead to a wide range of impacts on agriculture, public health, water quality, ecosystems, transportation, and wildfire risk. This is a reoccurring natural hazard in every Texas county and has no geographic boundary. Droughts are also difficult to predict and monitor as the effects vary from region to region.[80] All of Austin County and its residents are susceptible to drought and its impacts.

Similarly, expansive soils pose a greater risk during times of drought followed by heavy rainfall and periods of dryness. Figure 6.7.1 below shows the expansive soil locations and their shrink-swell potentials within Austin County. Figures 6.7.2 through 6.7.8 show these expansive soils within each participating jurisdiction of this plan. Areas with high shrink-swell potentials are more at risk for damage than those with low shrink-swell potential.

Figure 6.7.1: Expansive Soils, Austin County

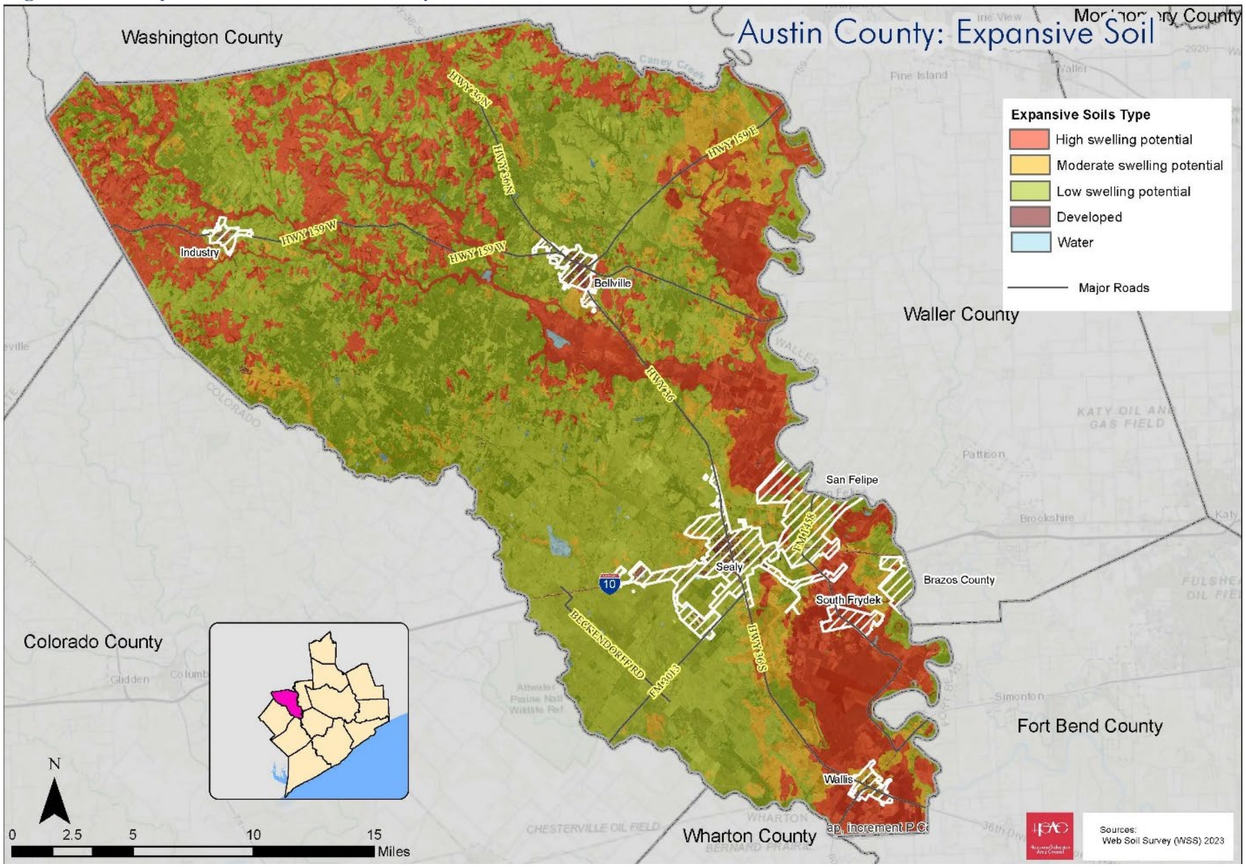


Figure 6.7.2: Expansive Soils, City of Bellville

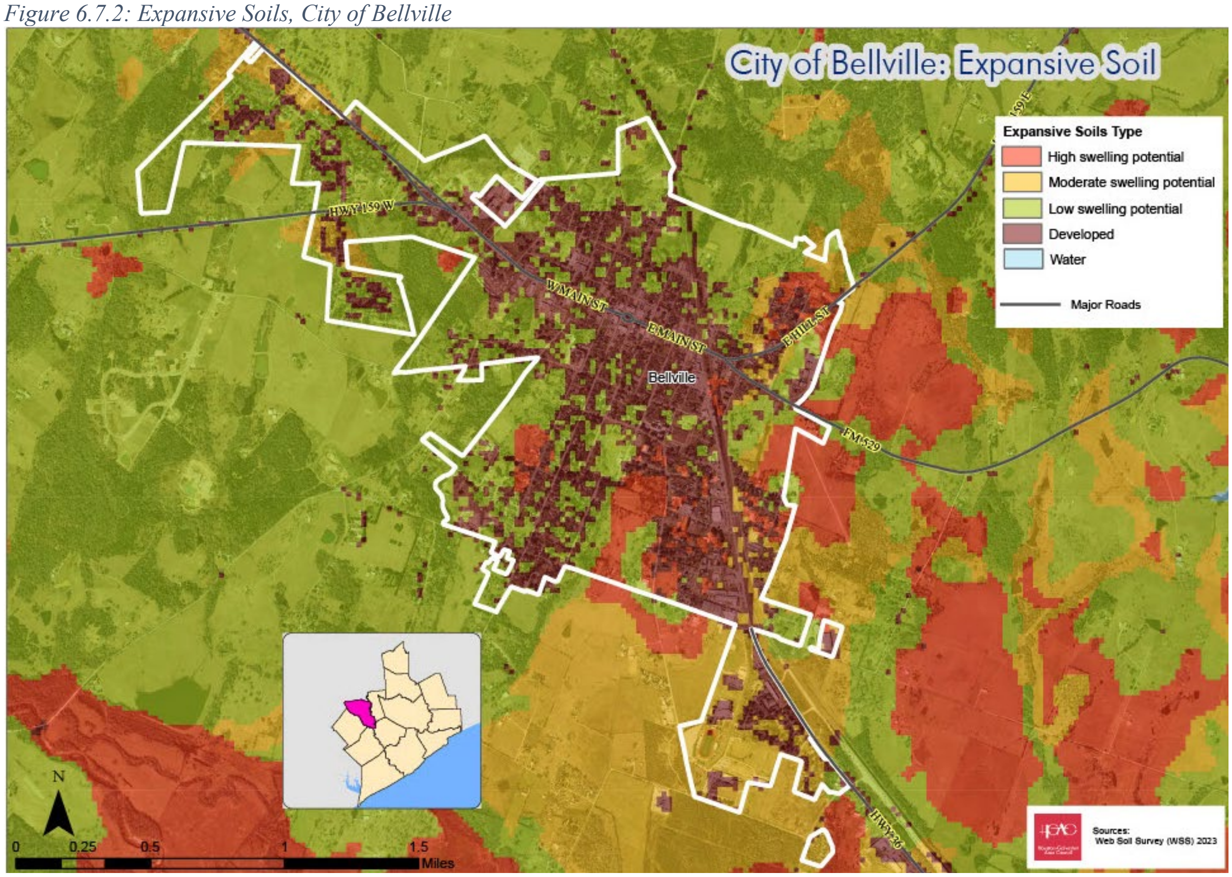


Figure 6.7.3: Expansive Soils, City of Brazos Country

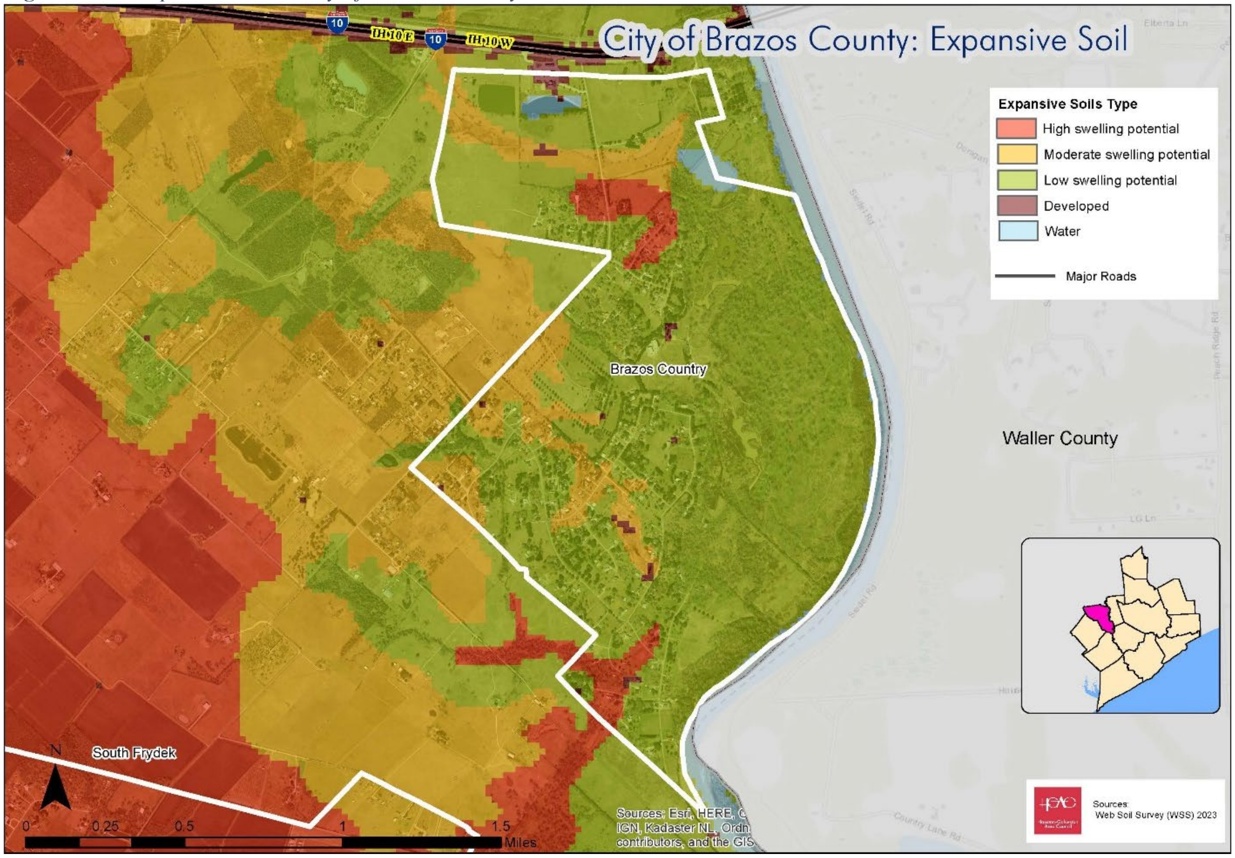


Figure 6.7.4 Expansive Soils, City of Industry

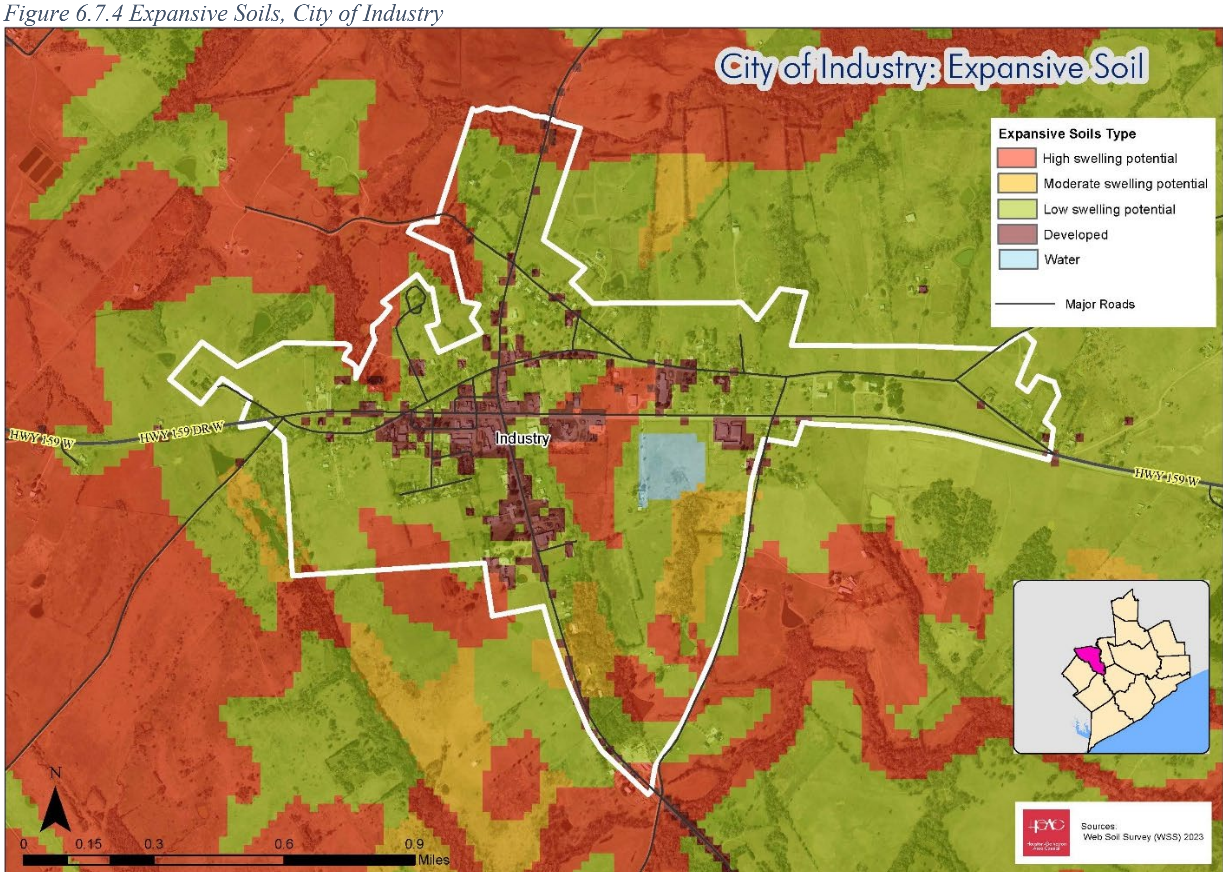


Figure 6.7.5 Expansive Soils, City of San Felipe

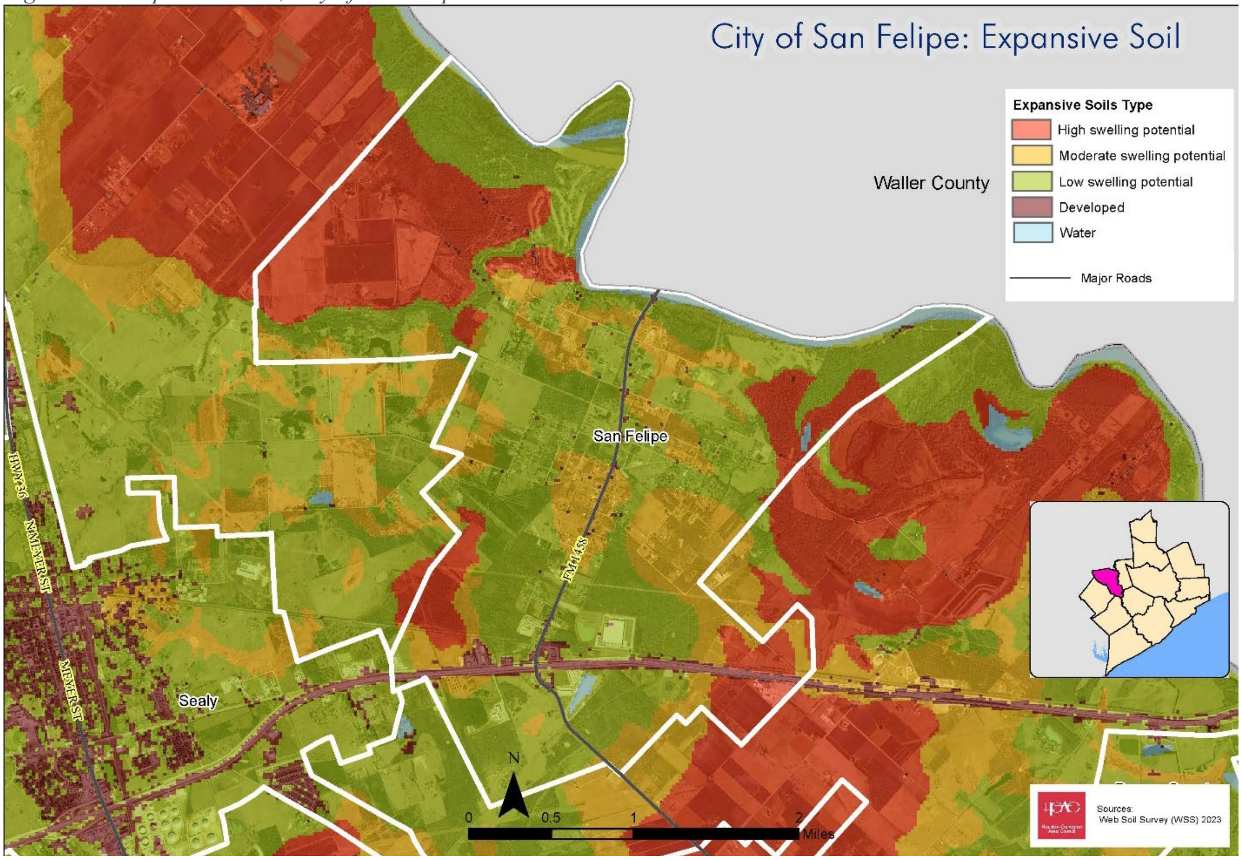


Figure 6.7.6: Expansive Soils, City of Sealy

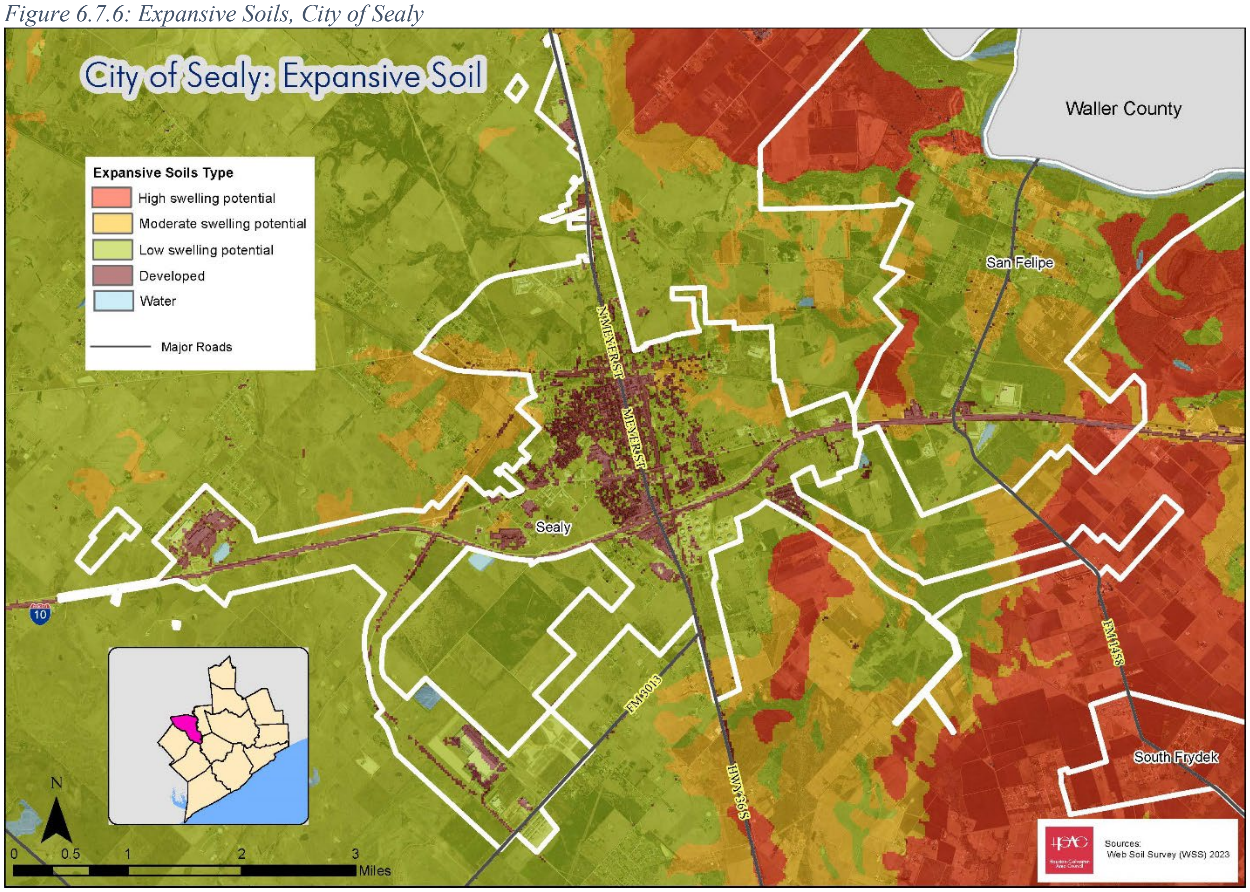


Figure 6.7.7: Expansive Soils, City of South Frydek

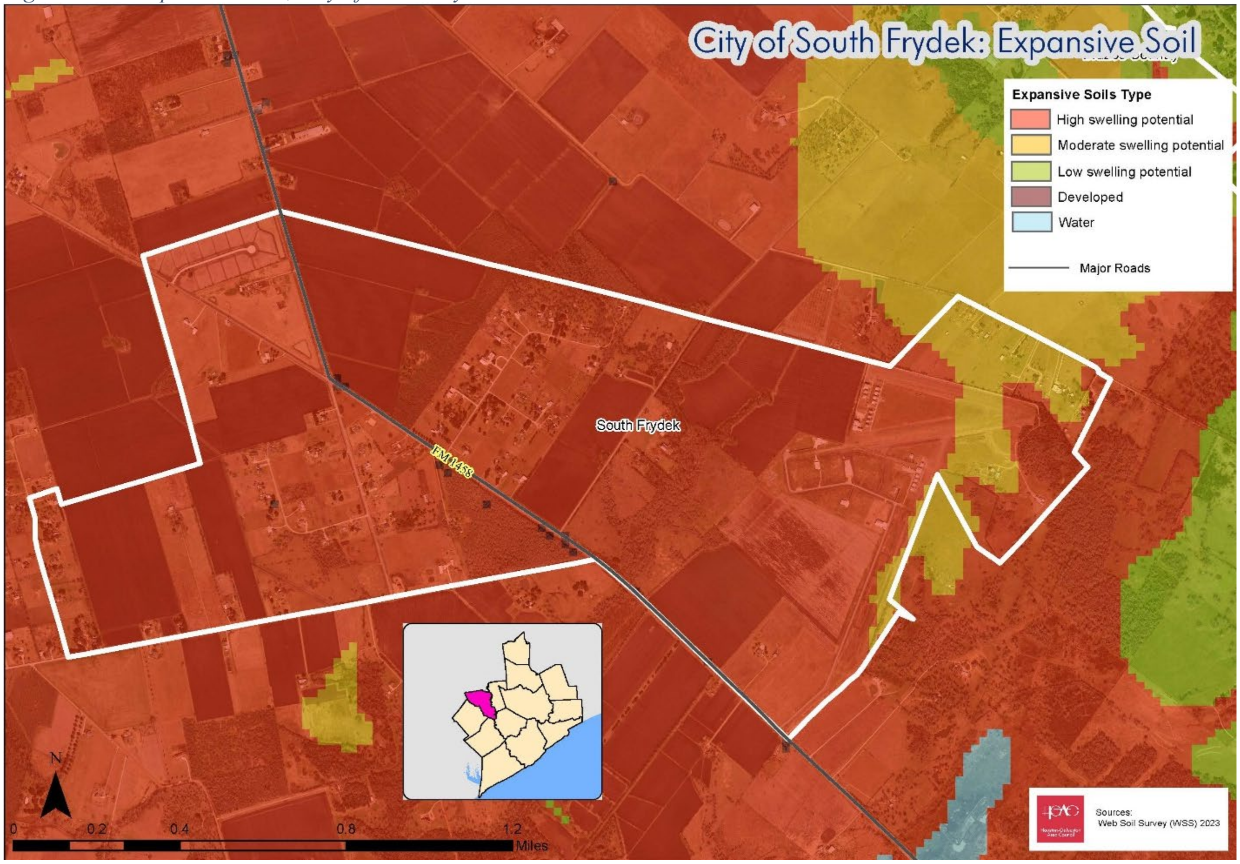
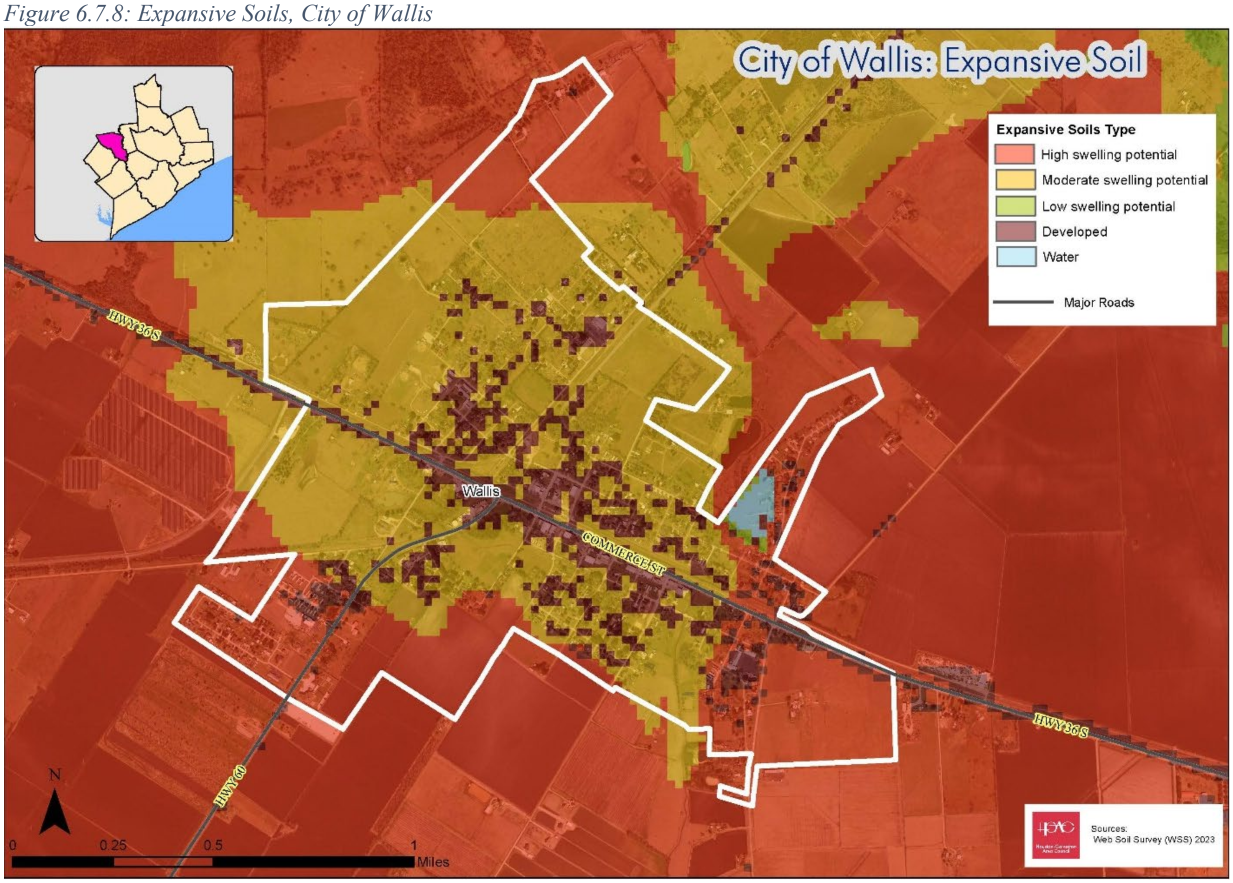


Figure 6.7.8: Expansive Soils, City of Wallis



Extent

The U.S. Drought Monitor (USDM) is a map that is updated each Thursday to show the location and intensity of drought across the country. The USDM uses a five-category system to classify levels of drought. These categories, seen in Figure 6.7.9 below, show experts' assessments of conditions related to dryness and drought including observations of how much water is available in streams, lakes, and soils compared to usual for the same time of year.[81]

Figure 6.7.9: Drought Monitor Categories

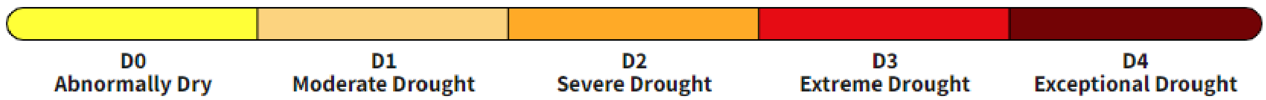
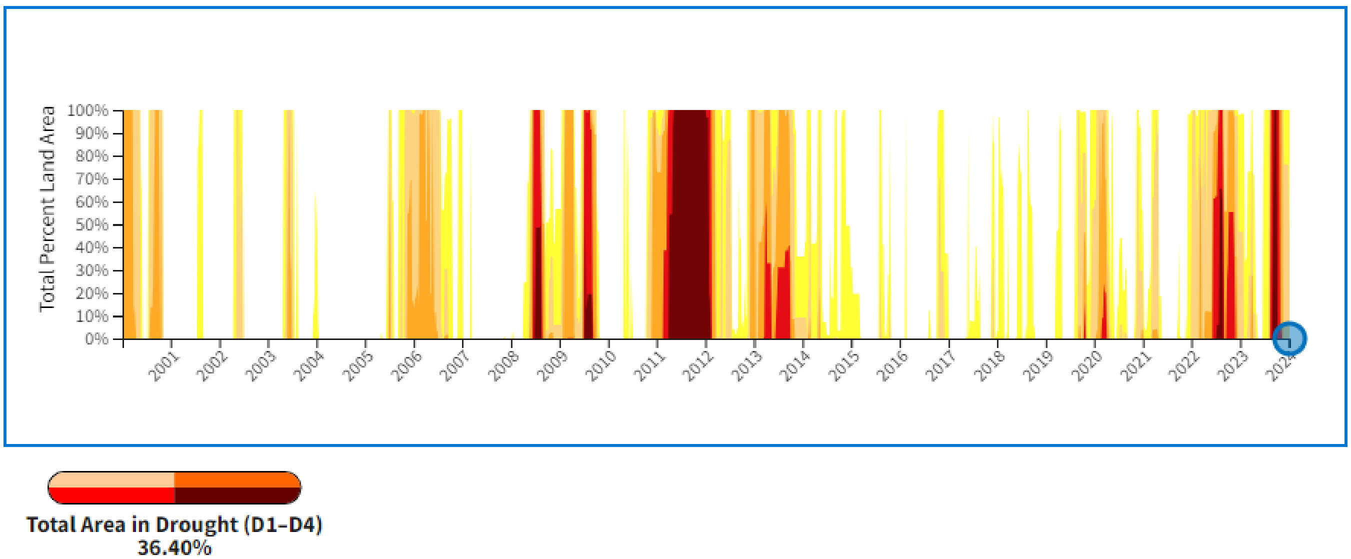


Figure 6.7.10 shows the USDM Drought Categories for Austin County since 2000. The county experienced drought levels of D1-D4 36.4%. The risk of drought occurring applies the same to the entire county. There are no known factors that make one area or community more prone to drought events than another. However, drought can adversely impact individuals employed in agriculture and natural resources over other industries. Severe droughts can also lead to crop and livestock losses, impacting the food supply and economy.[82]

Figure 6.7.10: U.S. Drought Monitor for Austin County (2000-2024)



The chart below shows the Linear Extensibility Percent (LEP) and Coefficient of Linear Extent (COLE) to show the Shrink-Swell Class of expansive soils. COLE is a test frequently used to characterize expansive soils. COLE is a measure expressed as a fraction of the change in a soil sample dimension from the moist to dry state. The LEP is a measure expressed as a percentage of the change in a soil sample dimension from the moist to dry state. The Shrink-Swell Class is found in comparing these two measurements. A Moderate to Very High rating marks soils that have the potential to contract and expand, leading to damage to critical infrastructure, foundations, and transportation structures. While most of the participating jurisdictions in this plan update have some degree of low swelling potential soils, the Cities of South Frydek and Wallis are located almost entirely within areas that have soils with moderate and high shrink-swell potentials.

Table 6.7.2: Linear Extensibility Percent & Coefficient of Linear Extent for Expansive Soils

Shrink-Swell Class	Linear Extensibility Percent	Coefficient of Linear Extent
Low	3	0.03
Moderate	3 to 6	.03-.06
High	6 to 9	.06-.09
Very High	Greater than or equal to 9	Greater than or equal to 0.09

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County drought events data from 1950-2023 is provided in the table below.[39]

Table 6.7.3: Austin County Drought Events (1950-2023)

Event Date	Fatalities	Property Damage Estimate	Crop Damage Estimate
4/1/1996	0	$-	$-
5/1/1996	0	$-	$-
6/1/1996	0	$-	$-
5/1/1998	0	$-	$-
6/1/1998	0	$-	$-
7/1/1998	0	$-	$-
8/1/1998	0	$1,000,000.00	$7,300,000.00
8/1/2000	0	$-	$-
9/1/2000	0	$-	$-
6/1/2022	0	$-	$-
7/1/2022	0	$-	$-
8/1/2022	0	$-	$-
9/1/2023	0	$-	$-
TOTALS:	**0**	**$1,000,000.00**	**$7,300,000.00**

Presidential Disaster Declarations

Presidential major disaster declarations, which must be requested of the President by a governor, are administered through FEMA. A Presidential major disaster declaration can be made within days or hours of the initial request. There have been no federally declared drought disasters for drought within the county since 1950.[1]

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

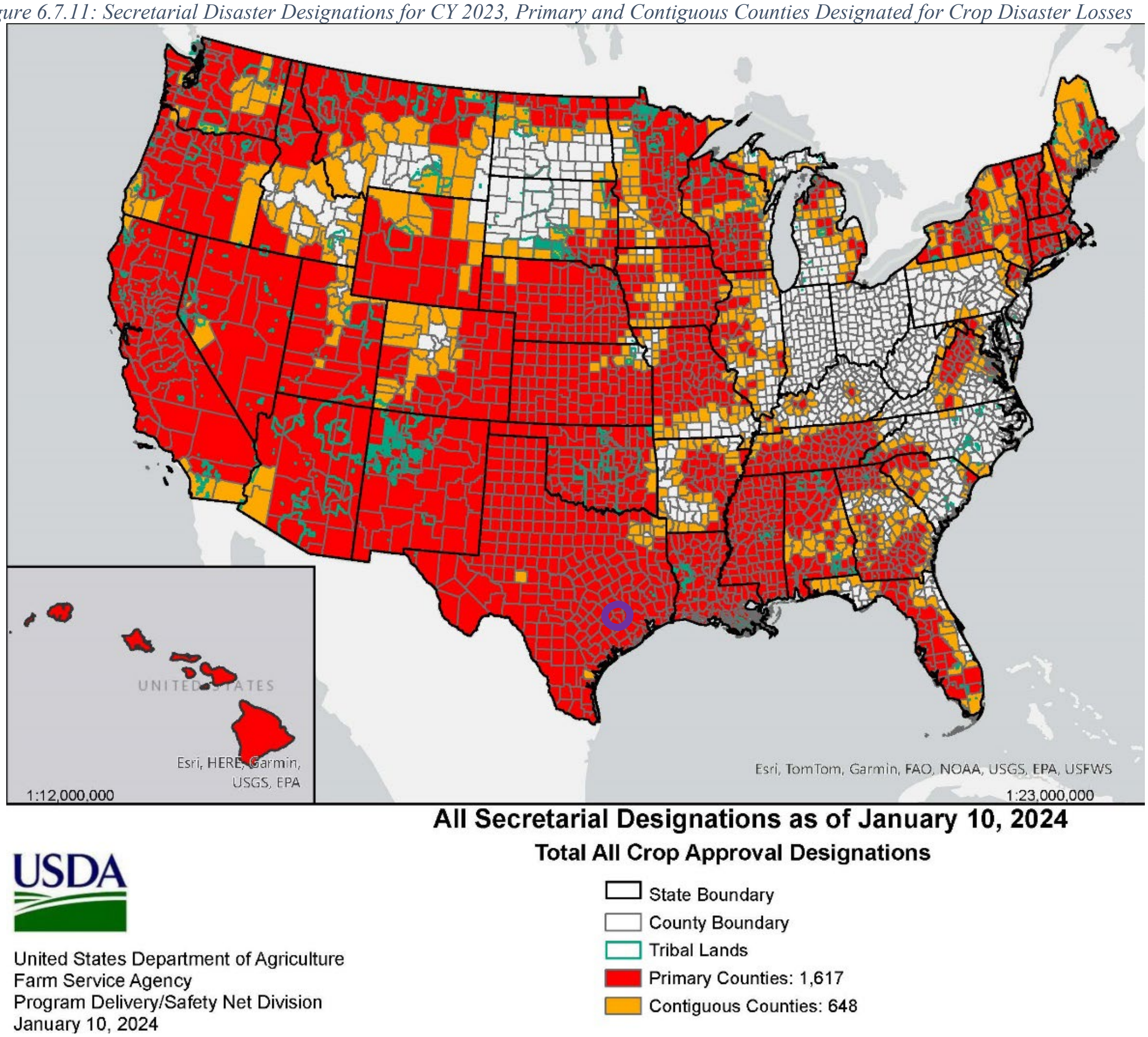
Table 6.7.4: USDA Declared Disasters (2018-2023), Drought

Crop Disaster Year	Disaster Description	Designation Number
2019	Drought-FAST TRACK	S4552

2019	Drought-FAST TRACK	S4571
2020	Drought-FAST TRACK	S4654
2020	Drought-FAST TRACK	S4658
2020	Drought-FAST TRACK	S4663
2020	Drought-FAST TRACK	S4669
2021	Drought-FAST TRACK	S4942
2022	Drought-FAST TRACK	S5197
2022	Drought-FAST TRACK	S5209
2022	Drought-FAST TRACK	S5214
2022	Drought-FAST TRACK	S5221
2022	Drought-FAST TRACK	S5240
2023	Drought-FAST TRACK	S5381
2023	Drought-FAST TRACK	S5499
2023	Drought-FAST TRACK	S5511

Figure 6.7.11 below displays counties declared primary (red) or contiguous (orange) disaster counties, where producers may be eligible for emergency aid. Austin County is listed as a primary county for CY 2023.[40] Austin County is outlined in purple.

Figure 6.7.11: Secretarial Disaster Designations for CY 2023, Primary and Contiguous Counties Designated for Crop Disaster Losses



Historic occurrences of expansive soils and related damages are not currently tracked or documented in any dataset from local, state, or national levels. Damages to homeowners and business owners are typically shouldered by the individuals when they are discovered. Though the effects and extent of expansive soils have been studied over a great period of time, there is no system in place and no future tracking method for these damages or associated costs.[63] Thus there is no way to quantify or show historic occurrences of this hazard.

Probability of Future Occurrences

Droughts are more likely to occur in summer months when temperatures are higher, and precipitation is less frequent. according to the FEMA NRI for drought Annualized frequency values for drought are 27.9 events per year over a 21-year period of record (2000-2021).[42] There have been 756 reports of drought for the county during this period of record. Impacts from expansive soils are directly associated with both drought and flooding hazards. The probability of future occurrences of drought can be found above in this hazard profile. The flooding hazard profile can be found in section 6.1.

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor the incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts from natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

EAL for Austin County each year according to the FEMA NRI for drought is listed as relatively low. EAL for various factors can be found in Table 6.7.5 below.[41] As stated above, the risk of drought occurring applies the same to the entire county. There are no known factors that make one area or community more prone to drought events than another. However, drought can adversely impact individuals employed in agriculture and natural resources over other industries. Severe droughts can also lead to crop and livestock losses, impacting the food supply and economy.

Table 6.7.5: Expected Annual Loss, Drought

Expected Annual Loss Hazard Type	Agricultural Exposure Value ($)	Expected Annual Loss ($)	Expected Annual Loss Rating
Drought	$11,048,942	$67,723	Relatively Low

Expansive soils are not included in the NRI. However, jurisdictions can be impacted by expensive financial costs to repair foundations and water lines for public facilities. School districts, homeowners, and business owners could also be impacted by broken pipes, cracked foundations, and other structural costly repairs caused by expanding and contracting soils. Pipes in critical facilities may also lead to a loss of service, or damaged roads/bridges can increase response time for emergency personnel. While newer buildings can be impacted; older buildings including critical facilities and homes are more likely to be impacted due to older buildings being exposed to numerous weather events and seasons, having building standards that do not take expansive soils into account, and the lack of engineering solutions to mitigate expansive soils used in the past.

The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score. Expansive soils are not listed as a hazard type, drought is accounted for.

Figure 6.7.12: Risk Index by Census Tract, Drought

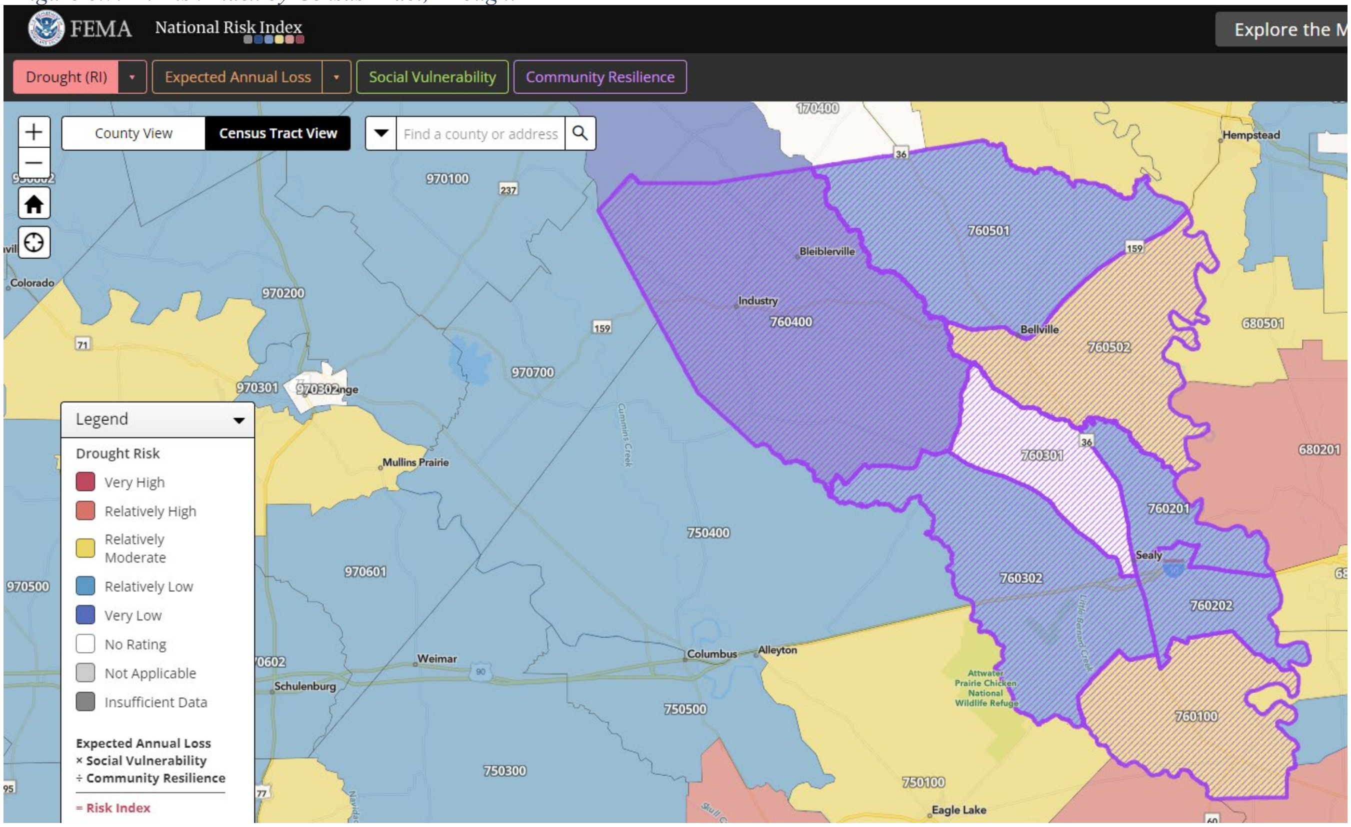


Figure 6.7.13: Social Vulnerability by Census Tract, Austin County

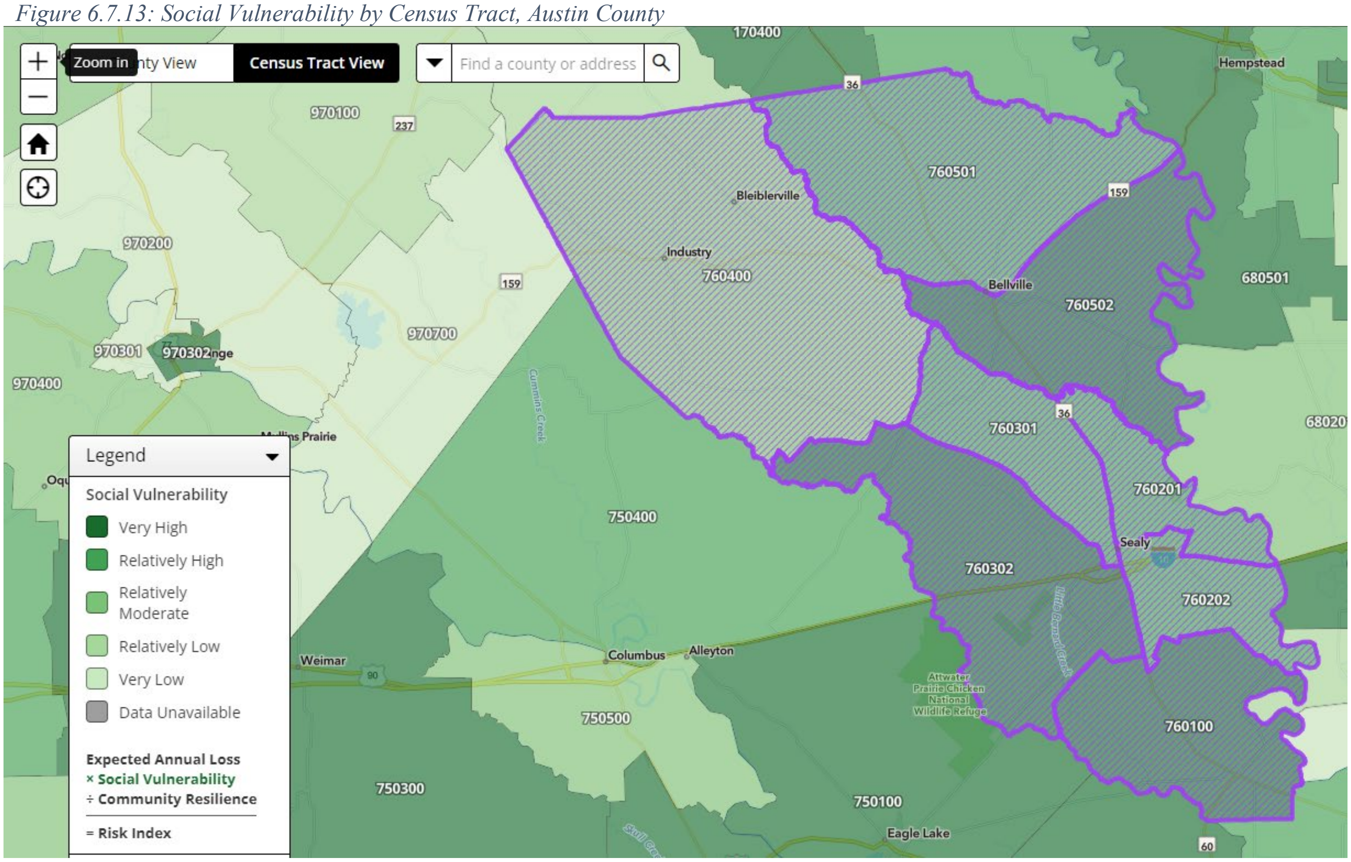


Figure 6.7.14: Community Resilience by Census Tract, Austin County

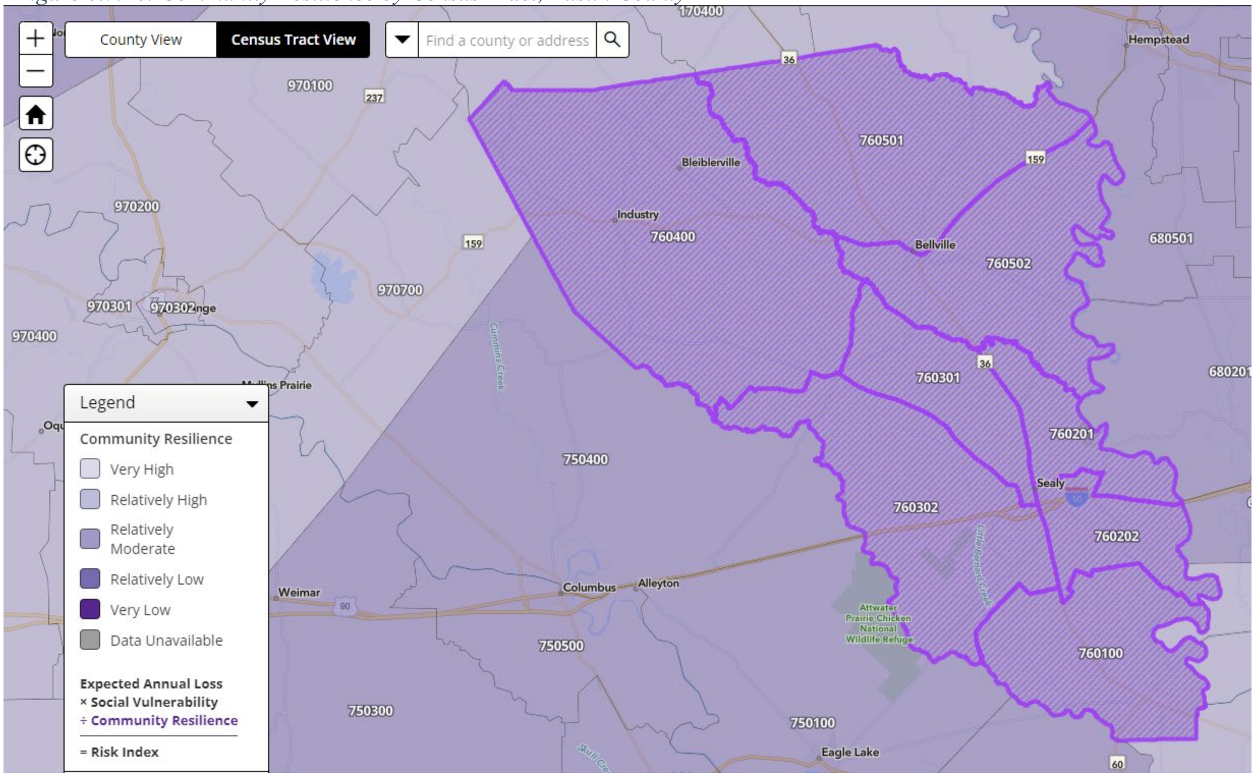


Figure 6.7.15: FEMA NRI Summary, Drought

Hazard Type: Drought

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively Moderate	96.2	0 – 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	93.65	0 – 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Low	93.28	0 – 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Low	92.15	0 – 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Low	90.89	0 – 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Low	84.01	0 – 100
7	Census tract 48015760100	Very High	Relatively Low	Very Low	77.74	0 – 100
8	Census tract 48015760201	Relatively High	Relatively Low	No Rating	0	0 – 100

Climate Change Impacts

According to the Office of the Texas State Climatologist, it is impossible to make a quantitative statewide projection of drought trends. However, the majority of factors at play point to an increase in drought severity.[43] It can be inferred that the impacts of climate change on expansive soils will grow as drought and flooding risks and associated impacts become more prevalent.

Table 6.7.6: Climate Change Impacts, Drought & Expansive Soils

Location	The location of droughts and expansive soils is not expected to change.
Extent/Intensity	The extent and intensity of drought and associated risks from expansive soils within the county may change (increase) due to increased precipitation and

	stronger storms which can lead to an increase in flooding events and rising surface temperatures, heat events, and increases in drought severity.
Frequency	There are no clear trends in drought frequency due to considerable variability in conditions that lead to droughts. Since expansive soils pose the most risk during periods of drought and flooding, and there is no way to data to track losses due to expansive soils, the frequency of expansive soil impacts also shows no clear trends.
Duration	The duration of drought events is not likely to change, however the intensity of droughts is expected to increase.

Section 6.8: Windstorm

6.8 Windstorm

Damaging winds are often called straight-line winds to differentiate the damage they cause from tornadoes or other hazards. Winds that cause damage at the ground are a result of outflows generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 mph. Damage from severe winds accounts for half of all damage reports and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. These damaging winds are often associated with other hazards such as thunderstorms, tornadoes, hurricanes, tropical storms, and tropical depressions.[83] Windstorms, or damaging winds, include many different variations. These damaging wind types and their definitions from NOAA can be seen in the table below.[84]

Table 6.8.1: Types of Damaging Winds

Damaging Wind Type	Description
Straight-line Wind	Used to define thunderstorm wind, which is not linked with rotation and is mainly used to differentiate from tornadic winds
Down Draft	A small-scale column of air that sinks toward the ground
Macroburst	An outward burst of strong winds that are more than 2.5 miles in diameter, occurs when a strong downdraft reaches the surface
Microburst	A small, concentrated downburst that produces an outward burst of relatively strong winds near the surface. Microbursts are less than 4 km in diameter and short-lived, lasting only five to 10 minutes. Maximum wind speeds sometimes exceed 100 mph. There are two kinds of microbursts: wet and dry. • A wet microburst is accompanied by heavy precipitation at the surface. • A dry microburst is common in places like the high plains and occur with little or no precipitation reaching the ground.
Downburst	A general term to describe macro and microbursts
Gust Front	The leading edge of rain-cooled air that clashes with a warm thunderstorm inflow
Derecho	A widespread and long-lived windstorm is associated with rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. If the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho.

Location

Similar to thunderstorms (Section 6.3), and the Tornado/Microburst (Section 6.4) hazard profiles, windstorms/ damaging winds are not confined to any geographic boundaries and can occur anywhere if the right conditions are present. The entire county is at risk for this hazard type. Thunderstorms will typically occur in warmer months such as Summer and Spring, and during the warmest parts of the day. Warm, moist air from the Gulf of Mexico is readily available to help fuel atmospheric conditions that produce thunderstorms and the damaging winds associated with them. Austin County is in an area that can see anywhere from 54-81 thunderstorm days per year.[84]

Extent

Wind intensity is measured by the NWS through the Beaufort Wind Scale. One of the first scales to estimate wind speeds and their effects was created by Britain's Admiral Sir Francis Beaufort (1774-1857). He developed the scale in 1805 to help sailors estimate the winds via visual observations. The scale starts with 0 and goes to a force of 12. The Beaufort scale is still used today to estimate wind strengths.[85] The table below outlines the measurements used by the Beaufort Wind Scale for use on land.

Table 6.8.2: Beaufort Wind Scale

Force	Speed, mph	Description	Specifications for use on land
0	0-1	Calm	Calm; smoke rises vertically.
1	1-3	Light Air	Direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	8-12	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	Moderate Breeze	Raises dust and loose paper; small branches are moved.
5	19-24	Fresh Breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	Strong Breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	Near Gale	Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	Gale	Breaks twigs off trees; generally impedes progress.
9	47-54	Severe Gale	Slight structural damage occurs (chimneypots and slates removed)
10	55-63	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs.
11	64-72	Violent Storm	Very rarely experienced; accompanied by wide-spread damage.
12	72-83	Hurricane	Reference the Saffir-Simpson Hurricane Scale

Additionally, NOAA and the NWS issues watches, warnings, and advisories for wind events when wind speeds can pose a hazard or are life-threatening. Table 6.8.2 describes the various wind-related warnings, watches, and advisories below.[86]

Table 6.8.3: Wind-Related Warnings, Watches, and Advisories

Watch/ Warning/ Advisory	Description

High Wind Warning	Sustained, strong winds with even stronger gusts are happening. Seek shelter. If you are driving, keep both hands on the wheels and slow down.
High Wind Watch	Sustained, strong winds are possible. Secure loose outdoor items and adjust plans as necessary so you're not caught outside.
Wind Advisories	Strong winds are occurring but are not so strong as to warrant a High Wind Warning. Objects that are outdoors should be secured and caution should be taken if driving.
Hurricane Force Wind Warning	Hurricane Force Wind Warnings are issued for locations along the water when one or both of the following conditions are expected to begin within 36 hours and are not directly associated with a tropical cyclone: sustained winds of 64 knots or greater or frequent gusts (duration of two or more hours) of 64 knots (74 mph) or greater.

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County windstorm events data from 1950-2023 is provided in the table below.[39]

Table 6.8.4: Austin County Wind Events (1950-2023)

Date	Jurisdiction	Event Type	Injuries/ Deaths	Property Damage	Crop Damage	Wind Speed (mph)
4/21/1958	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
4/29/1960	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
8/13/1977	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/21/1979	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/15/1980	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
4/23/1981	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/20/1983	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/8/1985	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	52
11/11/1985	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
12/19/1987	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
3/29/1990	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
1/18/1991	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/20/1992	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
5/9/1993	Wallis	Thunderstorm Wind	0/0	$5,000	$0	ND
4/5/1994	Halletsville	Thunderstorm Wind	0/0	$500,000	$50,000	ND
5/29/1994	N/A, Austin County	Thunderstorm Wind	0/0	$0	$0	ND
10/8/1994	Industry	Thunderstorm Wind	0/0	$5,000	$0	ND
3/7/1995	N/A, Austin County	Thunderstorm Wind	0/0	$3,000	$0	ND
3/13/1995	Bellville	Thunderstorm Wind	0/0	$0	$0	ND
4/29/1996	SEALY	Thunderstorm Wind	0/0	$5,000	$0	ND
9/20/1996	BELLVILLE	Thunderstorm Wind	0/0	$5,000	$0	ND
9/20/1996	CAT SPG	Thunderstorm Wind	0/0	$10,000	$0	55
5/21/1997	SEALY	Thunderstorm Wind	0/0	$5,000	$0	ND
5/30/1997	BELLVILLE	Thunderstorm Wind	0/0	$5,000	$0	ND
6/17/1997	KENNEY	Thunderstorm Wind	0/0	$5,000	$0	ND

12/23/1997	NEW ULM	Thunderstorm Wind	0/0	$3,000	$0	ND
2/10/1998	CAT SPG	Thunderstorm Wind	0/0	$25,000	$0	ND
2/10/1998	SEALY	Thunderstorm Wind	0/0	$5,000	$0	ND
2/10/1998	WALLIS	Thunderstorm Wind	0/0	$10,000	$0	ND
2/10/1998	BELLVILLE	Thunderstorm Wind	0/0	$10,000	$0	ND
6/5/1998	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	ND
5/2/2000	WALLIS	Thunderstorm Wind	0/0	$0	$200,000	ND
7/23/2000	INDUSTRY	Thunderstorm Wind	0/0	$15,000	$0	ND
7/23/2000	SHELBY	Thunderstorm Wind	0/0	$15,000	$0	ND
9/2/2000	INDUSTRY	Thunderstorm Wind	0/0	$25,000	$0	ND
9/2/2000	BELLVILLE	Thunderstorm Wind	0/0	$15,000	$0	ND
9/2/2000	BURLEIGH	Thunderstorm Wind	0/0	$15,000	$0	ND
11/5/2000	COUNTYWIDE	Thunderstorm Wind	0/0	$100,000	$0	ND
11/12/2000	BELLVILLE	Thunderstorm Wind	0/0	$10,000	$0	ND
11/12/2000	SEALY	Thunderstorm Wind	0/0	$80,000	$0	ND
11/12/2000	BELLVILLE	Thunderstorm Wind	0/0	$15,000	$0	ND
8/6/2001	SEALY	Thunderstorm Wind	0/0	$10,000	$0	ND
9/21/2001	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	ND
10/13/2001	BELLVILLE	Thunderstorm Wind	0/0	$0	$0	52
3/30/2002	SEALY	Thunderstorm Wind	0/0	$8,000	$0	60
12/12/2002	CAT SPG	Thunderstorm Wind	0/0	$5,000	$0	ND
12/23/2002	WALLIS	Thunderstorm Wind	0/0	$45,000	$0	52
6/13/2003	INDUSTRY	Thunderstorm Wind	0/0	$8,000	$0	58
8/11/2004	BELLVILLE	Thunderstorm Wind	0/0	$50,000	$0	65
8/11/2004	KENNEY	Thunderstorm Wind	0/0	$10,000	$0	50
11/23/2004	CAT SPG	Thunderstorm Wind	0/0	$5,000	$0	50
10/31/2005	BELLVILLE	Thunderstorm Wind	0/0	$13,000	$0	53
4/21/2006	NEW ULM	Thunderstorm Wind	0/0	$5,000	$0	50
3/12/2007	BUCKHORN	Thunderstorm Wind	0/0	$1,000	$0	48
3/14/2007	WALLIS	Thunderstorm Wind	0/0	$25,000	$0	58
4/25/2007	BELLVILLE	Thunderstorm Wind	0/0	$0	$0	52
5/14/2008	COCHRAN	Thunderstorm Wind	0/0	$2,000	$0	57
12/24/2009	MILLHEIM	Thunderstorm Wind	0/0	$10,000	$0	52
5/29/2010	WALLIS	Thunderstorm Wind	0/0	$10,000	$0	52
8/23/2010	NEW ULM	Thunderstorm Wind	0/0	$0	$0	52
8/24/2011	BELLVILLE	Thunderstorm Wind	0/0	$3,000	$0	55
8/24/2011	SEALY	Thunderstorm Wind	0/0	$2,000	$0	55
9/29/2011	WALLIS	Thunderstorm Wind	0/0	$3,000	$0	50
2/18/2012	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	56
2/18/2012	WALLIS	Thunderstorm Wind	0/0	$2,000	$0	56
8/10/2012	BELLVILLE ARPT	Thunderstorm Wind	0/0	$0	$0	55
4/16/2015	NELSONVILLE	Thunderstorm Wind	0/0	$0	$0	52
4/25/2015	SAN FELIPE	Thunderstorm Wind	0/0	$3,000	$0	50
4/25/2015	SAN FELIPE	Thunderstorm Wind	0/1	$2,000	$0	55
4/27/2015	INDUSTRY	Thunderstorm Wind	0/0	$12,000	$0	55
5/25/2015	NEW ULM	Thunderstorm Wind	0/0	$0	$0	60
5/25/2015	SEALY	Thunderstorm Wind	0/0	$0	$0	60
5/25/2015	SEALY	Thunderstorm Wind	0/0	$0	$0	56

5/27/2015	BELLVILLE	Thunderstorm Wind	0/0	$2,000	$0	54
5/23/2017	SEALY	Thunderstorm Wind	0/0	$1,000,000	$0	87
5/22/2018	BURLEIGH	Thunderstorm Wind	0/0	$2,000	$0	53
5/22/2018	SAN FELIPE	Thunderstorm Wind	0/0	$2,000	$0	53
1/10/2020	WEHDEM	Thunderstorm Wind	0/0	$3,000	$0	65
		TOTALS:	**0/1**	**$2,140,000**	**$250,000**	N/A

ND- No Data

Presidential Disaster Declarations

There has been 1 disaster declaration in which wind was included in the declaration title for Austin County. However, the declaration itself is listed as a "severe storm" for the incident type.[1]

Table 6.8.5: Federal Disaster Declarations, Tornado/ Microburst

Declaration Date	Title	Disaster Number
1/11/2006	Severe storms, tornadoes, straight-line winds, and flooding	4223

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.8.6: USDA Declared Disasters (2018-2023), Windstorms

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

Severe thunderstorms and their associated damaging winds are more likely to occur in summer months when temperatures are higher and moisture from the gulf helps to fuel thunderstorm development. According to the FEMA NRI for strong winds, annualized frequency values are 1.5 events per year over a 34-year period of record (1986-2021), with 52 events on record for this timeframe. [42]

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor that incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts of natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

Populations at risk for windstorms/ damaging winds include the entire county as this hazard has no geographic boundary. Additionally, people living in mobile homes are especially at risk from injury and death. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph.

EAL for Austin County each year according to the FEMA NRI for strong wind is listed as relatively low. EAL Exposure Values and EAL Values can be found in the tables below below.[42]

Table 6.8.7: Expected Annual Loss Exposure Values, Strong Win

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Strong Wind	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	Relatively Low

Table 6.8.8: Expected Annual Loss Values, Strong Wind

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Strong Wind	$192,348	$94,385/ 0.01	$3,892

N/A- Not Applicable

Historic loss ratios, according to the FEMA NRI, for strong wind events within Austin County are relatively moderate. The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score.

Figure 6.8.1: Risk Index by Census Tract, Strong Wind

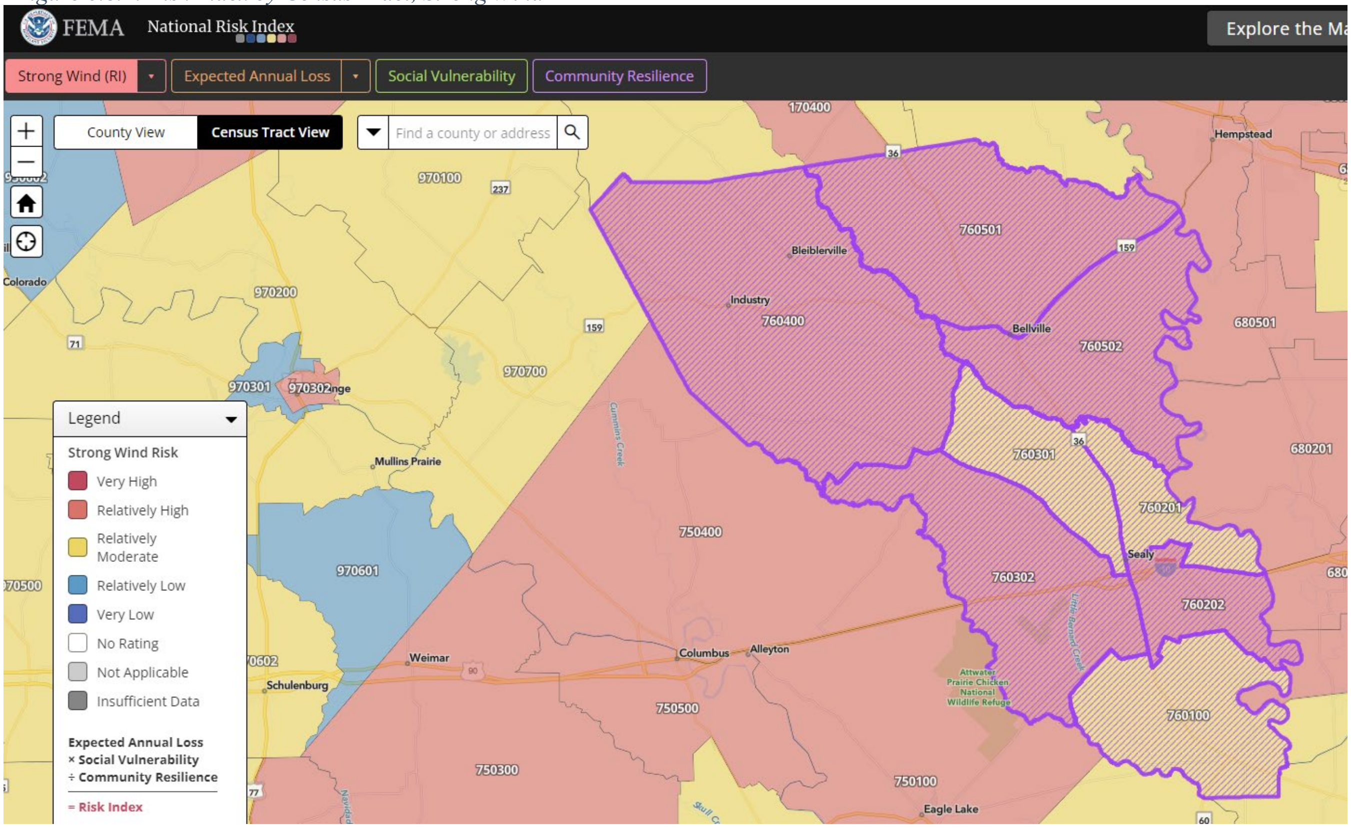


Figure 6.8.2: Social Vulnerability by Census Tract, Austin County

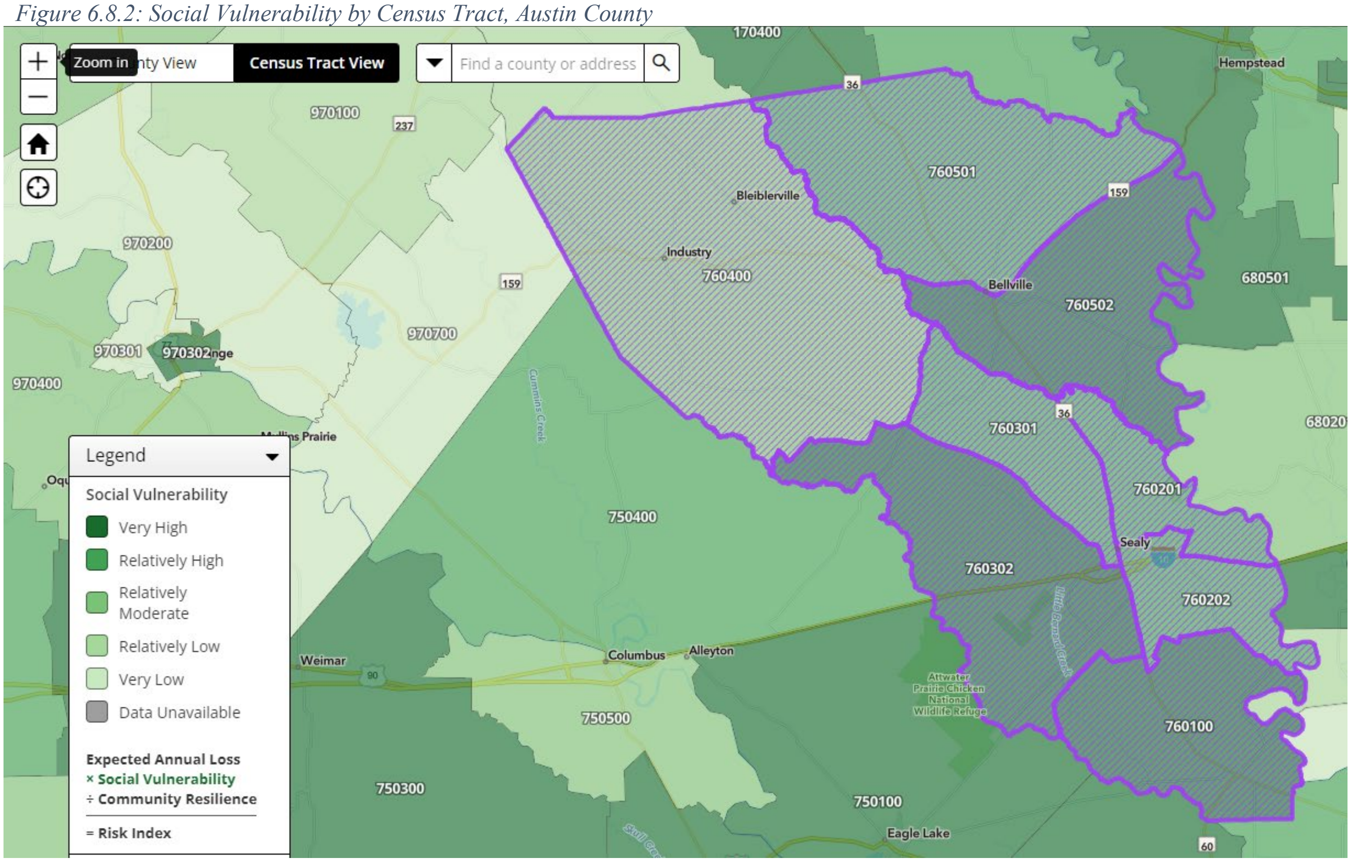


Figure 6.8.3: Community Resilience by Census Tract, Austin County

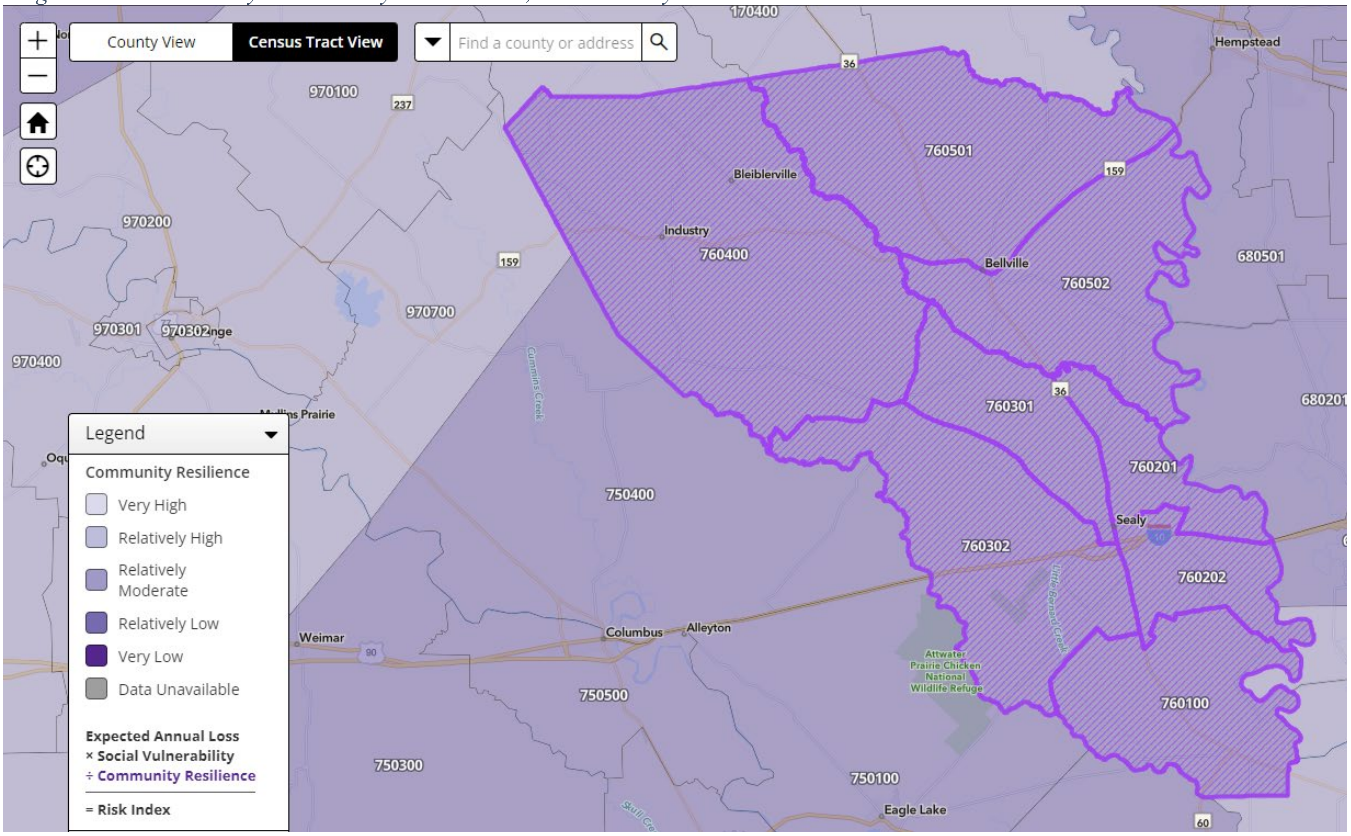


Figure 6.8.4: FEMA NRI Summary, Strong Wind

Hazard Type: Strong Wind

Rank	Community	Social Vulnerability	Community Resilience	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively High	91.53	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively High	90.16	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively High	86.28	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively High	86.24	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively High	82.19	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Moderate	77.52	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Moderate	69.96	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Moderate	67.16	0 100

Climate Change Impacts

Since windstorms and damaging winds are heavily related to severe thunderstorm development, this section will mirror that of Section 6.3 seen previously. According to the Office of the Texas State Climatologist, the climate data record for severe thunderstorms is poor and severe thunderstorms are too small to be simulated directly by present-day climate models. Over the past few decades, the severe storm environment over Texas has changed in complex and opposing ways. The amount of energy available for convection has decreased, and the amount of energy needed to initiate convection has increased at the same time. This suggests that environmental conditions have become less favorable for the occurrence of thunderstorms. However, the amount of low-level shear has increased, which would be expected to make thunderstorms more likely to become severe once they develop.

Changes in severe storm environments have not been uniform throughout the year, with environments becoming more favorable for severe thunderstorms and significant hail in Texas early in the spring and less favorable later in the spring. Lightning occurs most often during the months of May and June. Climate model simulations imply different prospects in the future. As temperatures increase, the amount of energy available to fuel these storms is simulated to increase as temperature and low-level moisture increase. This results in an overall increase in the number of days capable of producing severe thunderstorms. With these complex trends and partially contradictory information between models and observations, there is low confidence in any ongoing trend in the overall frequency and severity of severe thunderstorms.[43]

Table 6.8.9: Climate Change Impacts Summary, Windstorm

Location	The location of windstorms is not expected to change.
Extent/Intensity	The extent and intensity of windstorms within the county may change (increase) due to increased temperatures and energy available to fuel severe thunderstorms.
Frequency	There are no clear trends in windstorm frequency just as there are no clear trends in severe thunderstorm frequency. This is due to considerable variability in conditions that lead to them occurring. However, these hazards occur most frequently in warmer months, around May and June.
Duration	The duration of windstorms is not likely to change, however, the intensity of them is expected to increase due to rising temperatures and the proximity of the county to the Gulf of Mexico aiding to fuel thunderstorms.

Section 6.9: Hail

6.9 Hail

NOAA's National Severe Storms Laboratory (NSSL) defines hail as "A form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Hail can damage aircraft, homes and cars, and can be deadly to livestock and people."[87] Hail varieties are determined by how they grow and the maximum size. These differentiating frozen precipitations and their definitions from NOAA's NSSL can be seen in the table below.[88]

Table 6.9.1: Types of Frozen Precipitation

Frozen Precipitation Type	Description
Snow	forms mainly when water vapor turns to ice without going through the liquid stage. This process is called deposition. Snow can form in the gentle updrafts of stratus clouds or at high altitudes in very cold regions of a thunderstorm.
Graupel	soft, small pellets formed when supercooled water droplets (at a temperature below 32°F) freeze onto a snow crystal, a process called riming. If the riming is particularly intense, the rimed snow crystal can grow to an appreciable size but remain less than 0.2 inches. Graupel is also called snow pellets or soft hail, as the graupel particles are particularly fragile and generally disintegrate when handled.
Sleet	small ice particles that form from the freezing of liquid water drops, such as raindrops. At ground level, sleet is only common during winter storms when snow melts as it falls, and the resulting water refreezes into sleet prior to hitting the ground. In thunderstorms, sleet is possible above the melting level where cloud droplets become supercooled and may instantaneously freeze when making contact with other cloud particles or debris, such as dust particles. Sleet is also called ice pellets.
Hail	frozen precipitation that can grow to very large sizes through the collection of water that freezes onto the hailstone's surface. Hailstones begin as embryos, which include graupel or sleet, and then grow in size. Hailstones can have a variety of shapes and include lumps and bumps that may even take the shape of small spikes. Hailstones must be at least 0.2 inches in size.

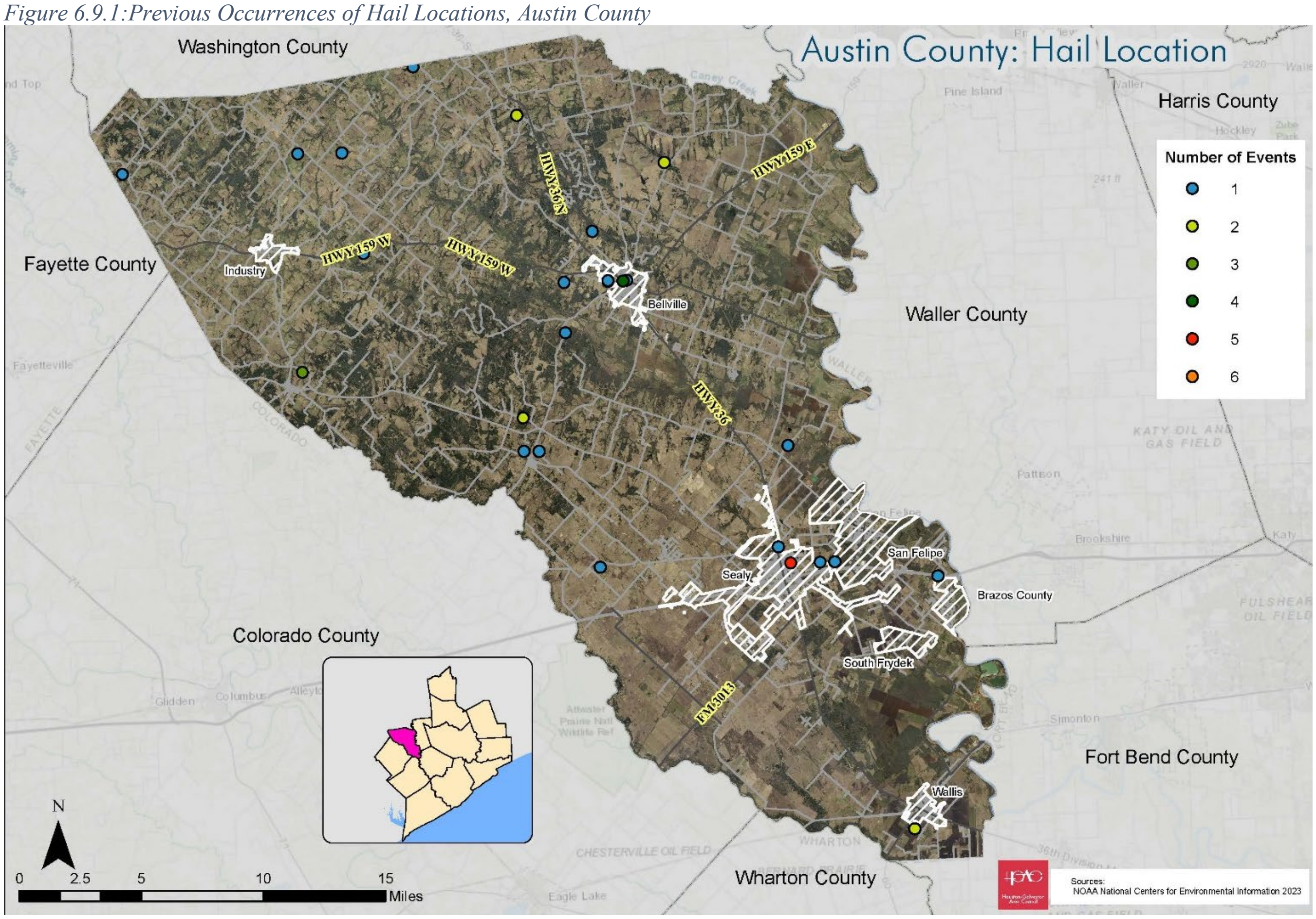
When forecasting for hail, forecasters look for deep moist convection, in addition to adequate updraft to keep the hailstone aloft for an appropriate amount of time, sufficient supercooled water near the hailstone to enable growth as it travels through an updraft, and a piece of ice, snow or dust for it to grow upon. There is no clear distinction between storms that do and do not produce hailstones. Nearly all severe thunderstorms probably produce hail aloft, though it may melt before reaching the ground.

Multi-cell thunderstorms can produce many small hailstones that are relatively short-lived and do not grow in size. In contrast, supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud where they can accumulate more layers of ice. In general, hail 2 inches or larger in diameter is associated with supercells. Hail falls to the ground when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft, the larger the hailstone can grow. Additionally, large hail often appears near the area within a thunderstorm where tornadoes are most likely to form[89]

Location

Similar to thunderstorms (Section 6.3), and the Tornado/Microburst (Section 6.4) hazard profiles, hail is not confined to any geographic boundaries and can occur if the right conditions are present within a thunderstorm, such as a supercell with a strong updraft. The entire county is at risk for this hazard. Thunderstorms and hail can happen at any time of the year. Typically, they occur most in warmer months such as Summer and Spring, and during the warmest parts of the day. Warm, moist air from the Gulf of Mexico is readily available to help fuel atmospheric conditions that produce thunderstorms and the updrafts that bring hail and damaging winds associated with them. Austin County is in an area that can see anywhere from 54-81 thunderstorm days per year.[57] Figure 6.9.1 depicts the locations within the county where previous hails events have occurred.

Figure 6.9.1:Previous Occurrences of Hail Locations, Austin County



Extent

The NWS classifies a hailstorm as "severe" if there is hail 00.75 inches in diameter or greater. Hail threats are categorized from non-threatening to extreme with associated map colors to depict hazard levels, as seen in the table below. NWS also generalizes hail sizes as small (less than 0.75 inches in diameter), large (0.75-1.75 inches in diameter), very large (1.75-2.75 inches in diameter), and giant (hail larger than 2.75 inches).[90]

Table 6.9.2: Severe Hail Threat Levels and Descriptions

Severe Hail Threat Level	Map Color	Threat Level Descriptions
Extreme	(magenta)	**"An Extreme Threat to Life and Property from Severe Hail."** • Within 12 miles of a location, a moderate likelihood or greater (16% probability or greater) of severe hail, with storms capable of baseball to softball sized stones. *See diameter description below.* • A high likelihood or greater (26% probability or greater) of severe hail, with storms capable of golf ball to baseball sized hail stones. • Avery high likelihood (36% or greater) of severe hail, with storms capable of nickel to golf ball sized hail stones.
High	(red)	**"A High Threat to Life and Property from Severe Hail."** • Within 12 miles of a location, a low likelihood (6% to 15% probability) of severe hail, with storms capable of baseball to softball sized stones. • A moderate likelihood (16% to 25% probability) of very large hail (golf ball to baseball sized hail stones). • A high likelihood (26% to 35% probability) of large hail (nickel to golf ball sized hail stones).
Moderate	(orange)	**"A Moderate Threat to Life and Property from Severe Hail."** • Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of baseball to softball sized stones. • A low likelihood (6% to 15% probability) of severe hail, with storms capable of golf ball to baseball sized hail stones. • A moderate likelihood (16% to 25% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones.
Low	(yellow)	**"A Low Threat to Life and Property from Severe Hail."** • Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of golf ball to baseball sized hail stones • A low likelihood (6% to 15% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones.
Very Low	(light yellow)	**" A Very Low Threat to Life and Property from Severe Hail."** • Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones. • A low likelihood or greater (6% or greater) of small hail (less than 3/4 inch).
Non-Threatening	(green)	**" No Discernable Threat to Life and Property from Severe Hail."** • Within 12 miles of a location, environmental conditions do not support the occurrence of severe hail.

Hail intensity is measured by the TORRO scale. The scale starts with H0 and goes to H10 with each increment of intensity or damage potential related to hail size, texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind. The table below outlines the TORRO Hail Intensity Scale and some associated size comparisons.[91]

Table 6.9.3: TORRO Hail Intensity Scale

Scale	Intensity category	Typical hail diameter (in)	Size Comparison	Typical damage impacts
H0	Hard hail	Up to 0.33	Pea	No damage
H1	Potentially damaging	0.33-0.60	Marble	Slight general damage to plants, crops
H2	Significant	0.60-0.80	Dime	Significant damage to fruit, crops, vegetation

H3	Severe	0.80-1.20	Nickel	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.20-1.60	Quarter	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.60-2.0	Half Dollar	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	2.0-2.4	Ping Pong Ball	Bodywork of grounded aircraft dented; brick walls pitted
H7	Destructive	2.4-3.0	Golf Ball	Severe roof damage, risk of serious injuries
H8	Destructive	3.0-3.5	Hen Egg	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Tennis Ball	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>4.0	Baseball	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County hail events data from 1950-2023 is provided in the table below.[39]

Table 6.9.4: Austin County Hail Events (1950-2023)

Date	Jurisdiction	Event Type	Injuries/ Deaths	Property Damage	Crop Damage	Magnitude (in.)
6/5/1955	N/A, Austin County	Hail	0/0	$0	$0	1.75
4/24/1962	N/A, Austin County	Hail	0/0	$0	$0	2
5/15/1980	N/A, Austin County	Hail	0/0	$0	$0	0.75
5/9/1981	N/A, Austin County	Hail	0/0	$0	$0	1
5/14/1981	N/A, Austin County	Hail	0/0	$0	$0	1
5/8/1985	N/A, Austin County	Hail	0/0	$0	$0	1.75
2/14/1987	N/A, Austin County	Hail	0/0	$0	$0	0.75
9/10/1987	N/A, Austin County	Hail	0/0	$0	$0	1
6/25/1990	N/A, Austin County	Hail	0/0	$0	$0	0.88
6/30/1992	N/A, Austin County	Hail	0/0	$0	$0	0.75
2/15/1993	Sealy	Hail	0/0	$0	$0	0.75
5/1/1993	Bellville	Hail	0/0	$5,000	$0	1
5/9/1993	Wallis	Hail	0/0	$5,000	$0	0.87
5/18/1993	Bellville	Hail	0/0	$50,000	$0	1.75
4/5/1994	Moulton	Hail	0/0	$50,000	$50,000	0.75
4/5/1994	New Kinkler	Hail	0/0	$500,000	$50,000	1.75
4/5/1994	N/A, Austin County	Hail	0/0	$5,000	$0	0.75
4/5/1994	N/A, Austin County	Hail	0/0	$5,000	$0	0.75
1/12/1995	Sealy	Hail	0/0	$0	$0	1
1/22/1995	Near Sealy	Hail	0/0	$0	$0	0.75

3/13/1995	Shelby	Hail	0/0	$0	$0	0.75
11/2/1995	Wallis	Hail	0/0	$5,000	$0	0.75
3/23/1996	N/A, Austin County	Hail	0/0	$0	$0	ND
3/23/1996	N/A, Austin County	Hail	0/0	$0	$0	ND
4/5/1996	CATSPRING/SEALY	Hail	0/0	$20,000	$0	1.75
4/5/1996	SEALY	Hail	0/0	$20,000	$0	1.75
4/21/1996	N/A, Austin County	Hail	0/0	$0	$0	2.75
4/21/1996	N/A, Austin County	Hail	0/0	$0	$0	2.75
4/21/1996	N/A, Austin County	Hail	0/0	$0	$0	2.75
4/21/1996	N/A, Austin County	Hail	0/0	$0	$0	2.75
4/21/1996	N/A, Austin County	Hail	0/0	$0	$0	2.75
8/12/1996	WALLIS	Hail	0/0	$10,000	$200,000	1.75
9/17/1996	N/A, Austin County	Hail	0/0	$0	$0	0.88
9/17/1996	N/A, Austin County	Hail	0/0	$0	$0	0.88
9/20/1996	BELLVILLE	Hail	0/0	$5,000	$0	1
5/30/1997	BELLVILLE	Hail	0/0	$10,000	$0	1.75
2/16/1998	NEW ULM	Hail	0/0	$3,000	$0	0.88
6/5/1998	WELCOME	Hail	0/0	$3,000	$0	1
2/27/1999	WALLIS	Hail	0/0	$3,000	$0	0.75
5/12/1999	BELLVILLE	Hail	0/0	$10,000	$0	0.75
5/30/1999	SEALY	Hail	0/0	$30,000	$0	2
5/2/2000	BELLVILLE	Hail	0/0	$10,000	$0	0.75
5/4/2000	NEW ULM	Hail	0/0	$15,000	$0	1
11/12/2000	BELLVILLE	Hail	0/0	$25,000	$0	1.75
2/26/2001	BELLVILLE	Hail	0/0	$5,000	$0	1
3/14/2001	SEALY	Hail	0/0	$5,000	$0	0.75
9/21/2001	BELLVILLE	Hail	0/0	$2,000	$0	0.88
3/30/2002	NEW ULM	Hail	0/0	$5,000	$0	0.75
3/30/2002	SEALY	Hail	0/0	$5,000	$0	0.75
10/19/2002	SEALY	Hail	0/0	$5,000	$0	0.75
3/13/2003	SEALY	Hail	0/0	$5,000	$0	0.75
4/24/2003	SEALY	Hail	0/0	$2,000	$0	1
8/8/2003	INDUSTRY	Hail	0/0	$2,000	$0	0.75
4/10/2004	BELLVILLE	Hail	0/0	$30,000	$0	1.75
6/4/2004	SEALY	Hail	0/0	$30,000	$0	0.75
6/4/2004	SAN FELIPE	Hail	0/0	$20,000	$0	0.88
12/21/2006	CAT SPG	Hail	0/0	$3,000	$0	0.75
6/3/2007	INDUSTRY	Hail	0/0	$0	$0	0.75
3/18/2008	BELLVILLE	Hail	0/0	$2,500	$0	0.75
6/26/2008	BELLVILLE	Hail	0/0	$13,000	$0	1.75
3/20/2013	BELLVILLE	Hail	0/0	$0	$0	1
3/20/2013	BELLVILLE	Hail	0/0	$25,000	$0	1.75
5/10/2013	BELLVILLE	Hail	0/0	$0	$0	1
4/19/2015	SEALY	Hail	0/0	$3,000	$0	1.5
5/21/2016	BELLVILLE	Hail	0/0	$0	$0	0.75
5/23/2017	MILLHEIM	Hail	0/0	$0	$0	0.75
5/9/2019	KENNEY	Hail	0/0	$0	$0	1.25

4/18/2020	BELLVILLE ARPT	Hail	0/0	$0	$0	1.75
4/18/2020	BELLVILLE ARPT	Hail	0/0	$0	$0	1.75
		TOTALS:	**0/0**	**$951,500**	**$100,000**	N/A

ND- No Data, N//A- Not Applicable

Presidential Disaster Declarations

There has been no disaster declaration in which hail was included for Austin County. [1]

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update for this hazard are listed in the table below.[40]

Table 6.9.5: USDA Declared Disasters (2018-2023), Hail

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

Severe thunderstorms and hail associated with them are more likely to occur in summer months when temperatures are higher and moisture from the gulf helps to fuel thunderstorm development. According to the FEMA NRI for hail, annualized frequency values are 2.7 events per year over a 34-year period of record (1986-2021), with 91 events on record for this timeframe. [42]

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provides a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. Expected annual loss (EAL) represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor that incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts of natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

If the wind during a thunderstorm is strong enough, hail can fall at an angle or sideways. This wind-driven hail can destroy siding on houses, break windows, break windows on cars, and cause severe injury and/or death to people and animals.[1] There are no known factors that make one area or community more prone to these events than another, the risk of a hail event applies the same to the entire county.

EAL for Austin County each year according to the FEMA NRI for hail is listed as relatively low. EAL Exposure Values and EAL Values can be found in the tables below below.[42]

Table 6.9.6: Expected Annual Loss Exposure Values, Hail

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Hail	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	Relatively Low

Table 6.9.7: Expected Annual Loss Values, Strong Wind

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Hail	$95,343	$26,557/ 0.00	$12,122

N/A- Not Applicable

Historic loss ratios, according to the FEMA NRI, for hail events within Austin County are relatively low. The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score.

Figure 6.9.2: Risk Index by Census Tract, Hail

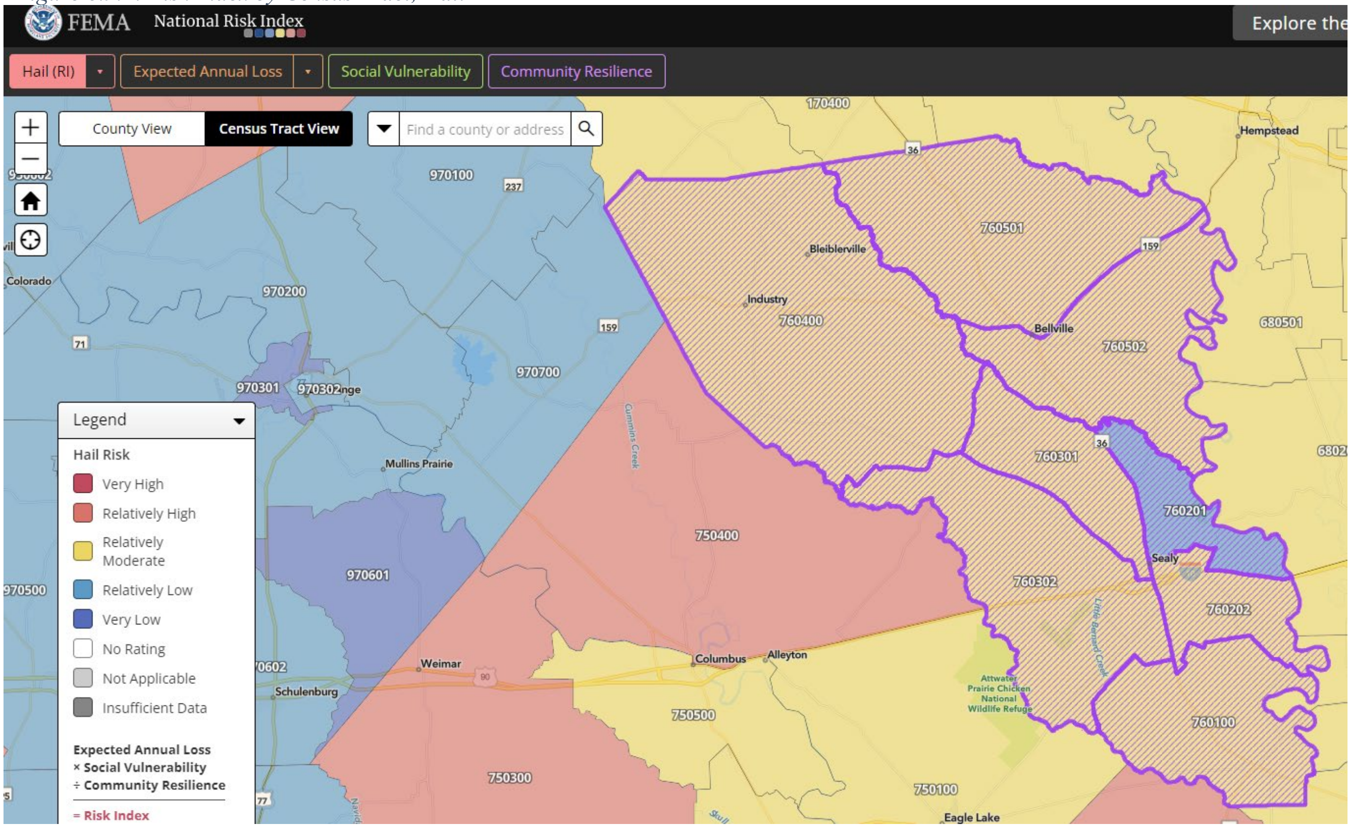


Figure 6.9.3: Social Vulnerability by Census Tract, Austin County

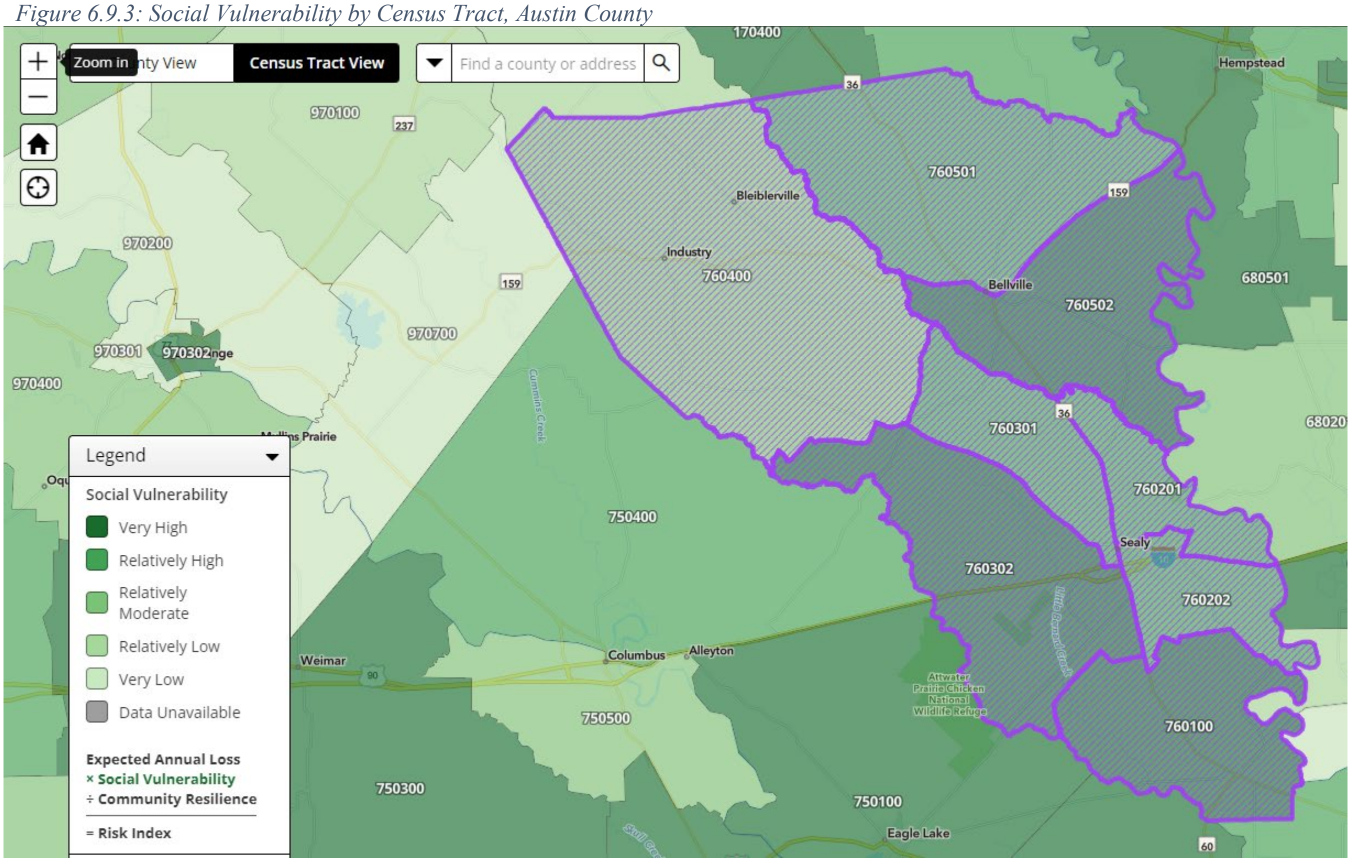


Figure 6.9.4: Community Resilience by Census Tract, Austin County

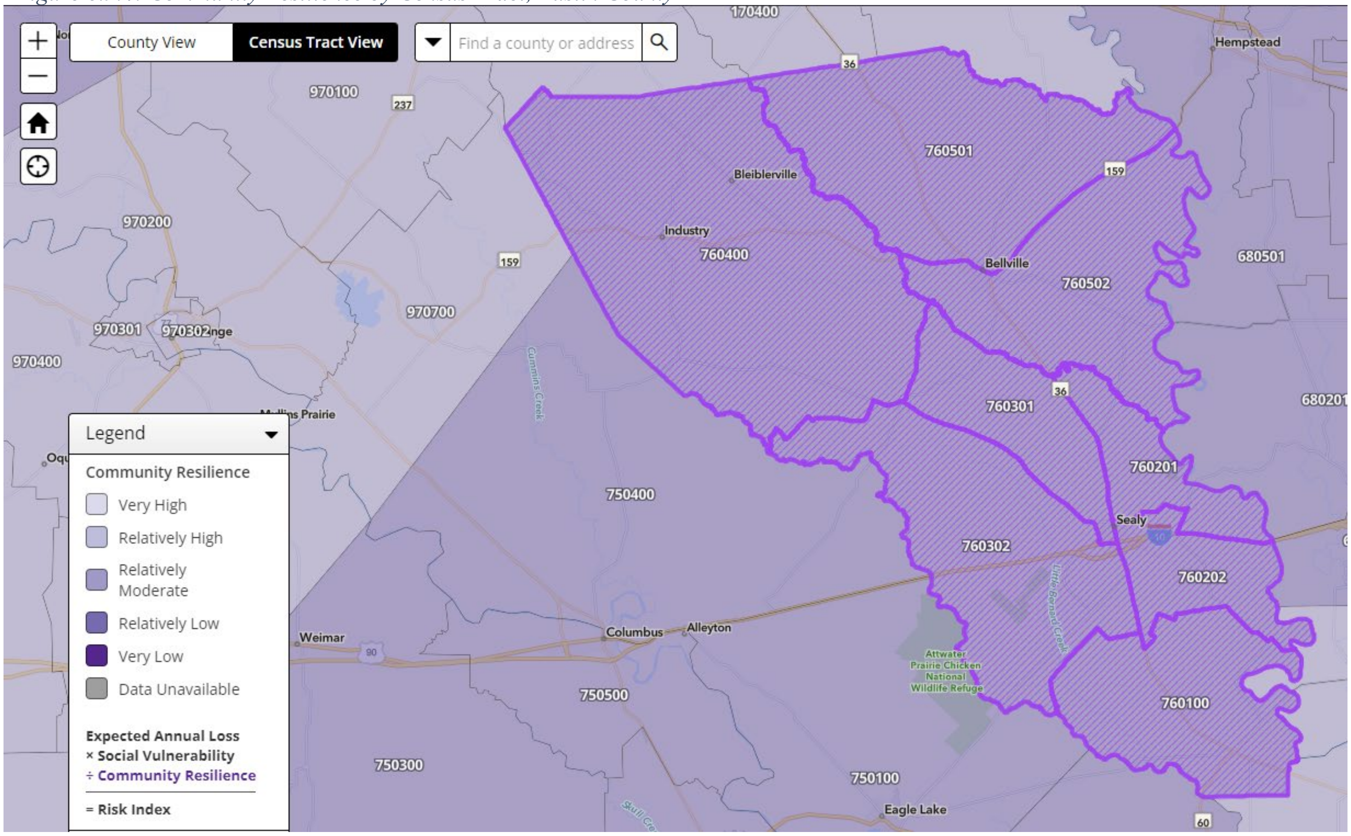


Figure 6.9.5: FEMA NRI Summary, Hail

Rank	Community	Social Vulnerability	Community Resilience	Hazard Type: Hail Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively Moderate	86.07	0 – 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	85.09	0 – 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Moderate	83.15	0 – 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Moderate	82.49	0 – 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Moderate	79.55	0 – 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Moderate	77.24	0 – 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Moderate	75.22	0 – 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Low	71.96	0 – 100

Climate Change Impacts

Since tornadoes, windstorms, and hail are heavily associated with severe thunderstorm development, this section will mirror that of Section 6.3, seen previously. According to the Office of the Texas State Climatologist, the climate data record for severe thunderstorms is poor and severe thunderstorms are too small to be simulated directly by present-day climate models. Over the past few decades, the severe storm environment over Texas has changed in complex and opposing ways. The amount of energy available for convection has decreased, and the amount of energy needed to initiate convection has increased at the same time. This suggests that environmental conditions have become less favorable for the occurrence of thunderstorms. However, the amount of low-level shear has increased, which would be expected to make thunderstorms more likely to become severe once they develop. Changes in severe storm environments have not been uniform throughout the year, with environments becoming more favorable for severe thunderstorms and significant hail in Texas early in the spring and less favorable later in the spring. Warmer temperatures are likely to lead to less hail overall, particular during the summer, but increases in available thunderstorm energy may lead to an increase of the risk of very large hail earlier in springtime. With these complex trends and partially contradictory information between models and observations, there is low confidence in any ongoing trend in the overall frequency and severity of severe thunderstorms.[43]

Table 6.9.8: Climate Change Impacts Summary, Hail

Location	The location of hail is not expected to change.
Extent/Intensity	The extent and intensity of hail is not expected to change. However, environments are becoming more favorable for hail in early spring.
Frequency	There are no clear trends in the frequency of hail within the county.
Duration	The duration of hail is not expected to change.

Section 6.10: Hurricanes, Tropical Storms, and Tropical Depressions

6.10 Hurricanes, Tropical Storms, and Tropical Depressions

Hurricanes form from the development of thunderstorms that are fueled by warm water and air over the ocean. Tropical waves and disturbances can lead to the formation of tropical cyclones. A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters and has a closed low-level circulation. Tropical cyclones can produce intense rainfall more than 6 inches, resulting in heavy flooding. Other dangers associated with the formation of these storms include storm surges, damaging winds, and rip currents, and tornadoes.[92] Slower moving larger storms can produce more rainfall and more dangerous outcomes. Classifications of tropical cyclones; tropical depressions, tropical storms, hurricanes, and major hurricanes are defined in the table below.[93]

Table 6.10.1: Tropical Cyclone Classifications

Classification	Definition
Tropical Depression	A tropical cyclone with maximum sustained winds of 38 mph (33 knots) or less. Tropical depressions can bring heavy downpours and sustained winds strong enough to generate rough surf and life-threatening rip currents.
Tropical Storm	A tropical cyclone with maximum sustained winds of 39 to 73 mph (34 to 63 knots). These storms are assigned a name and start to become more organized and circular.
Hurricane	A tropical cyclone with maximum sustained winds of 74 mph (64 knots) or higher. Hurricanes have very pronounced circulation of which an area of clear weather, an “eye” forms in the center.
Major Hurricane	A tropical cyclone with maximum sustained winds of 111 mph (96 knots) or higher, corresponding to a Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale.

Hurricane season for Texas officially begins on June 1 and ends on November 30. The greatest threat of a landfall for the Texas coast is between the beginning of June and the end of October. The NWS issues hurricane and tropical storm watches and warnings when these hazards are forming. These watches and warnings are issued or will remain in effect after a tropical cyclone becomes post-tropical, when such a storm poses a significant threat to life and property. The NWS allows the National Hurricane Center (NHC) to issue advisories during the post-tropical stage. Whenever a tropical cyclone or a subtropical storm has formed in the Atlantic or eastern North Pacific, the NOAA NHC issues tropical cyclone advisory products at least every 6 hours at 5 AM, 11 AM, 5 PM, and 11 PM Eastern Daylight Time (EDT). When coastal tropical storm or hurricane watches or warnings are in effect, the NHC issues Tropical Cyclone Public Advisories every 3 hours. The table below provides definitions of these tropical watches and warnings.[94]

Table 6.10.2: Tropical Watches and Warnings

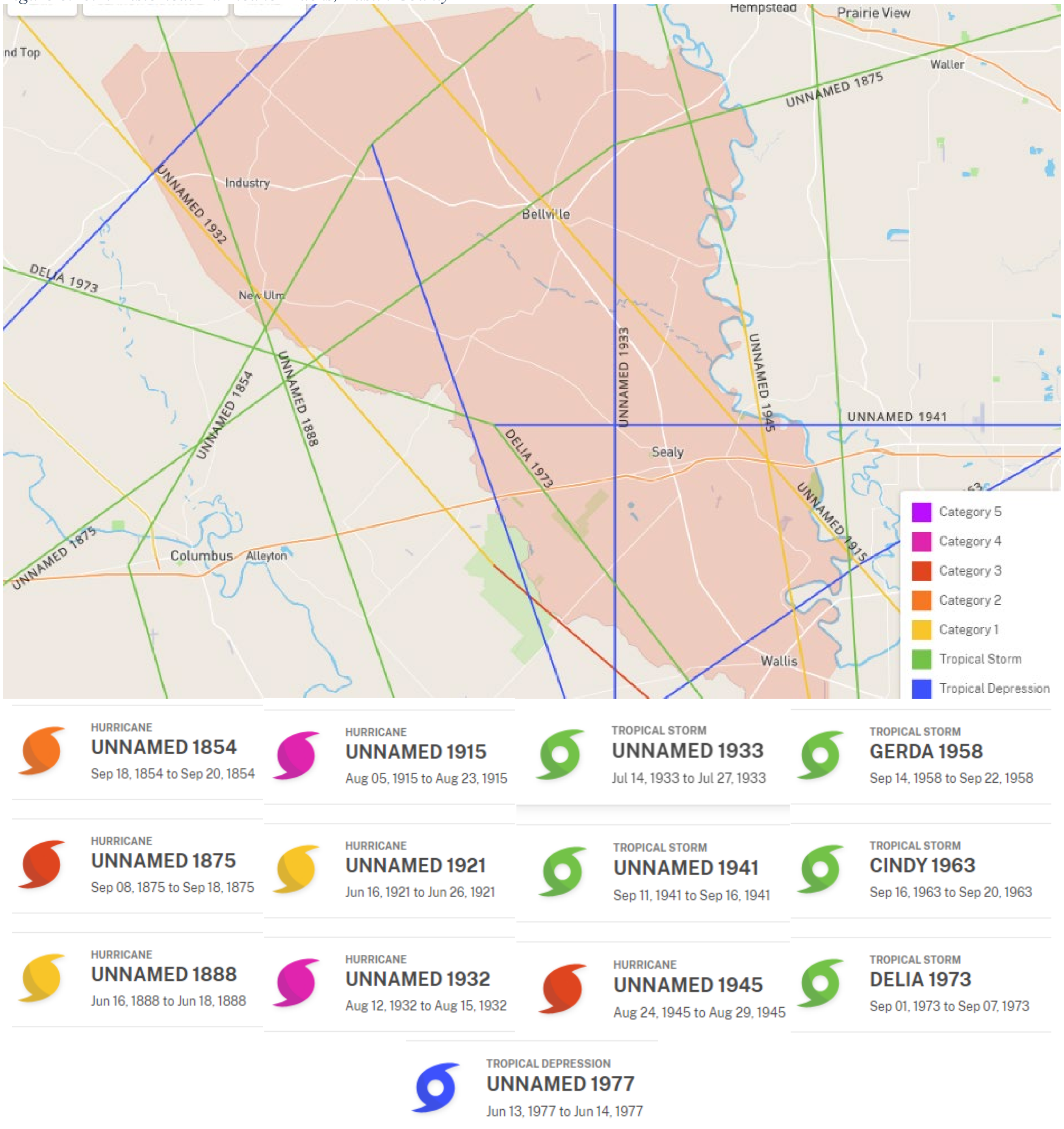
Name	Definition
Advisories	
Tropical Cyclone Public Advisory	Contains a list of all current coastal watches and warnings associated with an ongoing or potential tropical cyclone, a post-tropical cyclone, or a subtropical cyclone. Provides the cyclone position, maximum sustained winds, current motion, and a description of the hazards associated with the storm.
Watches	
Tropical Storm Watch	Tropical storm conditions (sustained winds of 39 to 73 mph) are possible within the specified area within 48 hours.
Storm Surge Watch	There is a possibility of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within 48 hours.
Hurricane Watch	Hurricane conditions (sustained winds of 74 mph or greater) are possible within your area. Because it may not be safe to prepare for a hurricane once winds reach

	tropical storm force, The NHC issues hurricane watches 48 hours before it anticipates tropical storm-force winds.
Warnings	
Tropical Storm Warning	Tropical storm conditions (sustained winds of 39 to 73 mph) are expected within your area within 36 hours.
Storm Surge Warning	There is a danger of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within 36 hours. If you are under a storm surge warning, check for evacuation orders from your local officials.
Extreme Wind Warning	Extreme sustained winds of a major hurricane (115 mph or greater), usually associated with the eyewall, are expected to begin within an hour. Take immediate shelter in the interior portion of a well-built structure.
Hurricane Warning	Hurricane conditions (sustained winds of 74 mph or greater) are expected somewhere within the specified area. NHC issues a hurricane warning 36 hours in advance of tropical storm-force winds to give you time to complete your preparations. All preparations should be complete. Evacuate immediately if so ordered.

Location

Austin County is located approximately 68 miles inland from the Gulf of Mexico. The winds from hurricanes, tropical storms and depressions typically have substantially weakened by the time they reach the county leading to minimal or no impacts. The rains generated from hurricanes, tropical storms and depressions do have a significant impact on flooding within the county. Flooding is profiled in Section 6.1 of this HMP. The figure below shows the historical hurricane, tropical storms, and tropical depression tracks that have crossed into Austin County. It is important to remember that these storms, named or unnamed, do not have to cross the county boundaries in order for the county to be at risk from their impacts.

Figure 6.10.1: Historical Hurricane Tracks, Austin County



Extent

Hurricane intensity is measured through the Saffir-Simpson Hurricane Wind Scale. The scale was originally developed by wind engineer Herb Saffir and meteorologist Bob Simpson. It has been an excellent tool for alerting the public about the possible impacts of various intensity hurricanes. The scale does not address the potential for other hurricane-related impacts, such as storm surge, rainfall-induced floods, and tornadoes. This wind caused damage general descriptions of the scale are to an extent dependent upon the local building codes in effect and how well and how long they have been enforced.[95]

The scale gives a 1 to 5 rating based only on a hurricane's maximum sustained wind speed and estimates potential property damage at each scale. Hurricanes of Category 3 and higher are known as major hurricanes. These hurricanes can cause devastating to catastrophic wind damage and significant loss of life due to the strength of their winds. Hurricanes of all categories can produce deadly storm surge, rain-induced floods, and tornadoes. These hazards require people to take protective action, including evacuating from areas vulnerable to storm surge.[96]

Table 6.10.3: The Saffir-Simpson Hurricane Wind Scale

Category	Sustained Wind Speeds	Types of Damage Due to Hurricane Winds
1	74-95 mph	**Very dangerous winds will produce some damage**: People, livestock, and pets struck by flying or falling debris could be injured or killed. 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	**Extremely dangerous winds will cause extensive damage**: There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) manufactured homes have a very high chance of being destroyed and the flying debris generated can shred nearby manufactured homes. Newer manufactured homes can also be destroyed. 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	111-129 mph	**Devastating damage will occur**: There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) manufactured homes will be destroyed. Newer manufactured homes will sustain severe damage with potential for complete roof failure and wall collapse. 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	130-156 mph	**Catastrophic damage will occur**: There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) manufactured homes will be destroyed. A high percentage of newer manufactured homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also 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	157 mph or higher	**Catastrophic damage will occur**: People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in manufactured homes or framed homes. Almost complete destruction of all manufactured homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. 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.

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County Hurricane, Tropical Storms, and Depressions events data from 1950-2023 is provided in the table below.[39]

Table 6.10.4: Austin County Hurricane, Tropical Storms, and Tropical Depressions (1950-2023)

Date	Jurisdiction	Event Type	Injuries/ Deaths	Property Damage	Crop Damage	Wind Speed (mph)
4/21/1958	N/A, Austin County	Tropical Storm	0/0	$25,000	$0	ND
4/29/1960	N/A, Austin County	Tropical Storm	0/0	$0	$0	ND
8/13/1977	N/A, Austin County	Tropical Storm	0/0	$0	$0	ND
TOTALS:			**0/1**	**$25,000**	**$0**	N/A

ND- No Data

Presidential Disaster Declarations

There have been seven federally declared hurricane disasters in Austin County since 1950. There is also one severe storm disaster the mentions a tropical storm and was included in the table below.

Table 6.10.5: Federal Disaster Declarations for Hurricane, Tropical Storms, and Tropical Depressions

Date	Disaster Number	Declaration Types	Incident Type	Declaration Title
8/26/1998	1239	Major Disaster Declaration	Severe Storm	Tropical Storm Charley
9/2/2005	3216	Emergency Declaration	Hurricane	Hurricane Katrina
9/21/2005	3261	Emergency Declaration	Hurricane	Hurricane Rita
9/24/2005	1606	Major Disaster Declaration	Hurricane	Hurricane Rita
8/29/2008	3290	Emergency Declaration	Hurricane	Hurricane Gustav
9/10/2008	3294	Emergency Declaration	Hurricane	Hurricane Ike
9/13/2008	1791	Major Disaster Declaration	Hurricane	Hurricane Ike
8/25/2017	4332	Major Disaster Declaration	Hurricane	Hurricane Harvey

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.10.6: USDA Declared Disasters (2018-2023), Hurricane, Tropical Storms, and Tropical Depressions

Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

The State of Texas HMP estimates the occurrence of hurricanes, tropical storms and depressions is trending upward, with a 400% increase in the 5-year planning cycle between 2017-2021.[63] According to the FEMA NRI for hurricanes in Austin County, annualized frequency values are 0.1 events per year over a 73-year period of record (1949-2021), with 17 events on record for this timeframe.[42]

Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provide a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor that incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts of natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

Populations at risk for hurricanes, tropical storms, and depressions include the entire county as this hazard has no geographic boundaries. Additionally, people living in mobile homes are especially at risk of injury and death from the tornadoes and dangerous winds produced by these types of hazards. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph.

EAL for Austin County each year according to the FEMA NRI for hurricane events is listed as relatively low. EAL Exposure Values and EAL Values can be found in the tables below. Tropical storms and tropical depressions are not included in the NRI and were omitted from these tables.[42]

Table 6.10.7: Expected Annual Loss Exposure Values, Hurricane

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Strong Wind	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	Relatively Low

Table 6.10.8: Expected Annual Loss Values, Hurricane

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Strong Wind	$2,289,293	$57,018/ 0.000	$50,470

N/A- Not Applicable

Historic loss ratios, according to the FEMA NRI, for hurricanes within Austin County are relatively high. The figures below show, by census tract, the risk index score for this hazard, the social vulnerability score, and the community resilience score.

Figure 6.10.2: Risk Index by Census Tract, Hurricane

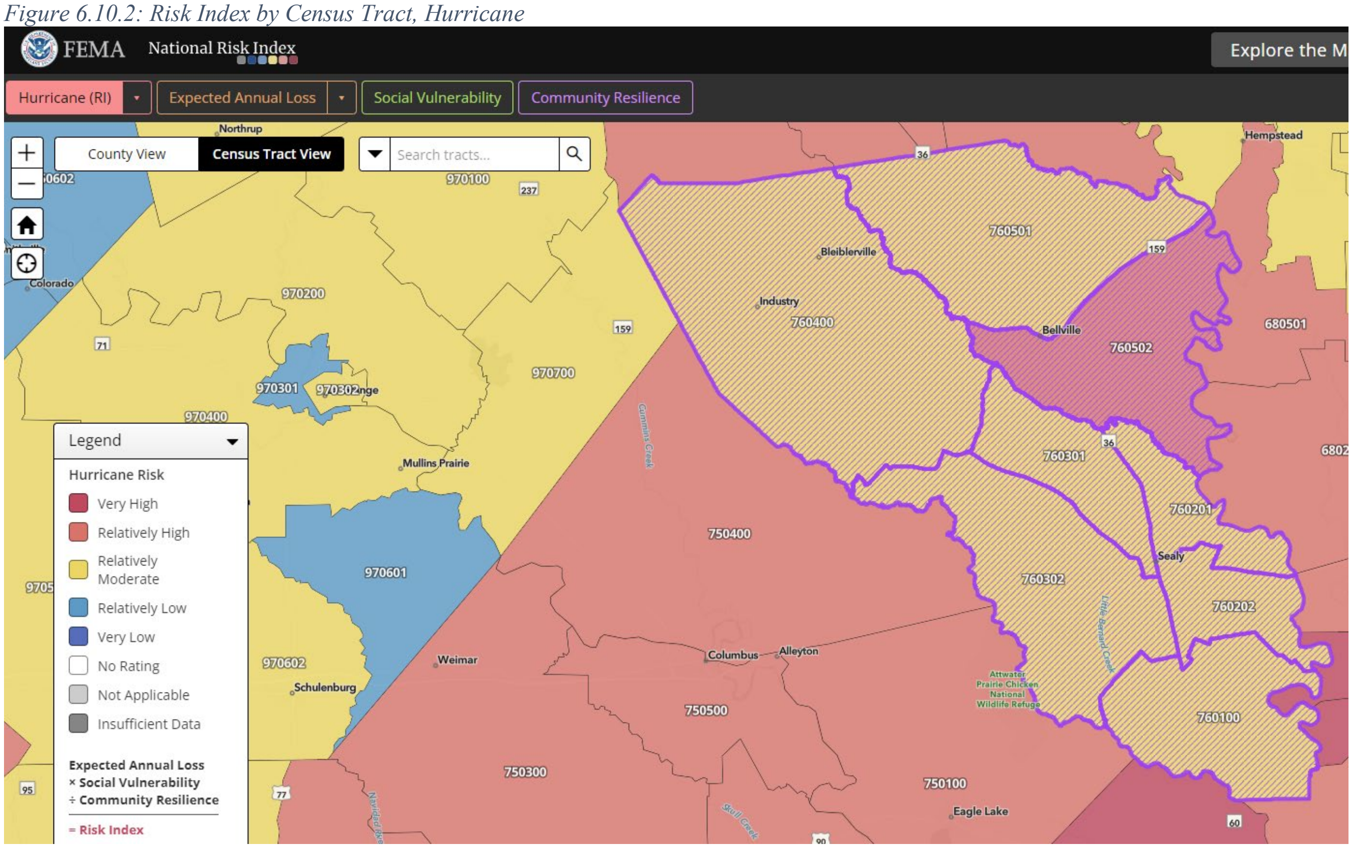


Figure 6.10.3: Social Vulnerability by Census Tract, Austin County

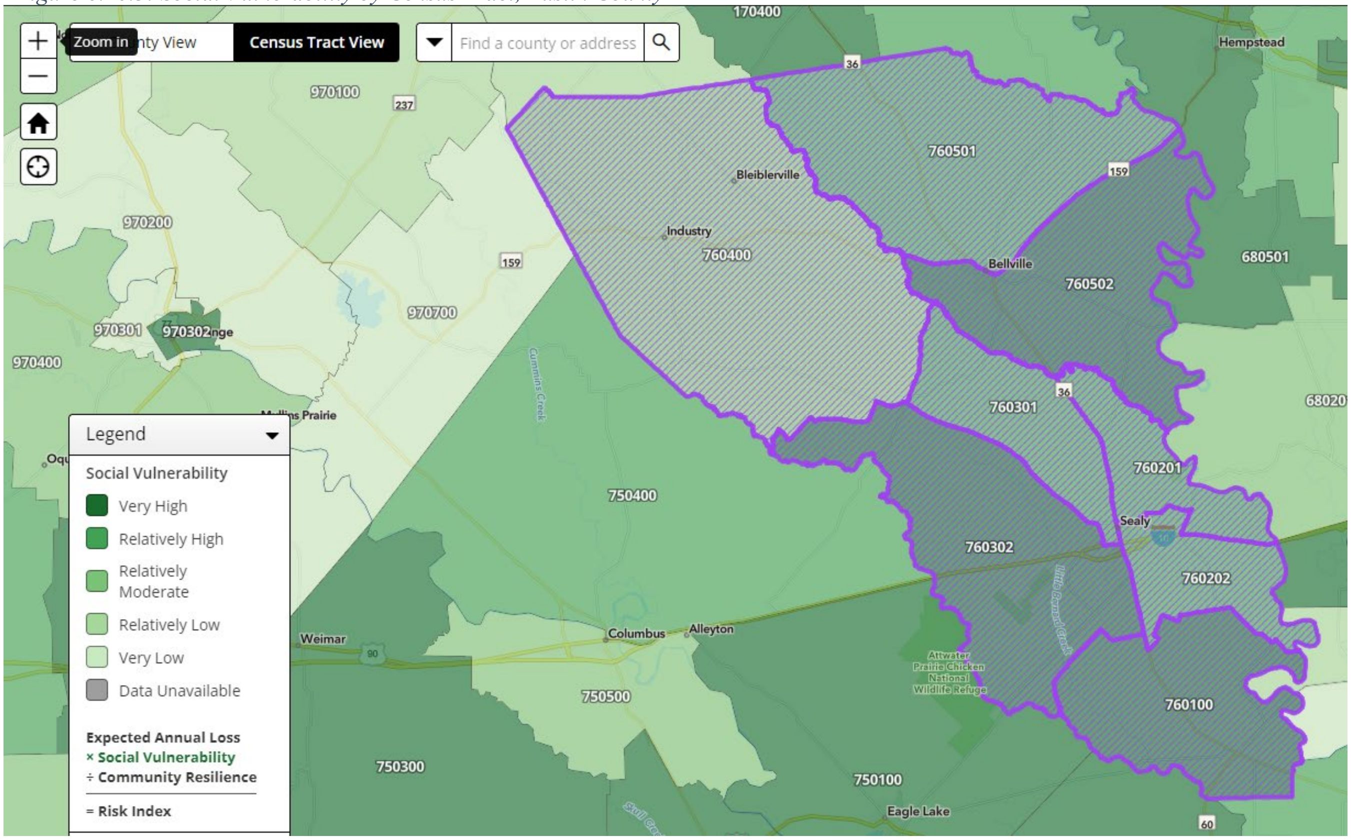


Figure 6.10.4: Community Resilience by Census Tract, Austin County

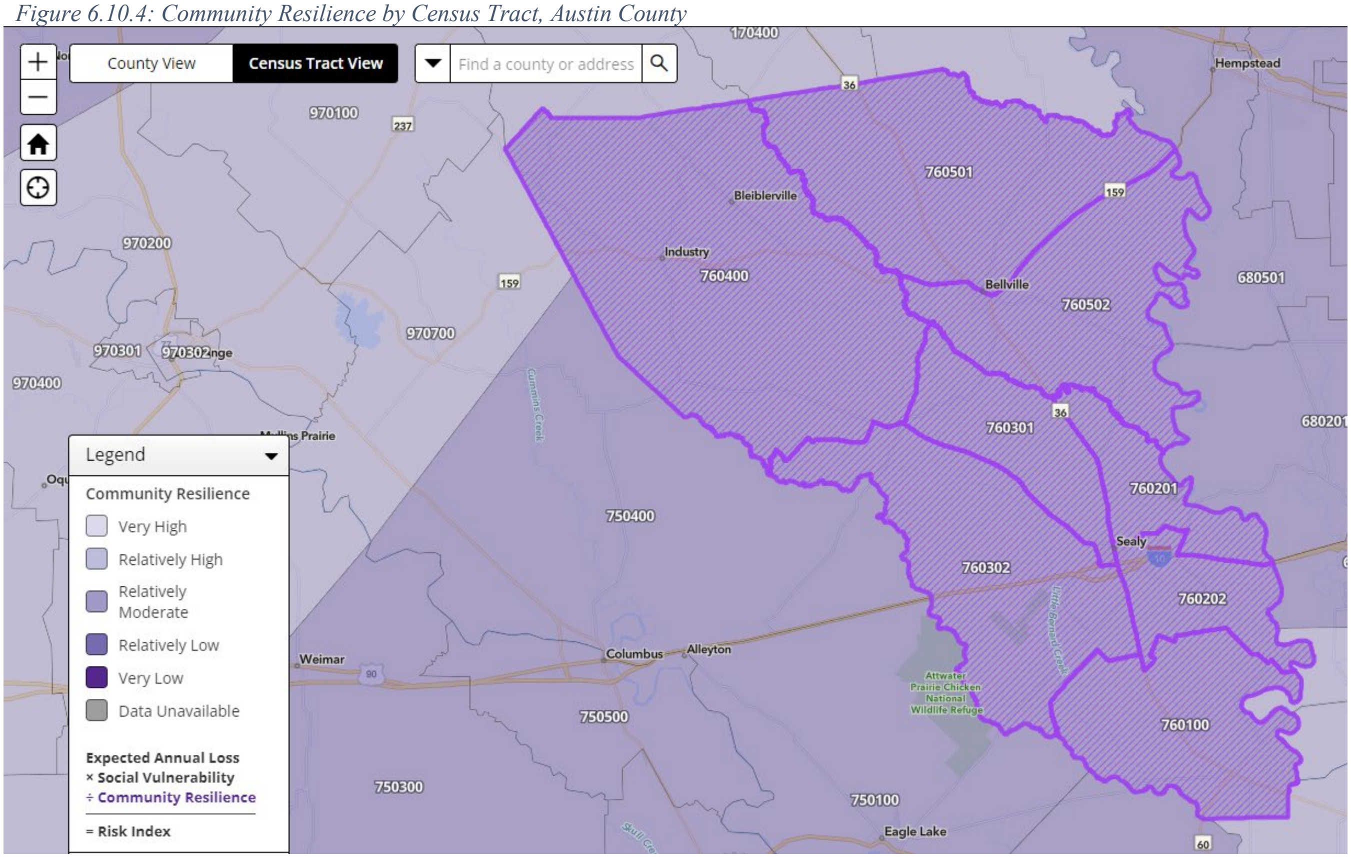


Figure 6.10.5: FEMA NRI Summary, Hurricane

Rank	Community	Social Vulnerability	Community Resilience	Hazard Type: Hurricane Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48015760502	Very High	Relatively Low	Relatively High	86.04	0 100
2	Census tract 48015760302	Very High	Relatively Low	Relatively Moderate	85.08	0 100
3	Census tract 48015760501	Relatively High	Relatively Low	Relatively Moderate	83.71	0 100
4	Census tract 48015760202	Relatively High	Relatively Low	Relatively Moderate	82.99	0 100
5	Census tract 48015760400	Relatively Moderate	Relatively Low	Relatively Moderate	79.64	0 100
6	Census tract 48015760301	Relatively High	Relatively Low	Relatively Moderate	77.6	0 100
7	Census tract 48015760100	Very High	Relatively Low	Relatively Moderate	72.69	0 100
8	Census tract 48015760201	Relatively High	Relatively Low	Relatively Moderate	69.8	0 100

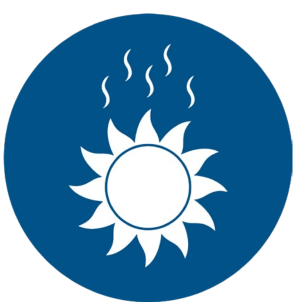
Climate Change Impacts

According to the Office of the Texas State Climatologist, hurricanes, tropical storms and depressions though unpredictable in quantity between 5-year planning cycles, will continue to intensify due to other climate related factors such as environmental conditions for thunderstorm intensity rising, warmer temperatures, and increasing ocean temperatures. As temperatures increase, the amount of energy available to fuel the storms, especially those that form over warm tropical waters of the Atlantic Ocean and Gulf of Mexico are expected to increase.[43]

Table 6.10.9: Climate Change Impacts Summary, Hurricane, Tropical Storms, and Tropical Depressions

Location	The location of hurricane, tropical storms, and tropical depressions is not expected to change.
Extent/Intensity	The extent and intensity of hurricane, tropical storms, and tropical depressions is not expected to change.
Frequency	There are no clear trends in hurricane, tropical storms, and tropical depressions frequency just as there are no clear trends in severe thunderstorm frequency. This is due to considerable variability in conditions that lead to them occurring. However, these hazards occur most frequently in warmer months. For the Texas coast, hurricane season officially begins on June 1 and ends on November 30. The greatest threat of a landfall for the Texas coast is between the beginning of June and the end of October.
Duration	The duration of hurricane, tropical storms, and tropical depressions is not likely to change, however, the intensity of them is expected to increase due to rising temperatures and the proximity of the county to the Gulf of Mexico aiding to fuel thunderstorms and tropical cyclone formation.

Section 6.11: Extreme Heat



6.11 Extreme Heat

Heat events, or extreme heat, is defined by the CDC as summertime temperatures that are much hotter and/or humid than average.[97] The US Department of Homeland Security's Ready.gov websites take this definition a step further by defining extreme heats as "a period of high heat and humidity with temperatures above 90°F for at least two to three days." Among all weather-related hazards, extreme heat is responsible for the highest number of annual deaths as the body must work extra hard to maintain a normal temperature.[98] Heat-related illnesses, like heat exhaustion or heat stroke, happen when the body is not able to properly cool itself. While the body normally cools itself by sweating, during extreme heat, this might not be enough. In these cases, a person's body temperature rises faster than it can cool itself down. This can cause damage to the brain and other vital organs. The table below provides classifications of various heat related NWS warnings and watches for extreme heat.[99]

Table 6.11.1: Heat Related Watches and Warnings

Name	Definition
Excessive Heat Outlook	**Be Aware!** The outlooks 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.
Excessive Heat Watch	**Be Prepared!** Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
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°F or higher for at least 2 days and nighttime air temperatures will not drop below 75°F; however, these criteria vary across the country, 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.
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°F or higher for at least 2 days, and nighttime air temperatures will not drop below 75°F; 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 may become seriously ill or even die.

Location

The risk of a heat wave occurring applies the same to the entire county. Austin County experiences the highest temperatures in the months of June to August, with average temperatures between 90°F and 100°F degrees. In areas that are more developed, the "urban heat island" effect (increased air temperatures in urban areas in contrast to cooler surrounding rural areas.) can occur due to higher concentrations of buildings and pavement. These materials absorb more heat during the day and radiate it at night, prohibiting temperatures from cooling as much compared to rural areas.[100]

Extent

Intensity of heat and extreme heat events are measured by temperature and the humidity. NOAA's heat index or the "Apparent Temperature" is an accurate measure of how hot it really feels when the relative humidity is added to the actual air temperature.[99] The figure below outlines the NOAA NWS heat index for shaded areas. In direct sunlight, these heat index values can be increased by up to 15°F. At temperatures over 103°F dangerous heat disorders can begin with prolonged exposure to the heat or increased physical activity in the heat.[100]

Figure 6.11.1: NOAA NWS Heat Index

NWS Heat Index

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

The table below outlines various effects on the body in relation to the heat index and associated temperature from the figure above.

Table 6.11 2: Heat Index

Color	Heat Index	Classification	Effect on the body
	Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
	Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
	Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
	Extreme Danger	125°F or higher	Heat stroke highly likely

Historic Occurrences

NOAA collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the NCDC storm events database. A condensed version of the Austin County heat events data from

1950-2023 is provided in the table below.[39] The previous *seven* occurrences of heat or excessive heat all occurred within the last year, 2023.

Table 6.11.3: Austin County Heat Events (1950-2023)

Date	Event	Deaths/ Injuries	Property Damage	Crop Damage
6/26/1999	Heat Event	0/0	$0.00	$0.00
8/1/1999	Heat Event	0/0	$0.00	$0.00
7/6/2000	Heat Event	0/0	$0.00	$0.00
8/29/2000	Heat Event	0/0	$0.00	$0.00
9/1/2000	Heat Event	0/0	$0.00	$0.00
6/24/2009	Heat Event	0/0	$0.00	$0.00
6/16/2023	Excessive Heat	0/0	$0.00	$0.00
6/25/2023	Excessive Heat	0/0	$0.00	$0.00
6/25/2023	Excessive Heat	0/0	$0.00	$0.00
7/12/2023	Excessive Heat	0/0	$0.00	$0.00
8/5/2023	Excessive Heat	0/0	$0.00	$0.00
8/23/2023	Excessive Heat	0/0	$0.00	$0.00
9/5/2023	Heat Event	0/0	$0.00	$0.00

Presidential Disaster Declarations

There have been no federally declared heat or extreme heat disaster federal declarations in Austin County since 1950.

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

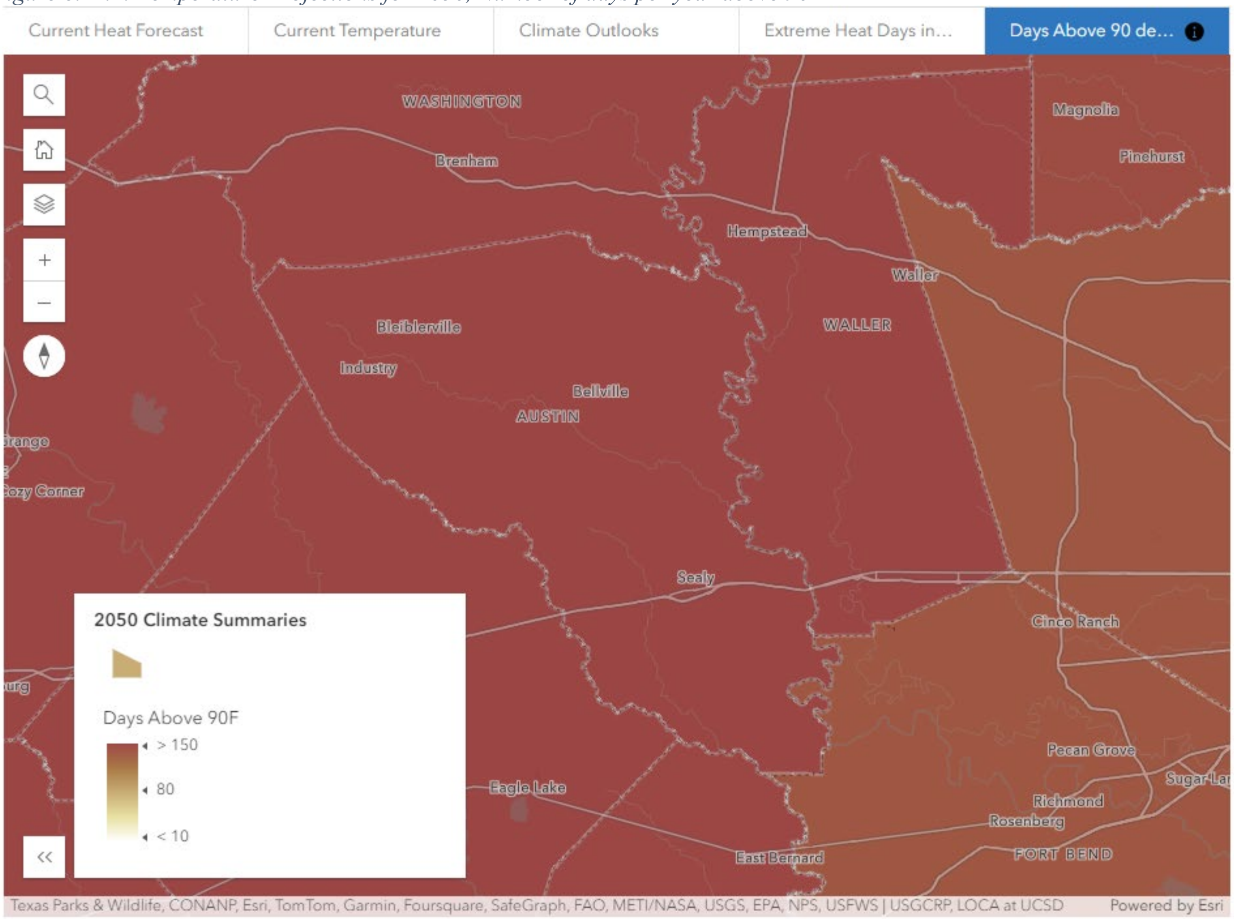
Table 6.11.4: USDA Declared Disasters (2018-2023), Extreme Heat

Crop Disaster Year	Disaster Description	Designation Number
2022	Excessive Heat	S5350
2023	Excessive Heat and Drought	S5569

Probability of Future Occurrences

The State of Texas HMP estimates the occurrence of extreme heat and heat events is trending upward, with a 600.5% increase in the 5-year planning cycle between 2017-2021.[63] According to the FEMA NRI for heat waves in Austin County, annualized frequency values are 0.0 events per year over a 16-year period of record (2005-2021), with 0 events on record for this timeframe.[42] This may change in the near future as NRI data is updated and recent heat events that have occurred within the county occurred after the reporting period used by the NRI. Additionally, as seen in the figures below, projections for number of days per year above 90°F, and number of days per year warmer then the top 1% historically, have both increased since previous reporting periods. These projections are expected to increase further by 2050. [101]

Figure 6.11.2: Temperature Projections for 2050, Number of days per year above 90°F



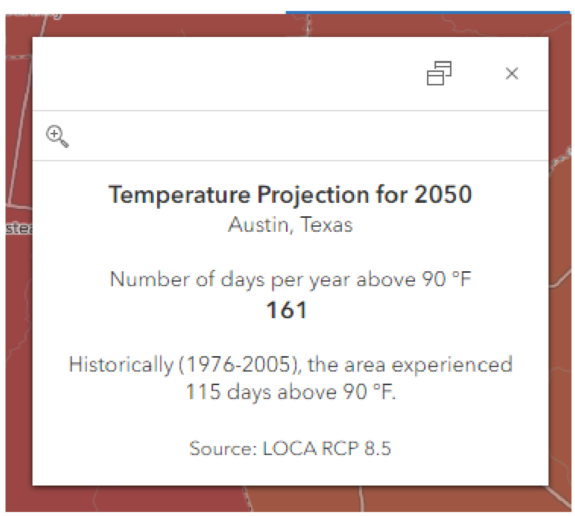
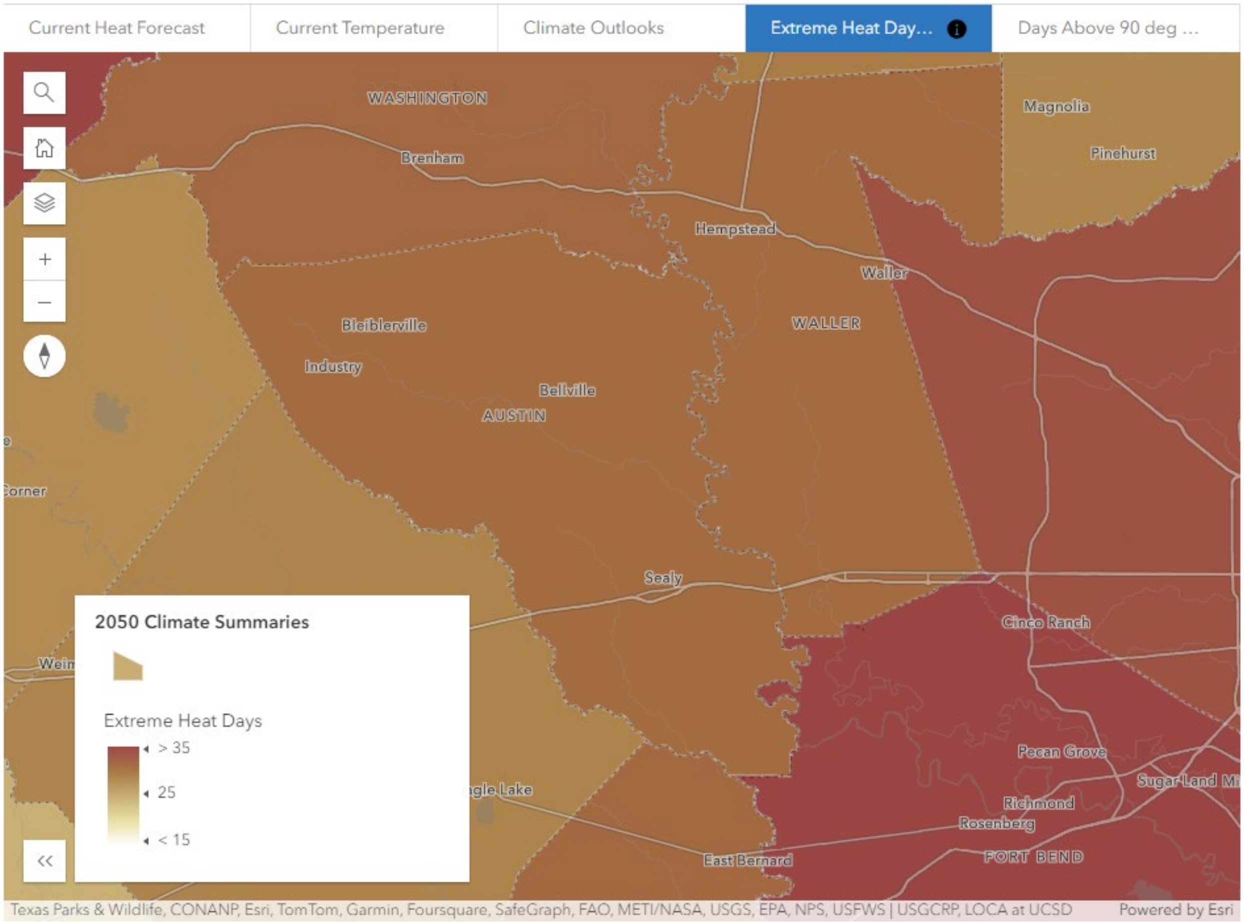
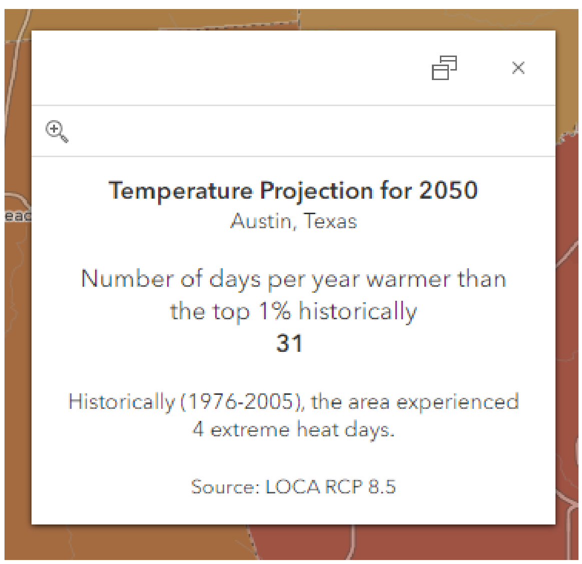


Figure 6.11.3: Temperature Projection for 2050, Number of days per year warmer then the top 1% historically





Populations at Risk

FEMA's NRI utilizes data from multiple sources including historical hazard events, hazard intensity, exposure of people and property to hazards, socioeconomic factors, and community resilience indicators. The NRI also incorporates hazard data to determine the frequency and intensity of various natural hazards. This information helps assess the likelihood of specific hazards occurring in different regions.

The NRI considers the exposure of communities to hazards and incorporates factors such as population density, infrastructure systems, and critical facilities that may be at risk during a hazard event. The NRI also generates risk scores for communities across the U.S. that provide a relative ranking of areas based on their overall risk level. This helps to identify areas that may require additional resources and attention for mitigation and planning efforts. The NRI risk equation includes 3 components. EAL represents the average economic loss in dollars resulting from natural hazards each year. The Community Risk Factor is a scaling factor that incorporates social vulnerability (the susceptibility of social groups to the adverse impacts of natural hazards) and community resilience (the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions) into the NRI. The outcome, the risk index, represents the potential negative impacts of natural hazards. The NRI EAL score, and rating, represent a community's relative level of expected loss each year when compared to all other communities at the same level.[48]

While heat events have the potential to damage buildings and crops, vulnerable populations are most at risk in the county during these events. These vulnerable populations include elderly adults, which are the most vulnerable demographic to heat waves as the body's ability to thermoregulate deteriorates with age. Additionally, those who are pregnant, people with heart or lung conditions, young children, athletes, and outdoor workers are also vulnerable to this hazard. Even young and healthy people can be affected if they participate in strenuous physical activities during hot weather.[97] Additionally, any critical facility acting as a cooling facility or any correctional facility that may lose power due to brown outs are also at risk. This is because of widespread power outages that may occur during peak heat hours during the day and the strain it puts on the Texas power grid.

EAL for Austin County each year according to the FEMA NRI for heat events is listed as relatively low, this is because the county is unrated for heat wave within the NRI. EAL Exposure Values and EAL Values can be found in the tables below.[42]

Table 6.11.5: Expected Annual Loss Exposure Values, Heat Wave

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agricultural Value ($)	EAL Total ($)	EAL Rating
Heat Wave	$7,118,991,434	$348,150,800,000/ 30,013	$37,985,562	$355,307,776,996	Relatively Low

Table 6.11.6: Expected Annual Loss Values, Heat Wave

Hazard Type	Building Value ($)	Population Equivalence ($)/ Population (#)	Agriculture Value
Heat Wave	N/A	N/A	N/A

N/A- Not Applicable

Climate Change Impacts

According to the Office of the Texas State Climatologist, extreme heat has recently become more frequent and more severe. For example, extreme summer heat is approaching values not seen since the early part of the 20th Century and is likely to surpass those numbers by 2036. The typical number of triple-digit days by 2036 is projected to be substantially larger, about 40%, than typical values so far in the 21st Century.[43] Additionally, with an increase in development and impervious pavement in areas the heat island effect will become more prominent in urban areas of the county. The fourth national climate assessment, an authoritative assessment of the science of climate change with a focus on the United States, notes that the annual average temperature over the contiguous U.S. increased by 1.2°F over the period 1986–2016 relative to 1901–1960. The frequency of heat waves has increased since the mid-1960s. Climate projections indicate that extreme heat events will be more frequent and intense in coming decades.[102]

Table 6.11.7: Climate Change Impacts Summary, Extreme Heat

Location	The location of extreme heat and heat events is expected to increase in urban areas of the county.
Extent/Intensity	The extent and intensity of extreme heat and heat events is expected to increase.
Frequency	Frequency of extreme heat and heat events is expected to increase.
Duration	The duration of extreme heat and heat events is expected to increase.

Section 6.12 Dam/Levee Failure

6.12 Dam/Levee Failure

A dam failure is defined as the systematic failure of a dam structure resulting in the uncontrolled release of water, often resulting in floods that could exceed the 100-year floodplain boundaries. Dam failures can be catastrophic due to the energy of the water stored behind the dam being capable of causing rapid and unexpected flooding downstream and immense destruction resulting in loss of life and substantial property damage. There are four major causes of dam failures, as outlined in Table 6.12.1 below.[103]

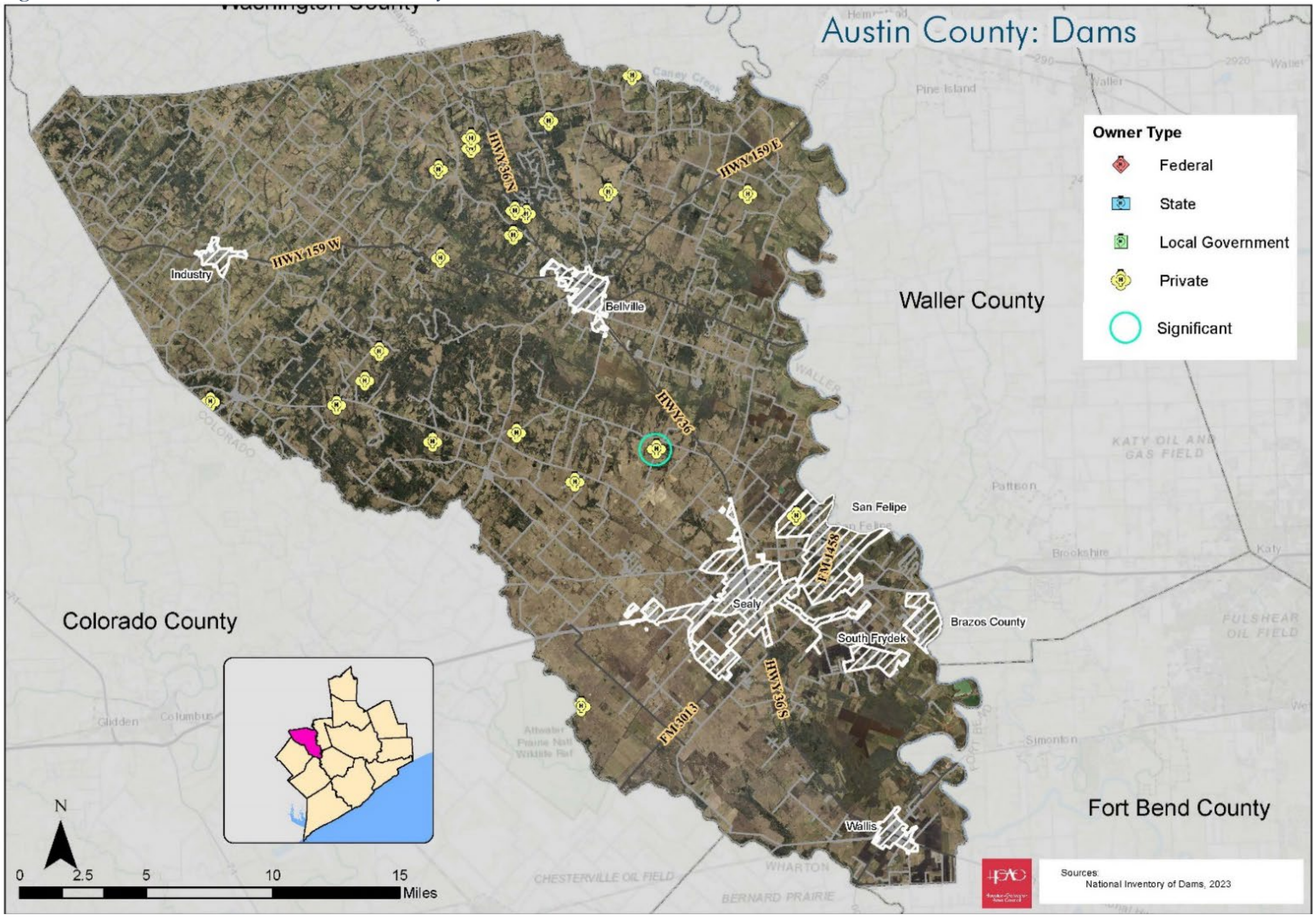
Table 6.12.6: Dam Failure Causes

Dam Failure Cause	Description
Overtopping	These failures occur because of poor spillway design, leading to a reservoir filling too high with water, especially in times of heavy rainfall.
Foundation Defects	These failures occur because of settling in the foundation of the dam, instability of slopes surrounding the dam, uplift pressures, and seepage around the foundation. All these failures result in structural instability and potential dam failure.
Piping and Seepage Failures	These failures occur because of internal erosion caused by seepage and erosion along hydraulic structures such as spillways. Erosion due to animal burrows and/or cracks in the dam structure contributes to these types of failures.
Conduit and Valve Failures	These failures occur as a result of problems with values and conduits.

Location

Figure 6.12.1 shows dam locations across Austin County and highlights those with significant hazard potentials.

Figure 6.12.1: Dam Locations in Austin County



Extent

The United States Army Corps of Engineers (USACE) keeps a database of dams, the National Inventory of Dams. Among the many attributes recorded is downstream hazard potential. Ratings of high, significant, or low are given to each dam depending on the potential hazard to the downstream area resulting from failure or maloperation. If it is estimated that there will be any probable loss of any human life this automatically puts the dam in the high hazard category. If there are any estimated economic, environmental, or lifeline losses this places a dam in the significant hazard category. If these losses are low and generally limited to the dam owner, a dam will be categorized as low hazard. The hazard potential rating does not reflect the current condition of the dam or the likelihood of the dam failing.[104] The Texas Commission on Environmental Quality (TCEQ) Dam Safety program also determines the hazard classification of dams based on the criteria in 30 Texas Administrative Code 299.14, as seen in Table 6.12.2 below.[105]

Table 6.12.7: Dam Hazard Classifications

Hazard Classification	Loss of Life	Economic Loss
Low	No loss of life	Minimal (located primarily in rural areas where failure may damage occasional farm buildings, limited agricultural improvements, and minor highways.)
Significant	Loss of human life possible (1-6 lives or 1-2 habitable structures in	Appreciable (located primarily in rural areas where failure may cause damage to isolated

	the breach inundation area downstream of the dam.)	homes, damage to secondary highways, damage to minor railroads, or interruption of service or use of public utilities.)
High	Loss of life expected (7+ lives or 3+ habitable structures in the breach inundation area downstream of the dam.)	Excessive (located primarily in or near urban areas where failure would be expected to cause extensive damage to public facilities, agricultural, industrial, or commercial facilities, public utilities, including the design purpose of the utility, main highways, or railroads used as a major transportation system.)

According to the USACE National Inventory of Dams, there are 21 total dams in the county with 1 being categorized as having a significant hazard potential (Peters Lake Dam). A dam is exempt from safety requirements, such as having an Emergency Action Plan on file if it has a maximum impoundment capacity of less than 500 ac-ft. and is either classified as a low or significant hazard, on private property, in a county with a population of less than 350,000 (as per 2010 census) and not within the corporate limits of a municipality. The Peters Lake Dam was built in 1939 and has an Emergency Action Plan on file that was revised on 1/20/2012. It sits south of FM 949 and is connected to Deadman Creek. Figure 6.12.3 below shows dam locations within the county. [106]

Table 6.12.8: Austin County Dams and Hazard Potential Totals

Significant Hazard Potential Dams	Low Hazard Potential Dams	Total Dams
1	20	21

Historic Occurrences

The Association of State Dam Safety Officials (ASDSO) Dam Incident Database provides basic information on dam safety incidents to ASDSO members, dam safety stakeholders, the media, and the public. According to the ASDSO, there have been no historical occurrences of dam/levee failures within Austin County.[107]

Probability of Future Occurrences

The State of Texas has not experienced loss of life or extensive economic damage due to a dam failure since the City of Austin dam failure of April 7, 1900, which was caused by heavy rainfall and faulty construction.[108] The risk of dam failure is monitored closely by TCEQ and local emergency management staff. The probability of a future dam/levee failure within Austin County is low. However, it is important to note that increases in the amount and intensity of rainfall will lead to additional pressures being placed on these systems. Additionally, as these dams/levees age, and as development increases in areas that are downstream of dam/levee inundation zones, the risk becomes higher. It is likely that dams within the county that are rated as low-hazard potential structures today may have a different classification in the future. TCEQ administers the High Hazard Potential Dam (HHPD) Grant Program, which provides technical, planning, design, and construction assistance in the form of grants for the rehabilitation of eligible high-hazard potential dams.[109]

Populations at Risk

Vulnerable populations for this hazard include those that are located within the inundation zones, and areas downstream of the dam that would be flooded in the event of a failure.

Climate Change Impacts

Temperatures and precipitation totals are expected to increase due to climate change, leading to more frequent or intense periods of rainfall and flooding. These increased volumes could potentially cause more pressure on aging dam infrastructure.

Table 6.12.9: Climate Change Impacts Summary, Dam/Levee Failure

Location	The location of dam/levee failures is not expected to change.
Extent/Intensity	The extent and intensity of dam/levee failure is not expected to change.
Frequency	There are no clear trends in the frequency of dam/levee failures within the county.
Duration	The duration of dam/levee failures is not expected to change.

Section 6.13: Emerging Infectious Diseases

6.13 Emerging Infectious Diseases

Emerging Infectious Diseases (EID) are defined by the National Institute of Allergy and Infectious Diseases as "infectious diseases that have newly appeared in a population or have existed but are rapidly increasing in incidence or geographic range."[110] Similarly, a pandemic is a disease outbreak that spans several countries and affects many people. Pandemics are most often caused by viruses which can easily spread from person to person.[111] This hazard profile will refer to EID and use the 2019 coronavirus, SARS-CoV-2, pandemic to give a clearer picture of the risk and vulnerability of this new hazard of concern for the county.

Location

The risk of EID applies the same to the entire county as this hazard has no geographic boundaries. However, areas that are more densely populated can contribute to the rapid spread of EID.

Extent

The extent of an infected population depends on how the illness is spread and methods of transmissibility and detection. In areas that are more densely populated, contact between infected and uninfected individuals may be greater than in rural areas leading to more chances for infection.

Historic Occurrences

Pandemics can emerge anywhere and quickly spread. It is difficult to predict when or where the next pandemic will occur.[112] According to the CDC, five pandemics have occurred within the US since 1918. The table below outlines these pandemics, when they occurred, and the underlying cause.[113]

Table 6.13.1: Historic Pandemic Occurrences in the US

Pandemic Name	Estimated Deaths (US only)	Cause
1918 Pandemic	675,000	Influenza virus, H1N1
1957- 1958 Pandemic	116,000	Influenza virus, H2N2
1968 Pandemic	100,000	Influenza virus, H3N2
2009 H1N1 Pandemic	12,469	Influenza virus, H1N1 pdm09 virus
2020 Covid-19 Pandemic	1,181,607	SARS-CoV-2 virus

Presidential Disaster Declarations

There have been 2 federally declared emerging infectious disease related disaster declarations in Austin County for EID listed under biological incidents.

Table 6.13.2: Federal Disaster Declarations for Emerging Infectious Diseases

Date	Disaster Number	Declaration Types	Incident Type	Declaration Title
3/13/2020	3458	Major Disaster Declaration	Biological	Covid-19
3/25/2020	4485	Emergency Declaration	Biological	Covid-19 Pandemic

USDA Disaster Declarations

The Secretary of Agriculture is authorized to designate counties as disaster areas to make EM loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM loan eligibility, other emergency assistance programs, such as FSA disaster assistance programs, have historically used disaster designations as an eligibility trigger. USDA

Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, by an Indian Tribal Council leader, or by an FSA SED. The Secretarial disaster designation is the most widely used. When there is a presidential disaster declaration, FEMA immediately notifies FSA of the primary counties named in a Presidential declaration. USDA Disaster Declarations for Austin County since the last HMP update are listed in the table below.[40]

Table 6.13.3: USDA Declared Disasters (2018-2023), Emerging Infectious Diseases

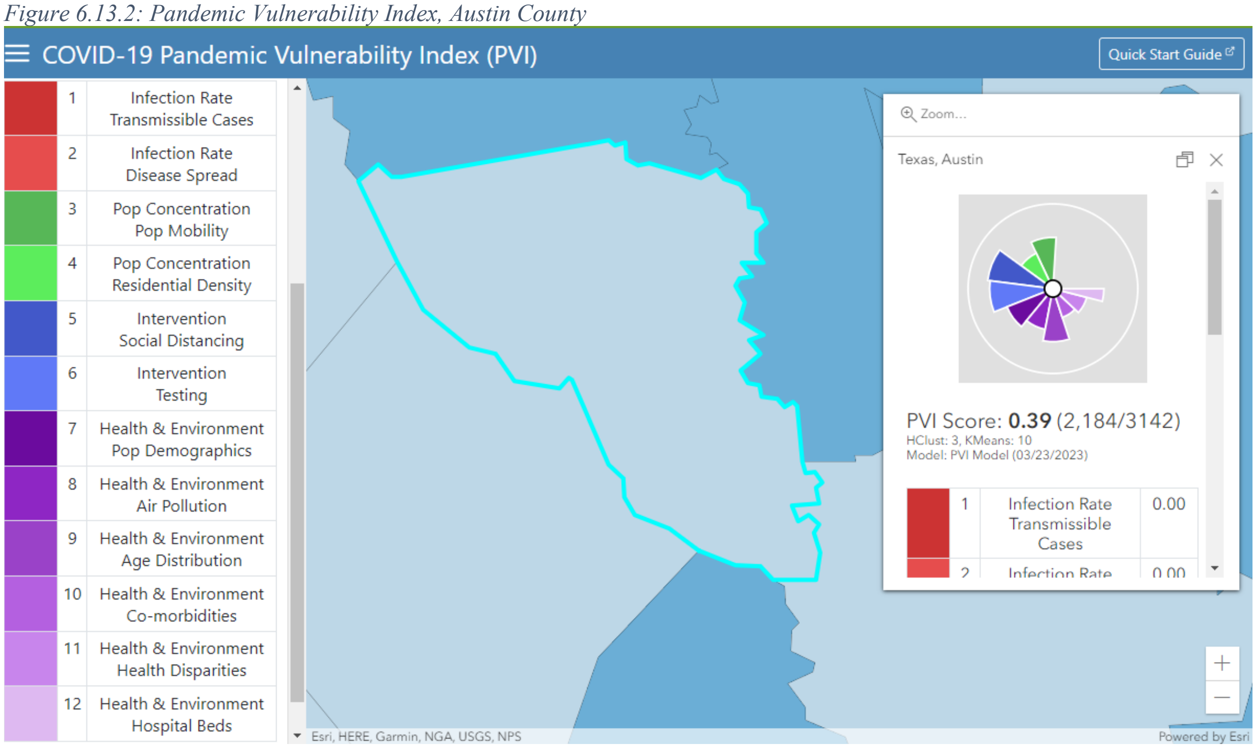
Crop Disaster Year	Disaster Description	Designation Number
	None	

Probability of Future Occurrences

EID and pandemics can emerge anywhere and quickly spread. It is difficult to predict when or where the next pandemic will occur. As seen in The National Center for Biotechnology Information review titled "The consequences of human actions on risks for infectious diseases", The number of events of emerging infections has been increasing over the last 100 years. EIDs have been reviewed extensively during the last two decades, and it is now generally accepted that most drivers of emerging diseases are ecological, and the majority of these caused by anthropogenic influences such as increased travelling and transport of animals and goods; changes in ecosystems; deforestation and reforestation; altered land use; increased irrigation and creation of water dams and reservoirs; and urbanization.[114]

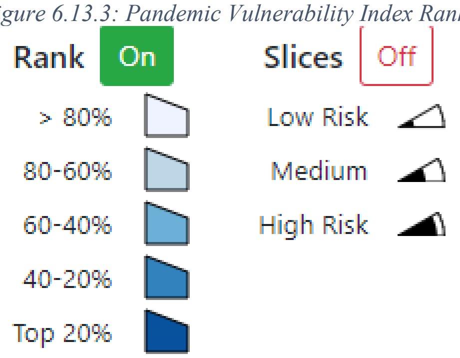
The National Institute of Environmental Health Sciences developed the COVID-19 Pandemic Vulnerability Index (PVI) Dashboard. This Dashboard creates risk profiles, called PVI Scorecards, for each county in the United States. The PVI summarizes and visualizes overall risk in a radar chart, which is a type of pie chart with various data sources comprising each slice of the pie. Austin County saw 6,867 Covid-19 cases and 83 deaths during the most recent pandemic. As seen in the figure below, Austin County's PVI score is 0.39.[115]

Figure 6.13.2: Pandemic Vulnerability Index, Austin County



The slices shown in the chart to the right indicate a different data source (as described on the left of the figure). The information from each slice is combined to generate a PVI score for each county. A 0.39 PVI score puts Austin County in the > 80% vulnerability ranking. Additionally, the bigger the "slice" shown for each item in the pie chart indicates the county has a higher risk for that area.

Figure 6.13.3: Pandemic Vulnerability Index Ranking Legend



Populations at Risk

EID can vary on severity for different populations based on age, underlying conditions, and how the disease is spread. The last 5 pandemics experienced in the US were respiratory illnesses. Populations that were/are most at risk include people who are older, those with heart or lung conditions, people with compromised immune systems, and people who are obese or diabetic.[116]

Climate Change Impacts

According to the CDC, milder winters, warmer summers, and fewer days of frost make it easier for these and other infectious diseases to expand into new geographic areas and infect more people. As climate changes, new infections may emerge that threaten human health or livelihood.[117]

Table 6.13.4: Climate Change Impacts Summary, Emerging Infectious Diseases

Location	The location of EID is expected to increase in urban areas of the county.
Extent/Intensity	The extent and intensity of EID is expected to increase.
Frequency	Frequency of EID is expected to increase.
Duration	There is no clear trend in duration of EID.

Section 6.14: Cybersecurity

6.14 Cybersecurity

The Internet has improved communication, innovation, and access to information, however due to its largely open and unregulated nature municipal governments are more vulnerable to the hazards associated with cybersecurity threats and incidents. FEMA defines cyberattacks as "malicious attempts to access or damage a computer or network system." Cyberattacks can lead to the loss of money or the theft of personal, financial, and medical information." Cybersecurity involves preventing, detecting, and responding to those cyberattacks that can have wide-ranging effects on individuals, organizations, the community, and the nation.[118] Cyber terrorism refers to an attack on information technology itself in a way that would radically disrupt networked services. For example, cyber terrorists could disable networked emergency systems or hack into networks housing critical financial information. Cyber-attacks can take many forms. They can use computers, mobile phones, gaming systems and other devices, they can include fraud or identity theft, block access or delete personal documents and pictures, may target children, and may cause problems with business services, transportation, and power.[119] The table below outlines some key terms and definitions for this hazard of concern.

Table 6.14.1:Key terms and definitions for Cybersecurity

Key terms	Definition
Threat actor	Who is behind the event? This could be the external "bad guy" that launches a phishing campaign or an employee who leaves sensitive documents in their seat back pocket.
Threat action	What tactics (actions) were used to affect an asset? The seven primary categories of threat actions include: Malware, Hacking, Social, Misuse, Physical, Error and Environmental.
Incident	A security event that compromises the integrity, confidentiality or availability of an information asset.
Breach	An incident that results in the confirmed disclosure—not just potential exposure—of data to an unauthorized party. A Distributed Denial of Service (DDoS) attack, for instance, is most often an incident rather than a breach, since no data is exfiltrated. That doesn't make it any less serious.

Location

These attacks have no set geographic boundary and can occur anywhere, facilitated by the internet. Cybersecurity is an evolving, borderless challenge especially if there are vulnerabilities in software, unsecure or weak passwords, social engineering attacks, and unsecure internet connections.

Extent

The effect of a cyber-attack event can vary depending on the type of attack and the magnitude of the event or events. According to the Verizon Data Breach Investigations Report (DBIR), "There are four key paths leading cyber-attacks: Credentials, Phishing, Exploiting vulnerabilities, and Botnets. All four are pervasive in all areas of the DBIR, and no organization is safe without a plan to handle each of them."[120]

Historic Occurrences

There have been no historic occurrences or documented cyber-attacks within Austin County. According to the Verizon DBIR, the North American Region (comprised of the US and Canada) has experienced 9,036 cybersecurity incidents, 1,924 of those with confirmed data disclosure between November 1, 2021, through October 31, 2022. 85% of breaches were due to system intrusion, basic web application attacks and social engineering. Threat actors for these breaches included external (94%), internal (12%), multiple (9%), and partner (2%). Motives for these cyber-attacks were financial (99%), espionage (1%), and grudge (1%). Data comprised included credentials (67%), internal (50%), personal (38%), and other (24%).

Presidential Disaster Declarations

There have been no federally declared cyber-attack or cyber terrorism-related disaster declarations in Austin County since 1950.

USDA Disaster Declarations

Because cyber-attacks and cyber terrorism is a human-caused hazard, no USDA Disaster Declarations are associated with the hazard.

Probability of Future Occurrences

As cybercriminals become more sophisticated in the future, the county's vulnerability to cyber-attacks may change significantly. It is difficult to predict the probability of future occurrences due to the unpredictable nature of this hazard. Opportunistic criminals might also leverage natural disasters to target already vulnerable systems.

To decrease the number of future cybersecurity related attacks, FEMA suggests a variety of prevention methods that can be incorporated now, such as: keeping anti-virus software updated, using strong passwords. Changing passwords monthly, watching for suspicious activity, checking account statements and credit reports regularly, using secure internet communications, using a Virtual Private Network that creates a secure connection, using antivirus solutions (malware, and firewalls) to block threats., regularly back up files in an encrypted file or encrypted file storage device, limiting any personal information shared online, changing privacy settings, and protecting home networks.[121]

Populations at Risk

Everyone is equally at risk for this hazard. As the US becomes increasingly reliant on technology, the vulnerability to cyber threats will increases. A significant number of people fear data breaches as the outcomes result in disruptions to sectors like transportation and healthcare and include societal impacts like mistrust.

Climate Change Impacts

Because terrorism is a human-caused hazard, no climate change impacts are associated with the hazard.

Section 7: Mitigation Strategy

Section 7: MITIGATION STRATEGY

The planning process, hazard analysis, and vulnerability assessment serve as a foundation for a meaningful hazard mitigation strategy. The mitigation strategy provides an outline for how the county and the local jurisdictions aim to address and reduce the risks associated with the natural hazards identified in the HMP and reduce the potential impact on residents and structures. The mitigation strategy is divided into three sections the mission statement, goals and objectives, and the mitigation action plan. The mission statement provides the overall purpose of the mitigation strategy and the HMP. The goals and objectives provide milestones for how the county aims to meet this purpose. The mitigation action plan details specific mitigation actions, or projects, programs, and polices the county aims to meet these goals and objectives.

Mission Statement

The HMP aims to implement new policies, programs, and projects to reduce the risks and impacts associated with natural hazards, including public education and partnerships between local officials and residents.

Goals

1) Educate citizens regarding emergency situations related to hazards.
2) Develop publications and educational information on all hazards that is easily accessible to all within Austin County.
3) Promote the use of emergency notification systems and weather alerts for all hazards.
4) Decrease the risk to life and property from hazards through planning, preparation, and mitigation.
5) Develop policies and strategies to effectively manage and reduce risk.
6) Increase the resiliency of Austin County through projects and strategies that reduce the impacts of hazards.
7) Enhance coordination between local jurisdictions, county, state, and federal agencies.
8) Support the continuity of operations before, during, and after hazard events.
9) Incorporate hazard mitigation into community planning such as codes/ordinances, day-to-day operations, and projects.
10) Identify, protect, and assist socially vulnerable populations recovery from hazard impacts.

Objectives

- Eliminate the number of vulnerable structures in areas susceptible to repetitive flooding.
- Alert motorist with permanent postings at roadways where flooding or flash flooding, or dangerous road conditions due to winter weather are prevalent.
- Provide alternative power sources for critical facilities and infrastructure.

Mitigation Action Plan

The mitigation action plan explains the specific programs, policies, and projects that the county and the local jurisdictions aim to implement for the county to reach its HMAP objectives and goals. The mitigation action plan provides the details of each mitigation action including which local department will oversee implementing the actions, how the county or local jurisdiction plan to pay for these actions, and the estimated time for implementing these actions.

Each jurisdiction and the county submitted their mitigation actions based on their greatest vulnerabilities and needs. Each action was evaluated for feasibility using FEMA's BCA Analysis Toolkit. The actions are separated by jurisdiction and include the BCA score for each.

All Participating Jurisdictions Mitigation Actions

Jurisdiction:	Austin County and All Participating Jurisdictions	**Action Number:**	ALL1
Hazard(s) Addressed:	Flooding, Wildfire, Severe Thunderstorms & Lightning, Tornado/Microbursts, Erosion, Winter Weather, Drought & Expansive Soils, Windstorm, Hail, Hurricanes, Tropical Storms, & Tropical Depressions, Extreme Heat, Dam/Levee Failure, Emerging Infectious Diseases, Cybersecurity,		
Project Title:	Education and Mitigation Techniques		
Project Description:	Implement an outreach and education campaign to educate the public on mitigation techniques for all hazards to reduce loss of life and property		
Responsible Entity:	County Judge and City Manager's office or Mayor for each participating jurisdiction		
Losses avoided:	Preservation of property, decreased financial losses due to natural hazards, and mitigating the loss of human life and injuries		
Cost Estimate:	$7,000	**Timeframe:**	12-24 months
Potential Funding Sources:	Local budget and salary, HMPG	**Benefit-Cost Analysis:**	N/A
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	Austin County and All Participating Jurisdictions	**Action Number:**	ALL2
Hazard(s) Addressed:	Drought & Expansive Soils, Extreme Heat		
Project Title:	Ordinance Adoption		
Project Description:	All participating jurisdictions will develop an ordinance to require incorporating drought tolerant landscape design into all new county and city owned properties.		
Responsible Entity:	County Commissioners Court and City Councils of each participating jurisdiction		
Losses avoided:	Reduction in water needs during drought, and preserving much needed ground water for agricultural purposes throughout the county		
Cost Estimate:	$1000	**Timeframe:**	3 months
Potential Funding Sources:	Staff time and wages	**Benefit-Cost Analysis:**	N/A
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction Specific Mitigation Actions

Austin County

Jurisdiction:	Austin County	Action Number:	A1
Hazard(s) Addressed:	Severe Thunderstorm & Lighting Winter Weather Hurricanes, Tropical Storms & Tropical Depressions		
Project Title:	Court House Generator		
Project Description:	Power backup supplies for critical infrastructure, Court House and secondary EOC		
Responsible Entity:	Austin County		
Losses Avoided:	Customer service to population served, further damage during a disaster with power interruption		
Partners:	Local contractor, meeting bid processes		
Cost Estimate:	$255,116	Timeframe:	12 -24 months
Potential Funding Sources:	HMPG, General Funds, GLO, FEMA	**Benefit-Cost Analysis:**	1.27
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	Austin County	Action Number:	A2
Hazard(s) Addressed:	Flooding Erosion		
Project Title:	Hurtig Road repair and bridge installation		
Project Description:	Culvert replacement with bridge and roadway repair		
Responsible Entity:	Austin County		
Losses Avoided:	Access to multiple homes and property dead end roadway.		
Partners:	Local contractor, meeting bid processes		
Cost Estimate:	$2,500,000	Timeframe:	12-24 months
Potential Funding Sources:	HMPG, General Funds, GLO, FEMA	**Benefit-Cost Analysis:**	2.2
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			Yes

Jurisdiction:	Austin County	Action Number:	A3
Hazard(s) Addressed:	Flooding Erosion		
Project Title:	Peter San Felipe bridge abutment and shoulder repair (closed bridge)		
Project Description:	Abutment repair, shoulder and roadway repair		
Responsible Entity:	Austin County		
Losses Avoided:	Access to multiple homes and property dead end roadway.		
Partners:	Local contractor, meeting bid processes		
Cost Estimate:	$1,827,601	Timeframe:	12 -24 months
Potential Funding Sources:	HMPG, General Funds, GLO, FEMA	**Benefit-Cost Analysis:**	1.75
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			Yes

Bellville

Jurisdiction:	City of Bellville		Action Number:	B1
Hazard(s) Addressed:	Severe Thunderstorm & Lightning, Winter Weather, Windstorm, Extreme Heat, Hurricanes, Tropical Storms & Tropical Depressions			
Project Title:	Sewer Lift Stations throughout the City			
Project Description:	Install generators at each lift station			
Responsible Entity:	City of Bellville			
Losses Avoided:	Outflow of wastewater into creeks and on land			
Partners:	Local contractors			
Cost Estimate:	$517,988	Timeframe:	36 months	
Potential Funding Sources:	DHS, FPMS, BRIC, HMGP	**Benefit-Cost Analysis:**	1.45	
Is this action related to a critical facility or lifeline?				Yes
Does this action reduce the effects of hazards on existing buildings?				Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?				Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?				Yes

Brazos Country

Jurisdiction:	City of Brazos Country	Action Number:	BC1
Hazard(s) Addressed:	Flooding		
Project Title:	Public Information and Awareness		
Project Description:	Acquire signage for road closures and detours during flood events to inform citizens of flood dangers		
Responsible Entity:	City of Brazos Country, City Council		
Losses Avoided:	Protection of life and loss of property (vehicles)		
Partners:	None		
Cost Estimate:	$5,000	Timeframe:	12 months
Potential Funding Sources:	General Funds	**Benefit-Cost Analysis:**	N/A
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			No
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			No
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Brazos Country	Action Number:	BC2
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Wildfire, Severe Thunderstorms & Lightning, Tornado/Microbursts		
Project Title:	Public Information and Awareness		
Project Description:	Expand evacuation and alert system to accommodate population growth		
Responsible Entity:	City of Brazos Country, City Council		
Losses Avoided:	Loss of life and property through early and broad notification of weather and wildfire events		
Partners:	None		
Cost Estimate:	$3,000	Timeframe:	12 months
Potential Funding Sources:	General Funds	**Benefit-Cost Analysis:**	N/A
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			No
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			No
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Brazos Country	Action Number:	BC3
Hazard(s) Addressed:	Wildfire		
Project Title:	Emergency Services		
Project Description:	Improve water system to support wildfire fighting activities		
Responsible Entity:	City of Brazos Country, City Council		
Losses Avoided:	Loss of life and property		
Partners:	None		
Cost Estimate:	$200,000	Timeframe:	12-18 months
Potential Funding Sources:	Water revenues, FEMA-Fire Mgmt. Assistance Grants, FEMA-Emergency Mgmt. Performance Grants, FEMA-All Hazards Operational Planning	**Benefit-Cost Analysis:**	3.98
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Brazos Country		Action Number:	BC4
Hazard(s) Addressed:	Flooding			
Project Title:	Prevention			
Project Description:	Adopt and enforce floodplain ordinance regulating the elevation of structures in a floodplain			
Responsible Entity:	City of Brazos Country, City Council			
Losses Avoided:	Loss of property by requiring structures to be 24" above the Base Flood Elevation			
Partners:	None			
Cost Estimate:	$2,000	Timeframe:	12 months	
Potential Funding Sources:	General Funds	**Benefit-Cost Analysis:**	N/A	
Is this action related to a critical facility or lifeline?				Yes
Does this action reduce the effects of hazards on existing buildings?				No
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?				Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?				Yes

Industry

<table>
<tr><td>Jurisdiction:</td><td colspan="2">City of Industry</td><td>Action Number:</td><td>I1</td></tr>
<tr><td>Hazard(s) Addressed:</td><td colspan="4">Severe Thunderstorms & Lighting,
Flooding,
Winter Weather,
Hurricanes, Tropical Storms, & Tropical Depressions</td></tr>
<tr><td>Project Title:</td><td colspan="4">Industry Generator Project</td></tr>
<tr><td>Project Description:</td><td colspan="4">Place generators at City and Fireman's Halls for City EOC operations and shelters for backup power systems</td></tr>
<tr><td>Responsible Entity:</td><td colspan="4">City of Industry</td></tr>
<tr><td>Losses Avoided:</td><td colspan="4">Reduce power outages during natural, man-made, and local disasters</td></tr>
<tr><td>Partners:</td><td colspan="4">City of Industry and Local Contractors</td></tr>
<tr><td>Cost Estimate:</td><td>$130,000</td><td>Timeframe:</td><td colspan="2">12-18 months</td></tr>
<tr><td>Potential Funding Sources:</td><td>DHS, FPMS, BRIC, HMGP</td><td>Benefit-Cost Analysis:</td><td colspan="2">.02</td></tr>
<tr><td colspan="4">Is this action related to a critical facility or lifeline?</td><td>Yes</td></tr>
<tr><td colspan="4">Does this action reduce the effects of hazards on existing buildings?</td><td>Yes</td></tr>
<tr><td colspan="4">Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?</td><td>Yes</td></tr>
<tr><td colspan="4">Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?</td><td>No</td></tr>
</table>

San Felipe

Jurisdiction:	City of San Felipe		Action Number:	SF1
Hazard(s) Addressed:	Extreme Heat, Erosion, Drought & Expansive Soils			
Project Title:	Restoration Street Project			
Project Description:	Resurface streets, blade work, grading streets, drainage control, and base work for Sealy Road, Alvin Steet, Baron De Bastrop, and Guadalupe Street,			
Responsible Entity:	City of San Felipe			
Losses Avoided:	Flooding to local residents and business			
Partners:	Local Road Construction Agencies			
Cost Estimate:	$2,800,000	Timeframe:	36-48 months	
Potential Funding Sources:	FEMA, USACE, FPMS, BRIC, HMGP	**Benefit-Cost Analysis:**	.06	
Is this action related to a critical facility or lifeline?				Yes
Does this action reduce the effects of hazards on existing buildings?				Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?				Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?				Yes

Sealy

Jurisdiction:	City of Sealy	Action Number:	S1
Hazard(s) Addressed:	Flooding, Erosion		
Project Title:	B&PW Park Detention Basin and Storm Sewer Improvements		
Project Description:	Expand existing B&PW detention basin and construct storm sewer improvements		
Responsible Entity:	City of Sealy		
Losses Avoided:	Avoid repetitive flooding of neighborhood during extreme rainfall events		
Partners:	None		
Cost Estimate:	$4,734,545	Timeframe:	12-18 months
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	.60
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Sealy	Action Number:	S2
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Erosion		
Project Title:	Sealy ISD Junior High Storm Sewer Detention Basin		
Project Description:	Construct Detention basin and storm sewer pipe to convey flood waters away from Sealy Junior High School. Implement a new 3.6-acre-foot stormwater detention basin and construct 1500 linear feet of 48" diameter storm sewer improvements to help relieve flooding at Sealy ISD Junior High Facility		
Responsible Entity:	City of Sealy		
Losses Avoided:	Mitigate Structure Damage and property damage to Sealy Junior High School		
Partners:	None		
Cost Estimate:	$892,264	Timeframe:	12-18 months
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	3.78
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Sealy	Action Number:	S3
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Erosion		
Project Title:	Generator for FM 3538 Regional Lift Station		
Project Description:	Install emergency power generator and automatic transfer switch		
Responsible Entity:	City of Sealy		
Losses Avoided:	Installing emergency power generator will protect residents and environment from sanitary sewer overflows during power outages		
Partners:	None		
Cost Estimate:	$109,221	Timeframe:	12 months
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	0.25
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Sealy			Action Number:	S4
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Severe Thunderstorms & Lightning, Extreme Heat, Winter Weather, Tornado/Microbursts, Windstorm, Cybersecurity				
Project Title:	Emergency Generator Columbus Rd FM-1094 lift station				
Project Description:	Install emergency power generator and automatic transfer switch for Columbus Rd FM-1094 lift station				
Responsible Entity:	City of Sealy				
Losses Avoided:	Installing emergency power generator will protect residents and environment from sanitary sewer overflows during power outages				
Partners:	None				
Cost Estimate:	$109,221	Timeframe:	12 months		
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	0.37		
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					No

Jurisdiction:	City of Sealy			Action Number:	S5
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Severe Thunderstorms & Lightning, Extreme Heat, Winter Weather, Tornado/Microbursts, Windstorm, Cybersecurity				
Project Title:	Generator for Michalke Rd Lift Station				
Project Description:	Install emergency power generator and automatic transfer switch for Michlake Rd. lift station				
Responsible Entity:	City of Sealy				
Losses Avoided:	Installing emergency power generator will protect residents and environment from sanitary sewer overflows during power outages				
Partners:	None				
Cost Estimate:	$109,221	Timeframe:	12 months		
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	0.33		
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					No

Jurisdiction:	City of Sealy	Action Number:	S6
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Severe Thunderstorms & Lightning, Extreme Heat, Winter Weather, Tornado/Microbursts, Windstorm, Cybersecurity		
Project Title:	Generator for Briarwood Estates Lift Station		
Project Description:	Install emergency power generator and automatic transfer switch for Briarwood Estates Lift Station		
Responsible Entity:	City of Sealy		
Losses Avoided:	Installing emergency power generator will protect residents and environment from sanitary sewer overflows during power outages		
Partners:	None		
Cost Estimate:	$130,461	Timeframe:	12 months
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	1.36
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Jurisdiction:	City of Sealy	Action Number:	S7
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Severe Thunderstorms & Lightning, Extreme Heat, Winter Weather, Tornado/Microbursts, Windstorm, Cybersecurity		
Project Title:	Generator for Water Plant- Ward Bend		
Project Description:	Installation of Emergency Power Generator for Ward Bend Water Plant. Ward Bend WP is the main SCADA HUB and provides pressure control for the entire City of Sealy water infrastructure. During power outages the SCADA system is unable to utilize master control of the City's water system and overall pressure is not able to be maintained throughout the distribution system. Install a 250k on-site permanent generator with automatic transfer switch. Generator will provide constant control and communication to remote sites including water towers and other water plants.		
Responsible Entity:	City of Sealy		
Losses Avoided:	Elimination of localized power outages and rolling blackouts that have been increased with climate change		
Partners:	None		
Cost Estimate:	$303,774	Timeframe:	12 months
Potential Funding Sources:	HMGP	**Benefit-Cost Analysis:**	1.64
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

South Frydek

No Action Items

Wallis

Jurisdiction:	City of Wallis			Action Number:	W1
Hazard(s) Addressed:	Drought & Expansive Soils				
Project Title:	Water Main Infrastructure				
Project Description:	Replace water main				
Responsible Entity:	City of Wallis, City Council				
Losses Avoided:	Water and Sewage disruption to a population 1,292 people				
Partners:	None				
Cost Estimate:	$2,000,000	Timeframe:	36-48 months		
Potential Funding Sources:	TWDB, BRIC, HMGP	**Benefit-Cost Analysis:**	73.16		
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					No

Jurisdiction:	City of Wallis			Action Number:	W2
Hazard(s) Addressed:	Flooding				
Project Title:	Wastewater System				
Project Description:	Prevent infiltration into the wastewater treatment plant.				
Responsible Entity:	City of Wallis, City Council				
Losses Avoided:	The impact of flooding on residents of Wallis includes threats to public health and safety from the floodwater itself, damage to residential and commercial properties				
Partners:	None				
Cost Estimate:	$3,000,000	Timeframe:	36-48 months		
Potential Funding Sources:	GLO, TWDB, HMGP, USDA	**Benefit-Cost Analysis:**	1.32		
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					Yes

Jurisdiction:	City of Wallis			Action Number:	W3
Hazard(s) Addressed:	Flooding, Hurricanes, Tropical Storms, & Tropical Depressions, Severe Thunderstorms & Lightning,				
Project Title:	Storm Drainage				
Project Description:	Improving drainage conditions preventing private and public flooding				
Responsible Entity:	City of Wallis, City Council				
Losses Avoided:	Replacement costs of flooding events replacing real property damage				
Partners:	None				
Cost Estimate:	$2,750,000	Timeframe:	36-48 months		
Potential Funding Sources:	GLO, TWDB, HMGP	**Benefit-Cost Analysis:**			
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					Yes

Jurisdiction:	City of Wallis	Action Number:	W4
Hazard(s) Addressed:	Hurricanes, Tropical Storms, & Tropical Depressions, Severe Thunderstorms & Lightning,		
Project Title:	Police Department Generator		
Project Description:	Prevention of power loss to critical facilities		
Responsible Entity:	City of Wallis, City Council		
Losses Avoided:	Failure of communications and first responder resources during disasters		
Partners:	None		
Cost Estimate:	$2,750,000	Timeframe:	12-24 months
Potential Funding Sources:	GLO, HMGP	**Benefit-Cost Analysis:**	1.2
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Bellville ISD

Jurisdiction:	Bellville Independent School District			Action Number:	BISD1
Hazard(s) Addressed:	Drought & Expansive Soils, Erosion, Extreme Heat				
Project Title:	Bus Transportation Maintenance Facility Roadway				
Project Description:	Replace gravel and convert to concrete reducing erosion and expansive soil problems				
Responsible Entity:	Bellville Independent School District				
Losses Avoided:	Will alleviate wear on school buses which cost upwards of 140,000 annually. Additionally, the renovation would allow continued support during disasters and mobile capabilities during critical events meeting normal and MOU applications improving hazard mitigation.				
Partners:	None				
Cost Estimate:	$2,000,000	Timeframe:	36-48 months		
Potential Funding Sources:	Community Bond, DHS, FPMS, BRIC, HMGP	**Benefit-Cost Analysis:**	0.51		
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					No
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					No
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					No

Jurisdiction:	City of Wallis			Action Number:	BISD2
Hazard(s) Addressed:	Severe Thunderstorms & Lightning, Tornado/Microbursts, Winter Weather				
Project Title:	High School Generator				
Project Description:	Provide backup power source for normal and disaster operations				
Responsible Entity:	Bellville Independent School District				
Losses Avoided:	Annual and quarterly power interruption can cost up to but not limited to $10,000 per event. Additionally, power outages during certain times of the year can cause unexpected school disruption and transportation problems due to activities already scheduled, which also affects outside participants. Furthermore, MOUs have been established to provide temporary shelter and transport during a disaster, which further increases mitigation problems.				
Partners:	None				
Cost Estimate:	$650,000	Timeframe:	36-48 months		
Potential Funding Sources:	Community Bond, DHS, FPMS, BRIC, HMGP	**Benefit-Cost Analysis:**	1.80		
Is this action related to a critical facility or lifeline?					Yes
Does this action reduce the effects of hazards on existing buildings?					Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?					Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?					No

Brazos ISD

No Action Items

Sealy ISD

Jurisdiction:	Sealy Independent School District	Action Number:	SISD1
Hazard(s) Addressed:	Cybersecurity		
Project Title:	Cyber Attack Prevention and Recovery		
Project Description:	Replace and remove damaged confirmed infrastructure dealing with confidential data systems		
Responsible Entity:	Sealy Independent School District		
Losses Avoided:	Student and Staff data		
Partners:	None		
Cost Estimate:	$3,500,000	Timeframe:	6-24 months
Potential Funding Sources:	DHS, TEA, HMGP	**Benefit-Cost Analysis:**	1.46
Is this action related to a critical facility or lifeline?			Yes
Does this action reduce the effects of hazards on existing buildings?			Yes
Does this action reduce the effects of hazards for new buildings, infrastructure, or future development?			Yes
Does the action identify, analyze, and prioritize actions related to continued compliance with the NFIP?			No

Section 8: Plan Maintenance

Section 8: PLAN MAINTENANCE

To remain an effective tool, the HMP will undergo continuous review and updates. This practice is known as plan maintenance and requires monitoring, evaluating, updating, and implementing the entirety of the written plan and planning process. To accomplish this, a Plan Maintenance Team (PMT) has been determined and is comprised of representatives from each of the county's participating jurisdictions. The Plan Maintenance Team Leader shall be the Austin County Emergency Management Coordinator.

Table 8.1.1: Plan Maintenance Team

Jurisdiction	Responsible Entity
Austin County	Austin County OEM and County Judge
City of Bellville	Emergency Management Coordinator, City Manager
Bellville ISD	Executive Director of Administration
City of Brazos Country	Mayor, City Manager
Brazos ISD	Chief Operations Officer
City of Industry	Mayor
Town of San Felipe	Mayor
City of Sealy	Mayor
Sealy ISD	Executive Director of Human Resources & Operations
City of South Frydek	Mayor
City of Wallis	Mayor

Public Involvement

Continued stakeholder and public involvement will remain a vital component of the HMP. The HMP will be hosted on the County and H-GAC websites, and public input can be submitted at any time. The PMT Leader is responsible for documenting public feedback and presenting the comments for discussion at each annual Plan Maintenance Meeting.

The PMT Leader will also conduct outreach and invite the public to annual Plan Maintenance meetings. The PMT Leader will notify the public of all annual meetings through by posting online and printed copies of the meeting agenda and posting fliers at city and county buildings 30 days prior to the meetings.
In addition, each participating jurisdiction will seek input from the public on the status of existing hazards, emerging vulnerabilities, and evaluate the HMP's strategy with the public. During each meeting, the PMT will provide an open comment forum for interactive discussion with the public. The development of new goals and strategies will be a joint effort between the PMT Leader, PMT, and public participants.

Procedures & Schedule

Procedures to monitor and evaluate the HMP were determined during the December 18th meeting. This ensures that the goals, objectives, and the mitigation strategy are regularly examined for feasibility, and that the HMP remains a relevant and adaptive tool. The PMT will meet annually and hold its first meeting within one year after the plan's approval date. An additional mid-year meeting will be held 18 months prior to the plan's expiration to develop a timeline and strategy to update the HMP.
Any new mitigation actions, strategies, or required studies, suggestions for improvements or changes to the entire written plan or planning process will be submitted to the County's representative. The representative will evaluate the items for compliance with TDEM and FEMA regulations before leading

the process to adopt or approve the new items or suggestions. Recommended changes, updates, and revisions will be implemented based on available funding to support revisions, and updates and will be assigned to appropriate officials with pre-determined timelines for completion. Updates to the HMP will then be adopted by the appropriate governing body.

Table 8.1.2: Plan Maintenance: Evaluation & Monitoring Procedures

Method and Procedures	Schedule	Responsible Entity
The PMT Leader will advertise all annual meetings in local newspapers, post invitations on the County social media pages, and post fliers at city and county buildings 30 days prior to the meetings.	30 days prior to annual meetings	PMT Leader
The PMT Leader is responsible for evaluating the entire plan prior to the meeting. Each PMT member will be asked to identify and discuss any deficiencies in the plan as it relates to their jurisdiction. Each PMT member will discuss their findings followed by public input and comments.	Annually	PMT Leader, PMT member for each participating jurisdiction, and Public
Emerging hazards, risks, and vulnerabilities will be identified and discussed. 1) PMT members are responsible for monitoring each natural hazard in their jurisdiction and providing a written and/or verbal update on any new occurrences and emerging risks. 2) The PMT Leader will seek input from participants and the public at the annual meetings by opening the meeting for public comment. 3) Newly identified hazards, risks, and vulnerabilities will be assigned to a PMT member to research and monitor.	Annually	Public and all participating jurisdictions
The PMT will evaluate the mitigation goals and objectives to ensure the HMP remains relevant, and the strategy continues to be effective. 1) PMT members will identify new projects and/or re-prioritize existing strategies based on changes in their jurisdiction, emerging hazards, and shifting priorities. 2) Mitigation strategies for the newly identified hazards, risks, and vulnerabilities will be proposed and discussed. 3) Funding sources and multijurisdictional cooperation for new initiatives will be determined.	Annually	PMT member for each participating jurisdiction
Each participating jurisdiction will evaluate their progress implementing the HMP and suggested improvements to the entire current written plan, public participation and planning process. 1) Representatives will publicly discuss progress and submit written progress reports to the team leader. 2) Completed and ongoing mitigation actions will be discussed by responsible entity. 3) Unaddressed mitigation actions will be evaluated for relevancy and/or amended to increase feasibility. 4) Feasibility of the mitigation strategy will be evaluated, and any necessary revisions will be proposed. 5) The team leader and each representative will report on all suggestions received throughout the past year on the	Annually	PMT, the responsible department identified in the mitigation action up for discussion, and the public.

planning process and the entire written plan and discuss how to incorporate these suggestions into current and future planning efforts.		
The PMT will develop a timeline and strategy to update the plan 12 months before it expires. The update strategy will include: 1) Identify entities responsible for drafting and submitting the update to TDEM. 2) Send appropriate representatives to G-318 training. 3) Determine funding needs and funding sources for plan update. 4) Review the entirety of the plan; discuss hazards, vulnerabilities and impacts identified in the plan and what to include/ revise in the update	12-18 months prior to HMP expiration	PMT Leader and PMT

Plan Integration

Integrating the HMP into county and local planning mechanisms is key to its success. Effective integration allows communities to benefit from existing plans and procedures to further reduce their vulnerability and risk. Upon approval of the plan and approval of updates or revisions as proposed by the PMT, each participating jurisdiction will follow the pre-determined actions:

To update and revise existing planning mechanisms to further integrate the HMP, each participating jurisdiction will follow a basic process(es) described in this section.

1.) Propose a policy, strategy, or regulatory amendment to the proper governing body.
2.) Advertise the amendment 15 days prior to meeting where it will be discussed. Advertising procedures for the public meeting(s) is outlined in the public involvement measures described in Section 8 of this plan.
3.) Provide the public, elected officials, and governing bodies the opportunity to discuss and comment upon proposed change(s).
4.) If the proposal is accepted, the change is implemented by the appropriate governing authority.

Several existing plans and programs that require integration of the HMP have been identified by the participating jurisdictions. The PMT will initiate the process described above. As each participating jurisdiction develops or approves new planning mechanisms, the mechanism's name and the integration method will be added to the HMP.

Table 8.1.3: Adoption and Integration Procedures

Participating Jurisdiction	Adoption and Integration Procedures
Austin County	HMP and plan amendments will be presented to the Commissioner's Court by the Austin County Emergency Management Office. An agenda for the meeting will be posted 30 days in advance, and a 30-day period of public comment will be provided. Upon approval by Commissioner's Court, the approved HMP will be integrated into existing planning mechanisms described in Table 8.1.2.
City of Bellville	The Bellville PMT representative will draft a proposal for incorporating the HMP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Council for consideration. Bellville will advertise the amendment no less than 14 days before the meeting where it will be discussed.
Bellville ISD	The Bellville ISD PMT representative will draft a proposal for incorporating the HMP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the Board for approval.
City of Brazos Country	The Brazos Country PMT representative will select mitigation actions to be budgeted into the City's annual budget to be implemented the following year and then present these actions to the Board for approval
Brazos ISD	The Brazos ISD PMT representative will draft a proposal for incorporating the HMP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the Board for approval.
City of San Felipe	San Felipe's PMT representative will draft a proposal for incorporating the HMP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Council for approval.
City of Sealy	The Sealy PMT representative will draft a proposal for incorporating the HMP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Council for consideration. Sealy will advertise the amendment no less than 14 days before the meeting where it will be discussed. If approved, the PMT representative will work with the City Manager to implement the proposal.
Sealy ISD	The Sealy ISD PMT representative will draft a proposal for incorporating the HMP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the Board for approval.
City of Wallis	The Wallis PMT representative will select mitigation actions to be budgeted into the City's annual budget to be implemented the following year. The proposal will be presented before City Council. An agenda will be published 14 days in advance.

Table 8.1.4: Integration of HMP and Planning Mechanisms

Plan Name	Integration Methods
Disaster Recovery Plan	Both plans should be updated and maintained in accordance with the other plan’s goals and strategies. The HMP will be consulted before any revisions or update to the disaster recovery plans are made.
Floodplain Management Plan	Austin County's floodplain regulations provide preventative measures to prevent future development in the floodplains, and it also provides corrective guidance on development in the floodplain. When the regulations are updated, it will be reflected the mitigation action strategy for flooding in Section 6.1 of this plan.
Emergency Operations Plan	Both plans will be continuously evaluated and monitored. Any Emergency Operations Plan updates will refer to, incorporate, and/or complement the HMP.
Subdivision/Zoning Ordinance	All participating jurisdictions will review their codes and propose the adoption of codes that support mitigation activities defined in the HMP when appropriate.
Planning & Development Regulations	Each participating jurisdiction has reviewed the vulnerabilities defined in the HMP and will adopt codes that support mitigation strategy and mitigation activities. PMT members will propose code amendments to the appropriate governing body, following to process to amend codes in the jurisdiction, and document any regulation amendments to be included in the HMP update.
Annual Budget	Austin County and each participating jurisdiction will review their annual budget each year for opportunities to fund their highest priority mitigation actions.
Flood Damage Prevention Ordinance	When the plan is updated or revised, the PMT will propose the adoption of codes that support mitigation strategy and mitigation activities.
Capital Improvements Plan	Jurisdictions will review their capital improvements plan for projects that can also serve as natural hazard mitigation infrastructure. The CIP will be updated with project schedules and policies that support the implementation of each jurisdiction's highest priority projects.

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